ABSTRACT

LAYTON, ROBBIE DALE. What Really Matters? The Role of Environmental Characteristics of Nearby Greenspace in Opinions of Park System Adequacy and Predicting Visits to Parks. (Under the direction of Gene Bressler and Art Rice).

While the provision of parks and other public greenspace environments has long been considered important in America and elsewhere, a body of empirical evidence to support this assumption has only begun to emerge within the past few decades. Gaps remain in the evidence base for determining what kind of greenspace to provide, how much to provide, where to provide it, and other decisions that must be made to assure that beneficial outcomes occur. As a result, such determinations typically rely upon normative standards and deliberative processes--asking people what they want or think they need--rather than on empirical evidence. Consequently, public perceptions play a large role in the way that greenspace is allocated within a community.

An assumption of this cross-sectional study was that managing those characteristics of greenspace most related to public perceptions of greenspace adequacy will yield the best results in terms of public support for and satisfaction with greenspace systems. The role of greenspace characteristics in stimulating use of parks was investigated as well, based on the assumption that greenspace use, satisfaction, and outcomes are interrelated with one another.

The Ecological Model of Behavior and Affordance Theory provided the study theoretical framework. Study participants were selected at random from the adult populations of each of four communities in the U.S. and aggregated to form a single dataset of 1,816 participants reflecting a range of socio-economic characteristics. Data from questionnaires reporting (a) participants' opinions about how well needs are met in their community, and (b) the frequency of visits to parks were correlated with characteristics of the greenspace system

around each participant's home derived through GIS. Multiple regression models were used to test relationships while controlling for respondent characteristics.

Results indicate that characteristics of the greenspace environment within close proximity (0.333 miles) of an individual's home are not reliable predictors of either opinion of overall greenspace adequacy in the community or the number of park visits. However, characteristics of the participant, including age and gender, relative importance assigned to parks, and community they lived in were found to be reliable predictors. Findings aligned with research in the literature indicating that perceptions of greenspace do not align with objective measures. This suggests that matching greenspace allocation with neighborhood demographics may be more reliable allocation strategies than those based on normative standards or perceived needs. The results also suggest that subjective variables, such as greenspace quality, design, and aesthetics, may play a stronger role than objective variables, such as quantity of greenspace and distance from home, in predicting behavioral outcomes associated with greenspace. Future research should seek to isolate and measure subjective characteristics of greenspace and test their relationship with greenspace or park use.

What Really Matters? The Role of Environmental Characteristics of Nearby Greenspace in Opinions of Park System Adequacy and Predicting Visits to Parks

by
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DEDICATION

This dissertation is dedicated first and foremost to Professor Gene Bressler--the person singly most responsible for making it happen. Without his encouragement, inspiration, and guidance, I would never have undertaken, let alone completed this effort. Secondly, this is dedicated to the faculty and staff at NCSU as well as all of the good people of the State of North Carolina, who provided the institutional system and financial support that made this possible. Last, but not least, it is dedicated to all of the thinkers and doers upon whose shoulders any fragments of new knowledge that might be found herein were built.

BIOGRAPHY

Robbie Layton is certified by the Council of Landscape Architectural Registration Boards (CLARB) as a Professional Landscape Architect (PLA) and holds registrations in multiple states. He was inducted to the American Society of Landscape Architects (ASLA) Council of Fellows in 2010. He is also a member of the National Recreation and Parks Association (NRPA) and is a Certified Park and Recreation Professional (CPRP).

After completing his BLA degree from Texas Tech University, Robbie was employed by the U.S National Forest Service, then worked for a private firm prior to helping found Design Concepts, CLA, Inc., where he is a senior principal. The nationally recognized, award-winning landscape architecture and planning firm is celebrating its 35th anniversary in 2016.

During the course of his career he has overseen a wide range of projects, from small-scale site designs to regional and statewide comprehensive master plans. His efforts over the past three decades have focused on the landscape of the public realm at all scales; and the research presented here is a culmination of the interests, insights, and inquiries ignited by that work and by his experiences in the classroom as both a student and an instructor. He received his MLA degree from the University of Colorado, Denver, and has taught studio and lecture courses at both the undergraduate and graduate levels for the past 18 years. He has also presented at conferences across the USA and has written articles on a variety of topics for trade journals and peer-reviewed publications. Robbie has served on the Roster of Visiting Evaluators for the Landscape Architecture Accreditation Board since 2005.

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I am grateful to all of the faculty members in the Landscape Architecture program at NCSU, who welcomed me into their fold and provided so much encouragement. I was fortunate to share the classroom with great teachers like Carla Delcambre and Kofi Boone, who inspired me with their scholarship, professionalism, and humanity. I also appreciate the unofficial "second home" offered to me by Myron Floyd, Michael Edwards, Jason Bocarro, and others in the Department of Parks, Recreation and Tourism Management at NCSU. That connection was crucial to the development and ultimate success of this work. I am particularly indebted to Luis Suau for his guidance on statistical procedures.

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CHAPTER 1: INTRODUCTION

Among the democratic ideals to emerge from the American experience in the United States' first century as a sovereign nation was the concept of urban park systems. Spawned in response to deteriorating living conditions in industrializing cities, parks were conceived as an antidote to congestion, pollution, and other urban ills (e.g., Cohen et al., 2012; Cranz & Boland, 2004; Crompton, 2007). The idea of providing urban parks to improve the health and "moral fiber" of citizens took root in American cities and spread to other settlements, large and small, throughout the world (Ibid.). By the end of the 19th century, government-run systems made up of parks, greenways, open space, and other elements were common in many municipalities (Retzlaff, 2010). These systems serve as public infrastructure, much like streets, sanitary sewers, and other utilities.

In the literature, the term "parks" is used to refer to both the parts of a system and the system as a whole. One may refer to the "park system" as made up of a number of "parks," but those may include greenways, nature preserves, and other types of sites. This is true in scholarly literature as well as common usage. Seeking greater clarity, this document will use the term "public greenspace" or simply "greenspace" to refer to the elements that make up a park system as well the system itself, and reserve the use of "park" to refer to a specific type of element within a greenspace system. However, quotations from the literature may be included that do not follow this convention.

Since the parks movement began, it has been intuitively recognized that greenspace provides benefits to public health and welfare, but until recently empirical evidence to

support this assumption was lacking (Cohen et al., 2012). Research within the past few decades has demonstrated that the benefits are real, suggesting that they should be made available to everyone fairly and equitably as a matter of environmental justice. However, due in part to the historic lack of an evidence base for decision-making, the procedures by which greenspace is allocated have been as much political as rational (Crompton, 2000). Recent research indicates that access to greenspace is not equitably distributed in many places (Boone et al., 2009; Smale & McLauren, 2005; Smith & Floyd, 2013), raising a need to better understand the forces at play in the decision process for greenspace planning. As with many things political, public opinion plays a large role in the decision process, but little research has focused on how such opinions come to be formed--i.e., factors that associated with opinions about the greenspace system in the human mind. A better understanding of the relationship between the characteristics of greenspace and how constituents judge it could lead to better and more equitable decisions about where and how to provide greenspace. Beyond the invert behavior of judging greenspace, understanding which factors affect overt behavioral outcomes--i.e., visits to parks--could lead to a better return on the public resources invested in the provision of greenspace. More frequent visits, longer stays, and increased engagement of visitors with greenspace are examples of how this might occur.

1.1 Greenspace as a Matter of Public Policy

In the literature, “greenspace” may refer to lands that range across a spectrum from completely private to completely public (e.g., Barbosa et al., 2007; Bates & Santerre, 2001; Kellett & Rofe, 2009). This study concerned public greenspace, i.e., parcels of land that are held or managed by a public agency for purposes of relaxation, pleasure, and other activities

beyond those associated with the basic needs of producing food, clothing and shelter. This study also focused on greenspace that is within or adjacent to an urban area--as defined by the U.S. Census Bureau (Census.gov, 2016)--as opposed to rural. (Thus, it does not include national and state parks and other greenspace areas that are in wilderness areas or remote locations.) In the U.S., public greenspace may be held at the federal, state, or local level. The rights and responsibilities of public agencies as landowners and managers of greenspace emanate from the U.S. Constitution, which states: "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people" (U.S. Const. amend. X). It allows entities down to the state and local level to pass taxes and make laws for the health, safety and welfare of citizens, sometimes referred to as the "police power" (Moiseichik, 2010, p. 19).

While places for the enjoyment of the outdoors have been a part of the built environment for several thousand years, the typical neighborhood parks, greenways, and other greenspace features that we associate with cities and suburbs today are a relatively recent phenomenon, arising as a function of government policy within approximately the past 150 years (Lagasse & Cook, 1965; Stanley et. al., 2012). The emergence of government-designated parks for the general public coincides with the rise of a middle class with time for leisure and a desire to escape the industrializing cities where the middle class lifestyle was prevalent (Giles-Corti et al., 2005). While early advocates saw the potential for parks to return economic as well as health benefits to the community (Rogers, 2009), greenspace became common in North American and European cities in the 19th century primarily through reformist movements aimed at treating the poor physical health and "moral

degradation" brought about by living conditions in rapidly growing industrial cities (Giles-Corti et al., 2005). Garvin and Berens (1997) add that during this time Americans recognized that investments in public parks stimulated expansive private investment, changed residential settlement, encouraged social interaction, and deeply affected the social fabric of the community. As a result, parks, trails and other greenspace features became policy elements that cities and states use to meet their responsibility to promote the health, safety, and welfare of their residents (Crompton, 2010). This is accomplished primarily through municipal or state planning and laws, but also from the initiative of institutions such as churches, schools, and corporations across a range of public, semi-public and private settings (Stanley et al., 2012). The sustained provision of greenspace as communities evolve and grow over time is dependent upon the decision process by which it is allocated.

1.2 Problem Statement

1.2.1 Allocation of greenspace.

At the local level the responsibility for providing greenspace often falls to municipal or county parks and recreation agencies and/or districts (Moiseichik, 2010). These agencies typically make decisions about the allocation of greenspace through a strategic planning process (Burtz, 2010). The strategic plan includes plans for managing the agency, as well as its programs and physical resources, including greenspace. The physical resource planning process commonly used is a standardized one, as outlined by Rasmussen (2010, Exhibit 11.3 on p. 219), that has been in use since the mid-1900s. It relies upon both the application of formal standards and response to public input. During the mid-20th century, much of the decision process for allocation fell to administrators who were guided by sets of standards

(Kellett & Rofe, 2009). However, over the past several decades the emphasis has shifted to direct citizen involvement to identify needs and respond to public desires (Crompton, 1999; Roberts, 2004). Crompton (1999) states that since this change in philosophy was introduced to the field of parks and recreation in 1991, the focus has shifted from "meritorious outcomes" to "a more narrow notion that such services are provided because particular segments of the population want them" (p. 1). According to Crompton, "user groups have been the dominant focus of agencies' efforts in recent years" (p. 1). Springgate (2008) added that "without a commonly understood and accepted definition of a park and the system in which it operates, these groups are often able to easily influence planning outcomes" (p. 13). As a result, importance has been placed on user satisfaction, but it is Crompton's view that this reduces overall support for parks and recreation because it does not address the need for broader community support that is necessary to fund greenspace. Community support is largely a function of opinions held by citizens who vote and participate in public process. As Crompton said, "to residents, perceptions are reality" (p. 4). Therefore, the opinions of residents are important. (As used here, "opinion" refers to the view that is held about something, based on belief or judgment. Investigating how such judgments are related to characteristics of greenspace are the aim of this study.) Crompton said that elected officials need to be convinced that the benefits of greenspace extend beyond on-site users to the greater community and that greenspace delivers collective benefits to the public. Citizen surveys that ask constituents to make judgments and express opinions about the greenspace in their community are an important source of information relied upon by elected officials in making such determinations.

1.2.2 Public opinion.

The shift to greater reliance on public involvement in the decision process has increased the importance of the opinions that citizens have about their greenspace system. Support or nonsupport for a greenspace system may be related to whether or not residents believe it is adequately serving the needs that it is intended to address. Such beliefs are based upon cognitive judgments made in the minds of residents and expressed through the public process. Empirical research now demonstrates that the outcomes of the decision process (i.e., the physical presence and attributes of greenspace in the community) have consequences that affect the health and well-being of all residents (Bedimo-Rung, 2005; Boone et al., 2009; Smith & Floyd, 2013). Therefore, determining what the factors are that affect the opinions citizens form about the greenspace system in their community is important. Unfortunately, research relating specific attributes of greenspace to the opinions of citizens is limited. In particular, evidence for the relationship between the size, quantity, and location of greenspace features and citizen opinions about the adequacy of greenspace is lacking, although there have been studies that relate peripherally to such questions. For example, Siderelis and Moore (1998) found that the inclusion of 20 site quality attributes improved their model's predictive power when examining which lakes individuals would chose to recreate at.

However, perceptions of greenspace within the community do not always correlate with objective measures (Ding et al., 2011; Lackey & Kaczynski, 2009). Spotts & Stynes (1984) investigated public awareness and knowledge of urban parks, looking at how familiar people were with parks in relation to (a) distances between residences and parks; (b) personal

characteristics such as race, age, and participation behaviors in park activities; and (c) park characteristics, such as size of the park, age of the park, degree of development, and proportion of acreage in active versus passive uses. They found that residents tended to be ill-informed about urban recreation opportunities, but identified three variables that were powerful predictors of awareness levels for parks: (a) distance to the park, (b) age of the park, and (c) degree of development of the park. Size of the park and the percentage of acreage in active versus passive uses were less powerful predictors. Adding weight to the suggestion that awareness of greenspace is low or flawed at best, Dunstan et al. (2005), using a tool they developed to assess the condition of the physical environment in examining associations between the physical characteristics of a neighborhood and the well-being of people who live there, found that associations between external assessments of the environment and individual views on greenspace were unreliable, leading them to question whether the need for greenspace has been overstated. Nonetheless, they suggest that the response of residents could be based on a wider area than that used in their study and suggest that a "future study could attempt to elucidate some of these issues" (p. 302). It should be noted that whether they accurately match objectively measured characteristics of greenspace, perceptions are as important, and perhaps more important than objective measures because "people make their decisions based on their perceptions" (Bai et al., 2013, p. S40). It is conceivable to me that perceived characteristics of the local greenspace system have more to do with the opinions that individuals form than do the objective ones.

Seeing greenspace as an integral part of people's everyday social-environmental relationships and not just as places for nature-based retreats, Dinnie et al. (2013) called for

more research on the social qualities of greenspace, to explore "the social and institutional practices through which everyday engagements with urban greenspace take place, and how those practices are linked (or not) to feelings of well-being" (p. 2). Assuming that satisfaction with one's surroundings is linked to well-being, neighborhood attachment--defined as "a social-psychological process that capture's one's emotional connection to his or her social and physical surroundings" (Comstock et al., 2010, p 435)--could be an important aspect of social-environmental relationships. According to Hoffmann et al. (2012), the *number of nearby urban greenspaces* is one of the best predictors of neighborhood attachment, which in turn is an important indicator of residential satisfaction. However, when Ellis et al. (2006) considered *park quality* in their investigation of variables affecting neighborhood satisfaction, they excluded it from the final analysis due to low factor loading.

Beyond the characteristics of greenspace, personal characteristics of the individual are also important factors in how someone perceives their environment. Payne et al. (2002) looked at the relationship between age, race, and residential location with respect to perceived need for more park land, desired function of that park land, preferences for style of recreation, and level of existing visitation to local parks. They found that age was the strongest predictor of support/nonsupport for additional park land, while race had the strongest influence on the preference for type of recreation activity. Another recent study highlights the importance of race in perception of greenspace value, as well as the association of higher quality parks with more support for increased access to parks (Smiley et al., 2015). However, Payne et al. (2002) suggest that while age, race, and residential location are salient issues in explaining preferences, "other factors may play a stronger role in shaping park and

recreation preferences" (192), one possible example being that of interracial contact rather than race itself. Park characteristics may also be among those other factors. However, studies that examine perceptions of park quality aspects among the general population are limited (Bai et al., 2013). Also limited are studies that examine the relationship between characteristics of the greenspace system in a person's community and their perception of that system. In reviewing the literature for this dissertation, no studies were found that examined the effects of the specific attributes of parks examined in this study on an individual's opinion of the adequacy of the overall greenspace system in their community. This identifies a gap that should be addressed by researchers to increase the knowledge basis upon which decisions about greenspace allocation are made. As research continues to define and clarify the relationship between the physical characteristics of greenspace and the *objective* needs of people, it should also attempt to clarify the relationship between the physical characteristics of greenspace and *subjective* perceptions, such as perceived adequacy and quality, which influence the provision of greenspace.

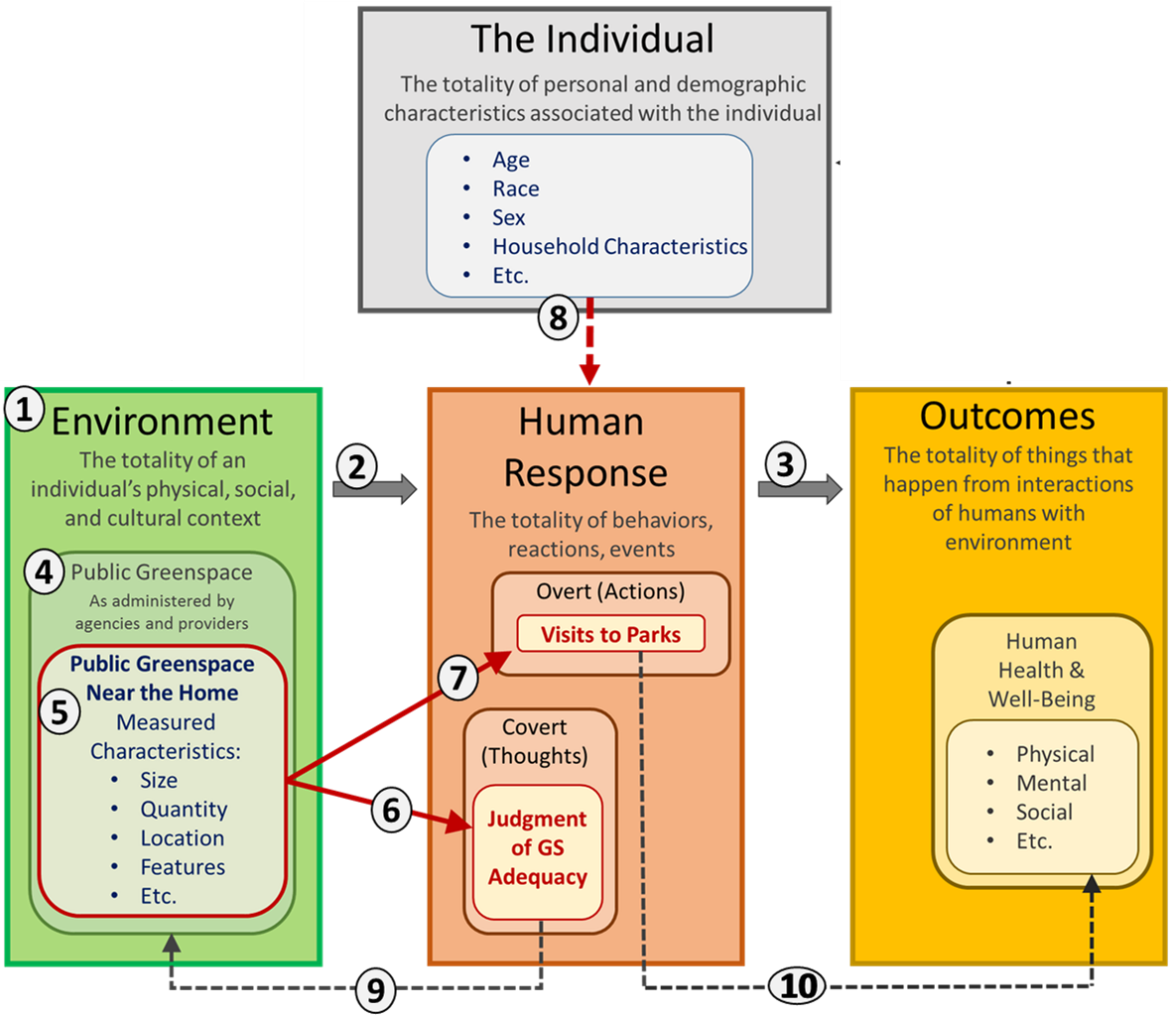
1.3 Study Purpose

The relationships between greenspace as a part of an individual's environment, the individual's behavior, and the outcomes of that behavior are diagrammed in *Figure 1.1*. Of primary interest in this dissertation are the relationships between the characteristics of greenspace in the nearby area around an individual's home and two behaviors highlighted in red in the diagram: judgments of the adequacy of the community's greenspace system to meet needs, and visits to parks by the individual's household. The aim of the dissertation research presented here is to provide evidence enabling one to develop a better understanding

of the relationship between the characteristics of greenspace and the opinions and behaviors of community members related to greenspace. The study is limited to urbanized places within parts of the United States, but may have application in other places where the provision of public greenspace is a policy goal. The objectives are to study factors that affect judgments about the adequacy of a greenspace system that are formed in the mind, and to examine how those factors affect the frequency of visits to parks. This was accomplished through the application of theories of human psychology to (a) analyze the opinions formed concerning the adequacy of greenspace systems in order to determine the influence of certain characteristics of greenspace that will be described in detail below on such judgments, and (b) compare the frequency of visits to parks by members of a household to objective characteristics of the greenspace system surrounding the home.

The hypotheses were that physical characteristics of the greenspace system play a role in two human behaviors: (a) judging the adequacy of the local park system, a covert cognitive behavior that occurs entirely within the mind, and (b) the overt act of visiting a park, which happens outside the mind. Characteristics of the individual--such as age, race, household income, and household composition--were controlled for in the study. The hypotheses were tested by objectively measuring several physical attributes and subjective qualities of the greenspace system, as described in this document, around an individual's place of residence and comparing the measurements to the individual's responses to a survey that asked their opinion of how well the parks in their community met needs and how often someone from the household visited a park.

Statistical methods were employed first to determine whether there was a correlation between the measured physical attributes and subjective qualities of the system and the individual's stated opinion of the park system's adequacy after controlling for characteristics of the respondent and their household. Next, the same objective and subjective measures of greenspace attributes were compared to the individual's reported frequency of park visits within the preceding 12 months, again controlling for individual and household characteristics.



Explanation: An individual's environment **(1)** influences their behaviors **(2)**, which in turn produce outcomes **(3)**. This study examines a subset of the environment that includes all of the policies, procedures, and features that collectively constitute what is referred to as 'public greenspace' (GS) **(4)**. Within that subset, the study focuses on measured characteristics of GS in the in the area near the individual's home **(5)** to determine how these are related to specific behaviors of the individual, including their judgment of the adequacy of the community's GS system **(6)** and to visits made to parks made by the individual's household **(7)**. Because characteristics of the individual also influence behavior, these are included as control variables **(8)**. The importance of these relationships stem from the influence that judgment has on the provision of GS in the environment **(9)** and from the association of GS with human health and well-being **(10)**. The research for this study focuses on items **(5)**, **(6)**, and **(7)**, with **(8)** included as control variables.

Figure 1.1 Relationship model for theoretical context of the study.

1.4 Study Significance: Informing the Process for Greenspace Allocation

Greenspace agencies compete for resources--primarily land and financial support--to be used in serving the need for government-provided services (Crompton, 2000). Greenspace is just one of many services, including public safety, utilities, and social services, which compete for a shrinking pool of resources. To justify the allocation of resources towards greenspace, elected officials must be convinced that doing so will deliver collective public benefits (Crompton, 2000). Crompton added that they also need to be confident that they have the political will of citizens behind them. Because the assumptions commonly used for allocating resources to greenspace lack a supporting evidence base, they do not hold up against competing needs for other services where the return on investment is more convincing. The purpose of this study was not to measure return on investment in public greenspace, but rather to look at specific outcomes--the public's opinion of whether needs were being met and the frequency of visits to parks--to determine if evidence could be found for a correlation between certain factors (measured characteristics of greenspace) and those outcomes. A better understanding of the dynamic relationships between public opinions of service and what is actually being provided will aid decision makers in allocating greenspace and maintaining the support needed to meet the needs that greenspace satisfies. It can also inform additional research into the relationships between the environment and human perceptions and behaviors.

1.5 Definition of Key Terms

The following definitions apply to key terms that are used in this document:

Attributes – As used here, attributes are measurable properties of an object, in this case a person (sample respondents), place (greenspace parcels), or thing (amenities located within greenspace parcels). Size, age, type and quantity are examples of attributes that are used in this study.

Behavior – There is widespread disagreement as to what qualifies as behavior (Levitis et al., 2009). In this study, behavior is defined as the internally coordinated responses of an individual to internal and/or external stimuli, excluding responses more easily understood as ontogenetic or developmental changes (as paraphrased from Levitis et al., 2009). While Levitis et al. and others debate whether cognitive processing in itself is a behavior, for the purposes of this study the forming of a decision, opinion, or conclusion is considered a behavior, as distinguished from the mechanism by which such thoughts are processed.

Components – These are the constituent parts of a greenspace system that support its usefulness for human purposes. Components can be either manmade--such as playgrounds, sports courts, athletic fields, and picnic facilities--or natural, such as a pond, stream, or wooded area. A set of codes and definitions for components used for this study is found in Appendix E.

GRASP® - This trademark is applied to products and services involving the measuring, recording, managing, and analyzing of data using protocols and procedures developed jointly by Design Concepts CLA, Inc. and GreeenPlay LLC whenever the products and services are produced under the control of either or both of those firms. Among

the products carrying the GRASP® trademark are level of service measurements (LOS) derived from GRASP® protocols using GIS technology that are used to produce indices and measurements that are used in this study. The GRASP® protocols and procedures described in Appendix D have been published in planning studies and trade journals and presented at conferences nationally and abroad and may be freely accessed and used by anyone. However, use of the GRASP® label is restricted. The GRASP® trademark is also applied to the *GRASP®-IT* tool, an audit tool developed for use in assessing greenspace locations and features. The codes and definitions found in Appendix E are those developed for the GRASP®-IT audit tool. Data bearing the GRASP® trademark has been acquired for use in this study.

Greenspace (sometimes also green space) – As used here this term broadly means lands that are set aside for purposes of relaxation, pleasure, and other intentions beyond those associated with the basic needs of producing food, clothing and shelter (recent trends to include community food gardens in parks notwithstanding). These might include conservation of natural resources, creating buffers between land uses, and mitigation from natural disasters such as flooding or geologic hazards. Such lands may be in either a natural state or developed and may include wetlands, water bodies, and other elements associated with green infrastructure. *Public Greenspace* is considered a subset of this and includes parks, greenways, open space and other areas owned or managed by public agencies and accessible for the purposes of recreation, relaxation, and/or conservation. *Greenspace System* as used in this study refers to a collective set of public greenspace elements including lands

and features within them that are owned or managed by one or more agencies for park and recreation purposes.

Judgment - A cognitive process by which value is assigned to objects or concepts. This process is subject to certain variable properties that can be analyzed (Sammut, 2013). For a detailed discussion of theories of judgment over time, see Rojszczak & Smith (2003).

Level of Service (LOS) – A defined measure of the level or degree to which an object or system of objects meets its intended purpose. In this study, actual measurements of LOS were compared to perceived LOS.

Need – The Shorter Oxford Dictionary defines "need" as a noun meaning "necessity or demand for the presence, possession, etc. of something." In psychology, needs can be divided into categories, such as innate or instinctual needs, which are associated with survival, and acquired needs such as tastes, cultural preferences, or chemical dependency (Katz, 1934). In a theory that has been widely accepted but also criticized, Maslow grouped needs into five hierarchical categories, theorizing that satisfaction of needs is a fundamental motivator of behavior (Neher, 1991). Some suggest that Maslow's categories are too broad and that additional categories are needed (Kenrick et al., 2011). In this study need refers to something (singular or plural) that an individual feels is wanted or required in relation to the presence of greenspace and the features and components that comprise a greenspace system. For this study each individual was allowed to determine their own definition of what "needs" implies.

Opinion – The Shorter Oxford Dictionary defines "opinion" as a "view that is held about a particular subject or point: a judgment formed; a belief." In this document, an

opinion is the attitude, view or belief expressed by an individual when asked to judge the performance of the greenspace system in their community against their own self-defined concept of "needs." Measures of attitude constitute public opinion when aggregated (Sammut, 2013).

Park – There is no widely accepted definition of what constitutes a park in general or within the academic and professional disciplines (Springgate, 2008). Springgate explained that the idea of a park as a place of respite, retreat, and beauty emerged out of the many types of gardens that evolved over the past several hundred years. Designers were inspired by landscape painters to use elements such as open lawns, pathways, water bodies, groves of trees, and earth forms to create scenic places with a relaxed style that allows for informal and flexible use of the land. Starting in the 1850s, Frederick Law Olmstead and others promoted the creation of such places with a social agenda meant to "elevate, inspire, and civilize" (Springgate, 2008, p. 2). These became the standard for what is commonly referred to as parks. Springgate proposed a definition using four criteria to identify a place as a park: (1) publicly accessible; (2) has identifiable boundaries; (3) contributes to overall community aesthetics; and (4) provides a community gathering space (p.3).

Barbosa et al. (2007) made a distinction between parks and other forms of greenspace when saying that "municipal parks are arguably more beneficial to local communities than other forms of urban green space" (p. 188). Others have called urban parks "the single most important category of publicly owned open space in US cities" (Talen, 2010, p. 473). However, the term "park" is commonly used by the general public and park agency practitioners to refer broadly to all of the lands and features that make up a greenspace

system. For this study, references to “parks” in surveys that were used as secondary data were interpreted to mean the broad set of greenspace elements found within the subject community. Thus, data from greenspace inventories conducted simultaneously with the surveys were matched with survey responses in the study.

Perception – According to the Shorter Oxford Dictionary, the meaning of “perception” as used in psychology is “the neurophysiological processes, including memory, by which an organism becomes aware of and interprets external stimuli.” As used here, perception is intended to refer to the mental impression that a person has about something; the way that something is regarded, understood, or interpreted by an individual.

Vicinity – A proximate area surrounding an individual’s residence that is assumed to be readily accessible and cognizable to them. In this study a radial Euclidian distance of 1/3 mile around an address was used as the vicinity for that residence.

CHAPTER 2: LITERATURE REVIEW

The intent of the literature review is to explore the body of knowledge concerning the relationships identified in *Figure 1.1* to gain an understanding of how those relationships operate and what factors play a role in them. The key topics covered are (a) the rationale and process for the provision of greenspace in the built environment, (b) the relationship between greenspace and human behaviors, and (c) the potential outcomes from such behaviors. This information will be used to identify gaps in the knowledge base and inform the methods that might be used to close those gaps.

Exposure to nature in the outdoors has long been considered a benefit for health and well-being. Recent research supports this notion, showing that the presence of greenspace is associated with multiple beneficial outcomes (Schultz et al., 2016) and that "general engagement with almost any natural environment, from urban parks to more remote wilderness, can enhance physical and mental health and well-being" (Dinnie et al., 2013, p. 2). A growing body of knowledge now provides evidence to support the long-established policy of providing public greenspace in order to make the benefits of exposure to nature freely available to urban dwellers.

For much of human history, exposure to nature was a part of everyday existence. With the shift from rural to urban lifestyles in the modern era (United Nations, 2014), access to nature can no longer be taken for granted. As a result, the provision of greenspace in the urban environment is increasingly important. This raises a concern for equity in its allocation (e.g., Seaman et al., 2010) and a need to understand the mechanics of its distribution (e.g., Boone et al., 2009; Smith & Floyd, 2013). It also places importance on assuring that public

investment in greenspace is producing the greatest possible return of benefits (Crompton, 2007). Addressing issues such as these can be aided by greater knowledge of the ways in which people interact with and respond to greenspace. This literature review positions greenspace as a topic of inquiry within the domain of research related to human behaviors and discusses ways in which the knowledge base for the relationship between humans and greenspace can be expanded.

2.1 Defining "Greenspace"

Terminology in the literature related to greenspace can be confusing. "Greenspace" and other related terms are used by different authors to mean things that are similar but not exactly the same. These terms refer generally to parts of the outdoor environment, but the precise aspects and/or portions of the environment being referenced varies. The word "environment" itself can be confusing. The World Health Organization (WHO) offers a definition of environment, describing it as "all the physical, chemical and biological factors external to a person, and all the related behaviors" (Pruss-Ustin & Corvalan, 2006).

The terms "greenspace" **(**sometimes written as *green space***)** and "natural areas" are often used interchangeably along with the term "public open space" (POS) and similar terms or phrases to refer generally to parts of the built and unbuilt environment that broadly encompass publicly accessible areas with natural vegetation (Lachowycz & Jones, 2013). However, the specific definition of what is included in each case is not always clear. "Green infrastructure" is another term used frequently to refer to parts of the environment with an emphasis on their role in serving multiple functions, including ecological ones and environmental mitigation (Amati & Taylor, 2010).

Similarly, determining what is “natural” varies from one study to another. For example, some definitions of nature rely on the inclusion of “elements of living systems that include plants and nonhuman animals across a range of scales and degrees of human management” to define an area as natural (Bratman, Hamilton & Daily, 2012, p. 1249). This would seem to exclude nonliving systems such as geologic processes, water bodies, and climatic events from the realm of natural unless they are accompanied by living systems, but in practice that does not appear to be the case within the literature on greenspace.

Numerous studies can be found in the literature that use all of these terms in general ways, often without defining clearly what parts of the environment are being referenced, and different studies use different terms to refer to what seem to be very similar things (e.g., Flores et al., 1998; Giles-Corti et al., 2005; Lang et al., 2008; Lopes & Camanho, 2012; Tian et al., 2011). Because greenspace seems to be one of the more frequently used terms to encompass parks, greenways, and related areas set aside or managed as part of public policy for recreational use, aesthetic appreciation, well-being, and quality of life, greenspace is the term that will be used here when discussing the literature, except in cases of direct quotations and paraphrasing, in which case the terms used in the source material will be retained.

The focus of this research study is public greenspace in the area surrounding an individual’s place of residence. Accordingly, the literature reviewed here will focus on, but is not limited to, greenspace that is near or within urban areas as opposed to nonurban areas such as wilderness and rural areas.

2.2 Greenspace Research

The content of literature represented here can be broadly interpreted within two major themes:

- Human responses to greenspace and the connections between those and general health and well-being. The focus here is on covert and overt behavioral responses and how those relate to the provision of greenspace and to health outcomes. Covert responses include cognitive perception and the formation of attitudes and opinions within the mind, while overt ones include actions outside the mind, such as visitation, participation, and use of greenspace, as well as actively supporting its provision and sustained existence.
- Access to greenspace, both perceived and objective, as enabled through the availability of parks, trails, and other features.

There is overlap and interaction between the themes. Within them, two sets of variables occur: (a) characteristics of greenspace, and (b) characteristics of humans. Each of these can be further classified. Greenspace characteristics can be thought of as objective or subjective. Objective characteristics include such things as the empirical quantity of greenspace land and features within it, and the distance to them from an individual's place of residence. Subjective characteristics of greenspace include perceptions of distance and quantity, comfort and convenience, and aesthetics. Human characteristics can be divided into those associated with the individual, such as age, sex, and race, and other demographic indicators, as well as those associated with the individual's surroundings, such as neighborhood density, household composition, and jurisdiction of residence.

These themes and variables are interwoven throughout the literature reviewed here, as diagrammed in *Figure 2.2.* This review seeks to connect them in a general understanding of why public greenspace exists, how it affects people, and how it is sustained and perpetuated within the built environment.

2.3 Human Responses to Greenspace

2.3.1 The connection of greenspace with human health.

The connection between the outdoor environment and general well-being has been intuitively recognized for centuries. Recent research confirms this assumption, and today there is a body of knowledge supporting the role of greenspace in public health (e.g., Bedimo-Rung et al., 2005; Kaplan, 1995; Sallis et al., 2012). Much of the research to date has focused on behavioral outcomes, especially physical activity, because of its association with obesity. But there is a growing interest in the role of greenspace in mental restoration, social cohesion, and other dimensions of health. Empirical evidence has shown that greenspace supports a range of health benefits, including physical, mental, social, environmental, and economic ones (McKenzie, 2009; Sallis & Spoon, 2015).

Unpacking what happens when people are exposed to nature or when it is located in proximity to them is a focus of much current research found in the literature. For example, one recent study examines associations between the duration, frequency, and intensity of exposure to nature and various domains of health in an urban population to suggest potential dose-response guidelines (Shanahan et al., 2016). Others ask whether it is the built environment, social environment, or lifestyle attitudes that explain people's behaviors relative to their environment (Joh et al., 2009). The theoretical construct for much recent

research is an ecological model of behavior that has been growing in use as a framework for public health (Sallis et al., 2006). In this model the built environment--defined as the entirety of places built or designed by humans--is one of multiple domains that influence behaviors, such as physical activity, which in turn affect health and well-being. This includes parks and other greenspace features, which are "well positioned to play a role in disease prevention" (Sallis et al., 2012, p. 730). At the same time, potential negative effects--including the release of hydrocarbons that contribute to air pollution and pollens that aggravate allergies—are also associated with greenspace (Hartig, et al., 2014). Crompton (2001) listed a number of other potential negative effects of greenspace, including reduced property values for adjacent parcels if the park lacks proper security or maintenance. Crompton added nuisances such as street parking, vandalism, noise, lights, and the presence of undesirable groups to the list of adverse impacts from parks.

2.3.2 Perceptions of greenspace.

Individual perception may affect the relationship between greenspace and public health (Sallis, 2006). As Brownson et al. (2009) point out, "for some attributes of the perceived environment, such as aesthetics, it can be argued that perceptions are the reality" (p. S101). Perceptions are a product of both objective and subjective aspects of the environment. Qualitative attributes have been found to affect preferences for places to recreate, walk or exercise (Bai et al., 2013, Tveit & Sang, 2014). They also play a role in the way that an individual experiences a particular place, which in turn can affect their opinion of how that place and others like it should be managed (Andereck & Knopf, 2007). At the same time, perceptions do not always align with objective measures of greenspace (Lackey &

Kaczynski, 2009; Wang, 2013). Qualitative research might be useful in explaining such inconsistencies and others found in quantitative research relating urban parks to physical activity (McCormack et al., 2010).

Engagement with nature--whether through physical immersion or contact, viewing it from a distance, or contemplating it in the mind through thoughts, memories, or images--has a perceptual aspect that is interrelated with behaviors and potential outcomes. Perceptions of greenspace may affect how one engages with it, and in turn the ways in which an individual engages with greenspace can affect their perception of it. Seaman et al. (2010) noted that studies investigating the connections between local environments (including greenspace) and human experiences and perceptions tend to focus on physical characteristics of the neighborhood or characteristics of the people who live there. They add that "less is known about whether the effects of place may affect individuals differently, in a manner that may further entrench inequalities both within and between areas" (p. 2). For example, differences in perception regarding local greenspace may reflect the life-course stage and background of individuals:

> "…parents of young children sought safe and pleasant spaces to play, those without dependent children prioritized spaces for socializing with others . . . and some prioritized the enjoyment of nature" (Seaman et al., 2010, p. 4).

Thus, Seaman et al. conclude, relationships between greenspace and well-being reflect different aspirations, expectations, and intentions within greenspace use. This explains

Ambrey & Fleming's (2013) finding that lone parents and the less educated benefit to a greater extent from the provision of public greenspace than the general population.

The local environs beyond the greenspace may be a factor in perceptions and behaviors as well. Few studies of greenspace and health have focused on non-park extrinsic elements in the environs, such as actual and perceived development density, local public security conditions and neighborhood relationship (Lo & Jim, 2010). In comparing public perception among different residential communities towards urban greenspaces in Hong Kong, Lo & Jim (2010) found that social qualities, such as good relationships with neighbors and caring about the community's concerns, were more important than physical aspects of parks in influencing park perception and patronage.

The relevance of such findings to the research presented in this study is that they point to a need to gain a better understanding of the connection between the local environment, including greenspace, and the experiences, perceptions, and beliefs of people who live within it. This information, in turn, can be used to inform and ultimately improve the process by which decisions about the provision of greenspace in the local environment are made. Hofmann et al. (2012) make the case for such study:

> "Knowledge must be generated that landscape planners and landscape architects can apply to the design of urban green spaces and to the implementation of nature conservation strategies for urban areas. To that end, it is important to study how green spaces within cities are perceived and assessed by potential users" (p. 2).

Understanding how greenspaces within cities are perceived and assessed by potential users is therefore a primary aim of this dissertation. Such information can be used by

planners and policymakers to improve the provision of beneficial greenspace in the urban environment.

2.4 Use of Greenspace

While parks and other greenspace features have been a part of the public realm for nearly 200 years, surprisingly little is known about the science linking the characteristics and conditions of such settings with visitation and use (Cohen et al., 2010). Bates and Santerre (2001) lamented that "very little, if anything, is currently known formally about the structure of demand for open space" (p. 99). Others have called for research to examine how the actual usage of greenspace varies across urban areas and social groups (Barbosa et al., 2007).

While the variables affecting greenspace use may be unclear, data for park usage are readily available. A recent study indicated that 80% of U.S. adults spend some amount of time in public parks (Dills et al., 2012). Studies of U.S. and Australian parks showed that over 70% of those surveyed had visited a park at least once in the past 12 months (Giles-Corti et al., 2005). However, a study conducted in 1994-1995 found that most park participation comes from a smaller group of active enthusiasts, with only a third of the population accounting for the majority of participation days, and less than a quarter accounting for 70% or more of the total participant days (Bedimo-Rung, Mowen & Cohen, 2005). A 2014 study in the Midwest found that almost half of the participants had used parks within the past month, and a similar number reported engaging in some park-based physical activity in a usual week (Kaczynski et al., 2014). A 2016 study of park use within 174 neighborhood parks (generally those between two and 20 acres and intended to serve residents living within a one mile radius) across the U.S. found that average hourly use

during park hours was 20 people per park, which is below the carrying capacity of most parks (Cohen et al., 2016). Usage of a typical park averages between 1% and 5% of its capacity during normal use periods and seldom exceeds 20% of the total capacity at peak periods (Gold, 1977).

According to Godbey (2009), the amount of time spent by individuals in a park is difficult to accurately determine. Godbey said that most national surveys that track participation in outdoor activities do not measure duration of park visits, and they assess frequency only crudely, based on self-reported recall of activities over various time periods and other techniques that lead to inaccurate estimates (Godbey, 2009). However, evidence suggests a general decline in certain nature-based activities such as hunting, fishing, and camping over the past several decades, with reduction of 18 to 25 percent from peak levels (Godbey, 2009). This assumption has been challenged by others who say that the decline has been offset with increases in other forms of outdoor activity (Godbey, 2009). In a 2014 survey, 13% of respondents reported spending less than five minutes outside, while 13% spent five to 10 minutes a day outside (NRPA, 2014). Of those aged 55 and over, 38% spent at least an hour a day outside compared to only 25% of those under 35. In a study from the 1970s, it was estimated that the average working adult spent 1.4 hours of free time outdoors each day, but only six minutes of that were spent in public parks (Gold, 1977). A more recent meta-analysis of eight studies from the U.S., Europe and Great Britain found that the median time spent per day outdoors was 1.04 hours for weekdays and 1.64 hours on weekends (Diffey, 2011). This averages to 1.2 hours per day, which is similar to the 1.4 hour number

from the 1970s. That similarity suggests that the six-minute figure for time spent in parks from the 1970s may still be reasonably applicable today as well.

Participation rates for park activity depend upon a variety of demographic, socioeconomic, and regional characteristics. Among these are gender, race/ethnicity, socioeconomic status, and residential location (Bedimo-Rung, Mowen & Cohen, 2005). Cohen et al. (2106) found higher poverty level to be negatively associated with number of park users in neighborhood parks. Age is another such factor. Harrison et al. (1995) reported that children and adolescents make up between 30% and 60% of all users of natural greenspace in urban areas. However, in a 1998 study of people over 50 years of age in Northeast Ohio, 40% said they visit parks frequently, 50% visited occasionally, and 10%reported no use of local parks (Payne et al., 2002). Godbey (2009) reported that a five-city study of parks found that 85% of adult users age 50 and older had visited a local park in the previous 12 months. Thirty-eight percent visited once a week or more, 22 percent one to three times per month, and 25 percent less than once per month. Only 15 percent had not gone to a local park at all. Lack of time, money, personal health, information, transportation and access, safety concerns, maintenance and/or inadequacy of park facilities, and the lack of leisure companions are among the reasons commonly offered for not engaging in park-related activities. Among the most preferred strategies for increasing park use are improving safety, increasing awareness, providing more park activities, and locating parks closer to homes (Bedimo-Rung, Mowen & Cohen, 2005).

While use of parks for physical activity is a focus of much recent research, there is a distinct social aspect to park visits as well. When Payne et al. (2002) asked people with

whom they visit parks, they found that only 8% visit alone, while 33% visit with family members, 17% with friends, and 41% with both family and friends.

In their study to determine why some parks are used more than others, Cohen et al. (2010) list park size, the number and type of amenities and physical features, and the population density around the park as obvious physical factors that have the potential to influence park usage. In looking at these closer, they found that park size was positively associated with park use. Park size was also found to be a significant positive predictor of the number of park users (though park size was not significant after controlling for other related factors in the model) in a study of neighborhood parks by Cohen et al. in 2106. In a separate study of visits to both urban and rural parks, Shores and West (2009) found no linear associations with park visitation for either the size or number of amenities in a park, but suggest that the type of amenity present may be more important than the number of amenities at a given site. The example they offer is trails, which are more likely to attract visitors of all ages and backgrounds, and therefore may compensate for a lack of other amenities. However, Kaczynski et al. (2014) found that while certain park amenities are indeed associated with park use across wide demographics, the significance of the relationship for specific amenities varies considerably among different demographic groups.

Organized programming has been found by Cohen et al. (2013) to be the most important correlate of park use. In their 2010 study, Cohen et al. found the presence of organized activities to be positively associated with park use. Dog parks, walking paths, water features, and multipurpose fields were the areas most frequently in use.

Cohen et al. (2010) found no statistically significant correlation between the number of users and population density in the surrounding neighborhood, although in another study (Cohen et al., 2016) population density was found to be a significant predictor of park users in neighborhood parks. Cohen et al. (2010) found that perceptions of safety were not associated with the number of people counted in parks. In contrast, Active Living Research (2010) (ALR) reported that that perceived safety, along with park aesthetics and condition may be associated with park visitation. ALR also states that park proximity is associated with higher levels of park use and that having more park area (acreage) within a community is associated with higher physical activity levels. ALR adds that limited access to parks and recreational facilities in lower income populations and some racial and ethnic populations partially explains lower physical activity levels among those populations. However, the importance of distance to a park as a barrier to participation is inconclusive. Kaczynski et al. (2014) found that distance to the closest park was not significantly related to park use. Because so many people rely on cars for transportation, distance to a park may not be a substantial barrier when parks are well-equipped and attractive (Cohen et al., 2015). Kaczynski et al. (2014) did, however, find both the number of parks and the amount of park space within one mile of home to be significantly associated with park use.

In summary, the literature reveals that almost everyone visits a park at some time, but only about a third of them visit regularly (Bedimo-Rung, Mowen & Cohen, 2005). There are many potential reasons for this, including ones related to the individual (age, gender, racial, ethnic, and socioeconomic status, place of residence, awareness of the park system, and other factors), and ones that are characteristics of the environment (proximity, number, and size of

parks, amenities they contain, safety, and a variety of other variables). Objective measurements of those characteristics of the greenspace environment do not always align with the way they are perceived by people, but objective measures and perceptions are both important factors in how greenspace is used. However, the exact nature of the interactions between variables affecting greenspace use is far from clear at the present time. There is ample justification for additional research, particularly in light of the evidence that visiting a park is conducive to health and well-being.

2.5 Access to Greenspace

2.5.1 The concept of access.

While the mere presence of greenspace provides benefits such as ecosystem services and increased home values (Sallis & Spoon, 2015) to the entire community, including those who never visit a park, experiencing greenspace firsthand is an important aspect of its potential to provide benefits. Thus, assuring that access to greenspace is available to those it is intended to benefit is important. To do so, we must understand the dynamic relationships between access to greenspace, its distribution and configuration within the environment, and the behaviors and perceptions of individuals towards it. All are interrelated in the overall goal of providing for the general health, safety, and welfare.

Seaman et al. (2010) include the provision of greenspace as a community resource among four key factors that shape decisions around its usage. (The others involve lifestyle and life-stage factors, individual values, and levels of felt integration--how involved, comfortable, and connected they feel within their community.) Thus, access to greenspace is

a multi-dimensional concept that involves objective and subjective variables as illustrated by Wang, Mateo-Babiano and Brown (2013) in *Figure 2.1*.

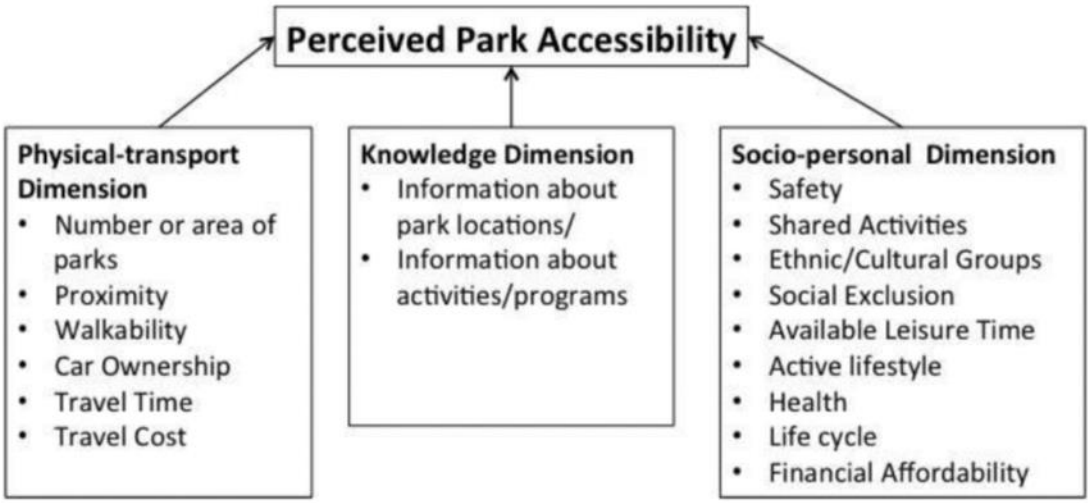


Figure 2.1 Multi-dimensional aspects of access to greenspace. From: Wang, D., Mateo-Babiano, I., and Brown, G. (2013).

Objective measurement of the physical characteristics of greenspace is the primary way in which access is evaluated, while socio-personal factors and other subjective variables of greenspace accessibility are often overlooked (Seaman et al., 2010). For example, the fear of unruly young people among older people may result in self-exclusion, a product of the perceptions that subgroups have of one another (Seaman et al., 2010). The physical attributes of greenspace alone do not capture all important barriers to access. Even physical attributes, which can be objectively measured, are experienced through what Seaman et al. (2010) describe as "subjective and inter-subjective 'rationalities' around the appropriateness of using greenspace as a leisure choice or in daily life" (p. 7). Thus, Seaman et al. conclude, there is a need to consider access from a broad perspective that includes both objective and perceived measures.

2.5.2 Measurements of greenspace.

In recent years, a heightened interest in research relating greenspace to health has resulted in a number of quantitative and qualitative measures for assessing greenspace environments and new tools with which to measure them (Sallis, 2009). These include both objective and subjective measures of park quality, along with number and condition of features and park size. Some scholars have proposed the development of indices that combine multiple variables into more simple measures as a way to facilitate research, surveillance, planning, advocacy, and health-related environmental justice (Kaczynski et al., 2016). The application of different measures to research has resulted in a growing body of literature relating greenspace to health and well-being, but the translation of such tools and measures to the practice of greenspace planning lags behind, as planners continue to rely upon normative standards (Chona et al., 2010).

Presence and proximity are two of the most common objective measures used in both greenspace planning and research (Chona et al., 2010; Harrison et al., 1995). This includes greenspace quantity or areal extent as typically measured in acres or hectares, and proximity, as measured by a variety of distance techniques. These are often examined in relation to demographics. For example, Ambrey and Fleming (2013) found a positive relationship between the percentage of public greenspace in a resident's local area and their self-reported life satisfaction (defined by Vassar & Merrick, 2010 as one's global appraisal of life quality in accordance with their specifically chosen criteria). They also found that the perceived value of greenspace increases with population density.

2.5.3 The provision of greenspace.

As explained in Chapter 1, the provision of greenspace has been a function of various levels of government in America since the 1800s, emerging as a policy element that cities and states rely upon in their responsibility to "take actions that promote the health, safety, and welfare of their residents" (Crompton, 2010, p. 72). This includes the exaction of land and other resources from private citizens for the purpose of providing parks and other greenspace elements, which has been upheld in the courts (Crompton, 2010). Local agencies have traditionally relied on objective measures such as land area, population, and proximity to guide decisions about how greenspace should be provided (Chona et al., 2010; Harrison et al., 1995). Once lands have been designated as public greenspace, they become part of the "public trust" and as such take on a unique position within U.S. legal doctrine. They are differentiated from other lands and property of the government, and the ability to alter or dispose of them is curtailed without due process (Kearney & Merrill, 2011). They also are one of a few special places where the First Amendment rights of free assembly are given particularly high priority by the courts and "the rights of the State to limit expressive activity are sharply circumscribed" (Kozlowski, 2001). Thus, greenspace is recognized for its influence on the human condition throughout society, from a constitutional level down to the individual.

In the urban environment, the responsibility of allocating and managing greenspace for the public good is delegated to local authorities through the states by virtue of the police powers enabled in the 10th Amendment of the U.S. Constitution. This role is typically assumed by municipal and county agencies or sometimes assigned to special districts

(Moiseichik, 2010), under the general heading of "parks and recreation." These agencies manage lands, facilities, and programs as an overall system. The concept of providing parks as part of a comprehensive system of greenspaces emerged in the mid-19th century, spurred by the efforts of Frederick Law Olmsted and Calvert Vaux in the late 1860s (Retzlaff, 2010), and other reformers throughout the latter decades of the century (Scott, 1969). The reform movement took hold as a result of conditions associated with rapid growth and the exploitation of immigrant workers during industrialization. At that time, groups were forming in cities to combat a host of ills that included fraudulent elections, poor sanitation and water supplies, spreading slums, and intolerable congestion. It began with a struggle to regulate tenement houses and improve the living conditions of the urban poor and expanded to address the lack of play space for children and absence of social centers for adults. By 1884, the population density of Manhattan Island exceeded that of the most crowded cities in Europe. In 1895 it was found that half the population of the entire city lived in a group of wards whose total area was less than a tenth of the territory within the city's boundaries (Scott, 1969).

During this time, America was criticized at home and abroad for its maldistribution of wealth and the domination of corporations and syndicates in the government at all levels. In such a context, utopian ideas of reform were seen as a less radical alternative than waiting for the inevitable revolution that was sure to come (Scott, 1969). Creating more livable cities with parks, trees, and other green elements was seen as the way to make America's urban environment worthy of a great and powerful country. By 1902, the idea was taking hold that the government should employ every resource available to combat dangers that struck at the

very roots of society, including "the indiscriminate herding together of large masses of human beings ignorant of the simplest laws of sanitation, the evils of child labor, the corruption in political life, and, above all, the weakening of the ties which bind together the home" (Scott, 1969, p. 73). Parks, greenways, and other greenspaces were seen as important elements within the urban fabric that government could leverage to protect America's democratic way of life.

The reform movement's efforts bore fruit in cities across the country, including the creation of settlement houses for immigrants, use of school properties for children's play, and the creation of large numbers of playgrounds and parks. By the early years of the 20th century, planners like Frederick Law Olmsted, Jr, and John Nolen were beginning to think of the city as a complex of interrelated systems, with larger parks and outlying reservations, small playgrounds planned as adjuncts to schools, and neighborhood parks and larger playgrounds distributed throughout the city (Scott, 1969). The idea of greenspace as a *system* had taken root.

In 1868 Buffalo, N.Y. became the first city in the U.S. to build a planned park system. By the turn of the 20th century, Boston was leading the movement towards metropolitan systems and served as inspiration for other cities across the country, from Baltimore and Philadelphia in the East to Minneapolis and Cleveland in the Midwest, and Portland and Seattle in the West (Retzlaff, 2010). Many other cities followed suit with plans of their own for park systems, and efforts to define public open space standards began as early as 1901 (Kellett & Rofe, 2009). In 1906 a report was unanimously adopted at the first meeting of the National Recreation and Park Association (NRPA) outlining the need and space requirements

for certain recreation facilities (Buechner, 1971). These standards were primarily based on a ratio of park land to population, along with quantities of certain features (such as playgrounds or sports fields) to be provided on a per-population basis (Penbrooke, 2007). They also prescribed the geographic distribution of land and features by allocating them to a set of park types and specifying the distance by which each type of park was to be spaced across the geography. These so-called "NRPA Standards," as well as similar standards published by other organizations and agencies, were adopted and updated over the years until 1995, when NRPA discontinued them and recommended instead that each community determine for itself the right number of acres using a demand-based model as explained by Mertes and Hall in their 1995 text (Chona et al., 2010). Chona et al. add that:

> Nonetheless, the earlier standards remain widely referenced and used in practical park planning applications, especially when addressing the need for a standard that facilitates measurement of the distribution (in) equity across a large spatial extent (p. 235).

The persistence of such standards is problematic. As Harrison et al. (1995) note, approaches to open space planning which are based on acreage or typology distribution tend to "ignore the question of site quality and its relationship with the sense of well-being people experience when seeing or visiting a natural site" (p. 29). The repercussions of this are twofold. First, it may result in planning decisions that do not achieve the health-related goals for greenspace. Second, because the provision, design, and quality of greenspace can all be influenced by public policy (Sallis et al., 2012), failing to achieve the goals may reduce

support for greenspace and lead to poor decisions that further reduce its effectiveness, setting in motion a downward spiral.

The sense of well-being that people experience in a park or other greenspace location is just one of many factors that play a role in the opinions they form on matters of greenspace allocation. Opinions, in turn, translate into public policy. As explained earlier, forming an opinion is a behavior that has consequences for how greenspace is allocated when that opinion is expressed in the public process, affecting what benefits of greenspace will be made available to the public, where these will occur, and who has access to them. These are matters of public health and welfare. Thus, the standards by which greenspace is allocated need to be aligned with perceptions of greenspace value. Understanding the cognitive process by which these perceptions form is necessary.

Unfortunately, measurements of acreage and distribution (as measured by proximity) remain pervasive indicators by which access to greenspace is evaluated (Chona et al., 2010). This is due in part to the long history and quantitative nature of such measures. For example, a 1995 study by Harrison et al. includes a robust discussion on access distances and site sizes for natural greenspaces. It states that recommended distances and walking times were originally derived from "one of the most comprehensive surveys ever undertaken of park use throughout London" (p. 16) completed in 1964. (However, no specific citation is given for the source of that information, and a review of the references section did not provide enough clues to find it.) Harrison et al. also note that the National Playing Fields Association (NPFA) conducted time and distance trials with children of different ages, ranging from four

to 14, using a representative sample of pedestrian routes in the late 1980's, but that no details of the trials were published. A more recent example is the Trust for Public Land's ParkScore® index, which it calls "the most comprehensive rating system ever developed to measure how well the 100 largest U.S. cities are meeting the need for parks" (Trust for Public Land, 2016). The index is based equally on three indicators, two of which--acreage and access--are measures of size and distribution:

- **Acreage -** Median park size and park acres as a percent of city area
- **Facilities and Investment -** Spending per resident and average per-capita provision of four key amenities: basketball hoops, dog parks, playgrounds, and recreation and senior centers
- **Access -** Percentage of population living within a 10-minute walk of a public park along the public road network, uninterrupted by physical barriers

Other studies have included the number of park sites available within a given proximity as a measure of park access, finding that some populations have access to more parks, while others have access to more park acreage (Boone et al., 2009). While useful for highlighting inequities, the focus of such studies on quantitative attributes rather than qualitative ones may be leaving out important considerations, such as site quality (Harrison et al., 1995).

While standards for access based on quantity and distribution remain pervasive, the trend in recent decades is away from standards towards a "benefits" or "outcome-based" management approach in which "both the participant and non-participant (who also pays for

services, either through taxes, fees, or other methods) have become increasingly important to the satisfactory provision of park and recreation services" (Jamieson & Wolter, 2010, p. 1). Decisions have come to rely upon public input as well as objective measures to assess benefits and desired outcomes. This shift in philosophy has significant implications for greenspace planning because it makes public opinion a significant factor in greenspace allocation. While allocation of resources through a public process might seem well-aligned with the concept of greenspace as a democratic ideal, it could lead to inequities. Deliberative processes can favor elite classes or economic groups and are subject to manipulation by minority blocs who can veto the will of large majorities (De Souza Briggs, 2008; Fraser, 1990). Regardless of who holds the power, the application of public process raises the impetus for a better understanding of how public opinion is formed and how it operates in relation to greenspace. Otherwise, decisions based on perceptions may not align with goals that are based on objective measures. In time, it may be difficult to reconcile the differences between perceived access, objective access, and goals or standards that are based on one, the other, or some combination of the two.

This may already be occurring. Research on the quantity and spatial distribution of greenspace and relative access to it among different groups is common in the literature (e.g., Abercrombie et al., 2008; Barbosa et al., 2007; Boone et al., 2009; Chang & Liao, 2011; Cho & Choi, 2005; Chona & Wolch, 2010; Harrison et al., 1995; Nichols, 2001; Oh & Jeong, 2007; Smale & McLaren, 2005; Smith & Floyd, 2013; Smoyer-Tomic et al., 2004; Talen, 2010; Trust for Public Land, 2004; Wolch et al., 2005). A variety of tools and methods for conducting this research have been used, including audit tools to capture attributes of

greenspace parcels (Bedimo-Rung et al., 2006; Chona et al., 2007; Saelens et al., 2006; Kaczynski et al., 2012) and geographic information systems (GIS) to record, manage, and analyze the data (Brownson et al., 2009). While perceived access has been addressed in some studies (Andereck & Knopf, 2007; Bai et al., 2013; Lackey & Kaczynski, 2009; Payne et al., 2002), most have focused on objective measures such as acreage and proximity or total number of parks or other features. The findings from such studies show that objective access to greenspace varies among different socio-economic strata, ethnicities, and geographies (Boone et al., 2009; Smith & Floyd, 2013).

But accessibility should be thought of as a complex construct that incorporates perceptual, non-spatial dimensions including personal and social characteristics of individuals. Wang et al. (2013) postulate that accessibility and place use are not independent concepts, but rather interactive constructs. (They note, however, that accessibility does not equate with place use). Others agree that opinions and preferences of individuals are key considerations in measuring park accessibility and posit that these vary with social, racial, and economic differences (Smiley et al., 2016). Greenspace quality, including better park amenities, more and revitalized infrastructure, enhanced maintenance, and a safer environment may play a stronger role in perceived access than do the proximity and quantity of land (Smiley et al., 2016). In any case, research indicates that agreement between perceived and objective proximity to parks is generally poor (Lackey & Kaczynski, 2009; Wang, 2013). Thus, when citizens are asked to participate in the decision process for greenspace allocation, the actions they support are not likely to align with objective measures of proximity and availability, but will instead be based on some combination of quantitative

and qualitative factors that vary with socio-economic status, personal life experience, and other factors. If some constituencies are underrepresented in the decision process, the result will be that access-related decisions fail to address the preferences of certain groups (e.g., Smiley et al., 2016) and will not match up with objective measures of equity. This seems to have already occurred, as current research indicates that allocation policies for greenspace over the years have not resulted in a distribution that is equitable, raising questions of environmental justice and leading to criticisms of the allocation process and questions about how it might be improved.

2.6 Shifts in Greenspace Allocation Procedures

A major critique of the standards-based approach to allocating greenspace and managing it as a system is that the standards were never based on empirical evidence (Harrison et al., 1995; Kellett and Rofe, 2009; Moeller, 1965). However, the shift to a participatory model of allocation suffers from the disconnect between perceived and objective measurements of greenspace (Lackey & Kaczynski, 2009; Wang, 2013) and, as explained above, may lead to social inequities and a lack of support for greenspace where it may be needed.

According to Crompton (1999), the dominant role of user groups in park agency operations in recent years has resulted in a shift from "the original rationale, which focused on meritorious social outcomes, to a more narrow notion that such services are provided because particular segments of the population want them" (Crompton, 1999, p. 1). Crompton states that while benefit-driven programs may lead to higher levels of satisfaction and attract increased numbers of participants to park agency programs, this may not be what is needed to

convince elected officials to budget monies for the support of greenspace. “To justify the allocation of additional resources, elected officials have to be convinced that park and recreation agencies deliver collective or ‘public’ benefits” (p. 2). But public benefits can be measured in a variety of ways that are not consistent with one another.

Crompton said that greenspace needs to be positioned in the minds of elected officials and the general public relative to other services that are competitors for public tax dollars. Other services, such as utilities and public safety, rely heavily on objective measures of costs and benefits to justify the investment of tax dollars. But, Crompton (1999) notes, “the present position of park and recreation services that has existed in the minds of most stakeholders for several decades is that they are relatively discretionary, nonessential services” (p. 3).

Does this mean that greenspace planners should return to a standards-based allocation process and rely less on public opinion? Not necessarily. As empirical evidence mounts for the objective benefits of exposure to greenspace, investment of public resources will continue to be influenced by politics and public opinion. Individual perceptions are the basis of public opinion. Individual preferences influence the views of how greenspace areas should be managed (Andereck & Knopf, 2007). Such preferences translate into agency policies and decisions. As Andereck and Knopf point out, “continued research about the relationship between experiences and preferences will help recreation managers meet the needs of visitors and determine development policies in an appropriate and strategic manner” (p. 59). This can help avoid conflicts between different constituencies as well as inconsistencies between expectations and outcomes. According to Seaman et al. (2010), in some contexts conflict-

resolution efforts between potential users “may be as important as the provision of high quality infrastructure and greenspace” (p. 8).

2.7 Conclusions from the Literature Review

Parks and other greenspace features have been implemented for nearly 200 years by government at various levels as a means of providing for public health and well-being. Recent empirical evidence linking greenspace to a range of beneficial health-related outcomes supports the wisdom of continuing this policy, but also emphasizes the importance of assuring that investments in public greenspace produce the intended results. Springgate (2008) identified six criteria for park success, stating that they should be (1) safe and secure, (2) well maintained, (3) well designed and constructed, (4) appropriately located, (5) socially relevant and, (6) physically accessible.

Park use is another indicator of success, because it can be related to behaviors that are associated with beneficial health and well-being. Understanding the factors that motivate individuals to use greenspace can lead to greater park use and more effective design, planning, and provision of parks and other greenspace locations to achieve intended outcomes, and is a justification for the study presented here.

At the same time, support for the sustained provision of greenspace in the urban environment depends upon public opinion and the perceptions that constituents form about the greenspace system in their community. Perceptions of greenspace do not always match objective measures, creating the dilemma of matching perceptions and expectations with objectives and outcomes. Understanding what factors affect the opinions of greenspace that are formed by constituents can help planners align the provision of greenspace with both

expectations and behaviors to assure that it is both well-used and well-loved, and is another justification for the present study.

Reference	Benefits/Purpose of GS	Allocation & Distribution of GS (Access)	Characteristics of GS Related to Outcomes	Human Perceptions/Response to GS	Use of GS and Factors that Affect Use
Abercrombie et al. (2008)					
ALR (2010)					
Amati & Taylor (2010)					
Ambrey & Fleming (2013)					
Andereck & Knopf (2007)					
Bai et al. (2013)					
Barbosa et al. (2007)					
Bates & Santerre (2001)					
Bedimo-Rung (2005)					
Bedimo-Rung et al. (2006)					
Bedimo-Rung, Mowen & Cohen (2005)					
Boone et al. (2009)					
Brownson et al. (2009)					
Buechner (1971)					
Chang & Liao (2011)					
Cho & Choi (2005)					
Chona & Wolch (2010)					
Chona et al. (2007)					
Cohen et al. (2010)					
Cohen et al. (2013)					
Cohen et al. (2015)					
Cohen et al. (2016)					
Cohen et al. (2016)					
Crompton (1999)					
Crompton (2007)					
Diffey (2011)					
Dills et al. (2012)					
Dinnie et al. (2013)					
Giles-Corti et al. (2005)					
Godbey (2009)					
Gold (1977)					
Harrison et al. (1995)					
Hofmann et al. (2012)					
Jamieson & Wolter (2010)					
Joh et al. (2009)					
Kaczynski et al. (2012)					
Kaczynski et al. (2014)					
Kaczynski et al. (2016)					
Kaplan (1995)					
Kearney & Merrill (2011)					
Kellett & Rofe (2009)					
Lackey & Kaczynski (2009)					
Lellett & Rofe (2009)					
Lo & Jim (2010)					
McCormack et al. (2010)					
McKenzie (2009)					
Moeller (1965)					
Moisechick (2010)					
Nichols (2001)					
Oh & Jeong (2007)					
Payne et al. (2002)					
Penbrooke (2007)					
Saelens et al. (2006)					
Sallis & Spoon (2015)					
Sallis (2006)					
Sallis (2009)					
Sallis et al. (2006)					
Sallis et al. (2012)					
Schultz et al. (2016)					
Scott (1969)					
Seaman et al. (2010)					
Shanahan et al. (2016)					
Shores & West (2009)					
Smale & McLaren (2005)					
Smiley et al. (2016)					
Smith & Floyd (2013)					
Smoyer-Tomic et al. (2004)					
Talen (2010)					
TPL (2010)					
Tveit & Sang (2014)					
Wang, Mateo-Babiano & Brown (2013)					
Wolch et al. (2005)					

Figure 2.2 Diagram of sources referenced in the literature review. Only topics for which the source was cited are marked. Each source may have discussed other topics as well.

CHAPTER 3: CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS

This dissertation is positioned in the realm of environmental psychology. The study presented here (also referred to as "this study") applied two theories towards understanding interactions between people and the greenspace (GS) system around their place of residence. This chapter explains the theories and how they can be used to test a set of hypotheses about the relationship between GS characteristics and human behaviors. Specific variables derived from a park environment classification scheme and supported by the literature were identified for use in testing the hypotheses.

The first theory, the Social Ecological Model, lies on the behaviorist side of psychology, which concerns itself with observable, measurable actions that occur outside the mind as a result of stimuli within the environment. The behaviorist view focuses on observable phenomena rather than consciousness. Espoused by J. B. Watson in the 1920s and elaborated on by B. F. Skinner in the decades that followed, it supplanted earlier notions that most human behavior could be accounted for by heredity alone (Hupp, Reitman & Jewell, 2008). In the mid-20th century the paradigm shifted again, from a focus on behavior to a focus on cognition (Bargh & Ferguson, 2000; Luszczynska & Schwarzer, 2005). More recently, the two theories have merged to produce a complex combination of approaches to psychology known today as cognitive behavioral theory (CBT). CBT is based on the key proposition that environment, overt behavior (outside the mind), and covert behavior (inside the mind) influence each other (Hupp, Reitman & Jewell, 2008). Stated differently, environment, actions, and thoughts are all related to one another. CBT and the theories that

underlie it are used in this dissertation to examine the cognitive process that occurs when an individual is asked to judge the adequacy of a greenspace system and the behavioral response to greenspace as expressed by visiting a park.

The other theory, Affordance Theory, deals with the relationship between humans and the environment in terms of what it offers, provides, or furnishes to them (Gibson, 1979). It is used in this study to suggest explanations of opinions and behaviors related to the greenspace environment.

3.1 The Social Ecological Model

The social ecological model is based on the theory that individual behaviors are associated with the interaction of a person and their environment. It has been used in recent studies to associate beneficial activities, such as physical activity, with the provision of parks and other GS features in the environment (Sallis et al., 2006). Based on Bronfenbrenner's (1994) concept of socially organized subsystems that support and guide human growth, the ecological model states that the environment influences behavior at multiple levels, from individual and social factors to institutional, community, built environment, and policy factors (Sallis et al., 2012). GS operates at the level of the built environment in the ecological model, as illustrated in *Figure 3-2.* Simultaneously, characteristics of the individual, their household, and the neighborhood operate at the individual and social/cultural environment levels.

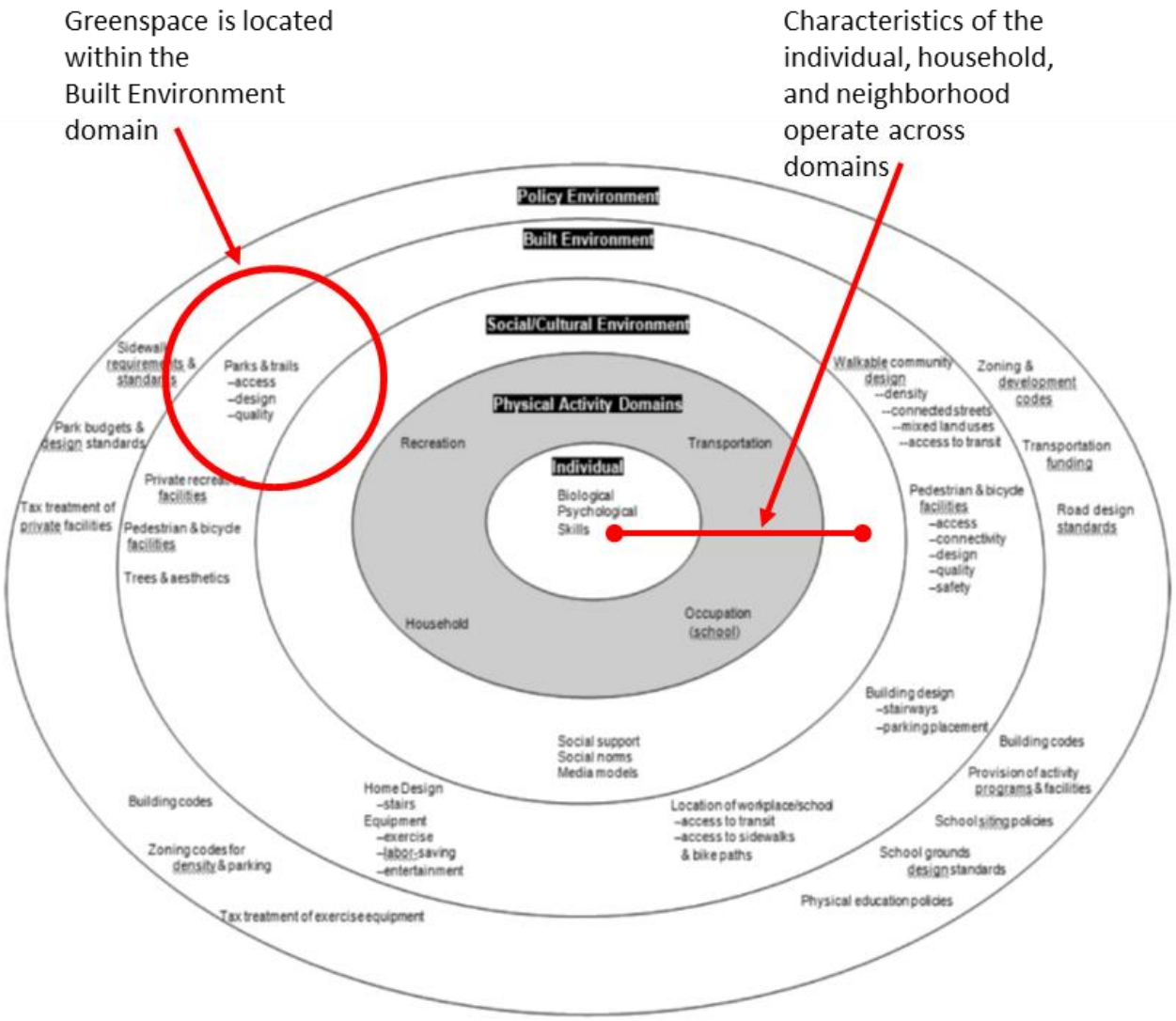


Figure 3.1 The Ecological Model. Adapted from Sallis et al. (2012), p. 730

The ecological model has roots in several disciplines dating back more than a century (McLaren & Hawe, 2004). It rests on "an evolutionary adaptive view of human beings in continuous transaction with the environment with the person and the environment continuously changing and accommodating one another" (Brower, 1988, p. 412). It assumes

that most of a person's life is driven not by conscious intentions and deliberate choices but by mental processes put into motion directly by features of the environment (Bargh and Chartrand, 1999). Environment is defined within the model in the broadest sense of the word, to include physical, social, cultural, and historical aspects of context as well as attributes and behaviors of persons (McLaren & Hawe, 2004). At the same time, the environment is uniquely defined for each individual. "According to the ecological model, the niche is defined more technically as that portion of the environment with which the individual has contact and upon which he or she is interdependent" (Brower, 1988, p. 412). Because of their focus on context, ecological models are suited to the study of behavior in natural (non-experimental) circumstances (McLaren & Hawe, 2004). In studying the effects of greenspace, experimental circumstances are difficult to create, so ecological models offer an important alternative.

Ecological influences operate at multiple levels (Sallis et al., 2006). Within each level (or domain) are behavior settings where behavior occurs. Behavior settings, as conceived by Barker (1968) occur at the interface between standing patterns of behavior, such as a basketball game or piano lesson, and the milieu, or environment, in which the behavior is happening. The milieu is considered to be circumjacent to the behavior, meaning it surrounds and encloses the behavior, and synomorphic in that it reflects a relationship between the behavior and the milieu—the things that happen within it. Thus, a behavior setting has both structural and dynamic attributes.

The built environment forms one level of the ecological model, within which greenspace provides behavior settings. Sallis et al. (2006) said that it is useful to consider

both access to and specific characteristics of behavior settings when predicting behaviors. My study looked at the system of parks, trails, and other greenspaces that surround an individual's home as a behavior setting and considered access and specific characteristics of that system. Characteristics of the individual, household, and neighborhood were included in the study as controls.

Ecological models are well suited for studying activity done in specific places as well as the characteristics of those places that facilitate or hinder activity (Sallis et al., 2006). In the study presented in this dissertation, the behaviors of interest are (a) the opinions formed about GS, and (b) visits to GS. The aim of the study was to predict how the characteristics of the environment affect such behaviors.

3.2 The Concept of Affordance

The study presented here (referred to in this dissertation as "this study") presumed that behaviors are affected by perceptions of the surrounding environment and that what one perceives is affected by "what the environment affords -- that is, its *affordances*" (Heft, 2010). Heft defined affordances as "relational properties of the environment taken with reference to a specific individual" (p. 17). Heft said that affordance is "a *specifiable property* of the environment taken relative to a person" (p. 19). "Affordances are properties of the environment that are both objectively real *and* psychologically significant" (p. 190). Heft noted that a single place is "not fully the same place for each user group" (p. 25) and stated that an affordance analysis of a landscape requires that we "identify the potential affordance properties of environments from the standpoint of prospective users of those settings" (p. 20).

According to Heft, affordance theory has been used in a variety of studies since its introduction by Gibson in 1979. Combining affordance theory with the ecological model in this study helped to explain how environmental attributes are associated with cognitive and behavioral responses. As used here, the concept of affordance suggested that different individuals may form different opinions of the same environment because they perceive different affordances from it. Examining variations in how individuals respond to specific characteristics of greenspace provided a better understanding of the ways in which attributes of a greenspace system are perceived as affordances.

3.3 Conceptual Framework

The conceptual framework for this study draws from a park environment scheme proposed by Bedimo-Rung et al. in 2005 (*Figure 3.3*) to describe the antecedents/correlates of park use as well as the relationships between park benefits, park use, and physical activity (Bedimo-Rung et al., 2005). The framework was applied to suggest correlates of park use but also by extension correlates for judgments, or opinions, formed about GS environments. The rationale for this is supported by Sammut's (2013) description of cognitive judgment as an *evaluative* expression and by the idea that people may place value on parks "even when they do not use them" (Bedimo-Rung et al., 2005, p. 161). For example, to some people the presence of parks is important even if they do not use the parks. This suggests that the correlates identified by Bedimo-Rung et al. could apply to opinions as well as park use and other behaviors.

The Bedimo-Rung framework includes six conceptual areas (features, condition, access, aesthetics, safety, and policies) that operate through four geographic areas (activity

areas, supporting areas, overall park, and surrounding neighborhood) to make up the set of park characteristics that affect behaviors related to parks. In the study presented here, a number of elements from both conceptual areas and geographic areas were investigated for their relationship to cognitive and behavioral responses to the GS environment.

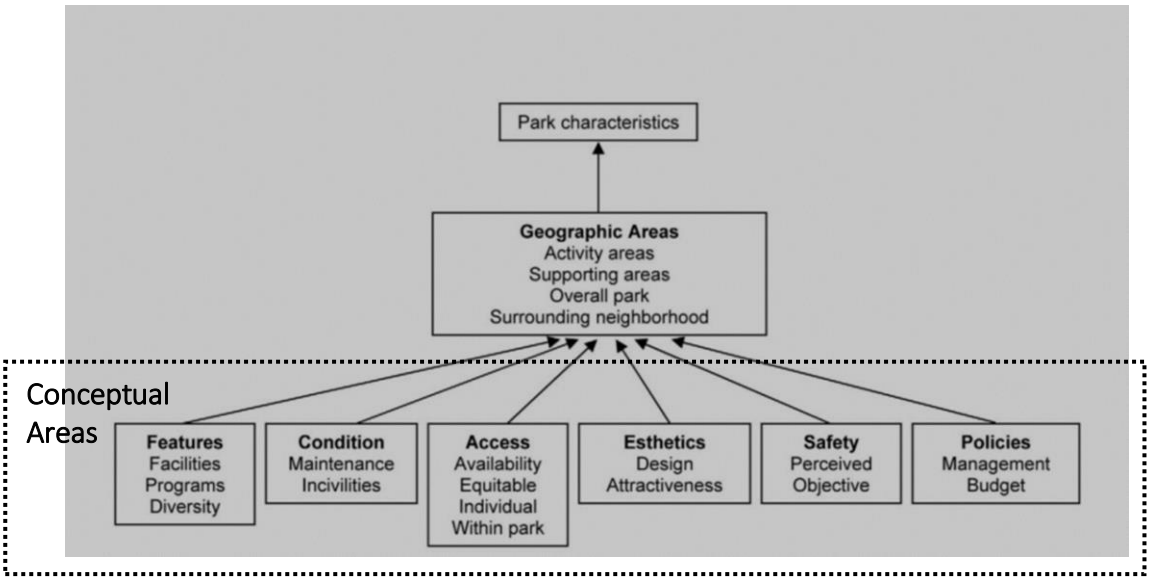


Figure 3.2 Bedimo-Rung Framework. Adapted from Bedimo-Rung, A.L., Mowen, A.J., and Cohen, D.A. (2005).

Figure 3.4 shows how several variables derived from the Bedimo-Rung conceptual framework were used in this study. Characteristics of GS (referred to as "parks" in the Bedimo-Rung Framework) were measured within the nearby area of an individual's home and analyzed for their relationship to behaviors, including the judged adequacy of parks and visits to parks. Elements of the Bedimo-Rung framework that were represented in this study included *features* (as indicated by size, quantity, and quality of GS as well as the number of

components—as defined in Section 1.5 and listed in Appendix E--within it), *condition* (including functionality, comfort, convenience, design and ambience), *access* (as indicated by quantity and proximity) and *aesthetics* (as indicated by design and ambience). Characteristics were objectively measured within all four of the geographic areas shown in the Bedimo-Rung framework and compared to behaviors of subjects to measure correlations. The elements of *safety* and *policies* were not directly reflected as variables, although they have an influence and interrelationship with the ones that are. A characteristic of the Bedimo-Rung framework is that the conceptual and geographic areas are not discrete and may overlap with one another.

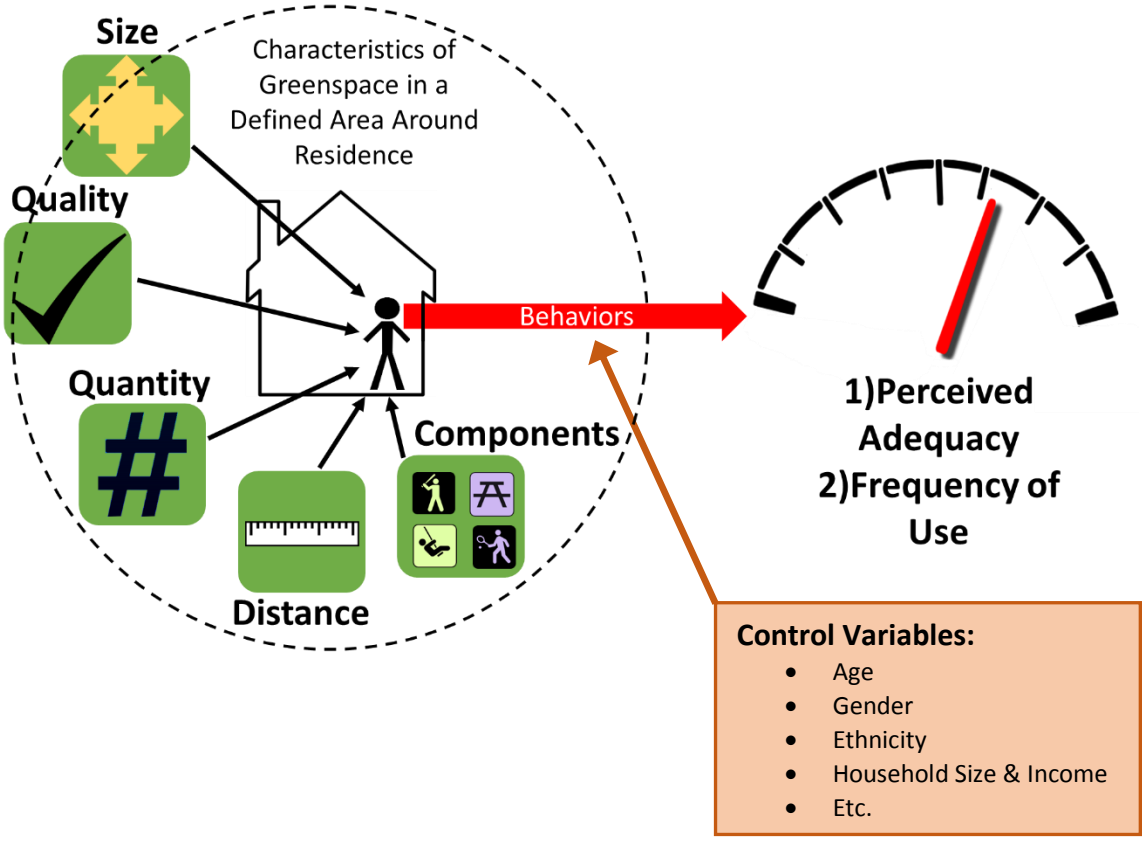


Figure 3.3 Greenspace characteristics and human behaviors.

3.4 Hypothesis and Research Questions

This study aimed to understand more fully the relationship between selected characteristics of the GS environment and two human behaviors. The hypothesis was that characteristics of GS within the physical environment near a residence influence the covert and overt behaviors of the residents living there and that indicators or "cues" from the GS environment can be used to understand and predict those behaviors. Characteristics of the residents and their neighborhood were included as control variables. This research tested this hypothesis by answering the following research questions:

Research Question 1 (RQ1) *- What is the nature of the relationship between physical greenspace characteristics and residents opinions on the adequacy of public greenspace systems?*

The question was examined by testing the following sub-hypotheses:

1) Distance to the nearest greenspace is related to an individual's opinion of adequacy of the GS system.
2) Size of the nearest greenspace is related to an individual's opinion of adequacy of the GS system.
3) Total number of greenspaces in the vicinity of home is related to an individual's opinion of adequacy of the GS system.
4) Number of greenspace features contained within the proximal area is related to an individual's opinion of adequacy of the GS system.

5) Park quality of the nearest greenspace is related to an individual's opinion of the adequacy of the GS system.

Research Question 2 (RQ2) - *What is the nature of the relationship between physical greenspace characteristics and residents frequency of use of public greenspace systems?*

The question was examined by testing the following sub-hypotheses:

1) Distance to the nearest greenspace is related to number/frequency of park visits.
2) Size of the nearest greenspace is related to number/frequency of park visits.
3) Total number of greenspaces in the vicinity of home is related to number/frequency of park visits.
4) Number of greenspace features contained within the proximal area is related to number/frequency of park visits.
5) Park quality of the nearest greenspace is related to number/frequency of park visits.

CHAPTER 4: METHODOLOGY

4.1 Research Strategy/Design

Creswell (2009) described three types of research design: qualitative, quantitative, and mixed (p. 3). The study presented here was quantitative, which Creswell located within the *postpositive* world view or paradigm, defining it as "a means for testing objective theories examining the relationship among variables" (p. 4). In this study, the objective theory that variables for the greenspace system within a defined proximity of an individual's place of residence are related to opinions and use of greenspace was tested. A cross-sectional approach examined correlations through the use of statistical regression models.

Correlational research is suited to this study because it allows for investigations within the naturally occurring environment to analyze relationships among variables (Groat & Wang, 2002). In correlational research, statistical analysis of measured variables can be used to explain or predict naturally occurring patterns. However, it cannot be used to establish causality. Thus, while the research presented here may allow for the prediction of associations of variables with certain outcomes, it cannot establish variables as the cause of the outcomes (Ibid).

Surveys are a data collection tactic frequently used in correlation research (Groat & Wang, 2002). Surveys were used along with a geographic information system (GIS) and direct observation for this study. Groves (2006) noted that surveys are frequently used by policy makers to document human thought and behavior which, according to Marans (2003), is used to inform policy and planning decisions. The availability of such surveys provided a source of secondary data for this study. The data were used, as proposed by Heath et al.

(2009), to form the primary focus of a new study. It also allowed for greater volumes of data to be collected with fewer resources and for analyses to be carried out with higher power, as noted by Rabinovich and Cheon (2011). Church (2001) confirmed that secondary data analysis can be based on the original data if these are available. In the study presented here, all of the necessary original data were available, and secondary analysis--answering new questions with data collected for other purposes (Glass, 1976)--was performed using it. Surveys were used in this study to collect thoughts (opinions) and behaviors (visits to parks) related to greenspace--along with personal and household data--from a random selection of adult residents within each of four study areas.

Geographic Information Systems (GIS) software (ArcMap 10.2) and direct observation with an environmental audit tool (GRASP®-IT) were used to obtain measures of environmental characteristics of the greenspace system within each of the four study areas, which were aggregated to form a single dataset. This was done to make the study representative of a wider geography and to assure adequate frequencies of data across the reported ranges for all variables.

The dependent variables examined in this study were (a) an individual's opinion of the degree to which the greenspace system in their community meets their needs, and (b) the frequency of visits made to a park from the individual's household. The independent variables were characteristics of the public greenspace derived from a proximate area around the individual's place of residence, described in detail in Section **4.5.2.** Characteristics of the individual, their household, and the area around their residence, as described in Section **4.5.1,** were used as control variables.

Table 4.1 presents a list of the data types, sources and other information for all data used in the study. The data are explained in detail in later sections of this chapter.

Table 4.1 Data sources.

				Purpose		
Data	Type	Source	Measure	DV	IV	CV
Age of participant	Ratio	Survey	Years			x
Children at home	Ordinal	Survey	Present/Absent			x
Degree of needs met	Ordinal	Survey	High/Low	x		
Design & Ambience (D&A) of nearest GS	Ordinal	GRASP®	Likert 1-3		x	
Distance to nearest greenspace	Ratio	GIS	Miles		x	
Gender	Nominal	Survey	Male/Female			x
GRASP® score of nearest GS	Ratio	GRASP®	Composite index		x	
GRASP® Walk Value	Ratio	GRASP®	Composite index		x	
Greenspace locations	Ratio	GIS	Discrete place names		x	
Importance of parks	Ordinal	Survey	Likert 1-5			x
Income (household)	Ordinal	Survey	Dollars per year			x
Location	Nominal	Survey	Jurisdiction			x
NonWhite_White	Nominal	Survey	Race			x
Population density	Ratio	Esri (GIS)	Persons per sq. mile			x
Size of nearest greenspace	Ratio	GIS	Acres		x	
Total components	Ratio	GIS	# of components		x	
Total GRASP® Value	Ratio	GRASP®	Composite index		x	
Total greenspace	Ratio	GIS	Acres		x	
Total over 55 in the home	Ratio	Survey	# of people			x
Total people in the home	Ratio	Survey	# of people			x
Visits to parks in previous 12 months	Ratio	Survey	# of Visits	x		x
Years in the community	Ratio	Survey	# of years			x

4.2 Study Area

The selection process for study locations began with a set of parks and recreation master planning projects for which secondary data were available from the archives of my

private practice firm. The firm had obtained and produced the data as part of projects on which I participated. These projects represented more than 90 communities in 23 states across the continental U.S. From these, a list was developed containing only projects for which the following were available: (a) complete archived raw data from public surveys that contained the variables of interest and (b) GIS files containing inventories of the greenspace system as it existed at the time the surveys were conducted.

This new list contained 15 locations (*Table 4.2*), which were reviewed more closely to select only those that had data available that met these conditions: (a) the surveys used random sampling, (b) the survey questionnaires included a particular question about how well needs for parks were met that will be explained below, and (c) the residential addresses of the respondents were included and could be matched with the responses. A final review was made to select those projects which took place within two years of 2010, as this would align with the timing of the national decennial census and allow for data from this study to be compared with census data and provide additional context for the interpretation of findings. This "sieve" process resulted in the four locations that were used for this study.

Because the four selected communities are located in three different states--Oklahoma, Maryland, and North Carolina--they represent a range of geographies, demographics, and other conditions as indicated in *Table 4.3*. Two of them, Cary, NC and Tulsa, OK are municipalities. The other two--Montgomery and Prince George's, Maryland--are counties. Thus, they represent a range of agencies, jurisdictions, and policies towards greenspace management.

Table 4.2 Potential study locations.

Location	Available Data	
	Full Data	Partial Data
Bloomington, IA	x	
Cary, NC	x	
Clackamas County, OR	x	
Coachella Valley, CA	x	
Corvallis, OR	x	
Denver, CO		x
District of Columbia		x
Keene, NH	x	
Lakewood, CO	x	
Montgomery County, MD	x	
Prince George's County, MD	x	
South Bend, IN	x	
Spokane, WA	x	
Tualatin, OR	x	
Tulsa, OK	x	

4.2.1 Study area locations.

The four study locations represented in the final selection are two cities and two counties: (1) Cary, North Carolina, (2) Montgomery County, Maryland, (3) Prince George's County, Maryland, and (4) Tulsa, Oklahoma (*Figure 4.1*). These locations cover a range of demographic and greenspace conditions. Together these communities represent a population of 2,320,089 people and a combined study area of 1,260 square miles. However, they are not intended to be a representative sample of all communities with greenspace systems throughout the U.S. or a particular portion of it.

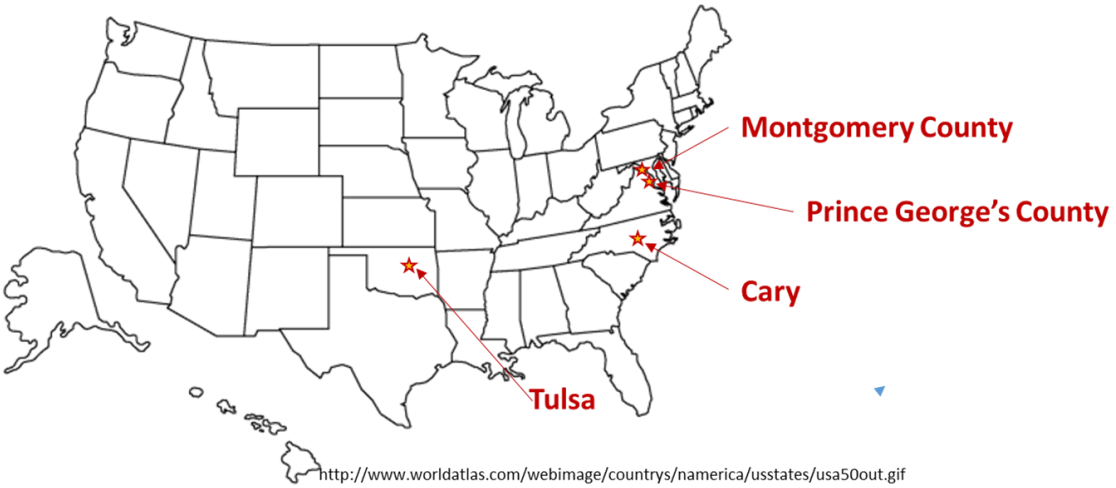


Figure 4.1 Study locations.

Cary, NC is a community of approximately 135,000 with a system of parks and greenways built according to many of the standards-based allocation procedures that were discussed earlier in Section 2.5.3. Cary's park system is the result of urban growth that has occurred in the latter part of the 20th and early part of the 21st century, while adhering to the planning models of the time. Cary currently has a land dedication requirement of 1/35th acre (or a cash equivalent) per each new single family dwelling unit for the purposes of providing parks (Town of Cary (A), 2016). Developments containing less than four units are exempt from the requirement. The Town of Cary Parks, Recreation and Cultural Resources Department is a nationally accredited agency with 82 miles of greenways and over 2,600 acres of parks (Town of Cary (B), 2016). Median household income in 2010 was $90,250. In 2010, 68.9% of residents were considered to be White alone, not Hispanic or Latino, while 19.8% of the population 2010-2014 was foreign-born (U.S. Census Bureau, 2016). Cary can be generalized for the purposes of this study as representing a relatively new, affluent, and

homogenous community that reflects the outcomes of standardized planning practices over the past several decades.

The geographic area included in this study was the area served by the Town of Cary Parks, Recreation and Cultural Resources Department in 2010, and is generally that area within the Town Limits and the Town's Extra-Territorial Jurisdiction. At 2,488 people per square mile in 2010 (U.S. Census Bureau, 2016), Cary has the highest overall density of the four locations in this study. This is not because it is particularly dense, but because the other study locations are more spread out and/or include extensive unincorporated areas. For comparison, population density in America's ten most dense cities range from more than 10,000 people per square mile in places such as Miami, Philadelphia and Chicago to over 27,000 in New York City (Governing, 2013). Cary's density in 2010 was comparable to Wichita, Kansas--which had 2,400 people per square mile--and slightly higher than nearby Durham, NC at 2,127. Raleigh, by comparison, had a density of 2,826 per square mile in 2010 (U.S. Census Bureau, 2016).

Tulsa, OK is a larger city than Cary, with a population of approximately 392,000 in 2010, and has a longer history and a wider diversity of greenspace types, sizes, and conditions. Over 135 parks and more than 6,000 acres are managed by the city's park system. In addition, the county and other agencies manage parks within the city. Tulsa's study area was approximately the city limits, which covered over 200 square miles.

Tulsa also has a more diverse socio-economic profile than Cary. The percentage of White alone--not Hispanic or Latino--population in 2010 was 57.9%, and the percentage of American Indian and Alaska Native alone was 5.3 %, which is significantly higher than the

other three locations, each of which had 0.5% or less in this category. It is also higher than other places where large Native American populations might be expected, such as Albuquerque, NM, which has 4.6% American Indian and Alaska Native alone. For comparison, in Flagstaff, AZ 12% of the population is American Indian and Alaska Native alone. Foreign-born persons were 10% of the population in Tulsa. Median household income was $41,241 which is less than half that of Cary.

Tulsa claims to be one of "America's Most Livable Communities" (City of Tulsa, 2016). Settled in the early 1800s, it was incorporated as a municipality in 1898. Known also as the "Oil Capital of the World," its fortunes have followed the economic cycles of the oil industry, starting with the discovery of oil nearby in 1901 (City of Tulsa, 2016). Many of its public greenspaces were constructed during population booms in the early 20th century and post-war eras. Some of those are showing signs of age and obsolescence, but Tulsa is in the process of adding new parkland and making extensive improvements along its riverfront with the help of extensive private investment (River Parks Authority, 2016). The reliance on private funding for parks provides opportunities for creating unique greenspaces that park agencies might not otherwise be able to provide, but has been criticized by some as leading to inequities in park services (Callahan, 2014). In the context of this study, Tulsa can be considered to represent a typical mid-American 20th-century city, with a greenspace system to match. This means that it has greenspaces that have been established over about a 100-year timeframe under varying planning philosophies that coincided with each era. Thus, its parks are diverse in size, age, and character, as is its population. However, Tulsa's density of 1,992 per square mile in 2010 is lower than many typical cities (but not as low as Oklahoma City,

at 956, or Anchorage at 171). Cities with comparable density are Colorado Springs at 2,140 or Durham at 2,127. In addition to serving as a representative of the many middle-class cities across America that were products of the 20th century, Tulsa's relatively high proportion of Native Americans (5.3%) brings that demographic group into the study.

Prince George's and Montgomery Counties are larger than both Cary and Tulsa, each having populations in the 900,000 range. The two counties abut each other and the District of Columbia. Both are served by the Maryland National Capital Park and Planning Commission (M-NCPPC), which is charged with protecting natural lands and providing parks and recreation services to residents of both counties. M-NCPPC was founded in 1927 for the purposes of long-range planning and the acquisition and development of parks (PG Parks, 2016). Under the M-NCPPC, each county's greenspace is managed separately by that county's Department of Parks and Recreation. Together, M-NCPPC's park systems in Prince George's and Montgomery Counties represent the widest diversity of greenspace characteristics and population demographics served within the study sample. Parks within the M-NCPPC include historic properties from colonial American times as well as more recent facilities and thus were created by a wide variety of allocation measures and philosophies. Census tract densities within the two counties range from a low of less than one person per square mile to more than 20,000 per square mile.

Montgomery County Department of Parks and Recreation manages more than 400 parks and 34,000 acres of park land (Montgomery Parks, 2015). The study area for Montgomery County was the entire area within the county boundary, 507 square miles. Among the ways by which Montgomery County acquires land for new parks is a process of

land dedication by request: “The Department may recommend that proposed projects dedicate land for roads, schools, parks, or recreation facilities” (M-NCCP, 2016). Montgomery County had a population of 971,777 in 2010, of which 49% were White, not Hispanic or Latino. Black or African American alone made up 17% of the population in 2010, as did the Hispanic or Latino category. Foreign-born persons comprised 32%, the highest of the four locations. Median household income 2010-2014 was $98,704. Overall density was 1,982 per square mile, although some census tracts have over 20,000 people per square mile (U.S. Census Bureau, 2016). For this study, Montgomery County brought the widest range of population densities, including census tracts with densities similar to those in the largest and most dense cities in America.

Prince George’s County Department of Parks and Recreation manages a total of 27,849 acres of land, consisting of 591 parks, as well as undeveloped parkland, conservation lands, and other facilities. The study area for this location was the 499 square miles within the county boundary. The department bills itself as the “most award-winning parks and recreation department in the country” (PG Parks, 2016). The county’s population in 2010 was 863,420 (U.S. Census Bureau, 2016), of which 15% was White alone, not Hispanic or Latino. In 2010, 65% of Prince George’s County’s population was Black or African American alone. Hispanic or Latino were 15% of the population in 2010. Foreign-born persons made up 20% of the population in 2010. Population density was 1,789 per square mile. Median household income 2010-2014 was $73,856. PG County’s Code of Ordinances requires that land in new subdivisions be dedicated upon request at the rate of 5% of any land on which a density of 1 to 4 dwellings per net acre is permissible, 7.5% of any land on which

a density of 4 to 7.5 dwelling units per acre is permissible, 10% of any land on which density of 7.5 to 12 dwelling units per acre is permissible, and 15% of any land on which density exceeding 12 dwelling units per acre is permissible (Prince George's County, 2015). In the context of this study, Prince George's brings a high proportion of non-White participants with a diverse range of income levels.

Table 4.3 shows a comparison of several variables for the selected locations. Note that these projects may have covered multiple years. Population shown is estimated for the year in which the project was completed. See Appendix E for a coded list of components cataloged in the inventories. All of this information was obtained from archived project files at my firm's business office.

In summary, the four locations represent a variety of demographic and greenspace characteristics. Data from the four were aggregated for this study, resulting in a total of 1,816 participants, of which 29.1 % were from Cary, 27.6% from Montgomery County, 26.3% from Prince George's County, and 17% from Tulsa. Additional descriptive statistics are provided in Chapter 5.

Table 4.3 Study location statistics.

Location	Master Plan Date of Study (1)	Study Population (2)	Study Area Size (Acres)	Number of Greenspace Sites (3)	Number of Components in Inventory (5)	Average # Components per Site	System Acres (6)	System Acres per 1000 Population (7)
Cary	2012	139,382	35,578	31 (4)	562	18.1	1629	11.7
Montgomery County	2010	967,000 (2)	324,164	496	2,182	4.4	36,273	37.5
Prince George's County	2008	828,770	318,926	526	2,369	4.5	25,989	31.4
Tulsa	2009	384,037	128,303	186	1,588	8.5	6,247	16.3

Notes:

(1) Publication date of study from which survey and greenspace data were derived. Inventory and survey data may have been collected in the prior year.

(2) Population estimates as reported in the study reports. For Montgomery County, two different estimates appear in the report: 966,026 & 967,900. An approximation of 967,000 was used for this table.

(3) The number of identified greenspace sites in the geodataset for the location's master plan study.

(4) This is the number used to run level of service (LOS) analyses in the Cary master plan, and does not include other providers that were inventoried but not included in the LOS analysis (an additional 12 locations).

(5) The number of components found in the components layer of the GIS for the study location. See Section 1.5 for definition of components. See Appendices D and E for more information.

(6) From the master plan reports. The total land area of all polygons found in the GIS dataset that were used in the master plan study tocompute LOS.

(7) The total system acres of greenspace in the LOS inventory divided by the study population, in thousands. This is a commonly used metric for park planning and policy formulation.

4.3 Sampling

Participants were individuals who had responded to public surveys conducted during master planning projects for park systems in each of the four study locations. All four surveys were conducted by the same consulting firm over a period of five years. The surveys had been commissioned by agencies in the study locations as part of park and recreation master plans.

RRC, the firm commissioned to conduct the surveys, is a professional research firm that conducts market research and data analysis. The sampling frame for these surveys was a random selection of individuals residing within the study boundary for each of the locations.

The source for this information was a third-party list purchased by RRC from a leading provider of data quality solutions with an emphasis on U.S., Canadian, and international address and phone verification and postal software. It came primarily from credit information, which RRC prefers over assessor's data, voter registration, utility billing, or other lists that may exclude renters, new residents, or others. RRC considered this the most exhaustive list available in terms of reaching all people who lived in the study area. In each of the survey locations, if RRC received more addresses than were needed for the project, they conducted their own random selection from the list using a function in SPSS Statistics. The final mailing list reflected a rigorous effort to assure that everyone residing within the study area had an equal chance of receiving the survey questionnaires. It was, however, limited to adults and may have excluded youth under the minimum age for credit purposes according to the jurisdiction.

When conducting the surveys, RRC attempted to obtain a sample that matched the demographic characteristics of the study area population as much as possible. Comparisons of the final responses used for this study with the demographic characteristics of the subject communities for two indicators—percent female and percent White—are shown in *Table 4.4*.

Table 4.4 Comparison of survey demographics by study location.

		Percent Female		Percent White			
Location	Number of Participants	Survey Responses	Census.gov	Survey Responses	Census.gov	Median Household Income (Census.gov)	Population Density per Sq. Mi. (Census.gov)
Cary	528	57	51	88	73	90,250	2,488
Montgomery County	502	62	52	72	62	98,221	1,978
Prince George's County	478	63	52	32	27	73,623	1,789
Tulsa	308	61	51	77	63	41,241	1,992

4.4 Survey Methods

Surveys were conducted by mailing questionnaires to a random selection of names and addresses as described above. Advantages of mailed surveys are that they allow researchers to obtain a large amount of information from a large sample, while giving respondents time to consider their answers. They also help reduce interviewer bias and have geographic flexibility (Hager et al., 2003).

Each form contained a unique identifier to eliminate duplication and allow for the tracking of responses. Respondents were asked to return the completed form by mail and in some cases were offered the option of completing the survey via internet at a password-protected site.

I received raw data from RRC in four separate files, one for each of the study locations.

Each contained all of the responses that were received by RRC. From those, I removed the subjects who did not meet all of the criteria for inclusion in the aggregated data set as explained below.

For Cary, 5,100 questionnaires were mailed to a random list of households. After counting for undeliverable ones, 5,010 were delivered. A total of 661 responses were received. Letters were mailed to all recipients approximately one week after the initial mailing as a reminder to complete the survey. The questionnaire was five pages long, with a total of 29 questions. The raw data file contained 653 subjects. Each subject's answer to the question regarding adequacy of the parks in the community was a primary variable for this study. Therefore, any subjects who did not respond to that question were removed, leaving 533 subjects. Because the subjects' addresses needed to be geocoded for the study, any subjects who could not be geocoded were removed. This included two subjects with P.O. boxes and three with no address. A total of 528 subjects remained for Cary.

Approximately 8,287 questionnaires were mailed out in Montgomery County, with 8,164 being delivered after subtracting those returned as undeliverable. The mailed questionnaires included a password-protected online version that participants could use instead of mailing the questionnaire if desired. To increase participation, follow-up postcard reminders were mailed approximately one week after the initial mailing. A second postcard reminder was sent to a sampling of 2,500 non-respondents two weeks after the full survey was mailed. The questionnaire for Montgomery County was six pages long and contained 18 questions. The Montgomery County raw data contained 555 subjects, of which 512 answered the question of interest regarding the adequacy of parks, so 43 non-respondents were

removed. Five subjects with P.O boxes and three with no address were then removed, leaving a total of 504 subjects for Montgomery County. It was later discovered that one of the unique identifiers for subjects appeared twice but with different responses, so both cases with that unique identifier were removed entirely from the dataset, leaving a total of 502 subjects.

The Prince George's questionnaire was mailed to 14,000 randomly selected households. The number of households selected was generally representative of the population distribution throughout seven subareas or Public Use Microdata Areas that comprise the county. One subarea, the Northwest subarea, consisted of two areas that were combined into one subarea to simplify the analysis results. A password-protected link (one per household) was included that allowed respondents to fill out the questionnaire online if they preferred. An outreach effort was made in which 425 non-respondents were called by telephone and encouraged to participate in the survey. Approximately 646 of the 14,000 mailed questionnaires were returned as undeliverable. The questionnaire for Prince George's County was six pages long and included 30 questions. The raw data from RRC for Prince George's County contained 1,429 subjects, which included 801 responses from an internet version of the survey open to anyone who chose to log on and fill it out. The 801 internet responses were removed, which left 628 subjects. Next, 120 responses that did not answer the question regarding the adequacy of the parks were removed, leaving 508 responses. Finally, eight subjects with P.O. boxes and 22 subjects with no address were removed, leaving 478 subjects for Prince George's County.

For Tulsa, a combination of mailed, online, and door-hanging questionnaires were used by RRC. The questionnaire was originally mailed to 8,000 randomly selected

households in the City of Tulsa and zip codes associated with it, which meant that some households may have been outside the city limits. Approximately 5% of the mailed questionnaires were returned as undeliverable. Recipients could choose to complete the survey online, using a password that was individually assigned (one per household). An additional 1,000 questionnaires were distributed via door hanging in selected neighborhoods where low response rate was otherwise expected. However, only 11 questionnaires were returned from the door-hanging method. The raw dataset from RRC contained 1,306 subjects. There were 856 from the open link internet (non-random) version that were removed, leaving 450 subjects. There were 59 nonresponses to the park adequacy question. Deleting these left 391 subjects. After deleting nine subjects with P.O. boxes and 74 subjects with no addresses, there were 308 subjects left.

The questionnaire for Tulsa was five pages long and contained 28 questions. The raw data files contained a total of 3,943 entries. After the exclusions for non-random entries, those that did not answer the question of interest, and those that could not be geocoded, 1,816 subjects remained.

The final tally was 528 for Cary, 502 for Montgomery County, 478 for Prince George's County, and 308 for Tulsa, totaling 1,816 respondents. Of these, not all had answered every question on the survey, so for some variables the total number of responses was lower. Additionally, the surveys varied in some of the questions asked, also reducing the number of responses. For example, questions rating the importance and number of times used for parks were not asked in Montgomery County. *Table 4.5* summarizes relevant information about the surveys.

Table 4.5 Summary of raw data from surveys.

Location	Year	Method	Selection	Sent	Responses	Response Rate	Margin of Error
Cary	2011	Mail, internet	Random	5,100	661	0.132	3.8%
Montgomery County	2010	Mail, internet	Random	8,287	555	0.07	4.2%
Prince George's County	2008	Mail & Phone	Random	14,000	628	Not Reported	3.9%
Tulsa	2009	Mail, internet, door hangers	Random	7,600	450	0.058	4.6%

Note: All figures as reported by RRC Associates

4.4.1 Response rate.

A total of 34,987 questionnaires were mailed out in the four locations. RRC received a total of 2,294 responses, for an overall response rate of 6.6%. Response rates within the individual locations varied. I computed the lowest response rate as 4.5% in Prince George's County. The highest response rate, as reported by RRC, was 13.2% in Cary. The response rates reported by RRC do not match precisely those that I computed from the raw data, due to differences in the methods by which RRC and I determined which responses were valid. This should not be a cause for alarm, given that response rate calculation procedures vary among academic survey organizations (Johnson & Owens, N.D.). In this case, the differences were not large in magnitude.

While response rates are widely used to judge the quality of surveys, they are also one of the most controversial features of an otherwise established methodology (Johnson & Owens, N.D.). The potential for bias causes concern for response rates. However, response rate alone does not predict the magnitude of nonresponse bias in a survey. Rather, it is the

risk of nonresponse bias that decreases with decreasing nonresponse rates (Groves, 2006). There is little evidence for the notion that low response rate surveys automatically equate to high nonresponse bias (Ibid). A key parameter is the strength of the correlation between the survey variable of interest and the propensity of the individual to respond, both for the entire survey and across items within it (Ibid).

Hager et al. (2003) noted that response rates are influenced by two factors--the type of subject being investigated and the method of data collection--pointing out that for mail surveys, low return rates and the threat of nonresponse bias are among the greatest challenges to success. The response rates for the mail surveys used in this study are low by standards typical of academic publications. However, Baruch (1999), pointed out that response rates in commercial surveys--such as the ones used here--tend to be lower than those in sciences. Additionally, response rates for surveys have been in decline for a number of years (Baruch, 1999; Groves, 2006; Johnson & Owens, N.D.). While there is no agreed norm as to what an acceptable response rate is for academic studies (Baruch, 1999), the response rates in this study are typical for surveys that are part of parks and recreation master planning efforts, based on my experience with more than 100 parks and recreation master plan projects.

Baruch (1999) recommended that whatever the response rate, it should always be made clear to the reader who the target population was, the number of people given the forms, how many were returned, how many were usable (and reasons for unusable ones), any differences across multiple populations involved, and whether any kind of “promotion” was used to increase participation. These suggestions were followed in reporting the research presented here.

The responses indicated that high importance of parks was a common belief among the participants. I assume this to be the greatest differentiator between respondents and non-respondents. Non-respondents may be individuals who either feel that parks are not important or who do not have a strong opinion about their importance one way or another.

4.4.2 Privacy protection

The survey results were made public at the time they were completed, including presenting them at public hearings and publishing them in reports and other public documents. Because the raw data files were distributed to the client agencies and members of the consulting teams at the time the planning projects occurred, there is no way to know how widely the information has been distributed or who currently has access to it. Nonetheless, precautions were taken throughout this study to protect the privacy of participants. A unique identifier assigned during the original survey process to each participant was used to assure privacy while allowing for data from multiple sources to be assigned to the correct participant. This allowed all names and addresses to be removed from the individual and aggregated datasets, and the raw datasets were stored in a secure location. Use of the secondary survey data for this study was approved by the North Carolina State University Institutional Review Board (IRB).

4.5 Data and Measures

4.5.1 Survey data.

Pertinent information from the raw survey results for each study area was compiled into a new master Excel spreadsheet, referred to hereafter as the “study location data,” for

each of the study locations. This was then aggregated into a single Excel spreadsheet containing the combined data for all four locations, referred to hereafter as the "master dataset." The following describes how the information was reported in the surveys and how it was coded in the master datasets:

- Address – street address (for geocoding).
- Age – reported as continuous in number of years.
- Children at Home – reported number of children under 18 in the home, recoded into categories of 0 = no children under 18 in the home; 1 = one or more children in the home.
- Degree of Needs Met – Response to the question on each survey asking the respondent's opinion of how well parks in the community were meeting needs. In the surveys, scale in Montgomery County, Prince George's County, and Tulsa was 0-5, with 1 = not at all; 2 = not very much; 3 = somewhat; 4 = mostly; 5 = completely; 0 = don't know. Scale for Cary was 0-9 where 1 = not at all met; 5 = somewhat met; 9 = completely met; 0 = don't know. Cary was recoded to the 0-5 scale as follows: 0 (new value) = 0 (reported value); 1 (new value) = 1-2 (reported value); 2 (new value) = 3-4 (reported value); 3 (new value) = 5 (reported value); 4 (new value) = 6-7 (reported value); 5 (new value) = 8-9 (reported value).

  Scales for all four locations were recoded dichotomously for the statistical analyses so that 0 (new value) = 0-3 (needs not highly met); 1 (new value) =

4-5 (needs highly met). This addressed the comparatively low number of responses at the low end of the ordinal scale in the data.

- Gender – reported as male or female, coded as 1 = Male; 2 = Female.
- Importance – opinion of how important parks are to the community. Scale for responses in Montgomery County, Prince George's County, and Tulsa was 0-5, with 1 = not at all; 2 = not very much; 3 = somewhat; 4 = mostly; 5 = completely; 0 = don't know. Survey responses in Cary were provided on a 0-9 scale where 1 = not at all met; 5 = somewhat; 9 = completely met; 0 = don't know. This was recoded for Cary to a 0-5 scale as follows: 0 (new value) = 0 (reported value); 1(new value) = 1-2 (reported value); 2 (new value) = 3-4 (reported value); 3 (new value) = 5 (reported value); 4 (new value) = 6-7 (reported value); 5 (new value) = 8-9 (reported value).
- Income – household income reported in a variety of categories in the four surveys, this was coded into three categories: 1 = under $50,000; 2 = $50,000-$100,000; 3 = over $100,000.
- Location – recoded from the address, based on the study location of the respondent's home address, coded categorically as: 1 = Cary; 2 = Montgomery County; 3 = Prince George's County; 4 = Tulsa.
- NonWhite/White – reported in a variety of categories in the four surveys, this was coded for the study as 1 = Caucasian/White; 2 = African American/Black; 3 = Hispanic/Latino; 4 = Asian; 5 = Native American; 6 = other, then re-coded into binary categories where 0 = Non-White; 1 = Caucasian/White.

- Total Over 55 – number of adults over age 55 in the home, reported as continuous.
- Total People – number of people in the home, reported as continuous.
- Visits - Reported number of times anyone in the respondent's household visited a park in the last 12 months.
- Years in Community – length of continuous residence within the jurisdiction, reported as continuous.

The unique identifier for each respondent was also extracted from the raw data for use in merging survey data with GIS data.

It should be noted that the questions on the surveys regarding the adequacy of the park system to meet needs were specifically asked in regard to *parks.* The surveys asked similar questions about a variety of features found in park and greenspace systems, and I decided that the term "parks," as used in the context of the surveys, could be reasonably applied to the types of greenspace features that were being studied here. In the surveys, the word "park" was not defined and it was left up to the respondent to determine for themselves what was to be included or referred to as a park. This is not unusual nor surprising, given that the term "park" is not well-defined in the literature or in general use, but is commonly used and understood to refer to outdoor places that are open to the public for purposes of relaxation, recreation, and related pursuits. Similarly, when asking about park visitation, the surveys did not define specifically what constituted a "visit" to a park. It was left to the respondent to determine this. Respondents were simply asked to state the number of visits to parks made by anyone from their household in the 12 months prior to the time of the survey.

Once the selected information was compiled into the study location data spreadsheet for each location, the addresses and unique identifiers were imported into GIS data files for further processing, and the names and addresses were then removed from the study location data spreadsheets. The raw data files were then moved to a secure location to protect the privacy of the individuals who responded to the surveys.

4.5.2 GIS data.

ArcMap 10.2—a Geographic Information System (GIS)--was used to analyze secondary data for the greenspace system from each of the study communities and generate new data regarding the greenspace in the area surrounding each respondent's address. The secondary GIS data came from multiple sources that provided it to consultants for master planning projects. During those projects, new data were added by myself and others under my direction using a systematic approach that included the GRASP®-IT audit tool, described in Section *4.5.2.3*.

4.5.2.1 Secondary GIS data.

The GIS datasets were obtained from archives at Design Concepts, who prepared them while serving on the planning team for the master planning projects from which the household surveys used in this study were derived. Design Concepts obtained the base GIS data from local authorities at the time parks and recreation master plans for each community were being conducted. The data included parcel boundaries for all greenspace owned or managed by the agencies for whom the surveys were commissioned, as they were known to exist at the time the surveys were conducted.

Additional information for each parcel was included with the base GIS files, although the exact content varied among the four locations. At a minimum, all four GIS datasets included the ownership status and place name of all greenspace parcels considered by each agency to be relevant to its mission.

Consistent across all four study location datasets was the inclusion of lands that would typically be thought of as "parks" in the local community. In some cases this included lands that belong to other providers, such as school districts. Such cases occur when schoolyards or lands of other providers are in general use by the public for park purposes. In some communities, such lands are closed to general use and are not included. In other communities, partnership agreements are in place that specify how and when the general public can use these lands. Certain lands where admission is controlled--for example, golf courses--were sometimes, though not always excluded. The determination of what to include or exclude was made by local authorities.

No attempt was made to assure that every bit of "green space" within each study area was included in the datasets. Instead, each dataset reflected the inventory of greenspace parcels within each of the study locations that might be generally thought of by local residents and policymakers as constituting the "park system" within that community. This aligns with the purposes of the present study, which focused on perceptions of the greenspace system as they occur in the minds of residents, rather than as it might be objectively defined or outlined to them in detail.

Any errors found in the GIS data during the inventory process were corrected at that time. Thus, the archived data represents the best and most accurate understanding of the true

configuration of each greenspace system at that time, which coincides with the time frame in which the survey was conducted.

4.5.2.2 Primary GIS data.

4.5.2.2.1 Geocoding. A separate GIS map file was created for each study location, except for Montgomery and Prince George's Counties. Those two were managed within a single map document since they are adjacent to one another in Maryland. This arrangement allowed for each study area's GIS map to remain in its own State Plane Coordinate System (SPCS), rather than combining them into a single national projection. This put the data into a common coordinate system with other databases covering the same area, such as those provided by counties or municipalities. It maintained a high level of accuracy of one part in 10,000 (USGS, 2013).

Layers that were not relevant to the current study were removed from the archival map files, and the file was saved under a new name. The archival files were then saved in their original unedited condition and archived to preserve a record of the original historical data used for the study and to maintain a backup of the data. Using the new map files, addresses of respondents and their associated unique identifiers from the new master dataset for each study location were imported into a geocoded layer. Geocoding of all survey responses had been done for Cary when the master planning project was performed and they were already in the archival GIS file, so there was no need to geocode addresses for Cary. Geocoding of the addresses in Montgomery County, Prince George's County, and Tulsa were performed by GIS staff at Design Concepts using ArcMap 10.2 and ESRI's World Geocoding Service through the firm's subscription to the service. Excel files containing the

addresses and unique identifiers were geocoded, then returned to me as shapefiles, which were then imported into the appropriate map file for each study location.

Geocoding accuracy varies by region and country as well as by the specific data model used to match addresses (Zandbergen, 2008). The specific model used in the ESRI Geocoding is not confirmed by ESRI's documentation, but my visual inspection of the results--zooming in to see where the points were located--suggested that a street network model was used. This model was explained in more detail by Zandbergen (2008):

> In this approach a street network is represented as street line segments that hold street names and the range of house numbers and block numbers on each side of the street. Address geocoding is accomplished by first matching the street name, then the segment that contains the house numbers and finally placing a point along the segment based on a linear interpolation within the range of house numbers. An optional off-set can be employed to show on which side of the street line segment the address is located. This approach to geocoding is referred to as "street geocoding" and has become the most widely used form of geocoding. Nearly all commercial firms providing geocoding services and most GIS software with geocoding capabilities rely primarily on street geocoding (p. 217).

The visual inspection of the results suggested that the degree of accuracy depends on the parcel sizes and relative number of addresses for a given distance of street. Where there were consistent parcel sizes and more street addresses for a given length of street, accuracy appeared to be higher than in more rural areas or areas where parcel size and number varied

for the same length of street. Overall, the visual inspection indicated that points generally fall within the area between the street centerline and the edge of the parcel in question and in the approximate center of the parcel's street frontage. However, exceptions were found where the point was placed farther from the street centerline and deeper within the parcel and near the edge of the parcel's street frontage. In most cases, the point was located somewhere in front of the home, between the house and the middle of the adjacent street.

4.5.2.2.2 Definition of proximity for each address. Once the geocoded address points were in the map files, the ArcMap 10.2 buffering tool was used to generate a circular buffer with a radius of 0.333 miles (1758.24 feet) centered on each of the geocoded address points. Buffers were created on each study map, with all of the buffers for that map stored on a single layer. Each of the four study location maps had its own layer of 0.333-mile buffers. *Figure 4.2* shows a hypothetical example, with buffers around two geocoded address points. The figure also shows greenspace parcels (locations) as polygons and the components found within them as points. Census tracts are shown to illustrate that the buffer for a given address may intersect multiple census tracts. This will be discussed further in Section *4.5.2.2.6.*

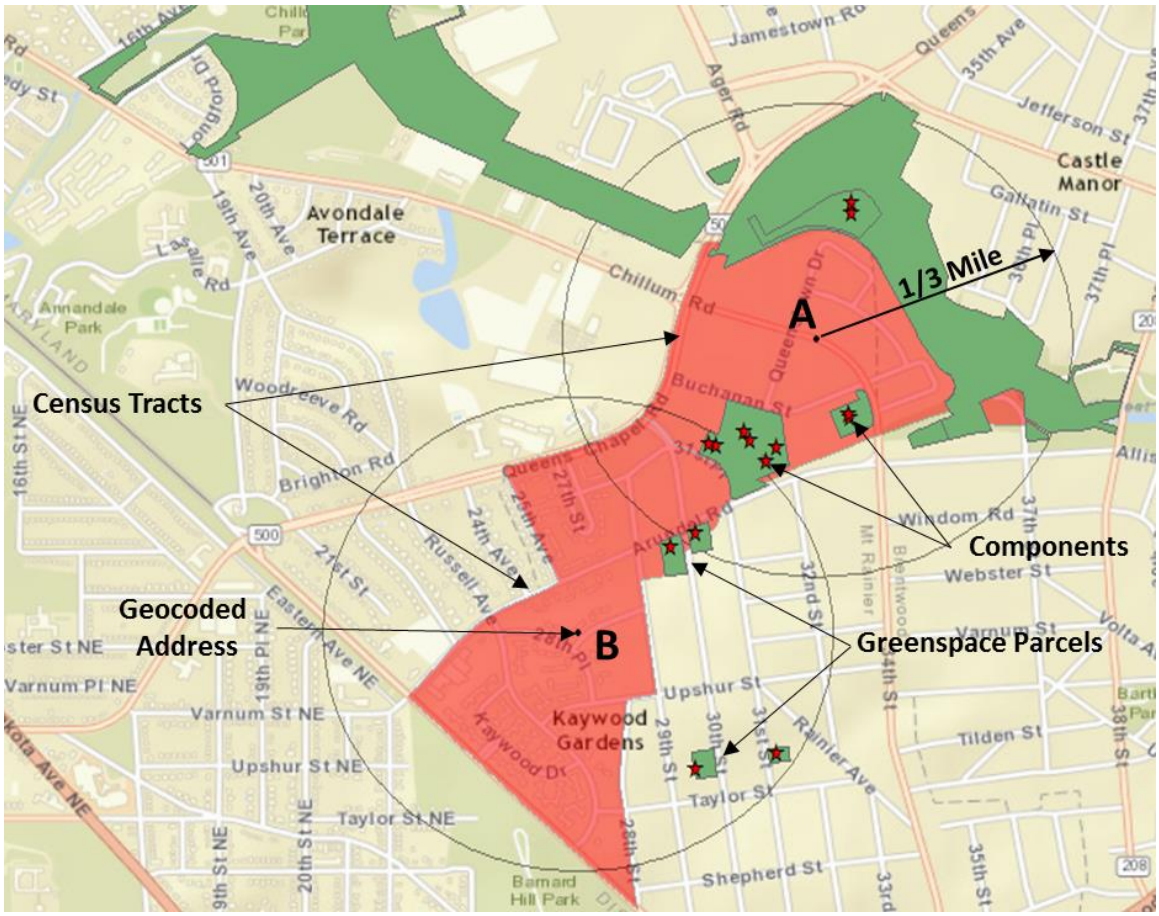


Figure 4.2 GIS example

Buffers are often used in geospatial research to reflect an individual's immediate neighborhood, but as Brownson et al. (2009) pointed out, "there is much debate about the most appropriate buffer size for this research" (p. S117). Brownson et al. noted that considerable variation in the geographic scale exists and offered examples ranging from 0.3 kilometers to one mile for measuring access to recreation facilities. Giles-Corti et al. (2006) defined "neighborhood" as a 10-15 minute walk from home.

There is also debate as to whether radial (Euclidian) or network buffers should be used. Some researchers propose that for travel on foot, Euclidean distance is preferable

because foot travel may involve shortcuts that are not always represented in digital representations of street networks (Smoyer-Tomic et al., 2004). Some researchers use both types in the same study, as indicated in *Table 4.6*, which shows a comparison of buffer types and distances from a number of studies in the literature. Because the digitally represented street networks used for this study were derived from a variety of sources and cover well over 1,000 square miles, it was not practical to thoroughly check them. Since the level of detail and accuracy of the street and pedestrian networks could not be absolutely verified, radial buffers were chosen. I selected the 0.333-mile distance based on the literature, as summarized in *Table 4.6*, practical experience in the field, and test trials conducted as part of my private practice as a conservative estimate of the spatial extent of the area around an address within which most destinations can be reached on foot within a 10-15 minute walk. The results of some of the test trials are available online at http://www.gpred.org/research-briefs/#brief-1. (Layton, 2014).

Table 4.6 Review of buffer types and distances

Study	Buffers		Access Distance Referenced	Notes
	Euclidian	Network		
Brownson, et al. (2009)	X		400 to 3200 Meters	400 Meters = 0.25 Miles, 3200 Meters = 1.98 Miles
Chang and Liao(2011)	X	X	Varies	Gravity model uses whatever distance exists
Cho & Choi, 2005)		X	Varies	Gravity model uses whatever distance exists
Dills, et al. (2012)		X	1 Mile	1 Mile = 1609 Meters
Forsyth, et al. (2007)	X		1.00 Kilometer	1 Kilometer = 0.62 Miles
Frank, et al. (2005)		X	1.00 Kilometer	1 Kilometer = 0.62 Miles
Giles-Corti, et al. (2006)			10-15 Minute Walk	0.25 Miles = 402 Meters (Buffers referenced but not reported)
Godbey (2009)			1 Kilometer and 1 Mile	0.25 Miles = 402 Meters (Buffers referenced but not reported)
Heinrich, et al. (2007)	X		0.80 Kilometers	0.8 Kilometers = 0.50 Miles
Nichols (2001)	X	X	0.50 Miles	0.50 Miles = 805 Meters
Oh and Jeong (2007)	X	X	1.00 Kilometer	1 Kilometer = 0.62 Miles
Smoyer-Tomic, et al. (2004)	X		0.80 Kilometer	0.8 Kilometers = 0.50 Miles
Talen (2010)			5 Minutes (1/4 Mile)	0.25 Miles = 402 Meters (Buffers referenced but not reported)
TPL (2004)	X		0.25 Miles	0.25 Miles = 402 Meters

4.5.2.2.3 Total greenspace for each address. For each map, the layer containing the buffers for the geocoded address points was intersected with the polygon layer containing the parcels that made up the greenspace system, using the ArcMap intersection tool. This created a new layer containing all greenspace lands falling inside the 0.333-mile buffer of each address. For example, address **B** in *Figure 4.2* contains five greenspace parcels within its 0.333-mile buffer. Each time a buffer crossed or encompassed a greenspace parcel, a new polygon was created that contained only the portion of the greenspace parcel falling within the 0.333-mile buffer for the associated address point, as shown in *Figure 4.3*. A total of 1,543 polygons were created for Prince George's County, 4,748 for Cary, 1,743 for Montgomery County, and 632 for Tulsa. In Prince George's and Montgomery Counties, some greenspace polygons associated with a particular address in one county may lie in the other county, because both counties are in a single map. These cases were not removed, on the theory that jurisdictional boundaries alone are not likely to prevent someone in one county from being affected by a park in the adjacent county. The point should be made that in all four study locations there may be cases where a residence is located near the study area boundary and is influenced by greenspace that is not included in the inventory because it lies beyond the study area boundary. I expected such cases to be limited in occurrence, given the relatively short 0.333-mile buffer distance.

The new polygons generated in the intersection operation were placed on a single polygon layer in each of the map files. Each polygon carried with it attributes indicating the place name of the greenspace parcel from which it was derived and the unique identifier for

the survey participant associated with the address point from which the buffer was derived. A new field was added to the attribute table for this layer and populated with the computed size of each polygon in acres. Other information found on the layer varied by study location, but each included typologies (e.g., neighborhood park, community center, etc.). The attribute table for the new polygon layer was exported to Excel for further operations. A separate Excel workbook was created for each study location.

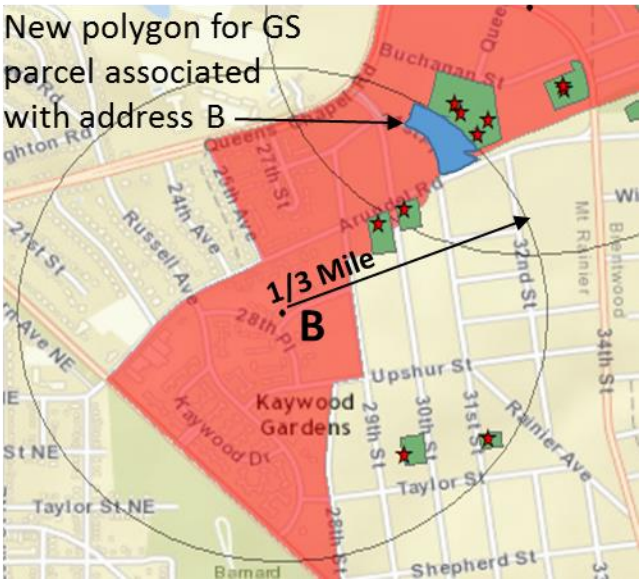


Figure 4.3 Creation of new polygons for GS parcels intersecting an address buffer

In Excel, parcel polygons carrying typology designations of types that were not considered parks were removed. In Prince George's County this included Arts Center (six records), Boxing Center (five records), Community Center (21 records), Indoor Centers (11 records), Sports and Learning Center (one record), Paintbrush Golf (one record), College Park Youth Services Center (one record), PG Stadium (one record), Nature Centers (seven

records), and “other” (two records). These facilities are primarily for indoor use and their sites are not conducive to typical park uses. Glenridge Childcare Center was not deleted because it contained a playground.

In Montgomery County polygon deletions included those designated as Golf (seven records), Margaret Schweinhaut Center (11 records), and Wheaton Community Center (nine records). No deletions were made for Cary or Tulsa as all typologies in the datasets were considered relevant.

Once the deletions were made, the total area of all polygons associated with each unique identifier was summed in Excel using the SUMPRODUCT function. Because the GIS layer containing polygons falling within buffers contained only the buffers that intersected greenspace parcels and did not include buffers that intersected no greenspace parcels, the results of the SUMPRODUCT operation did not include the full list of unique identifiers. Therefore, the results had to be merged with the full list of unique identifiers using the Excel VLOOKUP function, and zeros were entered under the column for total greenspace acres for those unique identifiers whose buffers did not intersect or contain any greenspace parcels. The unique identifiers and total greenspace acres data were then copied to the study location data spreadsheet for each study area.

4.5.2.2.4 Total number of greenspace locations for each address. The purpose of this operation was to determine the number of individual parks, greenways, or other greenspace locations (not to be confused with the four *study locations* that have been referred to in this document) occurring within the buffer for each address. Simply counting the number of greenspace polygons was not appropriate because the buffering operation can create multiple

polygons from a single greenspace location. Therefore, the REMOVE DUPLICATES operation was performed in Excel to remove duplicate occurrences of a single greenspace place name associated with a single unique identifier, and the remaining number of discrete greenspace place names falling within the buffer for each address was manually tallied. The VLOOKUP function was once again used to match the list of unique identifiers having one or more greenspace locations within their buffers with the list of all unique identifiers, including those with no greenspace locations in their buffers. Zero was entered for the unique identifiers that had no greenspace parcels within their buffers, and the full column of data was pasted into the study location spreadsheet for each of the four study jurisdictions.

4.5.2.2.5 Size of nearest greenspace for each address. Because it was *joined* with the layer containing all of the greenspace parcels, the attribute table for the layer containing distances from each address point to the nearest greenspace parcel as described in section *4.5.2.2.7* also contained all of the attribute fields for the greenspace locations. This included a field displaying the size in acres of the greenspace location that was nearest to each address point. This information was extracted from the Excel spreadsheet containing attribute data for the layer created in Section *4.5.2.2.4* and placed in the study location data spreadsheets.

4.5.2.2.6 Population density at each address. Population density within the 0.333-mile buffer for each address was determined by first obtaining an estimate of the 2010 total population within the buffer using ArcGIS Online Spatial Analysis Data Enrichment. According to ESRI, data for this comes from both ESRI's own data development team and third-party data suppliers. The population calculation is done through an ArcGIS Server geoprocessing service that gives access to a model running on the server (ESRI, 2016).

The estimated population number within each address buffer was added to the Study Location Spreadsheet in Excel for each location, then divided by the area within the buffer to generate a new column containing an estimate of the population density per square mile for the area within the 0.333-mile radius around each address. This provided a more accurate estimate of the true population density than using only the census block group population of the address itself, because the 0.333-mile buffer may overlay multiple census blocks and block groups, as shown in *Figure 4.2*.

4.5.2.2.7 Distance to nearest greenspace for each address. Buffers were not used to measure this variable. Instead, the straight line distance to the closest boundary of the nearest greenspace location, however far, was measured. This was true even if it was outside the 0.333-mile buffer for the address. ArcMap's *join* feature was used to find the straight line distance to the nearest greenspace parcel from each address point. This resulted in a new layer containing the unique identifier for all address points and the distance in feet to the closest edge of the nearest greenspace parcel. The attribute table for this new layer was exported to Excel and matched up with the appropriate unique identifiers in the study location data spreadsheets.

4.5.2.3 Data from GRASP®

4.5.2.3.1 The GRASP®-IT audit tool. Brownson et al. (2009) explained that "researchers use audit tools to collect primary data on physical features that are not commonly incorporated into GIS databases," including ones that "are best assessed through direct observation" (p. S106). A direct observation instrument developed by myself and colleagues, known as GRASP®-IT, was used to collect data for this study. Reliability and

validity testing of the GRASP®-IT audit tool were performed as part of this study as presented in Appendix G. Among the data captured with the GRASP®-IT audit tool is the presence/absence of a predefined and coded set of components as shown in Appendix E. Components are geolocated in GIS and a set of attributes are assigned to each component. The attributes are explained in greater detail later in this section.

The audit tool was used to capture data on the presence/absence, quantity, functionality, and other characteristics of the greenspace system in each of the study locations as part of prior master planning projects. The purpose at the time the data were collected was not the same as the purpose of the study proposed here, but they are used here as secondary data.

It should be noted that at the time they were compiled, these datasets were subjected to review at multiple levels and formally adopted by the local agency as a true and accurate representation of those greenspace assets within the community considered relevant to measuring levels of service in the community. While this does not guarantee them to be 100% accurate, it mitigates the potential error that Brownson et al. (2009) warned of when using GIS data. It should also be noted that the definition of what is considered "public greenspace" varies from one agency to another when preparing comprehensive plans, so the types of lands included in the GIS dataset for each community may vary. However, the data were consistent across the geographic extents within each study location. Thus, if greenspace from a particular provider (public schools, for example) is missing from one part of a study location's dataset, it is missing from the entire dataset for that study location.

The GRASP®-IT audit tool is intended to be used by trained observers who are familiar with the community and the range of greenspace features typically found within it. For the locations within this study, trainees were first given instruction in the use of the instrument. Next, they were taken on a tour of local greenspace sites to review a range of features and conditions, where they practiced rating various items. Their ratings were discussed with other trainees and the trainer to decide what rating was most appropriate for each item. After the training, the trainees were sent out on their own as observers to perform the audits.

Observers spent time meeting with agency personnel, community leaders, and residents as part of the audit process to gain an understanding of what the norms and perceptions were for community members in terms of needs and desires for greenspace characteristics. Based on that understanding, "expectations" were then defined for each greenspace feature as the normative conditions that would be expected by a typical resident of that community for that feature at its particular location. Observers then noted the presence or absence of a specific set of characteristics within the greenspace system and subjectively assessed those on a scale of 1 to 3, where 1 = below expectations, 2 = meets expectations, and 3 = exceeds expectations.

The assessed characteristics were divided into two categories: *modifiers*, which are characteristics of the overall site, and *components*, which are features within the site that people come there to use or enjoy. A listing of components and modifiers can be found in Appendix E. The modifiers and components were selected and refined by a team of experts,

including myself, over a period of six years prior to the completion of the earliest inventory in this study.

Modifiers include such attributes as shade, seating, drinking water, and restrooms. Components can be either manmade--such as playgrounds, sports courts, athletic fields, and picnic facilities--or natural, such as a pond, stream, or wooded area. A set of codes and definitions for components is found in Appendix E.

Modifiers were assessed for each greenspace location that was included in the GRASP®-IT inventory. These attributes were entered into a geodatabase as a polygon shapefile containing all of the greenspace parcels for each study location. If the attribute was not present or present but not functioning, no score (i.e., score of zero) was assigned to that attribute. If present, the attribute was assessed on a scale of 1 to 3. Criteria for the ratings is provided in Appendix D

Figure 4.4 illustrates the effect of modifiers on a hypothetical play structure. It shows that the same play equipment situated in two entirely different settings offers different value to the user.

Figure 4.5 illustrates the concept behind the scoring of modifiers for sites in which three different playgrounds are located. Note that modifier scores are not based on the playgrounds themselves, but rather for their *setting* or *context*. Thus, a modifier score is assigned to the entire site for each modifier variable.

Figure 4.4 The concept of modifiers.

Figure 4.5 Scoring concept for modifiers.

In addition to the overall site attributes represented by modifiers, the presence of components was noted at each site. As defined in Section **1.5**, the word "components" refers to the constituent parts of a greenspace system that support its usefulness for human purposes. Components can be either manmade--such as playgrounds, sports courts, athletic fields, and picnic facilities--or natural, such as a pond, stream, or wooded area. The GRASP®-IT audit tool incorporates a set of codes and definitions for components. These are found in Appendix E.

Components are similar to Barker's concept of behavior settings (Heft, 2001). Like behavior settings, components have a specifiable geographic location and discriminable boundaries, are quasi-stable, exist independently of any single person's experience of them, and the individuals who occupy them are interdependent. However, compared to behavior settings, the boundaries of components are less temporal and more clearly defined. While this is not absolute--for example, the component "educational experience" may include the area immediately proximate to an interpretive sign or it may include the entire context of a historic site--GRASP® components have a standardized definition intended to make them clearly and consistently identifiable from one instance to another, as defined in Appendix E. When a component was present, it was located on the map with a point in the approximate center of the component and the following characteristics were assessed and entered into a geodatabase point shapefile as attributes associated with that component:

- A ***Neighborhood Functional Score*** (Functional_Score_N): An assessment of the component's *functionality*, based on *how well that particular component serves its intended purpose at that specific location,* as considered from the perspective of an individual living within approximate walking distance of the component.
- ***Shade/Lights****:* The presence/absence of shade and/or lights for nighttime use at each component. The rationale is that these extend the period of time during which the component can be comfortably used.

The rationale behind the functionality assessment is that the expectations an individual holds for a given component in a specific location may vary depending on whether

the individual lives nearby or must travel some distance to use the component. For example, a small, simple play feature may completely meet the expectations of a person who spontaneously or casually walks down the street with their toddler to play on it for a short period, while it may not meet the expectations for play so well for someone who has made a greater effort to drive their child across town to use the play feature.

A point layer for components was part of the secondary GIS data obtained for this study. This had been created by Design Concepts' staff when the master plans for each location were being conducted. The layers were built from multiple sources, including shapefiles provided by local agencies, digitized points based on aerial photos, and notes made on-site by myself, my staff, and staff members from the client agencies. Each component was identified with a point on the map at the approximate center of the component. Thus the level of precision for any given component is roughly ½ the diameter of the component, but can be much lower for components that take up a small footprint on the ground. Based on experience and professional expertise, I estimate the general accuracy for component locations in the GIS to be within a range of about 20 feet. The final data for components was reviewed and approved by agency staff in each of the study area locations at the time the greenspace system master plans were completed.

The audits for each greenspace location were reviewed by agency staff for completeness to make sure that no locations or components were missed, and also reviewed for accuracy to assure that the assigned scores were an appropriate representation of what a typical member of the local community would expect. If agency staff felt that a score should be changed, it was discussed between the auditor and the staff representative. After

discussing the rationale for a particular score, deference was given to the agency staff as to what the final assessed value would be for that item. This was done on the assumption that local agency professionals are in a better position to make the decision, once they have given the matter full consideration.

With this collaborative and iterative process, it is assumed that the GRASP®-IT audit tool is an effective way to capture the essential qualities and characteristics of a greenspace system. It has performed well in that capacity for more than 15 years and in well over 100 greenspace system audits. However, until now it has not been tested for use in academic studies and scholarly applications. Reliability and validity testing were conducted as part of this study and are discussed in Appendix G.

4.5.2.3.2 Total components for each address. The layer containing the 0.333-mile buffers around each address point was *intersected* using the geoprocessing tools in ArcMap with the layer containing the components to generate a new layer containing all components located within the buffer for each address. In the hypothetical example shown in Figure 4.2, address '**A**' has 11 components in its buffer (two are overlapping and difficult to see at the scale of the figure) and address '**B**' has six components in its buffer. Information from the new layer was exported to Excel and entered into the study location spreadsheet for each study location. Based on my estimate of precision for component locations, there is a probability of approximately 1% that a component point will be erroneously included or excluded from a buffer (20' divided by 1,758' = 0.012). Because the error can occur equally in all directions, it is expected that such errors will cancel each other out across the entirety of the dataset.

4.5.2.3.3 Design & Ambience (D&A) of nearest. The GRASP®-IT audit includes a measure of the overall attractiveness and appeal of the greenspace site, coded as Design & Ambience (D&A). The GRASP® files obtained for each study area included this information, which was extracted and exported to the study location spreadsheet for each study location, where the D&A score for the nearest greenspace was associated with each address using the unique identifiers.

4.5.2.3.4 GRASP® composite indicator values.

4.5.2.3.4.1 Methodology for GRASP® composite indicators. Several different composite indicators have been developed heuristically over the past 15 years by myself and my colleagues for use in private practice based on the audit data from the GRASP®-IT tool. These have been applied on more than 100 projects in over 23 states in the U.S. and found to be useful in measuring various aspects of service provision within the parks and recreation field. Different algorithms have been used to produce these, but all generally rely on the assumption that the composite value of a park, program, and other public amenity or service is a product of *availability* (how easy is it to gain access to it?), *quantity* (how much, how many, or how big?), and *quality* (how good is it?) The underlying theory is that these variables interact with one another and can be combined to generate a composite measure that cannot be expressed by any single variable.

In applying this concept to parks, greenways, and other physical greenspace locations, the GRASP® methodology combines modifiers and components into a composite indicator for each component. Modifiers are considered to act upon or *modify* the experience of the components within a GS site. For example, the experience of using a playground is modified

by the presence of shade, restrooms, drinking fountains, and places to sit, because these can enhance the desirability of using the playground and the quality of the experience. Consider this in relation to the three components of nature dose described by Shanahan et al. (2016): frequency, duration, and intensity. Modifiers are attributes of the site that encourage users to visit more often, stay longer, and enjoy a deeper, more intense experience. Thus, a playground in a site that has no shade, seating, restrooms, and other amenities is assigned a lower value than one where such amenities are present. There are 15 modifiers that are scored on a scale of 0-3, as explained in Section *4.5.2.3.1*, for each site. One of the modifiers, Design & Ambience (D&A), is used separately as a multiplier in determining the total value of a component. The remaining 14 are summed to determine a total modifier score for the site, which is then re-coded into a value of 1, 2, or 3 as follows:

- Modifier total ≤ 11, modifier score = 1.1.
- Modifier total 12-24, modifier score = 1.2
- Modifier total >24, modifier score = 1.3

Each component is given a Modified Component Value that is computed from the functional score, the variable for lights and shade, and the modifier score of the site in which the component is located, as shown in *Figure 4.6.*

The calculation of the Modified Component Value is performed by taking the Neighborhood Functional Score and multiplying it by the site's modifier score, then by the site's D&A score, and finally by the lights/shade variable. If neither lights nor shade are present at the component, the multiplier value is 1.0. If either one is present, the multiplier value is 1.5. If both are present, the multiplier value is 2.0.

The variables are multiplied by one another to produce a Modified Component Value (labeled as Comp_Total_N_Value in the GRASP® system) for each component as follows:

GRASP® Modified Component Value = Component Functional Score x Modifier Score x D&A Score x Lights/Shade Variable

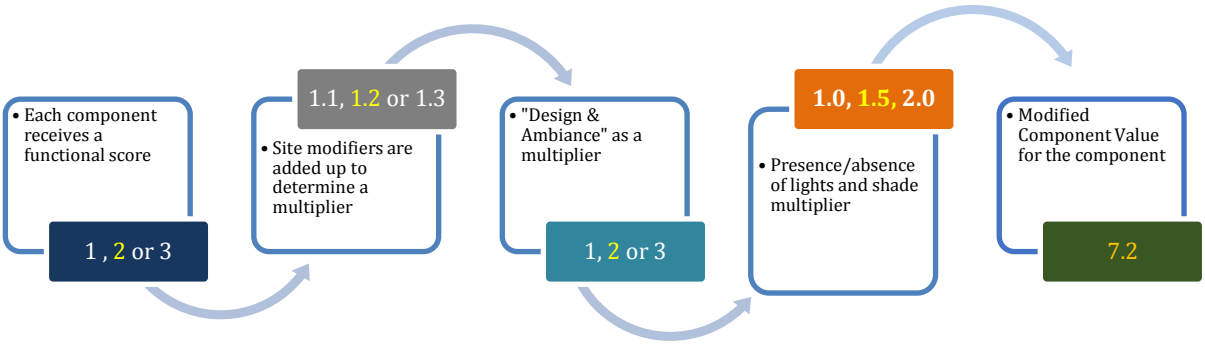


Figure 4.6 Process for determining GRASP® Modified Component Value for Individual Components.

Figure 4.6 shows an example in graphic form. In some cases, a weighting factor is also applied if the component is within a site that has restrictions on use or availability. This is commonly done with schoolyards, which may have limitations on the times of use. The typical weighting factor for a schoolyard would be 0.5, decreasing the Neighborhood Component Scores to reflect limits on availability. Weights are assigned on a case-by-case basis by the auditor and staff from the agency for whom the GRASP®-IT audit are being performed.

4.5.2.3.4.2 GRASP® Score of nearest greenspace for each address. The GRASP® Modified Component Value at each GS site was added together to produce a total GRASP® score for the site. A script in the GRASP® software performs this operation automatically and records the result in an Access database when a GRASP® audit of a site is performed. The total GRASP® scores for all of the inventoried sites were extracted from the Access database and imported into the Excel study location spreadsheet for each study location and matched with the *Nearest Park* variable for each unique identifier using VLOOKUP. This provided a total GRASP® score for the park that was nearest to each respondent address in the study.

4.5.2.3.4.3 Total GRASP® Value and GRASP® Walk Value for each address. The GRASP® Modified Component Values can be used in GIS to create choropleth maps, sometimes called "heat maps," in which shades or patterns represent the measurement of the statistical value being displayed. This provides a range of values across the geography as well as the value at any given location. In the GRASP® system, these are referred to as *Perspectives*. The concept for this process is illustrated with a single component—playgrounds--in *Figure 4.7* Actual Perspectives for Tulsa are shown in *Figure 4.8*.

GRASP® Perspectives were part of the secondary data obtained for each study area. The Perspectives had been created in ArcMap by assigning the GRASP® Modified Component Value to a buffer around each component, then overlaying the buffers from all components to generate composite scores that are the sum of all buffers overlaying one another at any given location. Thus, each address point on the map has a value that is the sum of all buffers that overlay it.

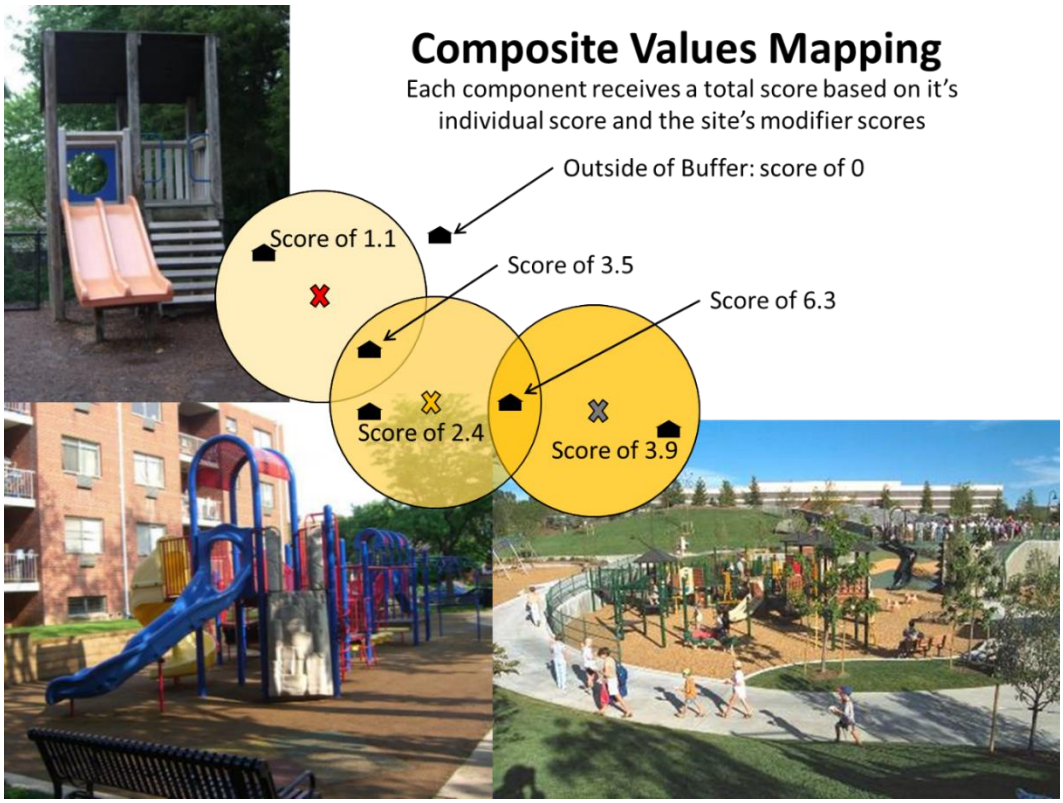


Figure 4.7 Concept for creating GRASP® Perspectives.

The first perspective used in each location was the GRASP® Neighborhood Composite Perspective (*Figure 4.8*). The map was created by applying two different buffers from the point location of each component in the inventory. The first buffer is a one-mile radial buffer, which was assigned the GRASP® Modified Component Value for its component. The second was a 0.333-mile radial buffer, which also received the GRASP® Modified Component Value for its component. The net effect of this is that a component's value is doubled within the 0.333-mile radius around it. When all of the buffers for all of the components are overlaid, the result is a shaded-values map. The intersection of all the buffers

creates a series of individual discrete polygons across the map, which can number into the thousands where there are large numbers of components in close proximity. Each polygon carries the value of all of the buffers that overlay it. A color ramp is used to display the values, with darker values representing higher composite values. A GIS query can be used to tabulate the value at the specific location for any point on the map. GIS staff at my firm did this to generate a table of values for the Overall GRASP® Value at the address of each address in the study area location datasets, which was then imported into the Excel study location spreadsheet for each study location.

A similar process was used to derive a GRASP® Walk Value at each address. Data were extracted from a GRASP® Walkability Perspective that had been generated at the time of the local agency's master planning effort (*Figure 4.9*). In the Walkability Perspectives, only the 0.333-mile buffers (and not the one-mile buffers) are used to limit the results to only those things within walking distance. Also, the buffers are truncated wherever they cross a feature that is considered to be a pedestrian barrier. Such barriers include highways, rivers, and sometimes major streets, railroads or other geographic features. The identification of barriers was performed by the local agency at the time the master planning efforts took place, so for the purposes of this study they were predetermined and accepted as-is. By querying the GIS, the GRASP® Walk Value for each address was extracted and imported into the Excel Study Location Spreadsheet for each study location. This was the final variable produced, thus completing the study location spreadsheets.

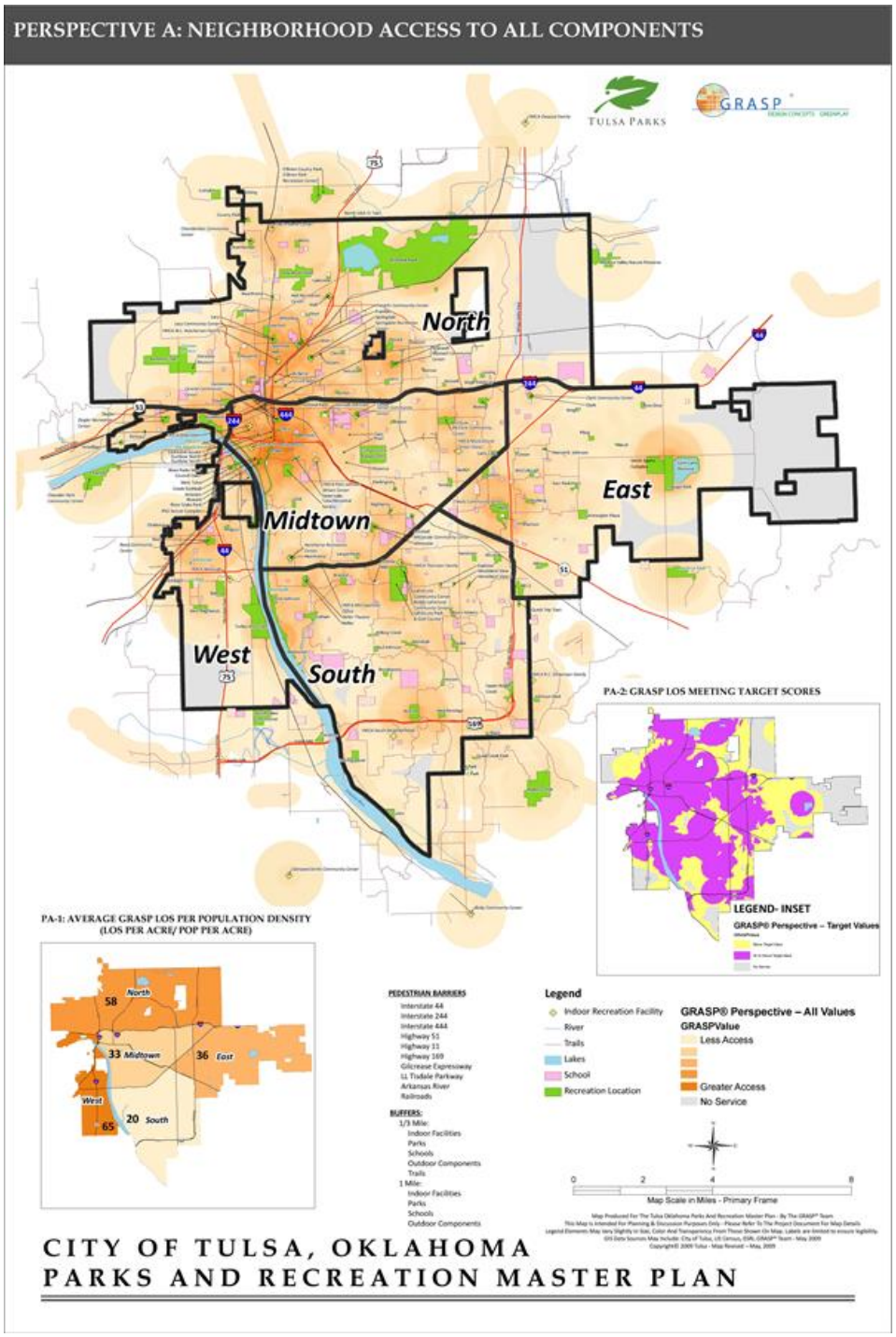


Figure 4.8 Sample GRASP® Neighborhood Perspective – Tulsa, Oklahoma.

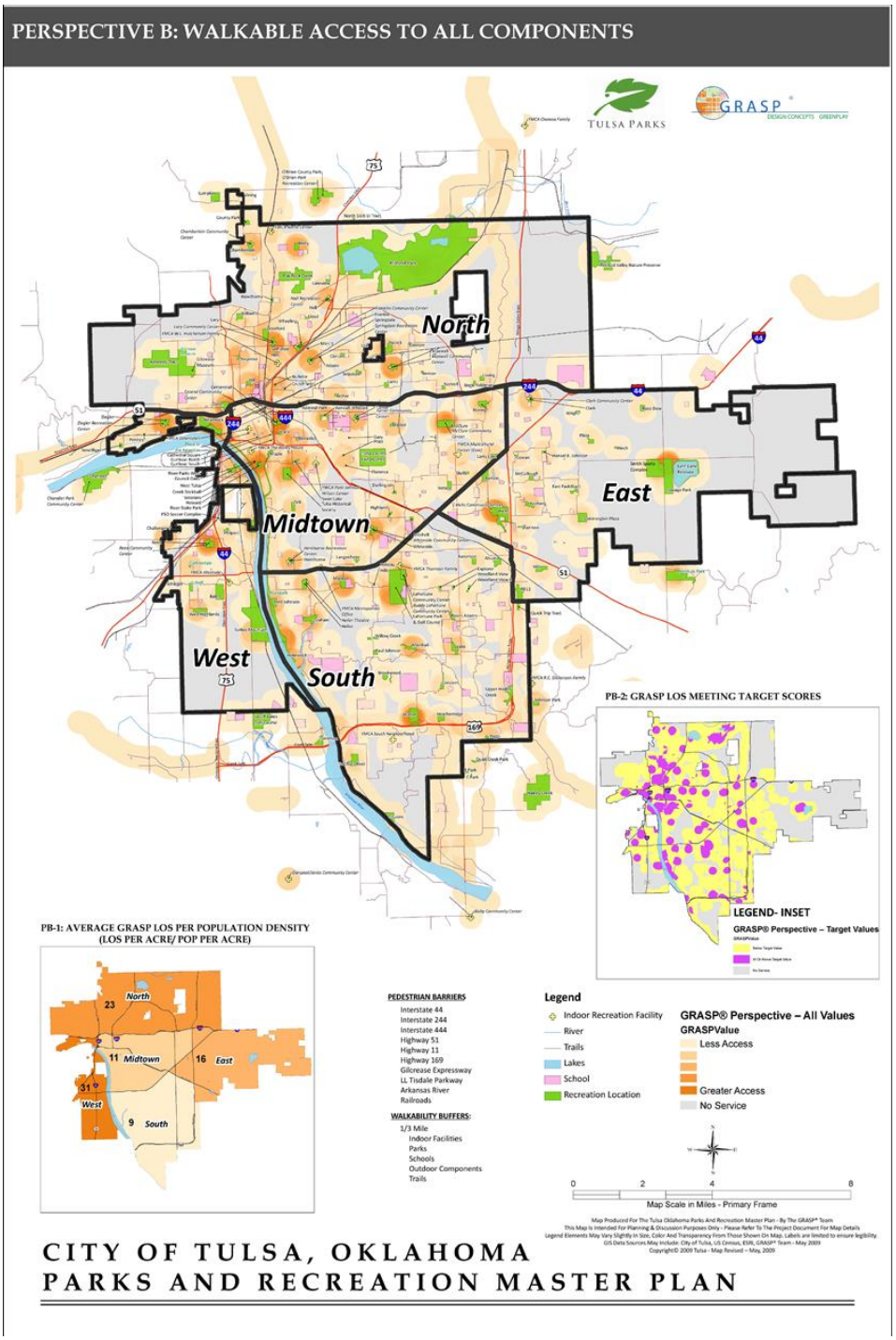


Figure 4.9 Walkability Analysis example – Tulsa, Oklahoma.

4.6 Compilation of Final Dataset

With the completion of the study location spreadsheets, the data from all four were aggregated into a single Excel spreadsheet. A code was added to identify which of the four study locations the participant was from, and a unique case number was added for each participant by numbering all records sequentially from one to 1,816. This allowed for the removal of the unique identifiers, assuring another level of privacy for the participants going forward. But before removing the unique identifiers, a final check of the data was conducted to assure that no errors were made in transferring data from the original source to the final dataset during the compilation process. This was done by selecting five unique identifiers at random from each of the four study locations and going back to the original source for each variable to confirm that the data associated with that unique identifier in the original data source was the same as in the final datasets. Similar tests had been conducted at various steps along the way, but this final checking assured the quality of the data before importing it into SPSS Statistics 23 for statistical analysis.

The secondary data was aggregated from four different surveys, and in some cases, there were questions not on one of the questionnaires that were included on the others. Also, not all respondents answered all of the questions. Therefore, there are different *n* values for some of the data, as shown in *Table 4.7*. Of particular note is that the questionnaire for Montgomery County did not include the question regarding visits to parks that was used as the dependent variable in Research Question #2 as explained below.

Table 4.7 Locations where data were obtained for each variable.

	Variable	Locations with available data: Cary	Montgomery County	Prince George's County	Tulsa	*n*	Reference Section
Control Variables	Age	x	x	x	x	1,686	4.5.2
	Children at Home	x	x	x	x	1,645	4.5.2
	Density	x	x	x	x	1,813	4.5.2.2.6
	Gender	x	x	x	x	1,758	4.5.5
	Importance	x		x	x	1,219	4.5.6
	Income	x	x	x	x	1,601	4.5.7
	Location	x	x	x	x	1,816	4.5.8
	NonWhite/White	x	x	x	x	1,702	4.5.9
	Total Over 55	x	x	x	x	1,661	4.5.10
	Total People	x	x	x	x	1,758	4.5.11
	Visits	x		x	x	1,107	4.5.12
	Years in Community	x	x	x	x	1,750	4.5.13
Independent Variables	Design & ambience of nearest GS	x	x	x	x	1,813	4.5.2.3.3
	Distance to nearest GS	x	x	x	x	1,813	4.5.2.2.7
	GRASP® score of nearest GS	x	x	x	x	1,804	4.5.2.3.4.2
	GRASP® Walk Value	x	x		x	1,333	4.5.2.3.4.3
	Size of nearest GS	x	x	x	x	1,813	4.5.2.2.5
	Total components	x	x	x	x	1,816	4.5.2.3.2
	Total GRASP® Value	x	x	x	x	1,811	4.5.2.3.4.3
	Total greenspace	x	x	x	x	1,816	4.5.2.2.3
	Total GS locations	x	x	x	x	1,816	4.5.2.2.4

4.7 Data Analysis Strategy

The data described above were used to examine the research questions. The first research question asks how characteristics of the greenspace system near an individual's home are related to their opinion of the adequacy of the greenspace system in the community to meet needs. The second research question examines relationships between those same greenspace characteristics and the frequency of visits to parks.

Data for greenspace characteristics were used as independent variables in regression analyses with opinions of GS adequacy and reported visits to parks used as dependent

variables in testing the research questions. The two research questions were examined separately, each with its own set of regression analyses.

4.7.1 Dependent variables.

The participant's response to the question regarding how well needs are met by the park system in their community—labeled as "Degree of Needs Met" in the dataset and coded dichotomously as either "Not highly met" or "Highly met"—was used as the dependent variable in the regression analyses for the first research question:

> ***Research Question 1 (RQ1)*** *- What is the nature of the relationship between physical greenspace characteristics and residents opinions on the adequacy of public greenspace systems?*

The participant's response to the question asking how many times someone from the participant's home had visited a park in the previous 12 months—labeled "Visits" in the dataset—was used as the dependent variable in the regression analyses for the second research question:

> ***Research Question 2 (RQ2)*** *- What is the nature of the relationship between physical greenspace characteristics and residents frequency of use of public greenspace systems?*

4.7.2 Independent variables.

Nine GS characteristics identified in *Table 4.1* were used as independent variables: (a) total greenspace in acres within the 0.333-mile buffer around the home; (b) total number of greenspace locations within the 0.333-mile buffer; (c) size in acres of the greenspace site whose boundary is closest to the home in a straight-line distance; (d) distance in miles to the closes GS site boundary; (e) total number of components within the 0.333-mile buffer; (f) design and ambience of the nearest GS site as measured with the GRASP®-IT audit tool; (g) GRASP® score of the nearest GS site; (h) Total GRASP® Value at the participant's home address; and (i) GRASP® Walk Value at the participant's home address.

These were selected based on the literature and on my own professional experience. The first five are quantitative measures commonly used in the literature and in the practice of greenspace planning and management to plan and manage GS allocation and distribution and investigate park use (e.g., Bedimo-Rung, et al., 2005). The remaining four are composite indices that combine quantitative (objective) and subjective assessments of GS characteristics into single measures that were developed as explained in Section *4.5.2.3.4.*

4.7.3 Control variables.

The focus of this study was on the relationship of the GS environment with opinions and behaviors of individuals. However, cognitive behavior theory asserts that these relationships operate through a number of filters, including anecdotal experience (Karthikeyan, 2007) and other complexities of the ecological structure of the decision environment (Thompson, Cole, & Dowding, 2004). A set of demographic and social

variables were incorporated into the study as a means of controlling for such complexities. These variables are identified in *Table 4.1*.

Eleven demographic and social characteristics for the respondent were used as control variables in the analyses: (a) location (jurisdiction) of the participant's home address; (b) importance of parks in the opinion of the participant; (c) participant's gender; (d) participant's race/ethnicity, classified as White or non-white; (e) number of years the participant has lived in the community where his address is located; (f) age of the participant in years; (g) whether or not there are children under age 18 living in the participant's home; (h) the total number of people over age 55 living in the participant's home; (i) the total number of people of all ages living in the participant's home; (j) the participant's household income; and (k) the population density of the area within a 0.333-mile radius of the participant's home address.

Another variable—the number of visits to parks made by someone from the participant's household, labeled as "Visits" in the dataset—was included as a control variable in Research Question 1. It was not used as a control variable in Research Question 2 because it was the dependent variable.

4.7.4 Statistical analyses.

The analytical process for the study is diagrammed in *Figure 4.10*. Several statistical analyses were used to examine the associations between GS characteristics and the dependent variables while controlling for demographic and social variables. First was a check for multicollinearity among the variables using the Bivariate Correlations function in IBM SPSS

23 and running a sequence of Variance Inflation Factor (VIF) tests with the SPSS Linear Function.

4.7.4.1 Method for examining correlates for degree of needs met.

Binary logistic regression was used to examine the combined influence of environmental characteristics on the response to the survey question regarding how well the system of parks and greenspace meets one's needs. The regression method allows for each variable to be analyzed while controlling for the others by holding them constant, thus isolating and identifying the effect of each variable within the overall set of relationships. The dichotomized responses to the question regarding the adequacy of parks was used to address the comparatively low number of responses at the low end of the ordinal scale in the data. The categorical nature of this variable prescribed the use of logistic regression (Field, 2013). The regression analysis estimated each independent variable's association with the probability of the dependent variable (i.e., respondent's opinion of how well the greenspace system meets needs) falling within the category of needs mostly or completely met, while holding all the other variables constant. Bivariate logistic regression in SPSS was used with each of the independent variables (IVs) and control variables (CVs) to obtain the unadjusted odds of an individual being within the category of needs Highly Met associated with a change in that IV or CV. This was followed with an analysis in which those IVs and CVs that displayed significant bivariate associations at $p \leq .05$ with the Degree of Needs Met DV were entered into a multivariate logistic regression model in SPSS to obtain adjusted odds ratios. The CVs were entered together in the first step and the IVs were added simultaneously in the second step. The value $p \leq .05$ was chosen because it is conventionally used in the literature

for studies based on the ecological behavior model that investigate the effects of GS characteristics on human behaviors (e.g. Kaczynski et al., 2014; Lackey & Kaczynski, 2009; Cohen, et al., 2012; Payne, et al., 2001).

4.7.4.2 Method for examining correlates for visits to greenspace.

For the Visits DV, bivariate linear regression in SPSS was used with each of the IVs and CVs to obtain the unadjusted associations for each variable. Linear regression was appropriate because the dependent variable was continuous (Field, 2013). A multiple linear regression analysis was conducted using only those IVs and CVs that displayed significant bivariate associations with the Visits DV to obtain adjusted associations for those variables. Again, the value $p \leq .05$ was chosen because it is conventionally used in the literature for studies based on the ecological behavior model that investigate the effects of GS characteristics on human behaviors.

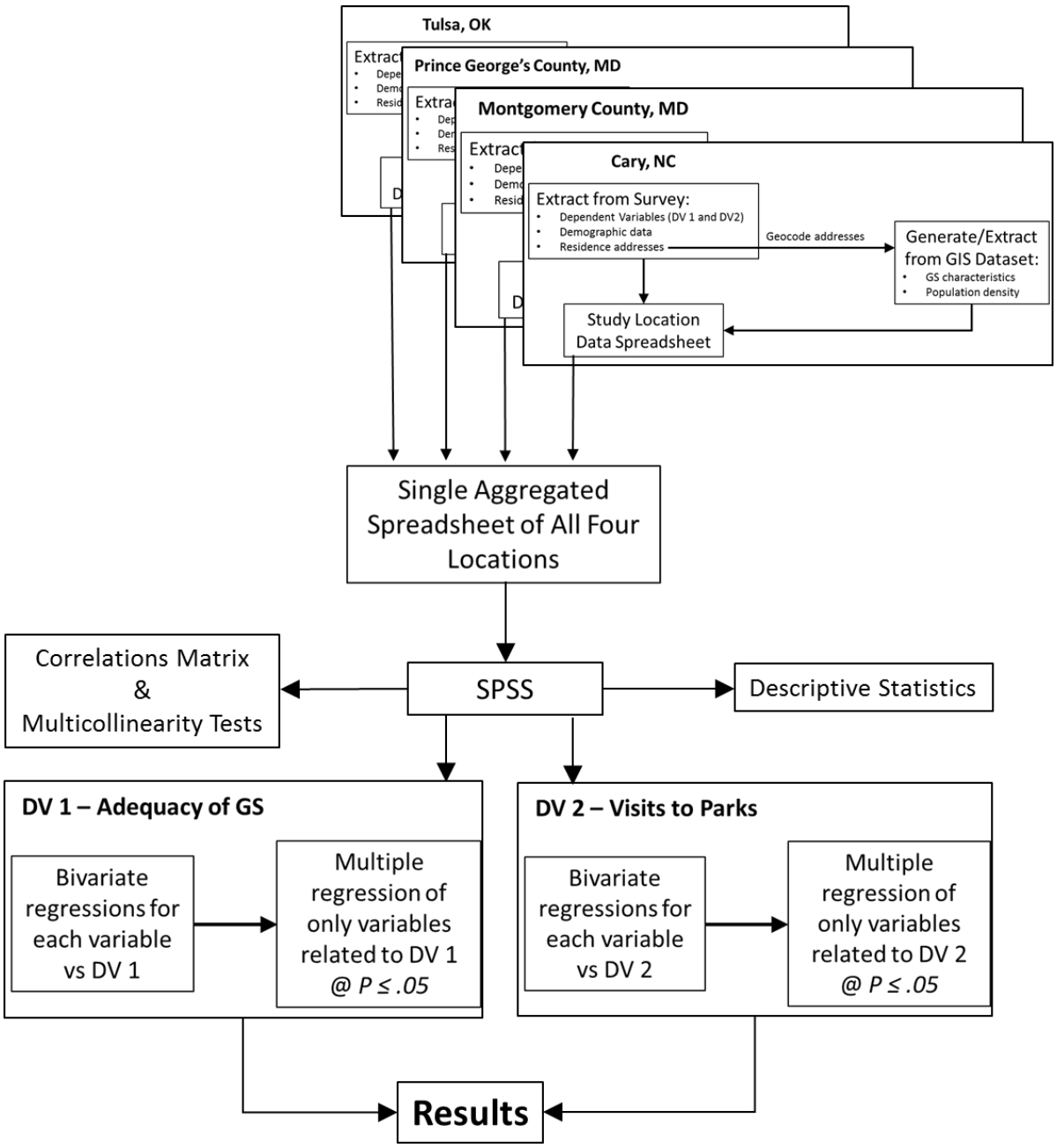


Figure 4.10 Process diagram.

CHAPTER 5: ANALYSIS AND FINDINGS

5.1 Introduction

This study's aim was to determine if certain characteristics of greenspace are related to opinions and behaviors. The opinion under study was an individual's assessment concerning the adequacy of the local park system to meet intended needs. The behavior of interest was the number of visits to parks made by the individual's household. Because this was a cross-sectional study of a select population, there was no attempt to define the direction of these relationships, establish causation, or assume that the results are generalizable to all populations. This can be viewed as a case study of the selected population that focuses on real-life context and has the capacity to generalize to theory (Groat & Wang, 2002). This research was a study of the real-life context of four subject communities, taken together as a cross-section of greenspace typical of that found in many parts of America. Results may be generalizable to theories about the relationship between people and greenspace and to communities that are similar to the ones in this study, but are not intended to be generalized to all communities in the U.S. or elsewhere. The findings of this study can inform theories about how greenspace is provided and used within the urban environment.

5.2 Descriptive Statistics

5.2.1 Sample description.

Responses from four survey questionnaires were combined and matched with GIS data according to home addresses of respondents, as explained in Chapter 4, to form a single dataset that was entered into IBM's SPSS Statistics 23 software for analysis. *Table 5.1* shows descriptive data for the aggregated dataset.

Among the aggregated data, 58.9% of respondents were female. 37.9% were male, and 3.2% were missing. Respondents ranged in age from 13 to 93, with a mean age of 49.59 and a median age of 48. Twenty-five percent of the respondents were age 38 or below, while 25% were over age 58. Race/ethnicity proportions were 62.7% White and 30.9% Nonwhite, with 6.3% missing. For the group that made up the Nonwhite category, African American/Black comprised 18.2% of the total sample. Proportions of the total sample for other races included Hispanic/Latino (3.4%), Asian (5.2%), Native American (2.7%), and Other (1.5%).

Residents of Cary made up 29.1% of the respondents, while Montgomery County represented 27.6%, Prince George's County 26.3%, and Tulsa 17%. Of the total sample, 25% had lived in the community for less than 6 years, while 25% had lived there for 30 years or more. The total number of people per household ranged from one to ten. Single-occupant households made up 15.6% of the respondents, while 25% had four or more people in the household. Households with children under 18 years of age made up 38.7% of the sample, while 51.8 percent did not have children under 18. Missing values accounted for 9.5% of the sample.

For all households, 51.5% had no people over the age of 55 living in the home. Households with people over age 55 made up 40.3%, with 8.6% missing values. The number of people over 55 in a household ranged as high as seven. Household income was under $50,000 per year for 18.9% of respondents, between $50,000 and $100,000 for 30.8%, and over $100,000 for 38.4%, with 11.9% missing.

Densities ranged from a low of 2,838 persons per square mile to a high of 20,022, with a mean of 4,245. Median density was 3,671 persons per square mile.

5.2.2 Descriptions of dependent variables.

For Dependent Variable #1 (DV1), Degree of needs met, 83.3% of the sample reported that needs were mostly or completely met, while 16.7% reported needs not mostly or completely met.

For Dependent Variable #2 (DV2), Visits, 39.1% of values were missing because there was no data on this variable for Montgomery County in the secondary data. Of the valid responses, the range was from zero to 100 visits in the previous 12 months. The mean was 18.98, with a median of 8 visits. For the valid responses, 20.5% reported one or fewer visits in the previous year, and 23.1% reported 20 or more visits.

5.2.3 Descriptions of independent variables.

The total amount of greenspace within the 0.333-mile buffer ranged from none to 143 acres, with a mean of 12.03 and a median of 1.6 acres. The total number of discrete GS locations ranged from zero to seven, with a mean of 0.95 and a median of 1.00. The distance to the nearest greenspace ranged from zero to 2.79 miles, with a mean of 0.39 miles, with a median of 0.27 miles. The total size of the nearest GS location ranged from 0.13 to 4,442.45 acres, with a mean of 131.92 and a median of 18.46 acres. The total number of components contained within the 0.333-mile buffer ranged from zero to 56, with a mean of 2.44 and a median of none.

For the GRASP® variables, the Total GRASP® Value ranged from zero to 1,842.62 with a mean of 469.5 and a median of 290. Twenty-five percent of respondents had a Total GRASP® Value of 136.9 or less, while 25% had a value of 763.4 or more. For GRASP® Walk Value, the range was from zero to 806.8, with a mean of 57.05 and a median of 26.40. For GRASP® Walk Value there were 26.6% missing values due to the fact that GRASP® Walk Values were not available for Prince George's County in the secondary data. For the valid responses, a GRASP® Walk Value of zero was found for 27.2% of respondents, while the upper quartile of respondents had a GRASP® Walk Value of 64.20.

For the GRASP® score of the nearest GS, values ranged from 2.20 to 413.40, with a mean of 49.38 and a median of 28.60. Values for the lowest quartile were 14.3 or lower, and for the upper quartile were 54.60 or higher.

The Design & Ambience value for the nearest GS ranged from one to three with a mean of 2.12 and a median of 2.00. Values of 2.00 were found for 7.4% of respondents, and values of 3.00 were found for 19.5%. The remaining 73% had values of 2.00.

5.4 Bivariate Correlations

Bivariate correlations were the first step in examining relationships between greenspace characteristics and the dependent variables. To test for redundancy and potential multicollinearity, pairwise correlations between all of the variables were examined with the SPSS Bivariate Correlation function in a two-tailed test, with cases excluded pairwise. All variables with a significant correlation to one another ($P < .05$) were examined to look for Pearson's correlations (r values) of 0.5 or greater. *Table 5.2* shows the correlations for all variable combinations that have R-values greater than .500.

As a further check for multicollinearity in the data, a sequence of Variance Inflation Factor (VIF) tests were run in SPSS Linear Function, with each of the environmental variables used as the dependent variable, the remaining ones as independent variables. This was repeated until all variables had been tested in the dependent variable position. Key results are summarized in *Table 5.3* According to Field (2013), tolerances lower than 0.2 and VIFs higher than 10 suggest potential problems with multicollinearity in the data. Neither of those occurred in this situation.

Table 5.1 Descriptive statistics for aggregated dataset variables.

		n	Minimum	Maximum	Mean	Std. Deviation
Control Variables	Age (years)	1,686	13	93	49.59	14.55
	Children at home (0 = none; 1 = some)	1,645	0	1	0.43	0.49
	Density (Population per square mile)	1,813	0	20,022	4,245	2,838
	Gender (1 = male; 2= female)	1,758	1	2	1.61	0.49
	Importance (5-point scale, higher = more important)	1,219	1	5	4.67	0.74
	Income (1 = < $50K; 2 = $50-$100K; 3 = > $100K)	1,601	1	3	2.22	0.78
	Location (Cary = 1, Montgomery County = 2; Prince George's County = 3; Tulsa = 4)	1,816	1	4	2.312	1.066
	NonWhite/White (0 = nonWhite; 1 = White)	1,702	0	1	0.67	0.47
	Total over 55	1,661	0	7	0.72	0.90
	Total people	1,758	0	10	2.82	1.46
	Visits	1,107	0	100	18.98	27.57
	Years in community	1,750	0	90	19.62	16.10
Independent Variables	Design & ambience of nearest GS	1,813	1	3	2.1	0.5
	Distance to nearest GS (miles)	1,813	0	2.79	0.39	0.38
	GRASP® score of nearest GS	1,804	2.2	413.4	49.4	64.3
	GRASP® Walk Value	1,333	0	806.8	57.0	95.7
	Size of nearest GS (acres)	1,813	0.13	4,442.45	131.92	374.28
	Total components	1,816	0	56	2.44	4.51
	Total GRASP® Value	1,811	0	1,842.6	469.5	441.1
	Total greenspace (acres)	1,816	0	143.78	12.03	20.83
	Total GS locations	1,816	0	7	0.95	1.08

Table 5.2 Significant variables with bivariate correlations greater than r = 0.50.

Variable 1	Variable 2	r	R-square
Age In Years	Years In Community	0.507	0.257
Total Components in Buffer	Sites Intersecting Buffer	0.515	0.265
Sites Intersecting Buffer	GS Acres in Buffer	0.562	0.316
Sites Intersecting Buffer	Distance to Nearest (Miles)	-0.580	0.336
Age Category	Total Over 55 In Home	0.586	0.343
GRASP Score of Nearest	DA of Nearest	0.600	0.360
Age In Years	Total Over 55 In Home	0.636	0.404
Total People In Home	Children in Home	0.693	0.480

Note: all correlations are significant at $p \leq .000$

Table 5.3 Results of multicollinearity test for independent variables.

Dependent Variable	Lowest Tolerance	Largest VIF	Average VIF	Associated Variable
Design & ambience of nearest GS	0.42	2.36	1.64	Total GS locations
Distance to nearest GS	0.48	2.09	1.72	Total GS locations
GRASP® score of nearest GS	0.43	2.32	1.62	Total GS locations
GRASP® Walk Value	0.42	2.38	1.76	Total GS locations
Size of nearest GS	0.42	2.38	1.74	Total GS locations
Total components	0.46	2.17	1.68	Total GS locations
Total GRASP® Value	0.47	2.11	1.72	Total GS locations
Total greenspace	0.46	2.19	1.66	Total GS locations
Total GS locations	0.52	1.94	1.58	GRASP® score of nearest GS

Next, all pairwise correlations for all variables with the two dependent variables were compared to see which ones were most strongly correlated with each dependent variable (*Table 5.4*).

Table 5.4 Correlations of all variables with dependent variables.

	Variable	DV1 - Degree of Needs Met			DV2 - Visits		
		n	Pearson Correlation	Sig. (2-tailed)	*n*	Pearson Correlation	Sig. (2-tailed)
Control Variables	Age	1,686	0.004	0.861	1,066	-.155**	0.000
	Children at Home	1,645	0.015	0.546	1,072	.105**	0.001
	Degree of Needs Met	1,816	1.000		1,107	0.034	0.256
	Density	1,813	-0.013	0.593	997	-0.006	0.839
	Gender	1,758	-0.003	0.908	1,038	.070*	0.021
	Importance	1,219	.136**	0.000	1,107	.193**	0.000
	Income	1,601	0.036	0.151	997	.071*	0.024
	NonWhite/White	1,702	.098**	0.000	1,031	0.059	0.060
	Total Over 55	1,661	-0.006	0.805	997	-.109**	0.001
	Total People	1,758	0.033	0.168	972	.092**	0.003
	Visits	1,107	0.034	0.256	1,107	1.000	
	Years in Community	1,750	-0.009	0.693	1,031	-0.038	0.223
Independente Variables	Design & ambience of Nearest GS	1,813	.054*	0.020	1,105	0.050	0.099
	Distance to Nearest GS	1,813	0.022	0.341	1,107	-.060*	0.045
	GRASP® Score of Nearest GS	1,804	.078**	0.001	715	.091**	0.003
	GRASP® Walk Value	1,333	.080**	0.004	1,105	.124**	0.001
	Size of Nearest GS	1,813	-0.021	0.375	1,105	-0.025	0.400
	Total Components	1,816	-0.009	0.702	1,105	.117**	0.000
	Total GRASP® Value	1,811	0.031	0.180	1,105	0.056	0.061
	Total GS	1,816	0.026	0.271	1,107	0.053	0.076
	Total GS Locations	1,816	0.011	0.636	1,107	0.005	0.871

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

5.5 Research Question #1 (RQ1): Relationship of Environmental Variables to Opinion of Greenspace Adequacy

The hypothesis of this study stated that characteristics of the physical environment influence the behaviors of individuals and that indicators from the GS environment around an individual's home can be used to predict certain behaviors, as described in detail in the previous chapters. Based on the literature, I expected that the relationship between the physical environment and human behaviors would also be related to demographic and social characteristics of the residents and their neighborhood. These relationships are diagrammed

in *Figure 3.3*. The first research question examined the relationship between the greenspace environment and respondents' opinions of the adequacy of the GS system in the subject's home community:

RQ1 *- What is the nature of the relationship between physical greenspace characteristics and residents opinions on the adequacy of public greenspace systems?*

The question was examined by testing sub-hypotheses that each of the following, measured in relation to the residence address of the individual, is associated with their opinion of the adequacy of the greenspace system: (a) number of features found within all of the nearby greenspaces; (b) total number of greenspaces; (c) total amount of GS in acres; (d) distance to the nearest GS; (e) size of the nearest GS; (f) a composite indicator that combines quantity and quality of GS features within a one-mile radius, described earlier as the *Overall GRASP® Value*; (g) a composite indicator that combines quantity and quality of GS features within a 0.333-mile radius, described earlier as the *GRASP® Walk Value*; (h) a composite indicator that combines quantity and quality of the nearest GS, described earlier as *GRASP® Score of* Nearest GS; and (i) a qualitative value that expresses the overall subjective qualities of design and ambience of the nearest GS, described earlier as *Design & Ambience of Nearest GS*. Characteristics of the individual were included as control variables in testing these hypotheses.

The dependent variable in this question (degree to which needs are met) is categorical in nature, while the independent and control variables are a mix of categorical and interval types. This combination of variables is suited to logistic regression (Field, 2013). Each of 12 control variables and nine environmental variables described below was first tested in a

bivariate regression against the outcome variable. Then variables that were found to be significant in the bivariate regression were tested together in a multivariate logistic regression.

The intent of the study was not to determine the effects of characteristics of individuals on opinions of greenspace, but only to control for them. Thus, potential control variables were selected that might affect an individual's perceptions of greenspace, based on the literature and/or my own opinion. These were each tested singly in a bivariate regression with the dependent variable to parsimoniously reduce the number of variables. Only those that were significant in the bivariate regression were used in the multiple regression in order to simplify it and increase its precision. The control variables that were tested in the bivariate regressions included:

- Age – Individuals of different ages have different needs and desires. For example, older adults may have a greater need for walking trails but less need for skateparks (Cohen et al., 2016)
- Children at Home – Individuals with children at home may have different needs and expectations than those without. For example, individuals without children at home may be less concerned about having a playground nearby.
- Density – The estimated density within the 0.333-mile buffer around the subject's geocoded address.
- Gender – The sex of the individual could affect their interpretation of what is meant by "needs" in some way. For example, Cohen et al. (2016) identified

multiple disparities in park use among subpopulations, including women and girls.

- Importance – The participant's response to the survey question regarding the importance of parks. It is possible that the importance an individual places on parks may affect how much weight they give to the environmental variables that are being tested in this study.
- Income – Different socio-economic strata could be associated with different needs and interests. Wealthier individuals may be better able to travel further and exercise greater choice of greenspace opportunities, while poorer ones may be more dependent upon and affected by the characteristics of nearby greenspaces (Cohen et al., 2016).
- Location – The study area (jurisdiction) of the participant's home address. This was included to account for differences in social environment and other factors that might not be accounted for in the other variables. For example, general preferences and expectations may vary from one community to another.
- NonWhite/White – The literature indicates that individuals of different ethnic and cultural backgrounds may perceive and value greenspace differently (Cohen et al., 2016; Smiley, 2016).
- Total over age 55 – Households with adults over age 55 may have different needs than those without (Cohen et al., 2016). For example, older adults may

be concerned about having safe and convenient places for walking, especially if they no longer drive their own car.

- Total People – Households with more people may have different needs and expectations for nearby parks than those with fewer people. For example, households with more people may imply a wider range of ages and interests, thus demanding a more diverse set of park settings and features.
- Visits – More frequent users of parks could be expected to have greater familiarity with the parks near their home, and this could affect their judgment of the adequacy of the park system to meet needs.
- Years in the Community – Individuals who have lived in the community longer could be expected to be more familiar with the parks near their home, which could affect their judgment of the park system's adequacy to meet needs.

The results of the bivariate regressions showed that only three of the control variables were significantly related to the outcome variable in the bivariate analysis: Location, Importance, and NonWhite/White. Therefore, these were the only control variables used in the multiple logistic regression.

When the environmental variables were tested singly in a bivariate regression with the outcome variable, three of them were significant: GRASP® Score of the nearest park, GRASP® Walk Value at the subject address, and Design & Ambience of the nearest GS

(Table 5.5). These were used as the independent variables in a multivariate logistic regression, together with the three control variables listed above.

The bivariate re-coded version of responses to the question of park adequacy was used as the dependent variable. In that version, a value of 0 = needs not mostly or completely met, and 1 = needs mostly or completely met. So, the multivariate logistic regression predicts the change in odds of an individual falling within the category of *needs mostly or completely met* that is associated with a one-unit change in each independent variable, when all variables in the equation are considered. The binary logistic regression was run in SPSS with all of the control variables listed above entered simultaneously in the first step, and each of the independent variables entered one at a time in the next steps. Results are shown in *Table 5.5*. The reader may also want to refer back to *Figure 4.10* for a diagram of the analysis process.

Of the control variables, Location and Importance remained significant, while NonWhite/White approached significance at the $P < .05$ level. None of the environmental variables were significant in the multivariate logistic regression (*Table 5.5).*

Table 5.5 Logistic regression for degree of greenspace needs met.

		Bivariate					Multivariate Logistic Regression			
	Variable	*n*	Unadjusted O.R.	95% C.I.	*P*	Nagelkerke R^2	*n*	Adjusted O.R.	95% C.I.	*P*
Control Variables	Age	1,686	1.001	[0.992, 1.010]	0.861	0.000				
	Children at Home	1,645	1.087	[0.830, 1.423]	0.545	0.000				
	Density	1,813	1.000	[1.000, 1.000]	0.593	0.000				
	Gender	1,758	0.985	[0.761,1.275]	0.907	0.000				
	Importance	**1,219**	**1.484**	**[1.252, 1.760]**	**0.000** **	**0.026**	**745**	**1.434**	**[1.096, 1.862]**	**0.008** **
	Income	1,601	1.131	[0.956, 1.338]	0.151	0.002				
	Location (Cary = Reference)	**1,816**	**1.000**		**0.000** **	**0.042**	**745**	**0.550**	**[0.331, 0.911]**	**0.020** *
	Montgomery		**0.582**	**[0.397, 0.854]**	**0.006** **					
	PGC		**0.323**	**[0.225, 0.463]**	**0.000** **					
	Tulsa		**0.390**	**[0.261, 0.583]**	**0.000** **					
	NonWhite/White (NonWhite = Ref)	**1,702**	**1.711**	**[1.317, 2.222]**	**0.000** **	**0.016**	745	1.692	[0.986, 2.875]	0.054
	Total Over 55	1,661	0.982	[0.848, 1.136]	0.805	0.000				
	Total People	1,758	1.064	[0.974, 1.163]	0.168	0.002				
	Visits	1,107	1.134	[0.997, 1.291]	0.056	0.006				
	Years in Community	1,750	0.998	[0.991, 1.006]	0.692	0.000				
							Nagelkerke R^2 for step 1 - control variables only = .062			
Independent Variables	**Design & Ambience of Nearest GS**	**1,813**	**1.340**	**[1.046, 1.717]**	**0.021** *	**0.005**	745	0.893	[0.526, 1.516]	0.676
	Distance to nearest GS	1,813	1.178	[0.841, 1.650]	0.341	0.001				
	GRASP® score of Nearest GS	**1,804**	**1.004**	**[1.002, 1.007]**	**0.001** **	**0.012**	745	1.003	[0.998, 1.009]	0.228
	GRASP® Walk Value	**1,333**	**1.004**	**[1.001, 1.006]**	**0.004** **	**0.014**	745	1.001	[0.998, 1.004]	0.412
	Size of nearest GS	1,813	1.000	[1.000, 1.000]	0.377	0.001				
	Total components	1,816	0.995	[0.969, 1.022]	0.702	0.000				
	Total GRASP® Value	1,811	1.000	[1.000, 1.000]	0.181	0.002				
	Total greenspace	1,816	1.004	[0.997, 1.010]	0.272	0.001				
	Total GS locations	1,816	1.028	[0.916, 1.154]	0.636	0.000				
							Nagelkerke R^2 for step 2 - all variables = .069			
							R^2 change = .007			

** Significant at the 0.01 level (2-tailed).
* Significant at the 0.05 level (2-tailed).

Thus, the only conclusive finding from the multiple logistic regression is that when asked to judge the adequacy of the park system, the odds of an individual concluding that needs are mostly or completely met are affected by which study area they live in and by the relative importance they assign to parks. The effects of study area location in the bivariate logistic regression indicate that, compared to Cary (the baseline case), the chances of an

individual being in the group whose needs are *mostly or completely met* are lower if they live in one of the other locations. Chances are lowest for people in Prince George's County, where the odds of being in the group whose needs are highly met is only about a third as much as an individual in Cary (O.R. = 0.32). For someone in Tulsa, the odds are slightly higher than Prince George's County (O.R = 0.39), and for Montgomery County the odds are a little over half that for Cary (O.R. = 0.58). For the Importance variable, moving one degree along the Likert scale of 1 – 4 results in an increase in odds of almost half again as much (O.R. = 1.43).

The results do not support the hypotheses that any of the environmental variables affect an individual's opinion of the adequacy of parks in their community in a predictable way. Where an individual lives and the degree of importance they place on parks both appear to play a role in the opinion that is formed, but the objective measures of the GS system tested here do not.

Three environmental variables were found to be significant in the bivariate regression and were analyzed *post hoc* to look for patterns that underlie them. (This step is not shown in Figure 4.7). The variables were dichotomized and cross-tabulated with the output variable to determine how each independent variable compared with the output variable:

- *GRASP® Value of Nearest Park* – A higher portion of those who say their needs are mostly or completely met (20%) have GRASP® values at the nearest park at or above a threshold value of 70 points than those who don't (13%). The threshold value was determined by an algorithm that is used in the

GRASP® process for planning projects. It is derived from normative values for indictors associated with a typical park, as explained in Appendix D.

- *GRASP® Walk Value* – A higher portion of those who say the need for parks is mostly or completely met have a GRASP® walk value at or above the threshold described above, compared to those who do not say that needs are mostly or completely met (25% vs 15%).
- *Design & Ambience (D&A) of Nearest Park* – There is a negligible difference between the portions of those who say needs are mostly or completely met and those who don't in terms of whether the design and ambience of the nearest park meets expectations, i.e., D&A = 2 or 3 (93% vs 92%).

Thus, in looking at the cross-tabulations, having higher GRASP® values for the nearest park and for the walk value at the address location are associated with reporting a higher level of needs being met. However, these relationships do not hold when other variables are controlled.

5.6 Research Question #2 (RQ2): Relationship of Environmental Variables to Frequency of Park Visits

The Ecological Model predicts that features within different levels of an individual's environment affect their behavior. The second research question in this study applied the model to a segment of the built environment—greenspace--and asked whether characteristics of the greenspace environment around an individual's place of residence are associated with the behavior of visiting greenspace. The hypothesis was that each of several characteristics of the greenspace environment around an individual's place of residence are related to the

frequency of visits by the individual's household to a park. Based on the literature, it was expected that demographic and social characteristics of the individual and the neighborhood would also have a relationship with visits to GS, so these were included in the model as control variables.

RQ2 *- What is the nature of the relationship between physical greenspace characteristics and residents frequency of use of public greenspace systems?*

This question examines the same variables as those used in RQ1 (conceptually illustrated in *Figure 3.4*), to test their relationship to the behavior of visiting a park. The question was examined by testing sub-hypotheses that each of the following, measured in relation to the residence address of the individual, is associated with the number of visits to a park by household members: (a) number of features found within all of the nearby greenspaces, (b) total number of greenspaces, (c) total amount of GS, (d) distance to the nearest GS, (e) size of the nearest GS, (f) a composite indicator that combines quantity and quality of GS features within a one-mile radius, (g) a composite indicator that combines quantity and quality of GS features within a 0.333-mile radius, (h) a composite indicator that combines quantity and quality of the nearest GS, and (i) a qualitative value that expresses the overall subjective qualities of design and ambience of the nearest GS.

These are the same independent variables that were tested in Research Question #1. The rationale for the first five is that they are ones traditionally used in planning and policy for providing parks for the use of constituents (e.g., Harrison et al., 1995; Kellett & Rofe, 2009). Variables (h)-(i) represent additional and/or alternative measures that could be applied, based on the literature review and my professional experience.

Similarly, the same control variables used in Research Question #1 were used in Research Question #2. The ways in which those variables might relate to the opinion an individual forms regarding the adequacy of the greenspace system were expected to operate similarly on decisions about the use of parks. The assumption was that both behaviors are affected by similar characteristics of the physical environment.

Because the data for park visits was continuous, a multiple linear regression model was used to analyze the decision process for park visits. All of the variables were tested against the outcome variable of park visits in single bivariate regressions. The variables with a significant bivariate correlation to the dependent variable were then used in a multiple linear regression, the results of which are in *Table 5.6*. Three of the control variables remained significant in the multiple regression: Importance, Gender, and Age. None of the environmental variables were significant in the multiple regression. The final model explains approximately 10% of the variation in responses to the question regarding household visits to parks (Adjusted R square = .111), and is significant *(P = .000).*

Table 5.6 Linear regression for number of park visits in previous 12 months.

		Bivariate					Multivariate Linear Regression				
	Variable	*n*	Unadjusted Coefficients (Standardized Beta)	95% C.I. for Beta	*P*	R^2	*n*	Adjusted Coefficients (Standardized Beta)	95% C.I. for Beta	*P*	R^2
Control Variables	**Age**	**1016**	**-0.155**	**[-0.429, -0.187]**	**0.000 ****	**0.024**	**566**	**-0.122**	**[-0.45, -0.028]**	**0.026 ***	**0.015**
	Children at Home	**985**	**0.105**	**[2.387, 9.413]**	**0.001 ****	**0.011**	566	0.117	[-0.508, 13.96]	0.068	0.014
	Density	1105	-0.006	[-0.001, 0.001]	0.839	0.000					
	Gender	**1066**	**0.07**	**[0.590, 7.367]**	**0.021 ***	**0.005**	**566**	**0.089**	**[0.484, 9.767]**	**0.031 ***	**0.008**
	Importance	**1038**	**0.193**	**[5.797, 11.019]**	**0.002 ****	**0.037**	**566**	**0.134**	**[2.819, 11.325]**	**0.001 ****	**0.018**
	Income	**997**	**0.071**	**[0.326, 4.710]**	**0.024 ***	**0.005**	566	-0.025	[-3.935, 2.132]	0.560	0.001
	Location	1107	-0.015	[-1.665, 0.984]	0.618	0.000					
	NonWhite/White	1031	0.059	[-0.145, 7.024]	0.060	0.003					
	Total Over 55	**997**	**-0.109**	**[-5.460, -1.514]**	**0.001 ****	**0.012**	566	0.001	[-3.426, 3.47]	0.990	0.000
	Total People	**1072**	**0.092**	**[0.612, 2.879]**	**0.003 ****	**0.008**	566	0.006	[-2.391, 2.639]	0.923	0.000
	Years in Community	1056	-0.038	[-0.181, 0.042]	0.223	0.001					
							R^2 for step 1 - control variables only = .085				
Independent Variables	Design & Ambience of Nearest GS	1105	0.05	[-0.482, 5.636]	0.099	0.002					
	Distance to nearest GS	**1105**	**-0.06**	**[-8.486, -0.106]**	**0.045 ***	**0.004**	566	-0.022	[-8.467, 5.14]	0.631	0.000
	GRASP® score of Nearest GS	**1105**	**0.091**	**[0.012, 0.057]**	**0.003 ****	**0.008**	566	0.076	[-0.003, 0.057]	0.075	0.006
	GRASP® Walk Value	**715**	**0.124**	**[0.012, 0.047]**	**0.001 ****	**0.015**	566	0.070	[-0.006, 0.039]	0.145	0.005
	Size of nearest GS	1105	-0.025	[-0.007, 0.003]	0.400	0.001					
	Total Components	**1107**	**0.117**	**[0.341, 1.021]**	**0.000 ****	**0.014**	566	0.068	[-0.16, 0.99]	0.157	0.005
	Total GRASP® Value	1105	0.056	[0.000, 0.016]	0.061	0.003					
	Total greenspace	1107	0.053	[-0.009, 0.181]	0.076	0.003					
	Total GS locations	1107	0.005	[-1.554, 1.834]	0.871	0.000					
							R^2 for step 2 - all variables = .111				
							R^2 change = .025				

** Significant at the 0.01 level (2-tailed).

* Significant at the 0.05 level (2-tailed).

The results of the multiple regression for this question do not support the hypotheses that the characteristics of the greenspace environment in the proximity of a residence, as tested here, are related to the decision by members of the household to visit a park. However, the four measures listed below were significant in the bivariate regression. These were analyzed further to look for patterns that underlie them:

1) *GRASP® Value of Nearest Park* - A higher portion of users than non-users have GRASP® Values of the nearest park at or above a threshold value of 70 points (20% of non-users vs. 25% of users).

2) *GRASP® Walk Value* – A higher portion of users than non-users have a GRASP® Walk Value at or above the threshold (29% of non-users vs. 35% of users).
3) *Distance to Nearest Park* – There is no difference between users and non-users for the percentage of those having a park less than a mile away (93%) vs. one mile or more away (7%).
4) *Total Components* – A higher portion of users than non-users have three or more components within the 0.333-mile buffer around their address (28% of users vs. 18% of non-users).

Thus, having higher GRASP® values for the nearest park and for the walk score at the address, along with having more components available within the 0.333-mile buffer of the address, are each associated with users versus non-users in the cross-tabs. However, these relationships did not hold up when other factors were controlled and, as such, should not be considered reliable. These relationships will be discussed in more detail in Chapter 6.

5.7 Summary of the Analysis and Findings

While some of the environmental variables examined in this study are significantly correlated individually with the dependent variables (DVs), none remain so when all significant variables are added to the multiple regression. Of note is the fact that the distance to the nearest GS and the total number of components were the only purely objective GS variables that showed significant bivariate correlation with either of the dependent variables. Both were significantly related to visits to parks in single bivariate regressions. However, two measures that include subjective assessments, *GRASP® Value of Nearest Park* and *GRASP® Walk Value*, were significant in bivariate regressions with both DVs.

CHAPTER 6: DISCUSSION

The research in this study examined the relationship between physical characteristics of greenspace and human behavior. Regression models were used to determine whether significant associations existed between the measured physical characteristics of greenspace in the proximity of a participant's home and their self-reported behaviors. The findings indicate that the most commonly used measures of greenspace characteristics, such as quantity and proximity, are not reliable predictors of the behaviors examined. However, they suggest that other, less common measures of subjective qualities may have potential.

6.1 Findings for Opinion of Park System Adequacy to Meet Needs

The first research question tested the hypotheses that each of several characteristics of the greenspace environment in the proximate area surrounding an individual's home are related to that individual's opinion of the adequacy of the park system to meet intended needs. While three greenspace characteristics--*GRASP® Score of Nearest GS*, *GRASP® Walk Value,* and *D&A of Nearest GS*--were found to be significant predictors of the opinion of GS adequacy when tested singly in a bivariate regression, none were significant when any other environmental variables were included in the model. Thus, I conclude that it cannot be reliably said that any of the environmental characteristics tested have a significant relationship to the decision that a person makes regarding the adequacy of the local park system to meet needs.

In addressing the question of whether needs are met by the park system, respondents were allowed to use their own definition of needs. One way that a need can be defined is as a discrepancy or gap between "what is" and "what should be" (The Office of Migrant

Education, 2001). Considering that 83% of the respondents in the dataset reported that the parks in their community were mostly or completely meeting needs, we can assume that most respondents consider the gap between "what is" and "what should be" to be small or nonexistent. In other words, they are mostly satisfied with the system in its current state. This may influence the findings reported here. And because no similar studies were found in the literature, it is not possible to compare this outcome directly with other findings, although aspects of this study can be compared with other studies where greenspace characteristics were investigated in relation to their association with physical health, mental and social well-being, and other benefits. But few have examined these characteristics in relation to overall judgments of greenspace systems.

6.1.1 Greenspace adequacy and GRASP® variables.

While they were not significant in the final regression, it is interesting that the three variables found to be significant in the initial bivariate regression--*GRASP® Score of Nearest*, *GRASP® Walk Value*, and *D&A of Nearest*--all incorporate subjective assessments of quality. Two of them--*GRASP® Score of Nearest* and *D&A of Nearest*--relate to characteristics of the greenspace location that is nearest to the participant's home address, and the third is a composite indicator derived from all of the greenspace features located within a 0.333-mile radius of the participant's home address, as explained in Section *4.5.2.3.4.3*. This suggests that measures of quality and other subjective characteristics of greenspace may have potential for further research and application in measuring greenspace services.

6.1.2 Greenspace adequacy and control variables.

The analysis revealed that two of the control variables--jurisdiction of residence and the importance of parks--were statistically significant in the final multiple regression, indicating that characteristics of the individual and household are potentially more important than characteristics of the greenspace environment. A third control variable, the race/ethnicity of the individual, approached significance in the final regression as well. Payne et al. (2002) found similar results in a study of park attitudes and preferences in Cleveland, Ohio. In their study, residential location was a significant predictor of support/nonsupport for additional parkland ($P = .022$) but did not play as strong a role in predicting park attitudes and preferences as age ($P = .013$). Age was the strongest predictor of support/nonsupport for additional parkland in their study, with older adults more likely to report that there was enough park land and younger adults expressing a need for additional park land. Race was also a significant predictor at $P \leq .045$, with Blacks more likely to indicate that more parkland was needed.

The significance of jurisdiction in the current study could be a case of self-selection. Compared to Cary, participants in the other three jurisdictions were less likely to consider needs to be mostly or completely met by the park system. It is possible that residents of Cary have chosen to live there because of their positive opinion of the greenspace system, while residents in the other locations live there for other reasons.

This study's data aligned with previous findings showing that people consider parks to be important. A national study in 2015 reported a "nearly unanimous" belief that local parks provide community benefits (Mowen et al., 2015, p. 2). In that study, only 8% of

respondents believed that local parks do not provide community benefits. Data in the present study were similar, with 7.3% of respondents rating parks as only somewhat or not at all important. In another study, Bai et al. (2013) found the statement "parks in my neighborhood are a benefit to the people who live here" to be the highest rated response in a set of seven quality items related to parks. The other items were related to cleanliness, attractiveness, safety, and personal interests. Thus, the high response levels for the importance of parks that are part of the data for this study corresponds with other studies.

Preferences for various park characteristics have been studied by others who have found that they vary among different populations (Alves et al., 2008) and that the inherent qualities of a particular place may play a lesser role than people's everyday social-environmental relationships in determining the benefits that they receive from greenspace (Dinnie et al., 2013). Dinnie et al. pointed out that people experience environments in different ways, and that considerations of interaction with the environment, with others, and with cultural narratives are key components. This may help explain why demographic and social variables associated with the individual were found in this study to be as important as characteristics of the greenspace environment, as reported in the previous chapter.

Others have looked at the allocation and distribution of greenspace from the perspectives of environmental justice and social equity (Boone et al. 2009; Bruton & Floyd, 2014; Barbosa et al., 2007; Smith & Floyd, 2013; Parsons et al., 2015; Smale & McLaren, 2005). While Bai et al. (2013) claimed that most such studies have focused on *perceptions* of access and availability, many have used objective as well as perceived measures of the greenspace characteristics tested here to assess equity and found that inequalities exist for

some populations and some variables (e.g., Boone et al., 2009). However, no one has studied the relationship between perceived and objective measures of greenspace equity – i.e., how perceived equity compares with objective measures of equity. While this study did not attempt do so either, it looked at something that might be similar or related, which is the relationship between perceived adequacy of the greenspace system to meet needs and objective measures of greenspace provision. It found little correlation between most objective measures and an individual's opinion of greenspace adequacy.

It is possible that what holds for the general population does not hold for specific groups. This study found race/ethnicity to be a significant variable in the bivariate analysis and to approach significance in the multiple regression ($P = .054$). A few authors have discussed differences in perceptions among ethnic and cultural groups, finding that some groups are underrepresented and their needs are not met in an equitable manner (Lee & Scott, 2016; Smiley et. al., 2016). A primary finding from this study is that when demographic and social characteristics are controlled, the measures typically used to determine greenspace adequacy and equity do not predict an individual's perception of greenspace adequacy. This, combined with the mixed conclusions from other studies as to which variables are significantly associated with greenspace inequality among different socioeconomic groups, suggests that perceived inequalities may be a result of variables other than those typically measured, such as quantity and proximity of greenspace. Perceived inequalities may have to do with the quality of GS, the types of amenities contained within it, or other factors, similar to what Smiley et al. (2016) reported for perceptions of park access and use. Their study found that Black and Hispanic residents were more likely to favor improvement of existing

parks while Whites preferred increasing or improving connections between parks and neighborhoods. Such differences in perceived needs could lead to differences in satisfaction with what is available among different populations.

Other demographic variables besides race/ethnicity have been shown to influence perceptions of parks (Bai et al., 2103). The fact that jurisdiction of residence--that is, which of the study locations a participant lived in--was a significant predictor of an individual's opinion of greenspace adequacy in this study suggests that a combination of variables that make one community different from another influences the judgment decision.

It was not the intent of this study to determine whether and how demographic and social characteristics of individuals operated in the judgment of greenspace, only to control for these variables in examining the role of environmental variables. However, given the results of the analysis, further discussion of them is appropriate here. The role of demographic and social characteristics in satisfaction with greenspace could be part of the larger question of life satisfaction and, more specifically, neighborhood satisfaction. It is conceivable that both are rooted in a general sense of health and well-being. People likely associate the presence of greenspace with health and well-being, as indicated by Mowen et al. in their 2015 study that found that "exercise – fitness and conditioning" was the most frequently mentioned benefit of local parks at the individual, household, and community level.

This perceived association of greenspace with a healthy life is borne out by others, such as a study conducted in Britain by Roe et al. (2106), which found that the attributes of place, both social (such as perceived trustworthiness of neighbors) and physical (e.g.,

perceived safety and attractiveness), have an impact on general health, and that there is a significant association between general health and neighborhood satisfaction. That study also found that the impact varies according to ethnicity. For example, good health in White British population was predicted by the presence of a second greenspace location within walking distance of home, but the relationship did not hold for other ethnic groups in that study. Thus, the effect of the number of greenspaces on various outcomes may hold true for some populations, but not for others. That is how the number of greenspaces could affect a specific population in the Roe et al. study, but have no significant effects on any outcomes in the present study. The discrepancy is likely due to the fact that the two studies were looking at different issues and used different measures and methods. For example, the Roe et al. study's finding just mentioned was for a specific population that was not part of this study, but it supports the general conclusion that personal characteristics play an important role in predicting people's behaviors related to greenspace.

Beyond physical health and well-being, life satisfaction includes mental, social, economic, and ecological health. In the 2105 study by Mowen et al., social benefits were among the most highly cited benefits that respondents felt parks provided at the community level. This aligns with findings from two European studies that found a positive relation between greenspace and less loneliness and between proximity to parks and collective efficacy (Holtan et al., 2015). While distance to parks was not found to be a significant predictor for opinion of park system adequacy in this study, the sense of well-being experienced from collective efficacy and social ties could be among the cognitive considerations in operation when someone is asked whether or not their needs are being met.

However, it should be noted that Holtan et al. did not find a relationship between the presence of parks and social capital, which they defined as the collective experience within a neighborhood that is comprised of shared knowledge, norms, rules, and networks. They did, however, find a relationship between tree canopy and social capital, suggesting that some parks (ones with more tree canopy) may help fulfill the need for social capital where others do not.

While satisfaction with the greenspace system in one's community and overall life satisfaction may be related in the ways just described, the connection should not be overstated. In their investigation of the heterogeneity of preferences for greenspace across people depending on their characteristics or circumstances, Ambrey and Fleming (2012) reported that, according to different studies, some greenspace attributes, such as accessibility and green area per capita, are associated with life satisfaction in China, but not in London. This is another example of demographic and cultural differences leading to different results, and emphasizes that care must be taken to avoid overgeneralization in interpreting the results of a study such as the present one.

In the end, the factors that matter most may occur at the individual. One reason for the lack of consistency in the ways that people respond to greenspace characteristics could be that perceptions vary widely from one individual to another and from one time to another for the same individual. As Seaman et al. (2010) explain it, the "objectively demonstrable conditions" that we typically measure, such as greenspace quantity and distance, are experienced through "subjective and inter-subjective 'rationalities' around the appropriateness of using greenspace as a leisure choice or in daily life" (p. 7). This is

essentially the concept of affordance, which was discussed in Section **3.3**, and which posits that what one perceives is affected by "what the environment affords – that is, its *affordances*" (Heft, 2010). In Heft's view, a single place is different for everyone who uses it. To fully understand the variables that affect an individual's opinion of greenspace, we would have to identify the potential affordance properties of environments--i.e., what they are perceived to offer--from the viewpoints of different prospective users. These can be difficult to generalize across something as large as a greenspace system and an entire community, and could result in large standard deviations for measurements of such properties, making statistical inferences unreliable. This could help explain the lack of reliability among typical measures of greenspace characteristics in predicting judgment outcomes.

6.1.3 Conclusions for greenspace adequacy study.

While no significant relationships were found for any of the greenspace variables used in this study in the multiple regression, significant relationships were found for the participant's jurisdiction of residence and perceived importance of parks. However, three greenspace variables that incorporate subjective assessments--*GRASP® Score of Nearest GS*, *GRASP® Walk Value,* and *D&A of Nearest GS*--were significant in the bivariate analyses. This suggests that characteristics of the individual, rather than characteristics of the greenspace system, play the greater role in an individual's opinion of the adequacy of the greenspace system in their community. The variables that showed promise in the bivariate regressions incorporate subjective values that may be more subject to influence from characteristics of the individual than objective measures, although this was not tested. Note

that at the individual level, perceptions of the measures typically associated with greenspace adequacy are unreliable. A number of studies have pointed to disparities between perceived and objective measurements of greenspace variables (Bai et al., 2013; Lackey & Kaczynski, 2009; Wang, 2013).

At the same time, people make decisions based on their perceptions (Bai et al., 2013). The unreliability of perceived measurements for greenspace variables may explain why objective measures of those variables are poor predictors of the opinions individuals form based upon them. If so, are other measurements possible that could prove more reliable? Park quality may be one untapped area. Roe et al. (2016) found that the perceived quality of the neighborhood (based on several social and physical indicators) is a consistent predictor of general health, with quality of greenspace emerging as a significant predictor for groups that experience the worst health. In another study involving surveys conducted in 18 parks, Smiley et al. (2016) found that a quality rating performed by those conducting the survey (based on number of facilities, cleanliness, and overall impressions) for the park where the survey was conducted was the only significant variable in predicting respondent's preferences between choices of preferred outcomes for proposed improvements to the park system. Stated more simply, an individual's opinion of what greenspace policies and actions should be implemented was dependent upon the quality of the park where they were surveyed. The quality of the park in which an individual was surveyed significantly predicted whether the individual preferred cleaning up and repairing existing parks or the development of new facilities.

Bai et al. (2013) noted that only limited studies have examined perceptions of park quality aspects among the general population and even fewer have examined them collectively. They proposed that future research should consider residents' perceptions in addition to GIS and audit data and presented a new park quality scale for use in studying the relationship between perceptions of parks and physical activity. The present study combines residents' perceptions with GIS data and introduces composite indicators (e.g., GRASP® variables) that combine park quality with other measures. In doing so, no significant correlations were found between perceptions of park adequacy and GIS measures of quantity and distance. However, composite indicators which incorporate park quality, while not significant in the final regression, were found to have potential for relating greenspace characteristics to individual perceptions. Out of nine greenspace variables, the only ones to show significance in the bivariate regressions were three that incorporate park quality ratings: *GRASP® Score of Nearest GS*, *GRASP® Walk Value,* and *D&A of Nearest GS*. All of the purely quantitative measures were not significant in any of the analyses. While this alone is not adequate evidence to conclude that measures of park quality are the answer to understanding opinions of park adequacy, it may encourage further exploration of such measures.

6.2 Findings for Park Visits

The second research question tested the hypotheses that each of several characteristics of the greenspace environment in the proximate area surrounding an individual's home (as detailed in Chapters 3 and 4) are related to the number of park visits by the individual's household. While four of the characteristics--*GRASP® Score of the Nearest*

Park, GRASP® Walk Value, Distance to Nearest Park, and Total Components--were found to be significant predictors of park use when tested singly in a bivariate regression, these were not significant when demographic and social variables were controlled for in the model. The conclusion is that all of the sub-hypotheses are false and that we cannot reliably say that any of the environmental characteristics tested have a significant relationship to the number of park visits made by a household.

Cohen et al. (2013) said that evidence in the literature is inconclusive on the relative contributions of individual preferences, socioeconomic status, or environmental factors regarding park use. This study aimed to add to the body of knowledge on those considerations, but the results are similarly inconclusive in a number of ways. They suggest that personal rather than environmental variables matter most, because three demographic and social variables were found significant in the final regression analysis. These were gender, race/ethnicity, and age of the respondent.

The four variables found significant in the bivariate linear regressions were the GRASP® score of the nearest park, the GRASP® Walk Value at the household address, the distance to the nearest greenspace location, and total number of components falling within the 0.333-mile buffer around the participant's address. The first two are composite indices that include subjective assessments of the quality of the greenspace site and components and have not been tested for their relationship to park use in other studies. The second two have been tested against park use, physical activity, and a number of related variables in a variety of studies.

Seven of the control variables were found significant in the initial bivariate regressions. These included the respondent's ranking of the importance of parks, their gender, age, number of children at home, number of adults over age 55 in the home, total number of people in the home, and household income. Only three of these--gender, race/ethnicity, and age of the respondent--were significant in the multiple regression.

In their study of park preferences and behavior, Payne et al. (2001) found that age was the strongest predictor of park visitation followed by race, and that residential location was not a significant predictor of park visitation.

6.2.1 Park visits and distance to nearest greenspace.

Distance to the nearest park was found to have a significant negative association with park visits in the bivariate regression, but no significance in the multiple regression. Studies on the effects of distance to greenspace on various behaviors are common in the literature, but findings are inconclusive. Kaczynski et al. (2014) found that distance was not related to use, but that having a large, attractive park farther from home may be more important than having a less desirable one within walking distance. McCormack et al. (2010) also found that having a park within walking distance of home does not always result in use. But in 2010 Godbey and Mowen reported that, according to scientific evidence, proximity to a park has a dramatic impact on participation and that closer was better, with distance from home being an important factor in whether a person will use it and how often. Mowen (2007) also reported that proximity is directly related to park use and duration. Coombes et al. (2010) found that respondents who lived further from urban greenspaces were less likely to visit them. As for perceived distance, in 2003 Mowen and Confer reported that perceived

accessibility was among several factors that were related the intentions of respondents to visit parks in the future.

This study's finding that distance to the nearest greenspace was significant in the bivariate regression for predicting visits to parks, but not in multiple regression, shows that different results for this variable among different studies may depend upon how it is measured and analyzed and what other variables are considered in the analysis.

6.2.2 Park visits and number of components.

The number of components within a proximity of 0.333-miles of the participant's home address was found to be significant in the bivariate regression, but it was not significant in the multiple regression. The evidence in the literature for a positive relationship between the number of greenspace features and park visits appears to be stronger than the conflicting reports for distance to greenspace. In Cohen et al.'s (2016) study, each additional target area in a park (defined as an area that can be observed in one scan and typically including one type of facility or supporting one type of activity) was associated with a 2% increase in person-hours of use. A study by Kaczynski et al. in 2014 study found that features were associated with use, except among the population of those 60 years old or more. As with the findings for distance to the nearest greenspace, the reason the findings in this study differ from those cited above may have to do with the sources of data, measures used, and analytical methods. The fact that this variable was significant in the bivariate regression but not the multiple one suggests that demographic and social variables play a role in how this variable operates. Because so many of the personal variables were significant in the bivariate regressions, with three of them remaining significant in the multiple regressions, it is possible

that personal variables account for a large enough portion of the variation that once they are accounted for, the variation caused by the number of components and other greenspace variables becomes insignificant. It could also mean that the variation associated with this variable in this study is accounted for in the control variables, even though the correlation analyses did not suggest that multicollinearity was present.

A contrary finding comes from Shores and West (2008), who found no linear association between the number of amenities and participation level in parks. Shores and West concluded that the type of amenity present may be more important than the quantity of amenities.

This analysis considered only the total number of components present. McKormack et al. (2010) say that access to specific park attributes may influence park use. The GRASP® variables, on the other hand, do incorporate other attributes of components, including functionality. They do not, however, account for the blend, mix, or types of components present.

6.2.3 Park visits and GRASP® values.

The two GRASP® variables that were significant in the bivariate analyses are both composite indicators that incorporate subjective assessments of park quality. One is keyed to the greenspace location nearest to the participant's home address, and the other is derived from the cumulative effects of all greenspace features within a 0.333-mile radius of the participant's home address. Although they did not remain significant in the multiple regression, the fact that they were significant in the bivariate regressions while other purely quantitative measures were not suggests that the subjective aspects of these measures could

have something to do with the results. Both of these variables are influenced by a combination of the number of features present and subjective assessments of the quality of those features. It could be that, as explained in the previous section, the number of features is the aspect of these measures that is influencing the results. But since the correlations between these variables was not unusually large, as shown in Appendix H, there may be other explanations.

It may be that the subjective assessments of qualitative characteristics influenced the results as well. The literature suggests that further study using variables that are more purely subjective and/or qualitative may provide more insight into this idea. For example, Mowen (2010) reported that research has shown that perceived park aesthetics, condition, and safety may be associated with visitation. Francis et al. (2012) proposed that use of public open space is determined by more than mere presence and that the quality of the space has an important influence. McKormack et al. (2010) said that park qualities are important for encouraging use. Mowen and Confer (2003) pointed to convenience, compatibility, and the relative advantage of a park over other existing parks as variables that are related to intentions to visit a particular park in the future. Kaczyski et al. (2016) found that an index for average park quality within one mile was significantly associated with park use. Cohen et al. (2015) observed that use of parks increased substantially after renovations that improved the quality of the parks. On the other hand, Cohen et al. (2010) found no significant correlation between perceived safety, which is a subjective assessment, and park use. McKormack et al. (2004) said that differences between how attributes are measured may account for inconsistent findings related to greenspace behaviors and that both objective and

perceived measures are needed. This study supports the potential for future measures of perceived, subjective, and qualitative values to be useful in sorting out the relationships between people and greenspace.

6.2.4 Park use and other greenspace variables.

The remaining variables did not have a significant relationship with park use in either the bivariate or multiple regressions. Other studies have looked at these with varying results. Cohen et al. (2016) found that each additional acre of park size was associated with a 9% increase in the number of users observed in a park. However, as in the present study, size did not remain significant after controlling for other factors. In a meta-analysis of research on the role of parks in active living, Mowen (2010) reported that research has shown that having more parks and more park area is associated with higher physical activity levels, although this is not the same thing as the number of visits to parks. Associations with park acreage and number of parks were significantly associated with park use in Kaczynski et al. (2014). In 2016, Kaczynski et al. also found that the number of parks within one mile was a significant predictor of park use. However, Kaczynski et al. (2016) reported that the amount of park space within one mile was not a significant predictor of park use. Similarly, Cohen et al. (2010) found no significant correlation with park acreage for park use. Thus, the evidence is mixed and inconclusive for park size and quantity in relation to park use.

6.2.5 Park use and significant control variables.

Three personal variables used as controls were found to be significant in both the bivariate and multiple regressions. These were the participant's gender, age, and race/ethnicity. Others have found similar results for these variables, including Cohen (2016)

and Seaman (2010). However, Shores and West (2008) found that minority residents visited parks at levels equal to or greater than their local population.

6.2.6 Park use and other control variables.

Demographic and social variables have been found to have mixed correlations with park use in other studies. Cohen et al. (2016) found a 13% increase in the number of users in a park for every 10,000 additional population within a one-mile radius of the park. Cohen et al. (2010), however, found no statistically significant correlation between the population density in the surrounding neighborhood and the number of users in a park. Socio-economic status, on the other hand, may affect use. Cohen et al. (2016) found that a 10% increase in poverty level of the surrounding neighborhood was associated with a 12% decrease in the number of users in a park. Cohen et al. (2012) observed fewer total users in higher poverty neighborhoods, but that there are more users per acre within the park. Cohen et al. (2013) said that demand for parks increases in higher income areas. Shores and West (2008) reported that minority residents visited parks at levels equal to above their proportion within the overall local population.

Although it did not show up as significant in either the bivariate or multiple regressions in the present study, Bedimo-Rung et al. (2005) listed residential location as among the demographic and social characteristics that influence park use. Others in their list included age, gender, race/ethnicity, and socioeconomic status, all of which proved to be significant in the bivariate regressions for this study. Age, gender, and race/ethnicity were found to remain significant through the multiple regression here as well. At the same time,

Mowen and Confer (2003) reported no significant relationships between demographic characteristics and intentions to visit a particular park in the future.

Lin et al. (2014) presented a study indicating that an individual's level of nature orientation--i.e., their connection to nature--is a strong determinant of visitation to parks. They proposed that measures to increase people's connection to nature may have more impact in increasing use of urban parks than measures to increase the availability of urban greenspace. This aligns with the positions of Cohen et al. (2010, 2013), and Mowen (2010) who suggested that programs to encourage more use of parks may be more important than physical characteristics of parks themselves.

6.3 Limitations

A number of limitations for this study are presented here, and suggestions for future research that could address them are offered in the next section.

Cross-sectional methods: This study is only a snapshot in time for the study locations. A longitudinal study to compare how changes in the variables over time are related to the research questions would provide stronger evidence for the results and have the potential to establish causality.

Correlational study: Three conditions that must be met to provide empirical evidence for causation are covariation, temporal order, and the elimination of other plausible explanations than change in a given independent variable for any observed changes in the dependent variable (Lavrakas, 2008). While this study examined covariation between the dependent and independent variables, it did not intend to establish the direction of this relationship or causality.

The results of this study are not intended to be generalizable for the purposes of predicting individual opinions or behaviors based on specific measured attributes of greenspace. The aim of this study was to inform the wider theory of the ecological model on the basis of how behaviors are affected by the presence of greenspace in an individual's environment near their home.

Limited sample: The four locations included in the study area were selected from a systematic process, but the sampling frame from which they were drawn was limited to those for which the secondary data was available. This limits the generalizability of the results to areas beyond those that are similar to the ones in this study. The focus of this study was on greenspace in urban and suburban areas and is not intended to be generalizable to rural areas, even though the study contained rural areas within it.

Self-reported data: The outcome variables, as well as most of the demographic and social variables, are self-reported data. These would be stronger if derived from direct observation. However, for the outcome variable in the first research question--opinion of park adequacy--and for the survey question on the importance of parks, observational measures are not feasible. Asking for an individual's opinion is the only way to obtain the data.

Secondary data and response rate: The use of secondary data made it feasible to draw data from a large geographic area and population sampling frame within the limited resources available for this study. However, because much of the data were collected by others and for different purposes, I had less control over the nature of the information. For example, I do not know if pilot tests or other pre-testing of the survey questions occurred,

although I do know that the questions are ones commonly used in such surveys within the parks and recreation industry. Use of primary data would have allowed for more consistency in the form and content of the survey questions and responses.

There are limitations to secondary data that should be acknowledged. The data may not be representative of some groups, or the specific questions relevant to a given research might not have been asked (Alvarez, 2012).

Heath et al. (2009) cautioned that before starting to work with an archived data set, it is essential to refer to all relevant documentation in order to understand the conditions under which the data were originally collected and the purposes which underpinned their collection. Because all of the secondary data used in this study were collected as part of a consulting project on which I was deeply engaged, those conditions have been met. In fact, much of the data related to greenspace characteristics were originally collected by me as primary data for the original studies. The secondary data used here falls within two categories: (a) household surveys conducted as part of planning projects in the four communities, and (b) GIS datasets that were created as part of those same planning projects. I was involved as a member of the consulting team that crafted and interpreted the surveys and oversaw the greenspace inventories, often collecting the data in the field myself.

The low response rate for the surveys is a particular concern that should be noted. While the response rate obtained is not unusual or unacceptable for the original purposes of the surveys used, it is lower than what would be desired for this study. It is possible that the responses are biased towards individuals who place high importance on parks and recreation as compared to the numbers of such individuals in the general population. Also, by its nature,

secondary data removes some of the biases that otherwise can occur because the sources are independent from the research objectives (Rabinovich & Cheon, 2011).

Assumptions about greenspace: The lack of clear definitions for such terms as "park" and "needs," as well as assumptions about what should and should not be included as greenspace might be considered limitations for this study. Lackey and Kaczynski (2009) noted similar limitations in their study. Similarly, measures based on the nearest greenspace to a participant's address may be overlooking the possibility that the nearest park may not be the one people use.

Definition of proximity: The question of what constitutes proximity to greenspace is a challenge noted in the literature by many researchers (e.g., Kaczynski et al., 2014; Mowen et al., 2007). Consequently, a wide range of definitions and methods are used—ranging from as little as .25 miles to almost 2 miles as shown in *Table 4.6*--making it difficult to compare results across multiple studies.

Focus on proximity: This study was intentionally limited to characteristics of greenspace in proximity to respondents' homes, but their responses in the surveys were not restricted to that environment. Respondents could consider any scale in answering the questions asked. It is possible that greenspace characteristics in the greater environment play a more significant role. A study that compares greenspace across a larger geography might find that some of the environmental variables used here become significant when analyzed at a larger geographic scale.

Focus on greenspace: The current study did not assess characteristics of the neighborhood other than population density and greenspace characteristics. Crime, socio-

economic status, and residential type (single-family versus multi-family, etc.) are some of the variables that may play a role in the interaction between people and greenspace.

Amenity types: This study did not look at the effects of amenity type. Only the presence, quantity, location, and functionality (assessed as the suitability of a feature for its intended purpose) of amenities were measured. Shores and West (2010) pointed out that amenity type may play an important role in the relationship between parks and behaviors.

GIS measures: As noted in the literature, the accuracy of GIS data can be inconsistent and is difficult to verify. While GIS datasets obtained from secondary sources are considered to be reliable representations of what exists "on the ground," the absolute precision and accuracy of any particular piece of information within them can vary, as noted by Brownson et al. (2009). Brownson et al. cautioned that threats to the validity of GIS data can stem from multiple factors, including the fact that GIS data are collected from multiple sources at different times for multiple purposes. Generally, GIS data is assembled at the county or other jurisdictional level from a variety of sources, usually by in-house staff or consultants trained in GIS. Brownson et al. added that errors in the GIS are difficult to identify. While this should be acknowledged, geospatial data from similar sources is normally used in research of the type presented here and is considered acceptable (e.g., Barbosa et al., 2007; Sister et al., 2010). According to Brownson et al., researchers typically address such discrepancies by providing evidence that the study area or population has remained fairly constant or by using archival data. In the case of the study conducted here, archival GIS data were used in order to align temporally with the survey data and U.S. Census data. Parcel data for greenspace locations were reviewed and verified by a combination of (a) ground-truthing by myself and

others, and (b) inspection of maps with parcel lines overlaid on aerial photos, conducted by staff persons who are familiar with the geography and knowledgeable of the parcels. The use of GIS data from multiple cases in different geographic regions, with large sample sizes at each location, also served to mitigate the effects of error in the GIS data.

GRASP®-IT audit tool: Use of GRASP® tools and measurements allowed this study to incorporate composite indicators and assessment of subjective characteristics as variables. However, because the GRASP®-IT audit tool was developed for purposes other than scholarly research, its reliability and validity are lower than what would be considered optimal for scholarly purposes on some measures. In this study, this is only an issue for those variables with GRASP® values and not for remaining variables.

Additionally, OECD (2008) cautioned that composite indicators can be misleading if poorly constructed or misinterpreted. A key objection is the potential for arbitrariness in the weighting process by which variables are combined. OECD advised that the construction of composite indicators "owes more to the craftsmanship of the modeler than to universally accepted scientific rules for encoding" (p. 14), and that the justification for a particular composite indicator lies in both its fitness for the intended purpose and in peer acceptance.

Low variability: For some greenspace characteristics, low variability may be a factor in the results obtained. The self-reported data regarding importance of parks and the degree to which needs are met, as well as the GRASP®-IT ratings for components, exhibited low variability in this study. In practice, park components vary little in their GRASP® functional scores. The majority are found to be suitable for their intended purpose and are assigned a functional score of 2, as explained in Appendix D. GRASP® algorithms widen the range of

final component values that are used to derive the variables examined here, but frequencies within the middle range are still high, as shown in Appendix H. Also, the nearest park may not be widely different from one location to another due to the prevalence of standards and shared practices within the park and recreation industry. From my experience, having applied the GRASP®-IT tool to evaluate hundreds of greenspace locations across the United States, local parks are not radically different from one another and tend to follow certain norms in terms of features and general characteristics. This is presumably due to the fact that parks are tax-supported facilities which are intended to serve their purpose, but are not expected to be overly extravagant. A purposive sample of parks with more diverse characteristics could be a way to examine this issue in future efforts.

Limited variability in the respondent characteristics may also occur. The consistency of the importance response has already been noted. The sampling frame was limited to adults, and only one response per household was generated as well. While the study locations represent diverse geography and demographics, they are not representative of the full range existing across the United States, let alone the rest of the world.

Another reason for low variability may be that expectations are set by existing conditions, and existing conditions tend to be similar for each type of greenspace feature from one place to another. Even when they differ from one community to another, existing conditions within the same greenspace system (i.e., lands managed by a single agency or group of agencies within the same jurisdiction or geographic region) tend to be consistent. This may result in constituents simply evaluating whatever conditions they experience as being acceptable (Manning & Krymkowski, 2010). This could explain the low variation in

the outcome variable for perceived adequacy of parks. In other words, the conditions that people experience and are familiar with may influence what they consider to be "acceptable."

Programs: Cohen et al (2010) and Mowen (2010) have reported that organized events, programs, and other management practices are strong correlates of park use. Variables related to programming and operations were not investigated in this study.

Additional demographic and social variables: The results of this study align with a general sense in the literature that personal variables are important correlates of perception and use of greenspace. Numerous variables besides the ones used in this study may be significant determinants of park perceptions and use. Awareness of the greenspace resources in one's community is one factor that should be studied further (Cohen et al., 2010). Perceived and objective crime and safety are also variables that may have a strong influence on behaviors related to greenspace.

Another demographic variable that was not included in this study is climate, including such things as precipitation, seasonal temperature variations, sunshine and ultra-violet radiation, wind, differences in humidity and hours of daylight, all of which could be moderators of the interactions between individuals and greenspace. There appears to be relatively little consideration of this in the research literature on park use, physical activity, and other outcomes (Humpel et al., 2002).

Geographic distribution: While it was hoped that the broad range of states represented in the original sampling frame would result in a sample that covered the widest possible geographic range of the United States, the sampling process was not intended to produce a sample that would allow generalization to all communities in all parts of the

United States. Three of the final four locations resulting from the selection process are located in the easternmost part of the U.S. The fourth, Tulsa, is difficult to classify as falling within a particular region and could be considered to represent aspects of the Midwest, South, and Southwest. So while the resulting sample does not represent the entire United States, it somewhat addresses an issue highlighted by Brownson et al. (2009), who pointed out that in studying effects of the physical environment on individuals "most evaluations of measurement properties were conducted in one region" (p. S119).

6.4 Future Study

Results in this study align with others which found evidence for the relationship between greenspace environments and human behaviors inconclusive for many variables. Future studies could seek to address this by choosing locations with more diverse demographics in terms of cultural and socioeconomic status and a broader range of greenspace characteristics in terms of quantity and distribution. Purposive sampling, larger samples, and true random sampling are some of the ways this might be approached. Such studies might also look deeper into interactions between the variables tested here. For example, what is the dynamic between attraction and distance? Kaczynski et al. (2014) reported that a more desirable park farther away may be more important than a less desired one nearby, or a park with more amenities may be less useful to some individuals than another park with fewer amenities, but of a particular type.

The dynamics between demographics and environmental characteristics also deserve more study, because different park attributes offer different affordances to different people. Also, research is needed to determine exactly what distances are meaningful for park users,

based on means of access. The standards used among different studies to define proximity, walking distance, and the concept of neighborhood lack clear evidence for what the appropriate metrics should be.

Longitudinal studies that make use of direct observation are needed. These would add stronger evidence for the questions posed here and provide knowledge on causality.

Standardized protocols for data collection are needed to allow for aggregation of data across multiple sources (Schultz et al., 2016). This study utilizes a small portion of the immense supply of data produced by park and recreation agencies on a continuing basis. However, as exhibited here, limitations on using that data for scholarly research stem from inconsistencies in methods and protocols for its collection. Collaboration early in the data collection process for park system master plans and other projects could allow researchers in both the academic and practice realms to share information and support one another's goals. It might also facilitate smoother translation of academic research into policies and practices.

Future studies should investigate variables that were not included here, such as awareness of greenspace locations and features. For example, the U.S. Department of Health and Human Services (2015) noted that the addition of signs and outreach activities in parks leads to increased physical activity among users. Cohen et al. (2010) also called for further study of awareness of park programs and features as a factor in park use.

The current study did not address the amount of use, capacity, or congestion within the proximate greenspace of participant's homes. The number of users in a greenspace facility could have both positive and negative effects on perception and use. More users could signal a more inviting environment in terms of social connections and safety, or it

could be seen as threatening or limiting to the experience of the facility and may even result in objectively congested, overused, and lower quality greenspaces. More research is needed to see how such opinions are formed and what the effects are on the use and allocation of greenspace.

Further study of park visits is needed to look at the implications of duration and the quality of the park experience. More studies are needed to determine not just the frequency and intensity of park visits, but also develop a deeper understanding of the meaning and quality of visits to parks. For example, questions of how much, how many, how far, etc. could be asked of the respondent.

The geographic areas included in this study are within or near urbanized ones, as defined by the U.S. Census Bureau (Census.gov, 2016), but the issues that greenspace addresses are found in rural areas as well, so more study in needed for those locations (Shores & West, 2010). All of the areas studied here fall within the boundaries of one or more agencies that provide parks and recreation services. Future studies should look at areas, both urbanized and rural, that are not served by a parks and recreation provider. Also, future studies that incorporate true random samples of communities and participants would strengthen the evidence produced and make it more generalizable.

This study focused on relationships between people and the greenspace around their place of residence. The surveys were sent only to residents and not to visitors of the communities in the study. Greenspace is often used by non-residents for special events, organized sports, or tourism. Future studies should consider the interaction of non-residents with greenspace and how this affects general health and well-being, as well as the greenspace

allocation process. Research questions to answer might include whether greenspace systems that target tourism in their allocation process result in higher or lower satisfaction rates among residents--and if so, why--and whether residents visit parks more frequently or less frequently in such communities.

Similarly, this study focused on adults, although the presence of children in the home was accounted for in control variables. Future studies should consider the interaction of children with greenspace, particularly the role of children in influencing the decision process for greenspace allocation and how children moderate the interaction of adults with greenspace. Dogs and other animals may also be moderators to consider, along with technological changes, such as drones and social media.

Lastly, this study points to a need for greater understanding of the role of subjective values and park quality attributes in the relationship between people and greenspace. Subjective values include such things as aesthetics, design quality, and sense of place, while safety, security, and cleanliness are examples of park quality attributes. Variables that incorporate such characteristics showed potential in this study. Better ways to measure park quality and aspects of the park experience are needed. The GRASP®-IT audit tool used here attempts to capture the aspects of comfort, convenience, and beauty in the park experience, but they blend those with objective measures of quantity and size. More precise and refined tools that isolate subjective characteristics of greenspace into focused indicators are needed. Composite indicators such as GRASP® Walk Score and GRASP® scores for the nearest park showed potential in this study for combining subjective values into indices that can be used to conduct research and inform policy, but the underlying measures that make up such

composite values should also be studied carefully to avoid obscuring associations that would be evidenced if they were examined individually (Humpel et al., 2002).

Much work is being done on physical activity levels in parks and on the role of greenspace in stress reduction and mental restoration, as well as other issues, but much of this research is keyed to traditional objective measures of greenspace quantity, size, capacity, and distance. Broader research that investigates subjective characteristics of greenspace is needed to thoroughly unpack the ways in which people experience and perceive greenspace.

6.5 Implications of the Study

The research presented here aimed to contribute to the body of knowledge for the relationship between the characteristics of greenspace in the area around a person's home and the perception and use of greenspace. The findings are useful to planners, designers, policymakers, public health officials, and all who make decisions around the provision, management, and use of greenspace as a public good. The particular questions in the study examined characteristics of greenspace attributes close to home that could potentially affect (a) the opinion of greenspace adequacy--how well it meets the needs it is intended to serve--and (b) the use of parks by an individual's household. The first of these questions has not been researched prior to now, as far as I can determine, so it adds new knowledge. The second one adds new findings to an expanding body of research into the use of greenspace.

In 2000, Bates and Santerre pointed out that "very little, if anything, is currently known formally about the structure and demand for open space" (p. 99). While a great deal of research has ensued in the intervening years, the truth remains elusive. Yet demand for parks, trails, greenways, conservation areas, and other forms of public greenspace continues

as it has for over 150 years. Greenspace providers attempt to meet this demand with outdated tools, uncertain measures, and a lack of empirical evidence to assure them how much net benefit their services generate for the typical person. In the end, it is the public decision process that determines how much of a public good is provided (Bates & Santerre, 2000). In a democratic society, the public decision process relies upon judgment decisions made by all of the individuals who take part in it. Understanding how these judgments are made can help align the provision of greenspace services with the perceived as well as objective needs of those whose judgment is critical to its continued existence.

6.5.1 Implications for practice.

This study has relevance to a number of professions, including planners, landscape architects, and managers of public greenspace and parks and recreation systems. Parks and other greenspace features play an important role in the form, character, and function of communities. In America, more than 9,000 local park and recreation departments and organizations manage well over 100,000 public park and recreation facilities, including approximately 20,000 individual parks and 10,000 playgrounds (Cohen et al., 2016; Mowen & Baker, 2009). Awareness of the importance of greenspace infrastructure for public health and well-being is expanding, driving a need for the profession to plan and manage it effectively. Knowledge of how people perceive and use greenspace is critical to making good decisions.

The shift in the allocation process for greenspace from a standards-based approach to a needs-based one that relies on public process drives a need for understanding how constituents make judgments and form opinions. Understanding why and how people use

greenspace is necessary if policies and plans are to be effective in assuring that benefits provided by greenspace reach their full potential. Asking constituents if their needs are met is only part of the equation. Understanding how what is provided to them affects their perception of needs and their use of greenspace is the other side of the equation. Aligning the perceived-and-met needs approach to allocation with the objective realities of how greenspace operates in terms of health and well-being will become even more critical as new evidence emerges. While surveys such as the ones used here indicate that overall levels of satisfaction with public greenspace are high, empirical studies have shown that equitable distribution of greenspace is not a reliable outcome of the planning processes and policies in place. At the same time, conflicting findings in the research field call into question the measurements by which determinations of inequality are made. It is up to researchers to find better ways to measure service and the equity of its distribution, but it will be up to practitioners to apply them so that more can be learned from further research.

Lee et al. (2004) compared the concept of satisfaction in the field of recreation and tourism to that of profit in the private sector, saying that measurement of satisfaction is how organizations measure success at meeting goals and achieving their mission. The question of how well needs are met that was used for this study is a standard feature of public parks and recreation surveys, often referred to in the industry as “the satisfaction question.” Lee et al. explained that satisfaction is a result of many factors beyond the control of greenspace managers. But there is general acceptance in the field that *service quality* influences satisfaction, and service quality is one thing that managers can control. Thus, managers who are able to learn what criteria visitors use in evaluating quality and experiencing satisfaction

may be in a better position to enhance satisfaction. According to Lee et al., “service quality is a specific judgment of services availed of while satisfaction is evaluated in broader terms” (p. 74). They argued that service quality influences satisfaction, which then influences behavioral intentions, including the intention to make use of greenspace facilities. They proposed that cognitive evaluation of service quality precedes affective judgment or satisfaction of greenspace, which then leads to use or non-use (Lee et al., 2004).

Lee et al. explained that the assumption has been made in the recreation industry that controlling the quantity and accessibility of greenspace features (how big, how many, and how far away) is the way to control service quality. Normative standards, benchmarking, and public process have all been applied towards these ends. In effect, needs are identified through subjective public process but addressed through standardized objective approaches to supply. Success, however, is determined by asking constituents the satisfaction question. This study and others infer that many of the measures used to assess supply are not aligned with the way in which demand is determined, i.e., the cognitive evaluation process of those whose needs managers are attempting to satisfy. This poor alignment could explain a general sense that parks and recreation are non-essential services (Crompton, 1999; Gaddo, 2016). Clear alignment of the measures by which needs are determined (both perceived needs as determined through public process and objective ones determined through empirical research), how they are addressed, and how success is verified is important for greenspace planners, designers, managers, and policymakers alike. Studies like this one will help achieve that alignment.

CHAPTER 7: CONCLUSIONS

This study indicates that while some characteristics of the greenspace near a person's home may influence their opinion and use of the greenspace system, the characteristics of the individual and the greater community, such as race, gender, and socio-economic status, play a larger role. Thus, support for greenspace and realization of the benefits it has to offer are not readily predicted by where, how much, how far, or what type is provided. This is not to say that those are not important considerations--there is a growing body of evidence that the presence of greenspace benefits people and communities in a number of ways. Such metrics may be critical for assuring that greenspace is beneficially provided to achieve a number of positive goals, but they may not be the right measures to use in assuring the support and satisfaction of constituents, nor in promoting use of the greenspace system. New metrics that incorporate both subjective and objective indicators are needed to achieve these goals.

The results of this study indicate that new and better ways to measure subjective values related to greenspace experience are needed. Instruments for measuring the quality of greenspace experiences are needed, but first we have to define what is meant by "quality" in terms of public greenspace (Bates & Santerre, 2000). What makes a park a "good" one? One answer might come from further research using normative theory and norm curves as illustrated in *Figure 7.1*. Such curves could be used to set standards for elements that support the comfort, convenience, and beauty of greenspace locations. Once established, they will need constant updating, as norms are subject to change over time (Manning & Krymkowski, 2010).

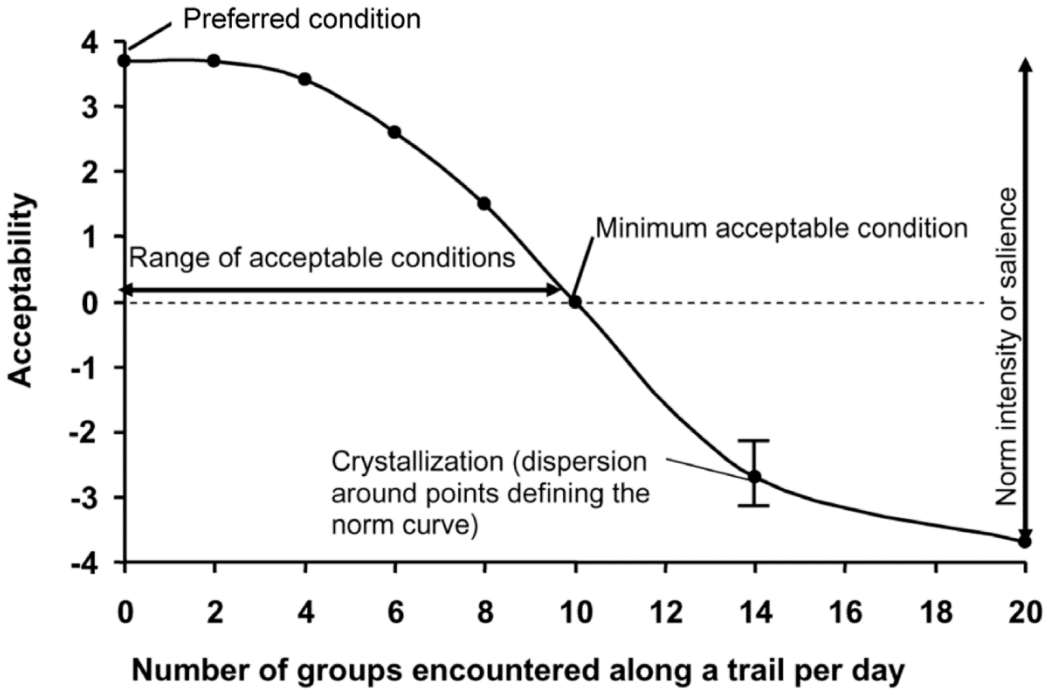


Figure 7.1 Norm curve example. Source: Manning and Krymkowski (2010, p. 13).

Composite indicators, such as the GRASP® variables used in this study, may also provide useful ways to measure subjective values. By incorporating functional capabilities, use capacities, ease of use, and other variables into a single index, such indicators would not only make it easier for practitioners to apply them, it would also standardize the way in which subjective values are captured. This would allow for aggregation of data from multiple sources, including those generated in the practice, to be used for further research.

A final word should be said about the size of the effects found in this and other studies related to interactions between people and greenspace. One reason for the inconsistencies found between multiple studies in this field of research could be simply that people are complex creatures and it is difficult to generalize among them, especially where

cognitive and overt behaviors are concerned. The effects of a single variable can be quite small and confounded by many other small variables. This does not mean, however, that they are not important. A small beneficial effect on a large number of people can have a great overall impact across the entire population (Hartig et al., 2014). For example, a relatively small lowering of the average blood pressure among all Americans could reduce the mortality rate by as much as 30% (Rose, 2001). If increased support for and use of greenspace led to even slight reductions in the nation's blood pressure, many lives would be saved. To rephrase what Rose (2001) called the "*Prevention Paradox*," a preventive measure which offers little to each participating individual brings much benefit to the population. By aligning the provision of greenspace with the perceptions of constituents so that they support, sustain, and use it, the kinds of effects found in this study and research, when added together, could have a large effect on the health and well-being of society. To put it another way, "A key principle is that interventions should be most effective when they change the person, the social environment, and built environment and policies" (Sallis et al., 2012, p. 729). Through greater understanding of the relationship between public greenspace and individual behaviors, the potential exists to do all of these.

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APPENDICES

Appendix A – IRB Approval Letter

NC STATE UNIVERSITY

Office of Research, Innovation and. Economic Development
Sponsored Programs and
Regulatory Compliance Services
research.ncsu.edu/sparcs/

Campus Box 7514
2701 Sullivan Dr. Suite 240
Raleigh, NC 27695-7514
P: 919.515-2444, F: 919-515-7721
E: sps@ncsu.edu

From: Deb Paxton, IRB Administrator
North Carolina State University
Institutional Review Board

Date: November 3, 2016

Title: Robbie Layton PhD Dissertation

IRB#: 5777

Dear Eugene Bressler & Robbie Layton,

The project listed above has been reviewed by the NC State Institutional Review Board for the Use of Human Subjects in Research, and is approved for one year. **This protocol will expire on 1/15/17 and will need continuing review before that date.**

NOTE:

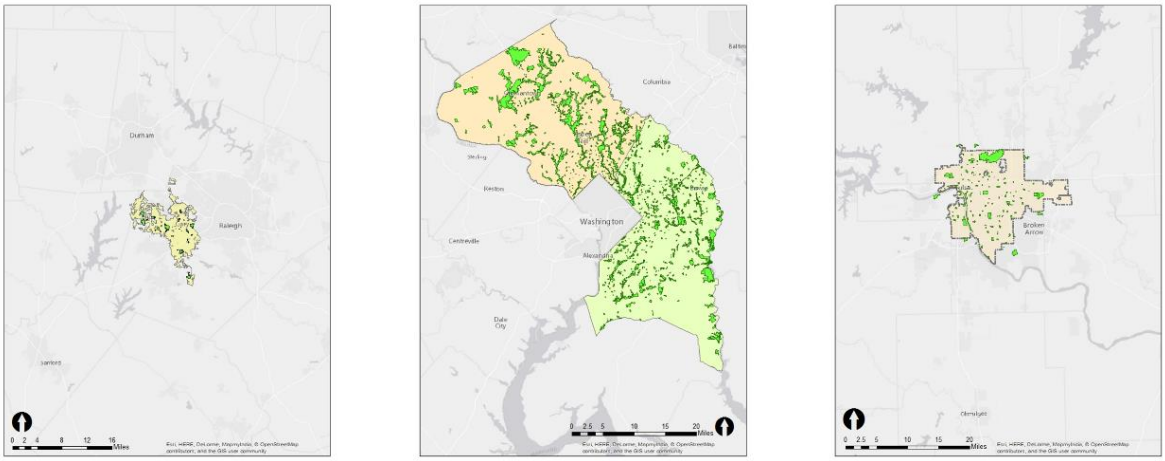
1. You must use the attached consent forms which have the approval and expiration dates of your study.
2. This board complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU the Assurance Number is: FWA00003429.
3. Any changes to the protocol and supporting documents must be submitted and approved by the IRB prior to implementation.
4. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days by completing and submitting the unanticipated problem form on the IRB website.
5. Your approval for this study lasts for one year from the review date. If your study extends beyond that time, including data analysis, you must obtain continuing review from the IRB.

Sincerely,

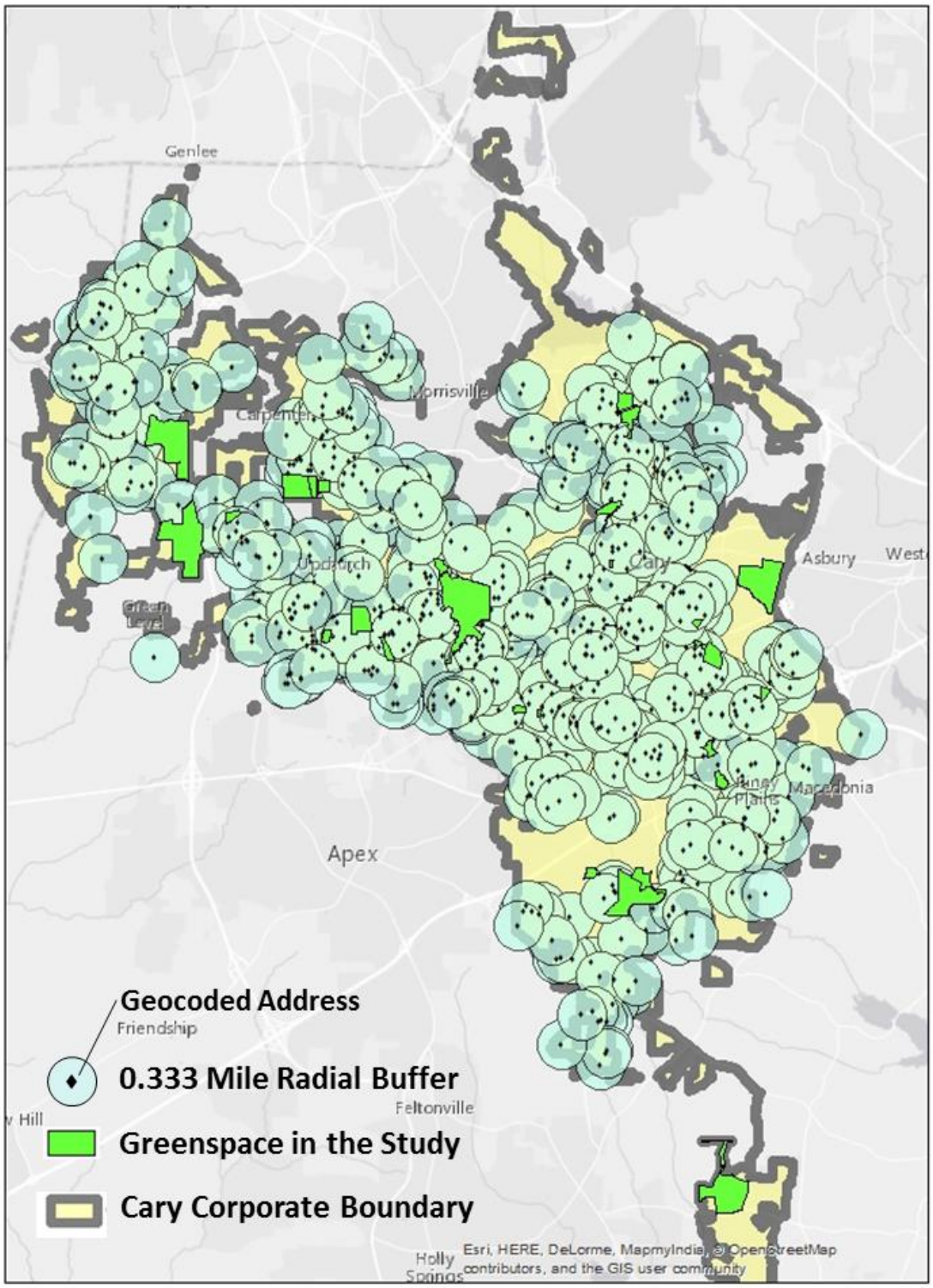
Deb Paxton
NC State IRB

Appendix B – Study Area Maps

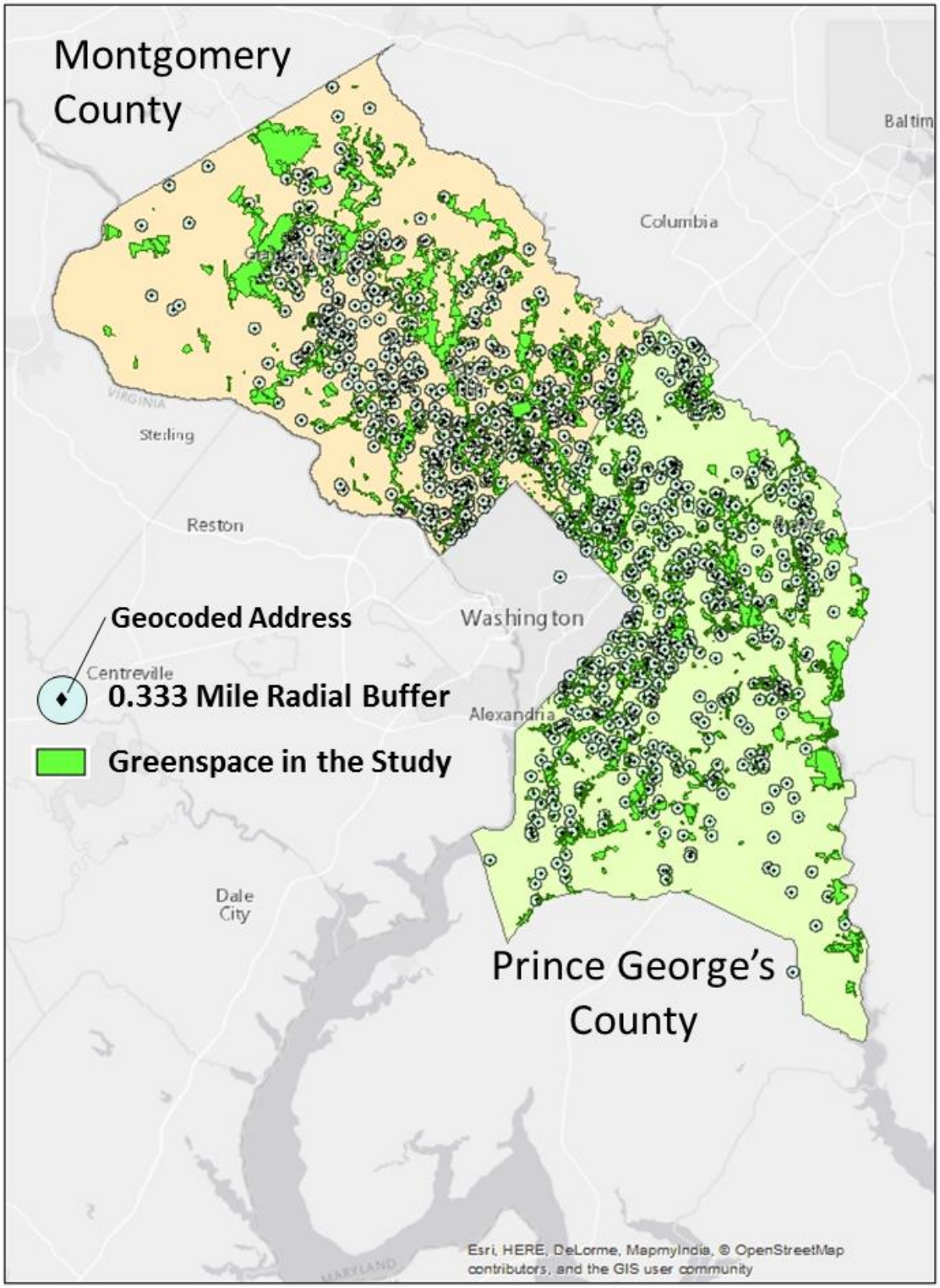
In this appendix are maps of the study areas showing the greenspace locations that were included in the dataset for each study area, the geocoded addresses before removing unusable ones, and the buffers associated with the addresses. The first map shows all locations at a single scale to allow for comparison of the relative size of the study area and distribution of greenspace within it. The larger scale maps show further detail, including the 0.333-mile buffers.



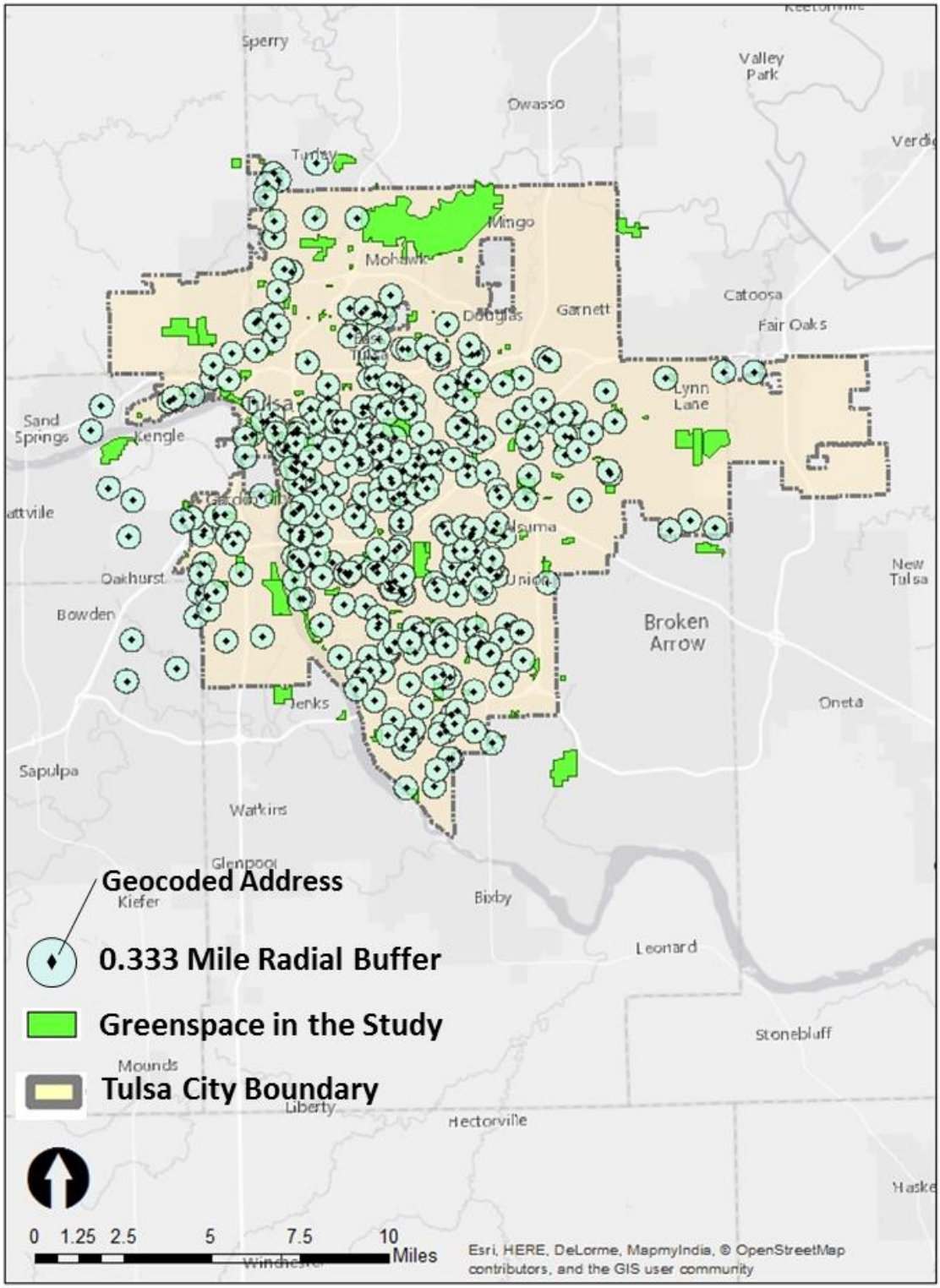
All Study Locations at Same Scale for Comparison



Cary, North Carolina Study Area Map



Montgomery County and Prince George's County, Maryland Study Area Map



Tulsa, Oklahoma Study Area Map

Appendix C - Surveys

This appendix includes the complete survey that was originally used by RRC Associates to collect data used in this study for secondary analysis. Each of the four study areas had a separate survey conducted. I extracted data from raw datasets from the surveys for use in this study. The extracted data was merged into a single dataset for statistical analysis.

Surv **TOWN OF CARY PARKS, RECREATION AND CULTURAL RESOURCES MASTER PLAN SURVEY 2011**

CURRENT PROGRAMS AND FACILITIES

PLEASE READ THE FOLLOWING DEFINITION OF **RECREATION** CAREFULLY BEFORE RESPONDING:
"Recreation" for this survey is, any activity done mainly for pleasure or enjoyment, away from the private home, in a park area or recreation facility.
This includes cultural, historical, entertainment, social group, nature or environmental education, and athletic-oriented activities.

1. A) Approximately how many times in the last 12 months have you or members of your household (include all family members and guests) used the following facilities, amenities, and programs supported and managed by the Town of Cary? *(ENTER # OF TIMES OR "0" IF NONE)*
B) Rate how important you feel each of these facilities/programs is to your household. (1 ="Not at all Important"; 9 ="Very Important")
C) Rate how well you think the facilities/programs are currently meeting the needs of the community. (1 ="Not at all Met"; 9 =" Completely Met")

Please provide responses even if you have not used the facilities, amenities or programs.	A) TIMES USED LAST 12 MOS	B) IMPORTANCE TO YOUR HOUSEHOLD (NOT AT ALL IMPORTANT – NEUTRAL – VERY IMPORTANT) Imp 1-15	C) THE NEEDS OF THE COMMUNITY (NOT AT ALL MET – SOMEWHAT – COMPLETELY MET) Meet 1-15	DON'T KNOW
Town Community Centers or Senior Center	Use 1	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town Recreation programs/classes – youth/teen	2	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town Recreation programs/classes - adult	3	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town Recreation programs/classes - seniors	4	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town sports leagues, camps, clinics (all ages)	5	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town cultural arts programs/classes (all ages)	6	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town athletic/sports fields/courts (in parks)	7	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town environmental education programs	8	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town greenways and trails	9	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Downtown cultural facilities	10	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town open space and natural areas	11	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town parks	12	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town amphitheaters (Koka Booth or Sertoma)	13	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Town regional sports venues (Cary Tennis Park, WakeMed Soccer Park, USA Baseball National Training Complex)	14	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0
Other: _____	15	1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	0

2. To what degree do you agree with the following statements about park and recreation facilities and services in the Town of Cary? *(CIRCLE APPROPRIATE RESPONSE FOR EACH)*

State	STRONGLY DISAGREE – NEUTRAL – STRONGLY AGREE	DON'T KNOW
1 Sufficient open space has been protected by the Town of Cary	1 2 3 4 5 6 7 8 9	0
2 Parks and recreational facilities are in proximity to my home	1 2 3 4 5 6 7 8 9	0
3 Town regional sports venues contribute to the local economy	1 2 3 4 5 6 7 8 9	0
4 Public art makes a positive contribution to parks & facilities	1 2 3 4 5 6 7 8 9	0
5 Town recreation facilities meet the needs of my household	1 2 3 4 5 6 7 8 9	0

3. If you do not use Cary parks, facilities, open space, trails, and programs, why not? *(MARK ALL THAT APPLY)* Skip

01) [ ] Not aware of programs/facilities offered
02) [ ] Don't have the programs I want (such as:_____)
03) [ ] Quality of equipment
04) [ ] Lack of facilities and amenities (such as:_____)
05) [ ] Overall maintenance
06) [ ] Crowding / not enough space
07) [ ] Too far from my house
08) [ ] Lack of transportation
09) [ ] Condition of facilities
10) [ ] Safety and security
11) [ ] Lack of parking
12) [ ] Customer service / staff knowledge
13) [ ] Price / user fees
14) [ ] Hours of operation
15) [ ] No time / other personal issues
16) [ ] Prefer other recreation providers
17) [ ] Other:_____

Nouse_1-10

4. What other parks, recreation facilities, open space, trails, and programs, if any, do you use? *(CHECK ALL THAT APPLY)* Skip

01) [ ] Private or public schools (i.e., gyms, athletic fields)
02) [ ] Churches
03) [ ] YMCA
04) [ ] Homeowners Association facilities (pools, tennis)
05) [ ] Private fitness clubs (Lifetime Fitness, Gold's Gym)
06) [ ] Other aquatic facilities/pools (Triangle Aquatics Center, University aquatic facilities, City of Raleigh)
07) [ ] Neighboring community facilities, including cultural (specify_____)
08) [ ] State or County Parks & Open Space
09) [ ] Youth sports associations or clubs (not Cary Parks & Rec)
10) [ ] Private instruction (dance, martial arts, etc.)
11) [ ] Others:_____
12) [ ] None of the above

OthpK_1-8

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1

CARY

FUTURE FACILITIES, AMENITIES, AND SERVICES TO INCLUDE

The Town of Cary funds parks, recreation, cultural resources, and trail operations & maintenance with user fees and tax dollars. As you read through the following statements, please keep in mind that while user fees, grants, and donations offset some costs, additional funds would be required for the building, operations, and maintenance of new parks, recreation, open space, and trail facilities.

5. In an effort to understand the greatest needs for INDOOR facilities to be added, expanded, or improved as funding allows over the next 5 or 10 years, please rate the following (1 ="Not at all Important"; 9 ="Very Important").

Ind

	IMPORTANCE TO YOU/YOUR HOUSEHOLD									
	NOT AT ALL IMPORTANT				NEUTRAL				VERY IMPORTANT	DON'T KNOW
01) Community gathering spaces	1	2	3	4	5	6	7	8	9	0
02) Multi-purpose gymnasium space	1	2	3	4	5	6	7	8	9	0
03) Indoor swimming pools with lap lanes for fitness swimming	1	2	3	4	5	6	7	8	9	0
04) Indoor leisure pools with aquatic play features (e.g., lazy river / water slide / children's splash area)	1	2	3	4	5	6	7	8	9	0
05) Warm water therapy / rehab pool	1	2	3	4	5	6	7	8	9	0
06) Fitness class space	1	2	3	4	5	6	7	8	9	0
07) Weight room and cardio fitness equipment	1	2	3	4	5	6	7	8	9	0
08) Visual / performing space (in addition to Page Walker Arts & History Center and new Cary Arts Center)	1	2	3	4	5	6	7	8	9	0
09) Large rental space (e.g., special events, private events)	1	2	3	4	5	6	7	8	9	0
10) Ice rink (e.g., ice skating, hockey, etc.)	1	2	3	4	5	6	7	8	9	0
11) Indoor tennis	1	2	3	4	5	6	7	8	9	0
12) Track for walking / running	1	2	3	4	5	6	7	8	9	0
13) Nature center and environmental instruction	1	2	3	4	5	6	7	8	9	0
14) Other: _____	1	2	3	4	5	6	7	8	9	0

6. Insert one number (1-14) from the list in Question #5 above for you and your household's highest priority to be added, expanded, or improved in Cary. Please also indicate your second and third priorities.

Mind1 Most important Mind2 Second most important Mind3 Third most important

7. In an effort to understand the greatest needs for OUTDOOR facilities to be added, expanded, or improved as funding allows over the next 5 or 10 years, please rate the following (1 ="Not at all Important"; 9 ="Very Important").

Out

	IMPORTANCE TO YOU/YOUR HOUSEHOLD									
	NOT AT ALL IMPORTANT				NEUTRAL				VERY IMPORTANT	DON'T KNOW
01) Playgrounds	1	2	3	4	5	6	7	8	9	0
02) Multi-purpose fields (e.g., soccer, football, lacrosse)	1	2	3	4	5	6	7	8	9	0
03) Baseball fields	1	2	3	4	5	6	7	8	9	0
04) Softball fields	1	2	3	4	5	6	7	8	9	0
05) Hard surface trails (paved or concrete)	1	2	3	4	5	6	7	8	9	0
06) Soft surface trails (unpaved)	1	2	3	4	5	6	7	8	9	0
07) Neighborhood parks	1	2	3	4	5	6	7	8	9	0
08) Nature preserves / natural areas	1	2	3	4	5	6	7	8	9	0
09) Cricket field	1	2	3	4	5	6	7	8	9	0
10) Frisbee / disc golf	1	2	3	4	5	6	7	8	9	0
11) Community gardens / urban agriculture	1	2	3	4	5	6	7	8	9	0
12) Display gardens	1	2	3	4	5	6	7	8	9	0
13) Outdoor swimming pool	1	2	3	4	5	6	7	8	9	0
14) Aquatic play features (splash parks)	1	2	3	4	5	6	7	8	9	0
15) Tennis courts	1	2	3	4	5	6	7	8	9	0
16) Dog parks	1	2	3	4	5	6	7	8	9	0
17) Skate parks	1	2	3	4	5	6	7	8	9	0
18) Community gathering spaces / outdoor event facility / amphitheater	1	2	3	4	5	6	7	8	9	0
19) Outdoor court games (e.g., croquet, bocce ball, shuffleboard)	1	2	3	4	5	6	7	8	9	0
20) Volleyball (sand courts)	1	2	3	4	5	6	7	8	9	0
21) Basketball courts	1	2	3	4	5	6	7	8	9	0
22) Historic sites	1	2	3	4	5	6	7	8	9	0
23) Other: _____	1	2	3	4	5	6	7	8	9	0

8. Insert one number (1-23) from the list in Question #7 for you and your household's highest priority to be added, expanded, or improved in Cary. Please also indicate your second and third priorities.

Most1 Most important Most2 Second most important Most3 Third most important

CARY

9. The following questions relate to parks and recreation facilities within the Maynard loop, including Downtown Cary and the Town Hall Campus.

Have you visited the Town Hall campus and downtown Cary in the last year? [1] Yes [2] No Viscary

If yes, what drew you to downtown? _____

If yes, did you participate in recreation or cultural resources activities when you visited? [1] Yes [2] No Partrec

If yes, what activities did you participate in? _____

The Town is working hard to create a more vibrant downtown, including updating and expanding the train depot as well as renovating the old Cary Elementary School into the new Cary Arts Center.

What additional amenities or activities would you like to see in downtown Cary in the future? Please rank your highest priority by inserting a "1", a "2" for your 2nd highest priority, and a "3" for your 3rd highest priority. Please choose three. Skip

Rank 1 = most important
Rank 2 = 2nd "
Rank 3 = 3rd "

1	Festivals	9	Additional art exhibition space
2	Concerts	10	Working studio space for artists
3	Parks	11	Movie theater
4	Public plaza	12	Preservation / adaptive reuse of historic buildings
5	Cafes and restaurants	13	Historical walking tour
6	Shopping opportunities	14	Public art
7	Museums	15	Other, please specify: _____
8	1,100 seat municipal auditorium		

If constructed, the greatest amenity for a new park in downtown Cary would be.... _____.

10. Where would you like to discover public art? Please rank your highest priority by inserting a "1", a "2" for your 2nd highest priority, and a "3" for your 3rd highest priority. Please choose three. Skip

Pubart 1 = most important
Pubart 2 = 2nd "
Pubart 3 = 3rd "

1	Bridges	5	Gateways to and from Cary
2	Parks	6	Public buildings (community centers, firehouses, schools)
3	Public gardens	7	Downtown sites
4	Greenways	8	Major roadways

11. Referring to possible additions or expansions to community recreation centers in the Town of Cary, please tell us which direction you most prefer based on the following extremes. ***(CHECK ONE RESPONSE)***

Addrec

	STRONGLY PREFER SMALLER	SOMEWHAT PREFER SMALLER	NEUTRAL	SOMEWHAT PREFER LARGER	STRONGLY PREFER LARGER	
Build a greater number of smaller community centers with fewer amenities	1☐	2☐	3☐	4☐	5☐	Build fewer, but larger multi-purpose regional recreation centers (incorporating gyms, pools, fitness, amenities)

12. How long would you be willing to travel to get to a community center with the amenities that you and members of your family want?

[1] 5 minutes [2] 10 minutes [3] 15 minutes [4] 20 minutes [5] Would not use a community center Longtrav

OPEN SPACE

13. What management aspects of OPEN SPACE are most important to you?

Open	NOT AT ALL IMPORTANT				NEUTRAL				VERY IMPORTANT	DON'T KNOW
1) Stream and creek conservation	1	2	3	4	5	6	7	8	9	0
2) Wildlife habitat and migration corridors	1	2	3	4	5	6	7	8	9	0
3) Preservation of agriculture (small farms/community gardens)	1	2	3	4	5	6	7	8	9	0
4) Enforcement of regulations (leash laws, encroachment)	1	2	3	4	5	6	7	8	9	0
5) Cultural and historical preservation (including scenic vistas)	1	2	3	4	5	6	7	8	9	0
6) Preservation, protection, and restoration of natural areas	1	2	3	4	5	6	7	8	9	0
7) Environmental education and volunteer opportunities	1	2	3	4	5	6	7	8	9	0
8) Greenway and trail maintenance	1	2	3	4	5	6	7	8	9	0
9) Other: _____	1	2	3	4	5	6	7	8	9	0

14. Using the numbers 1 through 9 for the items listed above, which aspects of open space management are you most supportive? Insert one number (1-9) from the list in Question #13 above for highest priority, second, and third.

Mopen1 Most important Mopen2 Second most important Mopen3 Third most important

CARY

FINANCIAL CHOICES

19. The Town of Cary funds the development, operations, and maintenance of facilities and services with user fees and tax dollars.

What is your opinion concerning where future funding for improvements should be spent? Please rank your highest priority by inserting a "1", a "2" for your 2nd highest priority, and a "3" for your 3rd highest priority. Please choose three. Skip

1 Add new parks
2 Add new indoor recreation space (e.g., weight rooms, fitness space, gymnasiums, leisure aquatics, class / meeting rooms, etc.)
3 Add new trails to connect or expand the greenway system
4 Add new natural areas
5 Add new cultural areas (Performing Arts Center, etc.)
6 Add new historical areas (Farm History Park, etc.)
7 Improve existing regional sports venues (Cary Tennis Park, WakeMed Soccer Park, and USA Baseball National Training Complex)
8 Add an outdoor aquatic center (outdoor pool, slides, lazy river, water play, etc.)
9 Make improvements and/or renovate and maintain existing facilities
10 Other, please specify:_____

Fund 1 = most important
Fund 2 = 2nd "
Fund 3 = 3rd "

SUGGESTIONS

20. Do you have any additional comments or suggestions that you would like to offer regarding parks, recreation facilities, open space, trails, and programs in Cary?

_____
_____
_____
_____

DEMOGRAPHICS

Just a few more questions about yourself for classification purposes...

21. How long have you lived in Cary?
4 Years OR [ ] Check here if less than a year
0 =

22. Where do you live in Cary? Live
1[ ] Western Cary (west of Highway 55)
2[ ] Downtown/Maynard loop
3[ ] Southern Cary (south of Highway 64)
4[ ] Central Cary (all other areas not listed above)
5[ ] I don't live in the Town of Cary

23. Please indicate your gender: Sex
1[ ] Male 2[ ] Female

24. What is your age? Age _____

25. People **Including yourself, how many people in total live in your household?**
Under18 **How many are under age 18?** *(ENTER "0" IF NONE)*
Over55 **How many are over age 55?** *(ENTER "0" IF NONE)*

26. Which of these categories best applies to your household? Marital
1[ ] Single, no children
2[ ] Single with children at home
3[ ] Single, children no longer at home (empty nester)
4[ ] Couple, no children
5[ ] Couple with children at home
6[ ] Couple, children no longer at home (empty nester)

27. Do you or any members of your household have a need for ADA-accessible facilities, services, or programs? Skip
1[ ] Yes (If yes, how many people? Normally) Ada
2[ ] No
3[ ] Don't know

28. Which of these categories best describes the total gross annual income of your household (before taxes)? Hinc
1[ ] Under $20,000
2[ ] $ 20,001 – 30,000
3[ ] $ 30,001 – 50,000
4[ ] $ 50,001 – 70,000
5[ ] $ 70,001– 100,000
6[ ] $100,001–150,000
7[ ] $150,001–200,000
8[ ] $200,001– 250,000
9[ ] $250,001 or more

29. Which of these categories best describes your ethnicity? Ethnic
1[ ] Caucasian/White
2[ ] Asian
3[ ] African American
4[ ] Hispanic
5[ ] Native American
6[ ] Other

Thank you for your time and valuable input!

Note: This survey is voluntary and individual responses will remain confidential. Aggregate data will be kept on public record and used to assist city leaders in writing a Master Plan that will shape the cultural and recreational opportunities in Cary in the future.

CARY

GREENWAYS AND TRAILS

15. What aspects of GREENWAYS and TRAILS are most important to you?

Trail	NOT AT ALL IMPORTANT				NEUTRAL				VERY IMPORTANT	DON'T KNOW
1) Trail connections within Cary (where? _____)	1	2	3	4	5	6	7	8	9	0
2) Connections to regional trails (where? _____)	1	2	3	4	5	6	7	8	9	0
3) Loop trails within parks (for fitness walking/jogging)	1	2	3	4	5	6	7	8	9	0
4) Signage and way-finding on trails	1	2	3	4	5	6	7	8	9	0
5) Trail maintenance	1	2	3	4	5	6	7	8	9	0
6) Amenities along trails (seating, water fountains, etc.)	1	2	3	4	5	6	7	8	9	0
7) Trailheads (with parking, access to water, restrooms, etc.)	1	2	3	4	5	6	7	8	9	0
8) Preservation, protection, and restoration of natural resources along greenway corridors (water, native plants)	1	2	3	4	5	6	7	8	9	0
9) Other: _____	1	2	3	4	5	6	7	8	9	0

16. Using the numbers 1 through 9 for the items listed above, which aspects of greenways and trails are you most supportive? Insert one number (1-9) from the list in Question #15 above for highest priority, second, and third.

Mtrail1 Most important Mtrail2 Second most important Mtrail3 Third most important

PROGRAMS, ACTIVITIES, AND SPECIAL EVENTS

17. Please indicate if YOU or any member of your HOUSEHOLD has a need for any of the following parks and recreation programs by circling 'Y' for YES or 'N' for NO next to the program listed. If YES, please then rate how well your needs are being met by the programs available from the Town of Cary.

Met	Need	HAVE NEED FOR THIS PROGRAM		IF YES, YOU HAVE A NEED, HOW WELL ARE YOUR NEEDS BEING MET BY PROGRAMS PROVIDED BY THE TOWN? NOT AT ALL MET				SOMEWHAT				COMPLETELY MET	DON'T KNOW
01) Athletic leagues - youth	1	1Y	2N	1	2	3	4	5	6	7	8	9	0
02) Athletic leagues - adult	2	Y	N	1	2	3	4	5	6	7	8	9	0
03) Instructional sports	3	Y	N	1	2	3	4	5	6	7	8	9	0
04) Day camp / after-school programs	4	Y	N	1	2	3	4	5	6	7	8	9	0
05) Teen activities	5	Y	N	1	2	3	4	5	6	7	8	9	0
06) Senior activities	6	Y	N	1	2	3	4	5	6	7	8	9	0
07) Co-ed recreational adult sports	7	Y	N	1	2	3	4	5	6	7	8	9	0
08) Children / youth activities (non-sport)	8	Y	N	1	2	3	4	5	6	7	8	9	0
09) Fitness and wellness programs	9	Y	N	1	2	3	4	5	6	7	8	9	0
10) General education, skills education (computers, cooking, babysitting, etc.)	10	Y	N	1	2	3	4	5	6	7	8	9	0
11) Swimming programs (Learn-to-Swim)	11	Y	N	1	2	3	4	5	6	7	8	9	0
12) Special events & festivals (concerts, Lazy Daze)	12	Y	N	1	2	3	4	5	6	7	8	9	0
13) Family programs	13	Y	N	1	2	3	4	5	6	7	8	9	0
14) Volunteer programs (coaching, senior volunteers)	14	Y	N	1	2	3	4	5	6	7	8	9	0
15) Visual arts programs (drawing, ceramics)	15	Y	N	1	2	3	4	5	6	7	8	9	0
16) Performing arts programs (dance, theatre, music)	16	Y	N	1	2	3	4	5	6	7	8	9	0
17) Heritage programs	17	Y	N	1	2	3	4	5	6	7	8	9	0
18) Environmental / nature programs	18	Y	N	1	2	3	4	5	6	7	8	9	0
19) Science, Technology, Engineering & Math programs (STEM)	19	Y	N	1	2	3	4	5	6	7	8	9	0
20) Therapeutic recreation/specialized programs for people with disabilities	20	Y	N	1	2	3	4	5	6	7	8	9	0
21) Inclusion services for people with disabilities	21	Y	N	1	2	3	4	5	6	7	8	9	0
22) Rental facilities	22	Y	N	1	2	3	4	5	6	7	8	9	0

18. Using the numbers 1 through 22 for the items listed above, which programs do you consider to be the most important to you? Insert one number (1-22) from the list in Question #17 above for highest priority, second, and third.

Mmet1 Most important Mmet2 Second most important Mmet3 Third most important

CARY

Vision 2030

Montgomery County RECREATION DEPARTMENT

m:\data\mncppc\2010\sys\mncppc.sys

M-NCPPC PARKS AND MONTGOMERY COUNTY RECREATION VISION 2030 SURVEY

You and your family can play an important role as we plan for future parks and recreation improvements, programs, trails, open space acquisitions, and other community investments. Please discuss the following questions with other members of your household so your answers reflect your combined opinions. ALL responses are important to us and will be kept confidential.

Please return your questionnaire within 10 days of receipt in the enclosed envelope to ensure all responses are recorded. If you have any questions about the survey, please call the Montgomery Parks Information and Customer Service Office at **301-495-2595**

SAVE MONEY AND TIME – complete the survey **online** by logging on to the following website with the password provided:

Sorv **www.rrcinfo.com/montgomery** **password:** _____

CURRENT FACILITIES AND PROGRAMS

1. **A. Approximately how often in the last twelve months have you or members of your household used the following FACILITIES and PROGRAMS in Montgomery County? (*ENTER "0" IF NONE)***

   B. Please rate how important you feel each of these facilities is to your household, using a scale from 1 to 5, where 1 means "Not At All Important" and 5 means "Very Important."

   C. Then, rate how well you think the facilities and programs provided throughout the county are currently meeting the needs of your household.

Please provide an answer for A, B and C whether you have visited the listed facilities or not.

	A. FREQUENCY OF USE (ANNUAL)	*B. IMPORTANCE TO YOUR HOUSEHOLD* (Crimp)					*C. MEETING THE NEEDS OF YOUR HOUSEHOLD* (Cmet)					
Facilities	NUMBER OF TIMES USED	NOT AT ALL IMPORTANT		NEUTRAL		VERY IMPORTANT	NOT AT ALL		SOMEWHAT		COMPLETELY	DON'T KNOW
01) Community/recreation centers	(Cscc) 1	1 1	2	3	4	5	1 1	2	3	4	5	0
02) Indoor aquatic centers	2	2 1	2	3	4	5	2 1	2	3	4	5	0
03) Outdoor aquatic centers (incl. splash parks & water features)	3	3 1	2	3	4	5	3 1	2	3	4	5	0
04) Skateboard parks and spots	4	4 1	2	3	4	5	4 1	2	3	4	5	0
05) Baseball fields	5	5 1	2	3	4	5	5 1	2	3	4	5	0
06) Softball fields	6	6 1	2	3	4	5	6 1	2	3	4	5	0
07) Soccer, lacrosse, football fields	7	7 1	2	3	4	5	7 1	2	3	4	5	0
08) Outdoor basketball courts	8	8 1	2	3	4	5	8 1	2	3	4	5	0
09) Indoor tennis	9	9 1	2	3	4	5	9 1	2	3	4	5	0
10) Outdoor tennis	10	10 1	2	3	4	5	10 1	2	3	4	5	0
11) Playgrounds	11	11 1	2	3	4	5	11 1	2	3	4	5	0
12) Picnic shelters	12	12 1	2	3	4	5	12 1	2	3	4	5	0
13) Ice rink	13	13 1	2	3	4	5	13 1	2	3	4	5	0
14) Hard surface trails	14	14 1	2	3	4	5	14 1	2	3	4	5	0
15) Natural surface trails	15	15 1	2	3	4	5	15 1	2	3	4	5	0
16) Nature center	16	16 1	2	3	4	5	16 1	2	3	4	5	0
17) Historic/archeological sites	17	17 1	2	3	4	5	17 1	2	3	4	5	0
18) Dog parks	18	18 1	2	3	4	5	18 1	2	3	4	5	0
19) Natural areas	19	19 1	2	3	4	5	19 1	2	3	4	5	0
20) Equestrian centers	20	20 1	2	3	4	5	20 1	2	3	4	5	0
21) Other:	21	21 1	2	3	4	5	21 1	2	3	4	5	0

1

Montgomery County

Similar to the previous question, please indicate: A) how frequently you or members of your household have used the following programs in the past 12 months, B) how important they are to your household, and C) how well they are meeting your needs.

Programs and Activities	A. FREQUENCY OF USE: NUMBER OF TIMES USED	B. IMPORTANCE TO YOUR HOUSEHOLD (Primp): NOT AT ALL IMPORTANT		NEUTRAL		VERY IMPORTANT	C. MEETING THE NEEDS OF YOUR HOUSEHOLD (Pamet): NOT AT ALL		SOMEWHAT		COMPLETELY	DON'T KNOW
01) Aquatics instruction (non-competitive)	Pause 1	1	2	3	4	5	1	2	3	4	5	0
02) Swim teams	2	2 1	2	3	4	5	2 1	2	3	4	5	0
03) Teen programs	3	3 1	2	3	4	5	3 1	2	3	4	5	0
04) Arts & crafts	4	4 1	2	3	4	5	4 1	2	3	4	5	0
05) Dance	5	5 1	2	3	4	5	5 1	2	3	4	5	0
06) Cooking	6	6 1	2	3	4	5	6 1	2	3	4	5	0
07) Exercise & fitness	7	7 1	2	3	4	5	7 1	2	3	4	5	0
08) Out of school programs (summer and after school)	8	8 1	2	3	4	5	8 1	2	3	4	5	0
09) Health & wellness	9	9 1	2	3	4	5	9 1	2	3	4	5	0
10) Martial arts	10	10 1	2	3	4	5	10 1	2	3	4	5	0
11) Instructional sports	11	11 1	2	3	4	5	11 1	2	3	4	5	0
12) Youth league sports	12	12 1	2	3	4	5	12 1	2	3	4	5	0
13) Adult league sports	13	13 1	2	3	4	5	13 1	2	3	4	5	0
14) Preschool programs (Tiny Tots)	14	14 1	2	3	4	5	14 1	2	3	4	5	0
15) Special interest classes	15	15 1	2	3	4	5	15 1	2	3	4	5	0
16) Senior programs	16	16 1	2	3	4	5	16 1	2	3	4	5	0
17) Community events & festivals	17	17 1	2	3	4	5	17 1	2	3	4	5	0
18) Therapeutic recreation / inclusion services	18	18 1	2	3	4	5	18 1	2	3	4	5	0
19) Volunteerism	19	19 1	2	3	4	5	19 1	2	3	4	5	0
20) Nature programs	20	20 1	2	3	4	5	20 1	2	3	4	5	0
21) Ice skating	21	21 1	2	3	4	5	21 1	2	3	4	5	0
22) Tennis	22	22 1	2	3	4	5	22 1	2	3	4	5	0
23) Living history programs	23	23 1	2	3	4	5	23 1	2	3	4	5	0
24) Community gardens	24	24 1	2	3	4	5	24 1	2	3	4	5	0
25) Other programs: _____	25	25 1	2	3	4	5	25 1	2	3	4	5	0

2. **To what degree do you agree with the following statements about park or recreation facilities in the county?** ***(CIRCLE APPROPRIATE RESPONSE FOR EACH)***

Agree	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	DON'T KNOW
1) Parks meet the needs of my household	1	2	3	4	5	0
2) Natural and cultural resources are adequately protected in parks	1	2	3	4	5	0
3) Park facilities are well maintained	1	2	3	4	5	0
4) Parks are safe to use during operating hours	1	2	3	4	5	0
5) Parks are not overcrowded	1	2	3	4	5	0
6) Recreation facilities meet the needs of my household	1	2	3	4	5	0
7) Recreation facilities are well maintained	1	2	3	4	5	0
8) Recreation facilities are safe to use during operating hours	1	2	3	4	5	0
9) Recreation facilities are not overcrowded	1	2	3	4	5	0

3. **If you or anyone in your household DOES NOT use parks or recreation offerings, why not?** ***(CHECK ALL THAT APPLY)*** Skip

01○ Not aware of programs or facilities offered
02○ Don't have the programs or facilities I want (such as:_____)
03○ No time or other personal reasons
04○ Lack of facilities and amenities
05○ Location of facilities not convenient
06○ Poor condition of outdoor facilities
07○ Poor condition of indoor facilities
08○ Inadequate ADA accessibility
09○ Safety and security
10○ Customer service
11○ Price or user fees
12○ Hours of operation
13○ Need more restrooms
14○ Lack of parking
15○ Lack of public transportation
16○ Other: _____

Nouse 1-10

FUTURE FACILITIES AND PROGRAMS

4. A. Thinking in general about how you and other members of your household spend your leisure time, please indicate if you or any member of your household has a need for any of the following parks and recreation facilities by circling 'Y' for YES or 'N' for NO next to the facility listed.

B. For each facility you have a need for, please indicate the level of importance you feel should be placed on adding, expanding, or improving facilities or amenities in Montgomery County. Use a scale from 1 to 5, where 1 means "Not at all Important" and 5 means "Very Important."

C. Then, to the right, indicate the top three facilities you feel are most in need of addition, expansion, or improvement. Insert a "1" for your highest priority, a "2" for your second highest priority, and a "3" for your third highest priority. Only select 3 items.

T3Fac 1-3

Facilities	A. HAVE NEED FOR THIS FACILITY? YES	NO	B. IMPORTANCE FOR ADDING, EXPANDING, OR IMPROVING (Fimpf) NOT AT ALL IMPORTANT			NEUTRAL		VERY IMPORTANT	C. TOP 3 PRIORITIES RANK THREE 1 TO 3
01)Community/recreation centers 1 (FnS)	Y	N	1	1	2	3	4	5	1
02)Indoor aquatic centers 2	Y	N	2	1	2	3	4	5	2
03)Outdoor aquatic centers (incl. splash parks &water features) 3	Y	N	3	1	2	3	4	5	3
04)Skateboard parks and spots 4	Y	N	4	1	2	3	4	5	4
05)Baseball fields 5	Y	N	5	1	2	3	4	5	5
06)Softball fields 6	Y	N	6	1	2	3	4	5	6
07)Soccer, lacrosse, football fields 7	Y	N	7	1	2	3	4	5	7
08)Outdoor basketball courts 8	Y	N	8	1	2	3	4	5	8
09)Indoor tennis 9	Y	N	9	1	2	3	4	5	9
10)Outdoor tennis 10	Y	N	10	1	2	3	4	5	10
11)Playgrounds 11	Y	N	11	1	2	3	4	5	11
12)Picnic shelters 12	Y	N	12	1	2	3	4	5	12
13)Ice rink 13	Y	N	13	1	2	3	4	5	13
14)Hard surface trails 14	Y	N	14	1	2	3	4	5	14
15)Natural surface trails 15	Y	N	15	1	2	3	4	5	15
16)Nature center 16	Y	N	16	1	2	3	4	5	16
17)Historic & archeological sites 17	Y	N	17	1	2	3	4	5	17
18)Dog parks 18	Y	N	18	1	2	3	4	5	18
19)Natural areas 19	Y	N	19	1	2	3	4	5	19
20)Equestrian centers 20	Y	N	20	1	2	3	4	5	20
21)Performing arts space (theater, dance, music) 21	Y	N	21	1	2	3	4	5	21
22)Multi-purpose gym space 22	Y	N	22	1	2	3	4	5	22
23)Gymnastics facility 23	Y	N	23	1	2	3	4	5	23
24)Weight room and cardio fitness space 24	Y	N	24	1	2	3	4	5	24
25)Climbing wall 25	Y	N	25	1	2	3	4	5	25
26)Indoor athletic fields (soccer, football, track) 26	Y	N	26	1	2	3	4	5	26
27)Computer labs 27	Y	N	27	1	2	3	4	5	27
28)Private rental space (community meeting, reception, party) 28	Y	N	28	1	2	3	4	5	28
29)Outdoor court games (croquet, bocce ball, shuffle board) 29	Y	N	29	1	2	3	4	5	29
30)Community Gardens 30	Y	N	30	1	2	3	4	5	30
31)Other facilities: _____ 31	Y	N	31	1	2	3	4	5	31

Montgomery County

5. **A. Similar to the previous question, please indicate if you or any member of your household has a need for any of the following parks or recreation programs by circling 'Y' for YES or 'N' for NO next to the program listed.**

B. For each program you have a need for, please indicate the level of importance you feel should be placed on adding, expanding, or improving the program in Montgomery County. Use a scale from 1 to 5, where 1 means "Not at all Important" and 5 means "Very Important."

C. Then, to the right, indicate the top three programs you feel are most in need of addition, expansion, or improvement. Insert a "1" for your highest priority, a "2" for your second highest priority, and a "3" for your third highest priority.

Fimpp T3prog 1-3

Programs	Fmp	A. HAVE NEED FOR THIS PROGRAM? YES	NO	B. IMPORTANCE FOR ADDING, EXPANDING, OR IMPROVING (NOT AT ALL IMPORTANT)		NEUTRAL		VERY IMPORTANT	C. TOP 3 PRIORITIES RANK THREE 1 TO 3
01) Aquatics instruction (non-competitive)	1	Y	N	1	1	2	3	4	5	1
02) Swim teams	2	Y	N	2	1	2	3	4	5	2
03) Teen programs	3	Y	N	3	1	2	3	4	5	3
04) Arts & crafts	4	Y	N	4	1	2	3	4	5	4
05) Dance	5	Y	N	5	1	2	3	4	5	5
06) Cooking	6	Y	N	6	1	2	3	4	5	6
07) Exercise & fitness	7	Y	N	7	1	2	3	4	5	7
08) Out of school programs (summer and after school)	8	Y	N	8	1	2	3	4	5	8
09) Health & wellness	9	Y	N	9	1	2	3	4	5	9
10) Martial arts	10	Y	N	10	1	2	3	4	5	10
11) Instructional sports	11	Y	N	11	1	2	3	4	5	11
12) Youth league sports	12	Y	N	12	1	2	3	4	5	12
13) Adult league sports	13	Y	N	13	1	2	3	4	5	13
14) Preschool programs (Tiny Tots)	14	Y	N	14	1	2	3	4	5	14
15) Special interest classes (dog obedience, CPR, adult education, etc.)	15	Y	N	15	1	2	3	4	5	15
16) Senior programs	16	Y	N	16	1	2	3	4	5	16
17) Community events & festivals	17	Y	N	17	1	2	3	4	5	17
18) Therapeutic recreation / inclusion services	18	Y	N	18	1	2	3	4	5	18
19) Volunteerism	19	Y	N	19	1	2	3	4	5	19
20) Indoor nature programs	20	Y	N	20	1	2	3	4	5	20
21) Outdoor nature programs	21	Y	N	21	1	2	3	4	5	21
22) Ice skating	22	Y	N	22	1	2	3	4	5	22
23) Tennis	23	Y	N	23	1	2	3	4	5	23
24) Living history programs	24	Y	N	24	1	2	3	4	5	24
25) Community gardens	25	Y	N	25	1	2	3	4	5	25
26) Children & youth activities (non sport)	26	Y	N	26	1	2	3	4	5	26
27) Cultural/arts programs	27	Y	N	27	1	2	3	4	5	27
28) Environmental education	28	Y	N	28	1	2	3	4	5	28
29) Gymnastics programs	29	Y	N	29	1	2	3	4	5	29
30) Other programs:	30	Y	N	30	1	2	3	4	5	30

6. **When you or members of your household participate in leisure and recreation activities, do you prefer that the facilities are: (*CHECK ONE ONLY*)**

1○ Close to home
2○ Close to work
3○ Close to kids' school
4○ Doesn't matter

Facinear

Montgomery County

7. **For each of the following facilities that could be added, expanded, or improved in Montgomery County, please indicate your preference regarding the following:** ***(CHECK ONE RESPONSE FOR EACH LINE)***

Option

1. 1○ Small local parks with fewer amenities	-OR-	2○ Large regional parks with more amenities
2. 1○ Indoor nature center	-OR-	2○ Outdoor nature education
3. 1○ Build a greater number of smaller community centers with fewer amenities	-OR-	2○ Build fewer, but larger multi-purpose regional recreation centers (incorporating gyms, pools, fitness and other amenities)

COMMUNICATION

8. a) **How do you usually or currently receive information on recreation programs and facilities in Montgomery County?** ***(CHECK ALL THAT APPLY)*** Skip

   b) **How would you prefer to be reached?** ***(CHECK ONE ONLY)***

RinFo_1-6 Bestinfo

	a) Currently Receive Information		b) Would prefer to Receive Information
01)	○	At the recreation facilities/program location	○
02)	○	Newspaper/magazine	○
03)	○	Flyer or brochure	○
04)	○	TV/radio	○
05)	○	Program guides	○
06)	○	Internet/website	○
07)	○	E-mail	○
08)	○	Word of mouth	○
09)	○	Through the schools	○
10)	○	Other: _____	○

   c) **How would you prefer to register for classes and programs?** ***(CHECK ONE ONLY)***

   1○ Internet
   2○ Mail / fax
   3○ In person
   4○ By telephone

Regclass

FINANCIAL CHOICES

M-NCPPC Parks and Montgomery County Recreation fund the development, operations, and maintenance of facilities, services, and programs with user fees and tax dollars.

9. **Where should future funding be spent? Please rank by inserting a "1" for your highest priority, a "2" for your 2nd highest priority, and a "3" for your 3rd highest priority. Please choose only three.**

   1 Add new park facilities
   2 Add new indoor recreation space
   3 Add new trails
   4 Add new classes and programs
   5 Add new natural areas
   6 Add new cultural or historical areas
   7 Make improvements to existing facilities
   8 Maintain facilities at current levels

Spend 1-3

Montgomery County

SUGGESTIONS

10. **Please list any additional facilities, programs, or activities that you would like to see added or expanded in Montgomery County in the future.**

_____

_____

11. **Do you have any additional comments or suggestions that you would like to offer regarding recreation facilities or programs in Montgomery County?**

_____

_____

DEMOGRAPHIC QUESTIONS

Just a few more questions about yourself to assist in classifying your responses . . .

12. **What is your home ZIP code?**
Zip _____

13. **How long have you lived in Montgomery County?** Skip
Yrlive years **OR** [i] Check here if less than a year
Lessyr

14. **Please indicate your sex:** Sex
1○ Male 2○ Female

15. **What is your age?** Age _____

16. **Including yourself, how many persons in your household fall within the following age groups?**
Please place the number of persons beside the appropriate age group.

Number of People?	*AGES:*
Peopl	0 to 17 *(ENTER "0" IF NONE)*
2	18 to 34 *(ENTER "0" IF NONE)*
3	35 to 54 *(ENTER "0" IF NONE)*
4	55 and older *(ENTER "0" IF NONE)*
5	**Total number of people in household** *(INCLUDING YOURSELF)*

17. **Which best describes the type of housing that you live in now?**
1○ Single-family detached house Typhome
2○ Townhouse or duplex
3○ Low-rise apartment or condo building with no elevator
4○ High-rise apartment or condo building with an elevator
5○ Other_____

18. **Do you or any members of your household have a need for ADA-accessible facilities or services?**
1○ Yes AdaSaci
2○ No
3○ Don't know

19. **Which of these categories best describes your household?** Hooseh
1○ Single, no children
2○ Single with children at home
3○ Couple, no children
4○ Couple with children at home
5○ Unrelated individuals

20. **Are you of Hispanic, Latino or Spanish origin?** Hispanic
1○ NO, I am not of Hispanic, Latino, or Spanish origin
2○ YES, I am of Hispanic, Latino, or Spanish origin

21. **What race do you consider yourself to be?** Race
1○ White
2○ Black or African American
3○ Asian, Asian Indian, or Pacific Islander
4○ Native American
5○ Other: _____

22. **Which of these categories best describes the total gross annual income of your household (before taxes)?** Hinc

1○	Under $25,000	5○	$100 – 149,999
2○	$25 – 49,999	6○	$150 – 199,999
3○	$50 – 74,999	7○	$200 – 299,999
4○	$75 – 99,999	8○	$300,000 or more

23. **To help us plan for future dog parks, how many dogs live in your household?**
Dogs _____ *(ENTER "0" IF NONE)*

Montgomery County

Thank you for taking the time to share your opinions.
Your input will be of value in helping us develop our Vision 2030 plan.

THE MARYLAND – NATIONAL CAPITAL PARK AND PLANNING COMMISSION
PRINCE GEORGE'S COUNTY PARKS AND RECREATION NEEDS ASSESSMENT SURVEY 2008

Sort

CURRENT PROGRAMS AND FACILITIES m:\data\mncppc\sys\mncppc.sys

1. **Approximately how many times in the last twelve months have you or members of your household (include all family members and guests) used the following recreation facilities and/or programs managed by M-NCPPC in Prince George's County? *(ENTER NUMBER OR 0 IF NONE)* Then, please rate how important you feel each of these parks and recreation facilities is to the community, using a scale from 1 to 5, where 1 means "Not At All Important" and 5 means "Very Important."**

	#TIMES USED	NOT AT ALL IMPORTANT				VERY IMPORTANT
Athletic fields	Time 1	Impor 1	2	3	4	5
Community centers	2	2 1	2	3	4	5
Neighborhood and community parks	3	3 1	2	3	4	5
Playgrounds	4	4 1	2	3	4	5
Swimming pools	5	5 1	2	3	4	5
Senior centers	6	6 1	2	3	4	5
Arts centers	7	7 1	2	3	4	5
Historic sites and museums	8	8 1	2	3	4	5
Golf courses	9	9 1	2	3	4	5
Gymnastics centers	10	10 1	2	3	4	5
Ice rinks	11	11 1	2	3	4	5
Tennis courts/tennis bubbles	12	12 1	2	3	4	5
Natural area parks (unprogrammed open space)	13	13 1	2	3	4	5
Nature centers	14	14 1	2	3	4	5
Trails	15	15 1	2	3	4	5
Waterfront parks	16	16 1	2	3	4	5
Fairland Regional Park	17	17 1	2	3	4	5
Walker Mill Regional Park	18	18 1	2	3	4	5
Watkins Regional Park	19	19 1	2	3	4	5
Cosca Regional Park	20	20 1	2	3	4	5
Prince George's Sports & Learning Complex	21	21 1	2	3	4	5
Fairland Athletic Complex	22	22 1	2	3	4	5
Prince George's Equestrian Center/Show Place Arena	23	23 1	2	3	4	5
Other:	24	24 1	2	3	4	5

2. **Overall, how well do you think the parks, trails, recreation facilities, and programs provided in Prince George's County are currently meeting the needs of the community? Please provide an answer for each choice whether you use the facility or not. *(CIRCLE APPROPRIATE RESPONSE FOR EACH)***

Satis

	NOT AT ALL	NOT VERY MUCH	SOMEWHAT	MOSTLY	COMPLETELY	DON'T KNOW
1 Athletic fields	1	2	3	4	5	0
2 Community centers	1	2	3	4	5	0
3 Neighborhood and community parks	1	2	3	4	5	0
4 Playgrounds	1	2	3	4	5	0
5 Swimming pools	1	2	3	4	5	0
6 Senior centers	1	2	3	4	5	0
7 Arts centers	1	2	3	4	5	0
8 Historic sites and museums	1	2	3	4	5	0
9 Golf courses	1	2	3	4	5	0
10 Gymnastics centers	1	2	3	4	5	0
11 Ice rinks	1	2	3	4	5	0
12 Tennis courts/tennis bubbles	1	2	3	4	5	0
13 Natural area parks (unprogrammed open space)	1	2	3	4	5	0
14 Nature centers	1	2	3	4	5	0
15 Trails	1	2	3	4	5	0
16 Waterfront parks	1	2	3	4	5	0
17 Fairland Regional Park	1	2	3	4	5	0
18 Walker Mill Regional Park	1	2	3	4	5	0
19 Watkins Regional Park	1	2	3	4	5	0
20 Cosca Regional Park	1	2	3	4	5	0
21 Prince George's Sports & Learning Complex	1	2	3	4	5	0
22 Fairland Athletic Complex	1	2	3	4	5	0
23 Prince George's Equestrian Center/Show Place Arena	1	2	3	4	5	0
24 Other:	1	2	3	4	5	0

Prince George's County

3. **If you indicated 1, 2, or 3 for any of the facilities, services, and programs in Question #2, do you have any comments/suggestions for how these can be improved to better meet the needs of the community?**

_____

4. **If you do not use parks, facilities, services, or programs managed or offered by M-NCPPC in Prince George's County, why not? If you do use the County's parks, facilities, services, and programs, what do you think is most in need of improvement? *(CHECK ALL THAT APPLY)*** Skip

01) [ ] Not aware of programs/facilities offered
02) [ ] Don't have the programs I want (such as:_____)
03) [ ] Lack of transportation
04) [ ] No time / other personal issues
05) [ ] Prefer other recreation providers
06) [ ] Lack of facilities and amenities (such as:_____)
07) [ ] ADA accessibility (explain:_____)
08) [ ] Condition of parks or facilities
09) [ ] Safety and security Needi_1 - 10
10) [ ] Location of facilities not convenient
11) [ ] Customer service / staff knowledge
12) [ ] Price / user fees
13) [ ] Hours of operation
14) [ ] Need more restrooms
15) [ ] Other:_____

5. **What other recreation programs or facilities, if any, do you use? *(CHECK ALL THAT APPLY)*** Skip

01) [ ] Private or public schools
02) [ ] Churches/houses of worship
03) [ ] YMCA/YWCA
04) [ ] Homeowners Associations facilities
05) [ ] Private health and fitness clubs
06) [ ] Private instruction (dance, martial arts, etc.)
07) [ ] Private golf courses
08) [ ] Trails outside of the County
09) [ ] Parks outside of the County OrecF_1 - 10
10) [ ] Private sports leagues
11) [ ] Prince George's County Boys & Girls Club
12) [ ] Municipal, State, and National Parks in the County
13) [ ] Civic associations
14) [ ] Others_____
15) [ ] None of the above

6. **Please rate the following aspects of Prince George's County Parks and Recreation Department (M-NCPPC). Use a scale from 1 to 5, where 1 means "Poor" and 5 means "Excellent."**

PKrec

	POOR				EXCELLENT	DON'T KNOW
1 Customer service of M-NCPPC staff	1	2	3	4	5	0
2 Number of Community Centers	1	2	3	4	5	0
3 Quality of Community Centers	1	2	3	4	5	0
4 Maintenance of Community Centers	1	2	3	4	5	0
5 Variety of recreation programs offered (e.g., classes, festivals, etc.)	1	2	3	4	5	0
6 Quality of recreation programs offered	1	2	3	4	5	0
7 Number of parks	1	2	3	4	5	0
8 Quality of parks	1	2	3	4	5	0
9 Overall maintenance of parks M-NCPPC maintains	1	2	3	4	5	0
10 Number or amount of natural areas available	1	2	3	4	5	0
11 Number of trails available	1	2	3	4	5	0
12 Connectivity of trails	1	2	3	4	5	0
13 Trail maintenance (e.g., surface repair, weeds, etc.)	1	2	3	4	5	0
14 Restroom availability and maintenance	1	2	3	4	5	0
15 Quality of signage	1	2	3	4	5	0

7. **Thinking in general about how you and other members of your immediate family spend your leisure time, how would you rate your or their interest in each of the following activites? For each activity, please indicate whether it is something you or members of your family 1 "Avoid," 2 "Could take or leave," 3 "Really enjoy but don't do as much as you would like," or 4 "Do on a regular basis."**

PKrec

	AVOID	TAKE OR LEAVE	REALLY ENJOY	DO ON REGULAR BASIS	DON'T KNOW
16 Going to museums	1	2	3	4	0
17 Attending the symphony	1	2	3	4	0
18 Attending the opera	1	2	3	4	0
19 Attending live theater productions (plays, musicals, dance performances)	1	2	3	4	0
20 Attending music concerts, other than the symphony	1	2	3	4	0
21 Attending live professional or semi-professional sporting events	1	2	3	4	0
22 Participating in indoor sports or exercise activities	1	2	3	4	0
23 Participating in outdoor sports or exercise activities	1	2	3	4	0
24 Participating in artistic or creative activities	1	2	3	4	0
25 Visiting historical sites	1	2	3	4	0
26 Attending community festivals	1	2	3	4	0
27 Traveling	1	2	3	4	0

FUTURE FACILITIES, AMENITIES, AND SERVICES TO INCLUDE

8. **Following is a list of INDOOR recreation facilities that could be added, expanded, or improved in Prince George's County. Please tell us how important each one is to you.** ***(CIRCLE APPROPRIATE RESPONSE FOR EACH)***

Idoor

	NOT AT ALL IMPORTANT				VERY IMPORTANT	DON'T KNOW
01) Community meeting rooms	1	2	3	4	5	0
02) Arts and craft space	1	2	3	4	5	0
03) Designated space for youth and teen activities	1	2	3	4	5	0
04) Designated space for seniors / older adults	1	2	3	4	5	0
05) Performing arts space	1	2	3	4	5	0
06) Multi-purpose gymnasium space	1	2	3	4	5	0
07) Indoor swimming pool with lap lanes for fitness swimming / competition	1	2	3	4	5	0
08) Indoor leisure pool	1	2	3	4	5	0
09) Gymnastics facility	1	2	3	4	5	0
10) Fitness class space	1	2	3	4	5	0
11) Weight room and cardio fitness space	1	2	3	4	5	0
12) Climbing wall	1	2	3	4	5	0
13) Indoor athletic fields (e.g., soccer, football, etc.)	1	2	3	4	5	0
14) Indoor tennis	1	2	3	4	5	0
15) Indoor racquetball	1	2	3	4	5	0
16) Indoor walking/running track	1	2	3	4	5	0
17) Ice rink	1	2	3	4	5	0
18) Other: _____	1	2	3	4	5	0

9. **Please rank the three most important INDOOR facilities above. Insert one number (1-18) from the list in Question #8 above for highest priority, second most important, and third most important priority.**

Midoor1 Most important Midoor2 Second most important Midoor3 Third most important

10. **Following is a list of OUTDOOR facilities that could be added, expanded or improved in Prince George's County. Please tell us how important each one is to you.** ***(CIRCLE APPROPRIATE RESPONSE FOR EACH)***

Odoor

	NOT AT ALL IMPORTANT				VERY IMPORTANT	DON'T KNOW
01) Baseball fields	1	2	3	4	5	0
02) Softball fields	1	2	3	4	5	0
03) Multi-purpose athletic fields for soccer, football, etc.	1	2	3	4	5	0
04) Picnic shelters	1	2	3	4	5	0
05) Skate park	1	2	3	4	5	0
06) Trails	1	2	3	4	5	0
07) Natural areas	1	2	3	4	5	0
08) Outdoor tennis courts	1	2	3	4	5	0
09) Basketball courts	1	2	3	4	5	0
10) Outdoor swimming pool	1	2	3	4	5	0
11) Outdoor water features / spraygrounds	1	2	3	4	5	0
12) Amphitheatre	1	2	3	4	5	0
13) Dog park	1	2	3	4	5	0
14) Playgrounds	1	2	3	4	5	0
15) Historic sites	1	2	3	4	5	0
16) Public gardens	1	2	3	4	5	0
17) Public art	1	2	3	4	5	0
18) Boating/fishing access	1	2	3	4	5	0
19) Other: _____	1	2	3	4	5	0

11. **Please rank the three most important OUTDOOR facilities above. Insert one number (1-19) from the list in Question #10 above for highest priority, second most important, and third most important priority.**

Modoor1 Most important Modoor2 Second most important Modoor3 Third most important

Any other indoor or outdoor facilities or amentities not on the lists that would be important to you and your family?

TRAILS AND NATURAL AREAS

12. **With respect to TRAILS and NATURAL AREAS, how important are the following to you and members of your household? Use a scale from 1 to 5, where 1 means "Not At All Important" and 5 means "Very Important."**

Trail

TRAILS	NOT AT ALL IMPORTANT				VERY IMPORTANT	DON'T KNOW
1 Improve trail connections	1	2	3	4	5	0
2 Improve trail maintenance	1	2	3	4	5	0
3 Build more trails	1	2	3	4	5	0
4 Provide parking areas at trailheads	1	2	3	4	5	0
5 Provide other trail amenities (such as benches, trash containers, drinking fountains, dog pick-up bag dispensers, signage, etc.)	1	2	3	4	5	0
6 Other: _____	1	2	3	4	5	0

Area

UNDEVELOPED OPEN SPACE/NATURAL AREAS						
1 Preserve wildlife habitat	1	2	3	4	5	0
2 Create wildlife viewing opportunities	1	2	3	4	5	0
3 Minimize the impact of housing density and traffic	1	2	3	4	5	0
4 Preserve cultural and historic land uses (e.g., farming)	1	2	3	4	5	0
5 Provide access for people to natural areas	1	2	3	4	5	0
6 Protect rivers, creeks, and wetlands (e.g., reduce flood potential)	1	2	3	4	5	0
7 Create buffers between adjacent communities	1	2	3	4	5	0
8 Other: _____	1	2	3	4	5	0

PROGRAMS, ACTIVITIES, AND SPECIAL EVENTS

13. **Please indicate if YOU or any member of your HOUSEHOLD has a need for any of the following recreation programs by circling 'Y' for YES or 'N' for NO next to the program listed. If YES, please rate the programs currently available in Prince George's County on a 1-to-5 scale, where 1 means "NONE OF YOUR NEEDS ARE BEING MET" and 5 means "100% OF YOUR NEEDS ARE BEING MET."** Skip

	HAVE NEED FOR THIS PROGRAM?		IF YES, YOU HAVE A NEED, HOW WELL ARE YOUR NEEDS BEING MET?				
	YES	NO	0% MET	25% MET	50% MET	75% MET	100% MET
01) Sports Leagues - Youth	1 Y	N	1	2	3	4	5
02) Sports Leagues - Adult	2 Y	N	2	2	3	4	5
03) Children / Youth activities	3 Y	N	3	2	3	4	5
04) Cultural / arts programs	4 Y	N	4	2	3	4	5
05) History programs	5 Y	N	5	2	3	4	5
06) Day camp / playground programs	6 Y	N	6	2	3	4	5
07) After school programs	7 Y	N	7	2	3	4	5
08) Nature and environmental programs	8 Y	N	8	2	3	4	5
09) Fitness and wellness programs	9 Y	N	9	2	3	4	5
10) Fishing programs	10 Y	N	10	2	3	4	5
11) Hunting programs	11 Y	N	11	2	3	4	5
12) General education, skills education (computer classes, cooking, babysitting, etc.)	12 Y	N	12	2	3	4	5
13) Golf programs	13 Y	N	13	2	3	4	5
14) Gymnastics programs	14 Y	N	14	2	3	4	5
15) Walking, biking and hiking	15 Y	N	15	2	3	4	5
16) Programs for seniors /older adults	16 Y	N	16	2	3	4	5
17) Community events and festivals (specify: _____)	17 Y	N	17	2	3	4	5
18) Therapeutic recreation/inclusion services	Y 18	N	18	2	3	4	5
19) Swimming programs / lessons	19 Y	N	19	2	3	4	5
20) Pre-teen / teen activities	20 Y	N	20	2	3	4	5
21) Tennis programs	21 Y	N	21	2	3	4	5
22) Volunteer programs	22 Y	N	22	2	3	4	5

Need Need

Prince George's County

14. **Do you have any additional comments or suggestions that you would like to offer regarding the above programs provided in Prince George's County?**

_____

15. **In general, who in your household participates in recreation programs and/or utilizes parks and recreation facilities?** ***(CHECK ALL THAT APPLY)*** Skip

1) [ ] Children
2) [ ] Pre-teens (10-12 years)
3) [ ] Teens
4) [ ] Young adults
5) [ ] Adults
6) [ ] Seniors (60+)
7) [ ] None of the above

Who_1 - 5

COMMUNICATION

16. a) **How do you usually or currently receive information on parks, recreation facilities, services, and programs (whether run by Prince George's County Parks and Rec Dept. or not)?** Skip

b) **Recognizing there is a cost to communicating with you, how can we best reach you?** ***(CHECK ONE ONLY)***

Rinfo_1 ⋮ Rinfo_7

	16a.	16b.	
			Bestinfo
01)	[ ]	[ ]	At the recreation facilities/program location
02)	[ ]	[ ]	Program guides
03)	[ ]	[ ]	Internet/website
04)	[ ]	[ ]	E-mail
05)	[ ]	[ ]	Word of mouth
06)	[ ]	[ ]	Local newspapers
07)	[ ]	[ ]	Flyer or brochure
08)	[ ]	[ ]	TV
09)	[ ]	[ ]	Radio
10)	[ ]	[ ]	Through the schools
11)	[ ]	[ ]	Other: _____

17. **Overall, how good a job is M-NCPPC doing in communicating with you about recreation facilities, parks, open space, trails, and programs?** Oinfo

POOR				EXCELLENT
1	2	3	4	5

TRANSPORTATION

18. a) **How do you currently get to parks and recreation facilities and programs in Prince George's County?** ***(CHECK ALL THAT APPLY)*** Skip Curt_1 - 4

b) **How would you like to get to parks and recreation facilities in Prince George's County?** Liket_1-4

	18a.	18b.	
1)	[ ]	[ ]	Walking
2)	[ ]	[ ]	Riding your bike
3)	[ ]	[ ]	Using public transportation
4)	[ ]	[ ]	Driving your car

FINANCIAL CHOICES

19. **M-NCPPC recreation programs are financially supported by taxes and user fees. What is your opinion concerning the current user fees charged by M-NCPPC for Prince George's County recreation programs and services? Would you say the fees are:** Taxes

1) [ ] Too little
2) [ ] About right
3) [ ] Too much
4) [ ] Don't know/uncertain

20. **The M-NCPPC is responsible for developing and managing a variety of park and recreation services and facilities. If you were responsible for budgeting $100 of the County's funds for new parks and recreation development or improvement projects, how would you spend it? You may allocate the entire amount to a single item or distribute it, based on your personal priorities, to two or more items (in minimum $5 increments).**

Community centers	$Budget
Cultural arts	$ 2
Sports facilities	$ 3
Additional trails and trail connections	$ 4
New parks	$ 5
Improvements to existing parks, trails, and open space	$ 6
Additional programs	$ 7
Other (please describe): _____	$ 8
TOTAL SHOULD EQUAL	**$100.00**

Prince George's County

SUGGESTIONS

21. **Do you have any additional comments or suggestions that you would like to offer regarding facilities, services, and programs provided in Prince George's County?**

_____

_____

_____

DEMOGRAPHIC QUESTIONS

Just a few more questions about yourself to assist in classifying your responses . . .

22. **Please indicate your gender:** Sex
    1) [ ] Male 2) [ ] Female

23. **What is your age?** _____

24. Tothh **Including yourself, how many people live in your household?**
    Und18 **How many members of your household are under age 18?**
    Over55 **How many members of your household are over age 55?**

25. **Which of these categories best applies to your household?** Househ
    1) [ ] Single, no children
    2) [ ] Single with children at home
    3) [ ] Single, children no longer at home (empty nester)
    4) [ ] Couple, no children
    5) [ ] Couple with children at home
    6) [ ] Couple, children no longer at home (empty nester)
    7) [ ] Multi-family household

26. **What is your home ZIP code?** Zip _____

27. **How long have you lived in the area?**
    Yrlive years **OR** [ ] Check here if less than a year
    0=

28. **Where is your home/property located (refer to map on back of cover letter for sub-area locations):** Locat
    1) [ ] Northeast sub area 4) [ ] Central East
    2) [ ] Northwest 5) [ ] Southwest
    3) [ ] Central West 6) [ ] Southern

29. **Most people think of themselves as belonging to a particular ethnic or racial group. Do you consider yourself to be:** Ethnic
    1) [ ] Caucasian/white (not Hispanic)
    2) [ ] African American/black
    3) [ ] Hispanic/Latino
    4) [ ] Asian or Asian American
    5) [ ] Native American
    6) [ ] Some other ethnic group: _____

30. **Which of these categories best describes the total gross annual income of your household (before taxes)?** Hinc
    1) [ ] Less than $25,000
    2) [ ] $25,000 but less than $35,000
    3) [ ] $35,000 but less than $50,000
    4) [ ] $50,000 but less than $75,000
    5) [ ] $75,000 but less than $100,000
    6) [ ] $100,000 but less than $250,000
    7) [ ] $250,000 but less than $500,000
    8) [ ] $500,000 or more

Thank you for taking the time to share your opinions.
Your input will be of value in helping us develop our parks and recreation plan.
If you have questions, please call 303-864-6957 or email 2010andbeyond@pgparks.com.

Prince George's County

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Surv

TULSA PARKS AND RECREATION MASTER PLAN SURVEY 2009

1. **Is your home/property located within the city limits of Tulsa?** Citylim
   1) [ ] City limits
   2) [ ] Unincorporated County
   3) [ ] Other: _____

2. **How long have you lived in the Tulsa area?**
   Yrlive years **OR** [ ] Check here if less than a year
   0=

3. **What is your home ZIP Code?**
   Zip_____

4. **Where is your home/property located (refer to map on backside of cover letter):** Ploc
   1) [ ] North Tulsa
   2) [ ] Midtown
   3) [ ] East Tulsa
   4) [ ] South Tulsa
   5) [ ] Other: _____

CURRENT PROGRAMS AND FACILITIES

5. **Approximately how many times in the last twelve months have you or members of your household (include all family members and guests) used the following recreation facilities and/or programs, supported and managed by the City of Tulsa?** ***(ENTER NUMBER OF TIMES OR "0" IF NONE)*** **Then, please rate how <u>important</u> you feel each of these parks and recreation facilities is to the community, using a scale from 1 to 5, where 1 means "Not At All Important" and 5 means "Very Important."**

Urate	#TIMES USED	NOT AT ALL IMPORTANT		NEUTRAL		VERY IMPORTANT
1 Community Centers (overall facilities and services)	Use1	1	2	3	4	5
2 Recreation programs	2	1	2	3	4	5
3 City athletic/sports fields	3	1	2	3	4	5
4 City trails	4	1	2	3	4	5
5 Nature centers / open space areas	5	1	2	3	4	5
6 Parks	6	1	2	3	4	5
7 Outdoor swimming pools	7	1	2	3	4	5
8 Other: _____	8	1	2	3	4	5

6. **Overall, how satisfied are you that the parks, recreation facilities, and programs provided in Tulsa are currently meeting the needs of the community?** ***(CIRCLE APPROPRIATE RESPONSE FOR EACH WHETHER YOU USE THE FACILITY/PROGRAM OR NOT)***

Need	NOT AT ALL	NOT VERY MUCH	SOMEWHAT	MOSTLY	COMPLETELY	DON'T KNOW
1 Community Centers (overall facilities and services)	1	2	3	4	5	0
2 Recreation programs	1	2	3	4	5	0
3 City athletic/sports fields	1	2	3	4	5	0
4 City trails	1	2	3	4	5	0
5 Nature centers / open space areas	1	2	3	4	5	0
6 Parks	1	2	3	4	5	0
7 Outdoor swimming pools	1	2	3	4	5	0
8 Other: _____	1	2	3	4	5	0

7. **If indicated 1, 2, or 3 for any of the above facilities, services, and programs, do you have any comments/suggestions of how these can be improved to better meet the needs of the community?**

_____

8. **If you do not use Tulsa parks and recreation facilities, why not? If you do use Tulsa parks and recreation facilities, what do you think is most in need of improvement?** ***(CHECK ALL THAT APPLY)*** Skip

   Needi_1 - 12

   01) [ ] Not aware of programs/facilities offered
   02) [ ] Don't have the programs I want such as:_____)
   03) [ ] Condition of community centers
   04) [ ] Quality of equipment
   05) [ ] Lack of facilities and amenities (such as:_____)
   06) [ ] Overall maintenance
   07) [ ] Accessibility (explain:_____)
   08) [ ] Lack of transportation
   09) [ ] Condition of parks
   10) [ ] Safety and security
   11) [ ] Lack of parking
   12) [ ] Customer service / staff knowledge
   13) [ ] Price / user fees
   14) [ ] Hours of operation
   15) [ ] Need more restrooms
   16) [ ] No time / other personal issues
   17) [ ] Prefer other recreation providers
   18) [ ] Other:_____

9. **What other recreation facilities and programs, if any, do you use?** ***(CHECK ALL THAT APPLY)*** OFac_1 - 8

   01) [ ] Private or public schools
   02) [ ] Churches
   03) [ ] YMCA/YWCA
   04) [ ] Homeowners Associations facilities
   05) [ ] Private health and fitness clubs
   06) [ ] Private instruction (dance, martial arts, etc.)
   07) [ ] Recreation facilities and centers in neighboring cities
   08) [ ] County Parks
   09) [ ] RiverParks
   10) [ ] Youth Sports Associations (not Tulsa Parks & Rec)
   11) [ ] Others_____
   12) [ ] None of the above Skip

Tulsa

COMMUNITY CENTERS

10. Listed below are the eleven community centers owned and operated by the City of Tulsa. First, please check which ones, if any, you have visited in the last twelve months. Second, please check which single community center, if any, you visit most frequently. Finally, please rate the overall quality of services and facilities provided by each of the facilities you have visited. Skip

	Visl2_1-8 VISITED IN LAST 12 MONTHS (CHECK ALL THAT APPLY)	Vismost VISITED MOST FREQUENTLY (CHECK ONLY ONE)	Comm RATE OVERALL QUALITY POOR				EXCELLENT
01) Chamberlain	1[ ]	1[ ]	1 1	2	3	4	5
02) Lacy	2[ ]	2[ ]	2 1	2	3	4	5
03) Owen	3[ ]	3[ ]	3 1	2	3	4	5
04) Centennial	4[ ]	4[ ]	4 1	2	3	4	5
05) McClure	5[ ]	5[ ]	5 1	2	3	4	5
06) Clark	6[ ]	6[ ]	6 1	2	3	4	5
07) Hicks	7[ ]	7[ ]	7 1	2	3	4	5
08) Whiteside	8[ ]	8[ ]	8 1	2	3	4	5
09) Heller	9[ ]	9[ ]	9 1	2	3	4	5
10) Reed	10[ ]	10[ ]	10 1	2	3	4	5
11) Waterworks	11[ ]	11[ ]	11 1	2	3	4	5
12) None of the above	12[ ]	12[ ]					

11. Parks and recreation facilities in the City of Tulsa are built, operated, and maintained with money from the City general fund (primarily from sales taxes). As you may be aware, many of the City's community centers are in need of repairs, renovation, and additional upkeep and maintenance, but limitations on the availability of the City's general fund and lack of dedicated funding to allocate to parks and recreation makes it difficult for major improvements to be made.

One alternative is for the City to contract with community partners to provide some level of services to adjacent communities.

Another alternative is to close, demolish, and replace some community centers with other park type amenities desired by the communities in which they are located.

A third alternative is to identify a dedicated source of revenue for parks and recreation facilities and services that allow for future improvements to be made, but that would require a vote of the people in a future ballot issue.

Using a 1 to 5 scale where 1 is "strongly opposed" and 5 is "strongly in favor," how would you rate each of these options?

Alt	STRONGLY OPPOSED		NEUTRAL		STONGLY IN FAVOR	DON'T KNOW
01) Contract out operations and maintenance of the centers to third party community partners	1	2	3	4	5	0
02) Close, demolish, and replace certain centers with other updated park type amenities	1	2	3	4	5	0
03) Fund improvements through the creation of a new dedicated funding source through vote of the people	1	2	3	4	5	0

And as a general direction for the City for the future, which would be your single overall preference: (Choose one only)

01) [ ] Contract out operations and maintenance of the centers to third party community partners
02) [ ] Close, demolish, and replace certain centers with other updated park type amenities
03) [ ] Fund improvements through the creation of a new dedicated funding source through vote of the people

Futdir

Tulsa

FUTURE FACILITIES, AMENITIES, AND SERVICES TO INCLUDE

12. In the next 5 to 10 years, what do you think will be the greatest needs for INDOOR facilities in Tulsa? Use a scale from 1 to 5, where 1 means "Not At All Important" and 5 means "Very Important."

Indoor

	NOT AT ALL IMPORTANT		NEUTRAL		VERY IMPORTANT	DON'T KNOW
01) Additional youth activity areas	1	2	3	4	5	0
02) Additional teen activity areas	1	2	3	4	5	0
03) Additional designated areas for seniors / Active Adults 60+	1	2	3	4	5	0
04) Additional multi-purpose gymnasium space	1	2	3	4	5	0
05) Additional indoor swimming pools with lap lanes for fitness swimming / competition	1	2	3	4	5	0
06) Additional indoor leisure pools with aquatic play features (lazy river / water slide / children's splash area)	1	2	3	4	5	0
07) Gymnastics facilities and instruction	1	2	3	4	5	0
08) Additional fitness class space	1	2	3	4	5	0
09) Additional weight room and cardio fitness space	1	2	3	4	5	0
10) Dedicated performing arts space	1	2	3	4	5	0
11) Dedicated visual arts space	1	2	3	4	5	0
12) Other: _____	1	2	3	4	5	0

13. Using the numbers 1 through 12 for the items listed above, what do you think will be the greatest need for INDOOR facilities in Tulsa? And second most important? And third most important? Insert one number (1-12) from the list in Question #12 above for highest priority, second most important, and third most important priority.

Indo1 Most important Indo2 Second most important Indo3 Third most important

14. Following is a list of OUTDOOR facilities that could be improved or added in the Tulsa area. Please tell us how important each one is to you. *(CIRCLE APPROPRIATE RESPONSE FOR EACH)*

Outdo

	NOT AT ALL IMPORTANT		NEUTRAL		VERY IMPORTANT	DON'T KNOW
01) Playgrounds	1	2	3	4	5	0
02) Athletic / sports fields	1	2	3	4	5	0
03) Trails and trail connections	1	2	3	4	5	0
04) Nature centers / open space areas	1	2	3	4	5	0
05) Outdoor swimming pools	1	2	3	4	5	0
06) Additional parks	1	2	3	4	5	0
07) Community gathering spaces / outdoor event facility / amphitheater	1	2	3	4	5	0
08) Restrooms	1	2	3	4	5	0
09) Tennis courts	1	2	3	4	5	0
10) Dog parks	1	2	3	4	5	0
11) Skate parks	1	2	3	4	5	0
12) Disc golf course	1	2	3	4	5	0
13) Other: _____	1	2	3	4	5	0

15. Using the numbers 1 through 13 for the items listed above, which facility do you consider to be the most important to you? And second most important? And third most important? Insert one number (1-13) from the list in Question #14 above for highest priority, second most important, and third most important priority.

Outdoor1 Most important Outdoor2 Second most important Outdoor3 Third most important

Tulsa

PROGRAMS, ACTIVITIES, AND SPECIAL EVENTS

16. Please indicate if YOU or any member of your HOUSEHOLD has a need for any of the following recreation programs by circling 'Y' for YES or 'N' for NO next to the program listed. If YES, please rate the programs currently available from the City on a 1-to-5 scale, where 1 means "NONE OF YOUR NEEDS ARE BEING MET" and 5 means "100% OF YOUR NEEDS ARE BEING MET."

Progm	Needp	HAVE NEED FOR THIS PROGRAM? YES	NO	IF YES, YOU HAVE A NEED, HOW WELL ARE YOUR NEEDS BEING MET BY PROGRAMS PROVIDED BY THE CITY? 0% MET	25% MET	50% MET	75% MET	100% MET
01) Athletic Leagues - Youth	1	1Y	2N	1	2	3	4	5
02) Athletic Leagues - Adult	2	Y	N	1	2	3	4	5
03) Children / Youth activities (non-sport)	3	Y	N	1	2	3	4	5
04) Day camp /after school programs	4	Y	N	1	2	3	4	5
05) Teen activities	5	Y	N	1	2	3	4	5
06) Programs for active adults age 60+	6	Y	N	1	2	3	4	5
07) Cultural / arts programs	7	Y	N	1	2	3	4	5
08) Environmental education	8	Y	N	1	2	3	4	5
09) Fitness and wellness programs	9	Y	N	1	2	3	4	5
10) General education, skills education (computers, cooking, babysitting, etc.)	10	Y	N	1	2	3	4	5
11) Gymnastics programs	11	Y	N	1	2	3	4	5
12) Swimming programs / swim team	12	Y	N	1	2	3	4	5
13) Special events (i.e. Concerts in the parks)	Y 13		N	1	2	3	4	5
14) Family programs	14	Y	N	1	2	3	4	5
15) Other:	15	Y	N	1	2	3	4	5

17. Using the numbers 1 through 15 for the items listed above, which program do you consider to be the most important to you? And second most important? And third most important? Insert one number (1-15) from the list in Question #16 above for highest priority, second most important, and third most important priority.

Progmo1 Most important Progmo2 Second most important Progmo3 Third most important

COMMUNICATION

18. a) How do you usually or currently receive information on parks, recreation facilities, services, and programs (whether City of Tulsa-owned or not)? Getinf_1-6 Skip

b) Recognizing there is a cost to communicating with you, how can we best reach you? *(CHECK ONE ONLY)*

	18a.	18b.	Bestreac
01)	[ ]	[ ]	Tulsa World
02)	[ ]	[ ]	Tulsa cable TV channel __
03)	[ ]	[ ]	Tulsa Parks and Rec program guide
04)	[ ]	[ ]	Flyer in water bill
05)	[ ]	[ ]	At the recreation facilities/program location
06)	[ ]	[ ]	Internet/website
07)	[ ]	[ ]	City E-mail (Listserve)
08)	[ ]	[ ]	Posters
09)	[ ]	[ ]	Other: _____

19. Overall, how good a job does the City of Tulsa do in providing you with information about recreation facilities, parks, trails, and programs?

POOR				EXCELLENT
1	2	3	4	5

Pinfo

SUGGESTIONS

20. Do you have any additional comments or suggestions that you would like to offer regarding parks, recreation facilities, services, and programs in Tulsa?

_____

_____

_____

_____

Tulsa

FINANCIAL CHOICES

The City of Tulsa funds parks and recreation operations and maintenance with user fees and tax dollars. Additional funds are required for the building, operations, and maintenance of new facilities. User fees, grants, and donations offset some costs.

21. What is your opinion concerning the amount of dollars currently being spent by the City of Tulsa for each of the following?

Cspen

Tulsa is spending:	TOO LITTLE	ABOUT RIGHT	TOO MUCH	DON'T KNOW
1 Providing current recreation programs	[1]	[2]	[3]	[4]
2 Maintaining existing parks and recreation facilities	[ ]	[ ]	[ ]	[ ]
3 Improvements to existing parks and recreation facilities	[ ]	[ ]	[ ]	[ ]
4 Building new parks and recreation facilities	[ ]	[ ]	[ ]	[ ]

22. To what extent, if any, would you be willing to support the following funding mechanisms to pay for operations and maintenance costs of new parks and recreation facilities, trails, and programs in Tulsa in the future?

Fundm

	DEFINITELY NOT SUPPORT	PROBABLY NOT SUPPORT	NEUTRAL	PROBABLY SUPPORT	DEFINITELY SUPPORT	DON'T KNOW/ UNCERTAIN
1 Reallocation from general sales tax funds	1	2	3	4	5	0
2 Reallocation from general property tax funds (mill levies)	1	2	3	4	5	0
3 New dedicated parks and recreation sales tax	1	2	3	4	5	0
4 New dedicated parks and recreation property tax	1	2	3	4	5	0
5 Increase user fees	1	2	3	4	5	0
6 Storm water fees	1	2	3	4	5	0
7 Additional trash pickup fee (i.e. $2/month dedicated to Parks and Recreation)	1	2	3	4	5	0
8 Fees from unobtrusive oil drilling in large tracts of undovolopod park land	1	2	3	4	5	0
9 Entertainment tax	1	2	3	4	5	0

DEMOGRAPHIC QUESTIONS

Just a few more questions about yourself to assist in classifying your responses . . .

23. Please indicate your gender: Sex

1) [ ] Male 2) [ ] Female

24. What is your age? Ageopen

25. Tothive **Including yourself, how many people in total live in your household?**

Tot018 **How many are under age 18?**

Tot055 **How many are over age 55?**

26. Which of these categories best applies to your household? Hoosch

1) [ ] Single, no children
2) [ ] Single with children at home
3) [ ] Single, children no longer at home (empty nester)
4) [ ] Couple, no children
5) [ ] Couple with children at home
6) [ ] Couple, children no longer at home (empty nester)

27. Most people think of themselves as belonging to a particular ethnic or racial group. Do you consider yourself to be: Ethnic

1) [ ] Caucasian/Anglo (not Hispanic)
2) [ ] African American
3) [ ] Hispanic/Latin
4) [ ] Asian
5) [ ] Native American
6) [ ] Other: _____

28. Which of these categories best describes the total gross annual income of your household (before taxes)? Hinc

1)	[ ]	Under $25,000	5)	[ ]	$100 – 149,999
2)	[ ]	$ 25 – 49,999	6)	[ ]	$150 – 199,999
3)	[ ]	$ 50 – 74,999	7)	[ ]	$200 – 249,999
4)	[ ]	$ 75 – 99,999	8)	[ ]	$250,000 or more

Thank you for your time and valuable input!

Tulsa

Appendix D - GRASP® Overview

This appendix includes descriptive and explanatory materials used at the time when the greenspace inventories in the four study areas were conducted. I followed these procedures, as did my staff, the agency representative, and the agency's staff in conducting the GRASP®-IT audits and producing the GRASP® metrics referred to in this study.

GRASP® Scoring Methodology and Process

INVENTORY DATA COLLECTION PROCESS

A detailed inventory of all parks and recreational facilities was conducted. The inventory located and catalogued all of the components and evaluated each one as to how well it was serving its intended function within the system. This information was used to analyze the *Levels of Service* provided by the system.

The inventory was completed in a series of steps. The planning team first prepared a preliminary list of existing components using aerial photography and the city's Geographic Information System (GIS). Components identified in the aerial photo were given GIS points and names according to the GRASP® list of standard components.

Next, field visits were conducted by the consulting team and by city staff to confirm the preliminary data and collect additional information. Additionally indoor facilities were scored and for the purposes of this study, each space is considered a component and is scored based on its intended function.

During the field visits and evaluations, missing components were added to the data set, and each component was evaluated as to how well it met expectations for its intended function. During the site visits the following information was collected:

- Component type
- Component location
- Evaluation of component condition
- Evaluation of comfort and convenience features
- Evaluation of park design and ambience
- Site photos
- General comments

After the inventory was completed, it was given to the City for final review and approval.

Component Scoring
The approved inventory is the basis for the creation of values used in the GRASP® analysis. Each component received a functional score that is related to the quality, condition, and ability of the space to meet operational and programming needs.
The range of scores for each component is as follows:

- **Below Expectations (BE) –** The component does not meet the expectations of its intended primary function. Factors leading to this may include size, age, accessibility, or others. Each such component was given a score of **1** in the inventory.
- **Meeting Expectations (ME) –** The component meets expectations for its intended function. Such components were given scores of **2.**
- **Exceeding Expectations (EE) –** The component exceeds expectations, due to size, configuration, or unique qualities. Such components were given scores of **3.**
- If the feature exists but is not useable because it is unsafe, obsolete, or dysfunctional, it may be listed in the feature description, and assigned a **score of zero (0).**

If a feature is used for multiple functions, such as a softball field that is also used for T-Ball or youth soccer games, it is scored only once under the description that best fits the use that for which the feature is designed.

The GRASP® analysis recognizes that value results from a combination of attributes. These include capacity or quantity, but can also include quality and accessibility. Quality itself is a combination of things, but essentially is based on the suitability of something for its intended purpose. For example, consider the value of an older-model luxury car to a brand-new economy model. Both cars may be suitable for the intended purpose of getting passengers to a destination, and they may have equal value, but the value is derived from different combinations of condition and features. The service value of components in the parks and recreation system works on similar principles.

An older model playground with lots of features, but in less-than-perfect condition may be equal in the value of service it provides to a new playground with fewer features that are in perfect condition and are ones that are currently most desired by the public. The metric in determining value is whether or not something meets expectations for its intended use. In the case of the cars, both cars meet the expectation to carry passengers safely, comfortably, and reliably to their destination, but each one does so with a different combination of attributes. A brand-new luxury car with lots of features, on the other hand, may clearly exceed this basic expectation.

Neighborhood and Community Scoring

Components were evaluated from two perspectives: first, the value of the component in serving the immediate neighborhood, and second, its value to the entire community.

Neighborhood Score

Each component was evaluated from the perspective of a resident that lives nearby. High scoring components are easily accessible to pedestrians in the neighborhood, are attractive for short and frequent visits, and are unobtrusive to the surrounding neighborhood. Components that do not have a high neighborhood score may not be located within walking distance of residents, have nuisance features such as sports lighting, or may draw large crowds for which parking is not provided.

Community Score
Additionally each component is evaluated from the perspective of residents in the community as a whole. High scoring components in this category may be unique components within the parks and recreation system, have a broad draw from throughout the community, have the capacity and associated facilities for community-wide events, or are located in areas that are accessible only by car.

Indoor Components
Indoor components are generally thought to be accessible to the entire community, partially because it is often not financially feasible to provide indoor facilities at a walking distance from every distance from each residence. Additionally indoor facilities often provide programs and facilities that are geared to the community as a whole, or in larger communities, are intended for a region of the city. For these reasons indoor facilities are given only one score.

Modifiers (Comfort and Convenience Features) Scoring

Outdoor Modifiers
Besides standard components, this inventory also evaluates features that provide comfort and convenience to the users. These are things that a user might not go to the parks specifically to use, but are things that enhance the users' experience by making it a nicer place to be. The presence of features such as drinking water, shade, seating, and restrooms in proximity to a component has the effect of increasing the value of the component. Modifiers encourage people to stay longer and enjoy the components more fully. These features are scored as listed above with the 1-3 system. In this case it is not important to get a count of the number or size of these components. Instead the score should reflect the ability of the item to serve the park. For example, having one bench in a 60-acre park may not be enough and therefore benches would receive a "1." Likewise, having 20 benches in a ¼ acre park maybe too many and would also score a "1." Conversely, a park with an appropriate number of benches that are located to take advantage of shade, views, and park activity, may score a "3."

Indoor Modifiers
For indoor facilities the comfort and convenience features change slightly to reflect the characteristics of the building. Building modifier categories include: Building modifier categories include: site access, setting aesthetics, building entry function, building entry aesthetics, overall building condition, entry desk, office space, overall storage, and restrooms and/or locker rooms.

Activity and Sports Lighting

During the site visit, evaluators recorded the presence of activity or sports lighting for each component. This modifier counts for lighting that allows for component use in the evening/night hours. This modifier does not apply to security lighting.

Shade
Like Sports and Activity lighting, shade can be added to outdoor components to extend use beyond normal hours or seasons.

Design & Ambience Scoring
Using the same rating system that is used for components and modifier the quality of Design and Ambience is scored. The quality of the users' experience is also enhanced by a pleasant setting and good design. Good design not only makes a place look nice, it makes it feel safe and pleasant, and encourages people to visit more often and stay longer

Trails Scoring
Because traveling the length of any given trail is difficult, trail information is often collected with the aid of staff. Trails can be scored as independent parks or greenways or as individual components within another park. The former type of trail receives its own set of scores for modifiers and design and ambiance. The trail in the latter situation takes on the modifiers and design and ambiance of the larger park in which it resides.

Ownership Modifier
This modifier is generally a percentage that is applied to the GRASP® score after other modifiers have been applied. It accounts for access and control of components that are provided by alternative providers. For example, in most cases schools are given a 50% ownership modifier which halves the GRASP® score to account for the limited access that the neighborhood has to school facilities.

INVENTORY COMPILATION AND SCORING PROCESS

Adjusted Modifier Score
Ultimately modifier scores are normalized to create one score to trepresent the overall affect of the comfort and convenience features on the site. Similar to the component scoring system the scale for the adjusted modifiers is 1.1 (BE), 1.2 (ME), 1.3 (EE), and at a site with no modifiers the value of the components is not increased. To determine the range that defines high, medium, and low, the total of all modifier scores is calculated. The range of totals in the community is then divided into three groups and given an adjusted score based on where it falls in the range of scores, thus scores of 1 to 11 = 1.1, 12 to 24 = 1.2, and 25 to 21 = 1.3.

Composite GRASP® Score
Finally, the final Composite GRASP® score for each component is determined by using the following formula:

(total component score) (adjusted modifier score) (design and ambiance score) (ownership modifier) =
Composite GRASP® score

ANALYSIS INSETS AND GRASP® TARGET SCORES

GRASP® perspectives show the cumulative level of service available to a resident at any given location in the City. It is a blended value based on the number and quality of opportunities to enjoy a recreation experience that exist in a reasonable proximity to the given location. If a philosophy is adopted wherein the goal is to provide some minimum combination of opportunities to every residence, a GRASP® score can be calculated that represents this minimum.

A reasonable goal would be to offer a selection of active and passive recreation opportunities to every residence, along with access to a recreational trail. The formula for calculating the GRASP® value of such a combination of components is:

Number of Components x Score for each Component x Modifier Value (will be 1.2 if adequate set of modifiers is present) x Design and Ambience Score (will be 2.0 if met to normal expectations) =* ***Base Score***

Target Minimums for Components
If we assume that a combination of three components and the park itself (acting as a component) should be made available to each home, then the number of components for a minimum level of service is four. Within these four components it is assumed that there is a mix of both active and passive components. Active components include things like courts, athletic fields, etc., and passive components include things such as picnic shelters, natural areas, landscaped gardens, art, etc. Although this example uses a park and outdoor components, service is provided in the same way from indoor components and is considered interchangeable with outdoor components assuming that a good mix of both are present in the parks and recreation system. "Making available," as used in GRASP®, means that they exist within a reasonable distance of the home.

Components that meet normal expectations for size, quality, capacity, and condition receive a score of two in the GRASP® system, so that score will be used to calculate the target minimum score.

Modifiers
In addition to components, parks, buildings, and other public spaces have things in them to make them more comfortable and convenient to use. In the GRASP® system these are called

modifiers. A modifier value in the middle range is considered "normal," and increases the values of the components by a factor of 1.2. For the purpose of calculating a minimum target score, therefore, a modifier value of 1.2 will be used.

Design & Ambience
The quality of the users' experience is also enhanced by a pleasant setting and good design. Components within a park or building that is well-designed and maintained in good condition offer a higher level of service than ones in a location that nobody wants to visit. Good design not only makes a place look nice, it makes it feel safe and pleasant, and encourages people to visit more often and stay longer. In the GRASP® formula, a site with a level of design and ambience that is consistent with local norms will have its component scores raised by a factor of two. A design and ambience factor of two will be used to calculate the minimum target score.

Computed Minimum Base Score
In determining the target score it is also assumed that the ownership value is 100%, meaning that there is no change in score based on ownership. Plugging in the assumptions described above, a minimum base score for park and indoor components is calculated:

Number of Components ***(4)*** *x Score for each Component* ***(2.0)*** *x Modifier Value (**1.2**) x Design and Ambience Score (**2.0**) = Base Score* ***(19.2)***

Trails Minimum Base Score
In addition to having access to a park with a base score, it is ideal to for residents to also have access to a trail. It can be assumed that a trail has an intrinsic value as providing both active and passive opportunities. Also the land or right-of way that contains the trail provides value to the community by providing a break in the urban landscape and providing the opportunity for the trail. This equates to three components. In same way that parks are modified with comfort and convenience scores and design and ambiance, trails also have increased value by considering these things. Thus the equation that creates the base score for trails is:

Number of Components ***(3)*** *x Score for each Component* ***(2.0)*** *x Modifier Value* ***(1.2)*** *x Design and Ambience Score* ***(2.0)*** *= Base Score* ***(14.4)***

When combining the base score for trails and base score for parks a score of **33.6** is used as the GRASP® score that can be reasonably expected for residents.

Because the ability to walk to components makes them more available, GRASP® places a premium on their scores for the area within walking distance. On the Perspective the Base Score is doubled within 1/3 mile of the component. (The 1/3 mile distance represents an approximate 10-minute walk. Barriers that restrict walking have also been taken into account, by cutting off the double-score value around the component at the barrier.) When the score is doubled, the desired GRASP® score is therefore **67.2** for any given residential

location, assuming that the basic set of components and other conditions described above have been met.

In built-out areas, in addition to the service received from the basic set of components described above, homes will also have access to components located further away from them than 1/3 mile. GRASP® assumes that components up to a mile away are "available" to a home. A mile is easily traveled by automobile, bicycle, or other means within a reasonable amount of time, unless unusual circumstances exist. The service value of these components is equal to their base score for the components, calculated according to the formula above. If the standard of having the basic set of components within 1/3 mile of each home is met uniformly across the entirety of an area within a one-mile radius of a given home, there could be as many as seven or more parks serving the home with the basic (non-doubled) score of 19.2 points. The total value of these would add another 134.4 points, raising the score at the subject residence to a total value of **201.6**. This explains why values much higher than the basic minimum of 33.6 are typically found on the composite Perspective.

Component Diversity
However, the mix of components needs to be considered further. For example, a home that is within 1/3 mile of four tennis courts and no other amenities would meet the basic numeric standard, but not the intent of the standard. Other duplications are even more likely within the one-mile radius. Based on this, it is recommended that the goal be to provide the minimum score to as many homes as possible, but also to exceed the minimum by some factor whenever possible.

GRASP® LEVEL OF SERVICE AND DETERMINING COMMUNITY EXPECTATIONS

When preparing GRASP® perspectives or summary tables using the GRASP® scores, the actual scores are grouped according to weather they are below target minimum score or above target minimum score. GRASP® score breaks are determined based upon what type of components are represented in each perspective and show how areas meet expectations.

Composite & Walkability
It is assumed that there is a point at which the number or quality of recreation components falls below target minimum score. Likewise, when a resident receives service from a certain number or quality of components, that level of service exceeds the target minimum score of the community.

The point at which service falls below target minimum score is determined as when a resident doesn't have access to a score which represents access to the equivalent of a park and a trail receiving the base score within one mile of their home. The score that equates to this condition is **67.1.**

Composite and walkability perspectives and summary tables use the following breaks:
>0 – 67.1 = below target minimum score
67.2+ = meets target minimum score

Appendix E – Component and Modifier Codes and Descriptions for GRASP®-IT Audit Tool

Shown on the following pages are codes for categorizing components in the GRASP-IT audit.

Outdoor Component List

Design Concepts

Component	COMPONENT AND DEFINITION
Amusement Ride	Amusement Ride - Train, go carts, etc.
Aqua Feat, Pool	Aquatic feature, Pool (Outdoor Pool) – Consists of a single lap pool. has restricted access and lifeguards.
Aqua Feat, Spray	Aquatic feature, Spray (Destination Sprayground) – Consists of many and varied spray features. Does not have standing water, but is large and varied enough to attract users from outside the immediate
Aqua Feat, Complex	Aquatic feature, Complex (Aquatic Park) – A facility that has at least one lap pool and one separate spray
Archery Range	Archery Range – A designated area for practice and/or competitive archery activities. Meets safety requirements and has appropriate targets and shelters.
Backstop, Practice	Backstop, Practice – Describes any size of grassy area with a practice backstop, used for practice or pee-
Ballfield	Ballfield – Describes softball and baseball fields of all kinds. Not specific to size or age-appropriateness.
Ballfield, Complex	Ballfield, Complex - 4 or more ballfields of similar size in used for tournaments.
Basketball	Basketball – Describes a stand-alone full sized outdoor court with two goals. Half courts scored as (.5). Not counted if included in Multiuse Court.
Batting Cage	Batting Cage – A stand-alone facility that has pitching machines and restricted entry.
Blueway	Blueway – River, Stream or canal, that is used for aquatic recreation.
BMX Course	BMX Course – A designated area for non-motorized Bicycle Motocross. Can be constructed of concrete or
Bocce Ball	Bocce Ball - Outdoor courts designed for bocce ball. Counted per court.
Concessions	Concessions - A separate structure used for the selling of concessions at ballfields, pools, etc.
Concessions with Restroom	Concessions with Restroom - A separate structure used for the selling of concessions at ballfields, pools,
Disk Golf	Disk Golf – Describes a designated area that is used for disk golf. Includes permanent basket goals and
Dog Park	Dog Park – Also known as “a park for people with dogs” or “canine off-leash area”. An area designed specifically as an off-leash area for dogs and their guardians.
Driving Range	Driving Range - An area designated for golf practice or lessons.
Educational Experience	Educational Experience - Signs, structures or historic features that provide an educational, cultural or
Equestrian Facilities	Equestrian Facilities - designed area for equestrian use.
Event Space	Event Space - A designated area or facility for outdoor performances, classrooms or special events, including amphitheaters, band shell, stages, etc.
Fitness Course	Fitness course – Consists of an outdoor path that contains stations that provide instructions and basic
Garden, Community	Garden, Community (vegetable) – Describes any garden area that provides community members a place to have personal vegetable/flower gardens.
Garden, Display	Garden, Display – Describes any garden area that is designed and maintained to provide a focal point in a park. Examples include: rose garden, fern garden, native plant garden, wildlife garden, arboretum, etc.
Golf	Golf – Counted per 18 holes. (18 hole course = 1 and 9 hole course = .5)
Handball	Handball – Outdoor courts designed for handball.
Hockey, Inline	Hockey, In-line - Regulation size outdoor rink built specifically for league in-line hockey games and practice.
Hockey, Ice	Hockey, Ice – Regulation size outdoor rink built specifically for league ice hockey games and practice.
Horseshoes	Horseshoes – A designated area for the game of horseshoes. Including permanent pits of regulation length.
Horseshoes, Complex	Horseshoes, Complex - Several regulation courts in single location used for tournaments.
Loop Walk	Loop Walk – Any sidewalk or path that is configured to make a complete loop around a park or feature and that is sizeable enough to use as a exercise route (min. ¼ mile - 1320 ft.- in length)
Miniature Golf	Miniature Golf - Outdoor miniature golf course.
MP Field, Small	Multi-purpose field, Small – Describes a specific field large enough to host at least one youth field sport game. Minimum field size is 45’ x 90’ (15 x 30 yards). Possible sports may include, but are not limited to: soccer, football, lacrosse, rugby, and field 1 hockey. Field may have goals and lining specific to a certain
MP Field, Medium	Multi-purpose field, Medium - Describes a specific field large enough to host at least one youth/adult field sport game. Minimum field size is 90’ x 180’ (30 x 60 yards). Possible sports may include, but are not limited to: soccer, football, lacrosse, rugby, and field 1 hockey. Field may have goals and lining specific to a
MP Field, Large	Multi-purpose field, Large – Describes a specific field large enough to host at least one adult field sport game. Minimum field size is 180’ x 300’ (60 x 100 yards). Possible sports may include, but are not limited to: soccer, football, lacrosse, rugby, and field hockey. Field may have goals and lining specific to a certain
MP Field, Multiple	Multi-purpose field, Multiple – Describes an area large enough to host a minimum of one adult game and one youth game simultaneously. This category describes a large open grassy area that can be arranged in any manner of configurations for any number of field sports. Minimum field size is 224’ x 468’ (75 x 156 yards). Possible sports may include, but are not limited to: soccer, football, lacrosse, rugby, and field hockey. Field may have goals and lining specific to a certain sport that may change with permitted use. Neighborhood or
MP Field, Complex	MP Field, Complex - Several fields in single location used for tournaments

Outdoor Component List

Design Concepts

Component	COMPONENT AND DEFINITION
Multiuse Court	Multiuse Court - A paved area that is painted with games such as hopscotch, 4 square, basketball, etc. Often found in school yards. Note the quantity of basketball hoops in comment section.
Natural Area	Natural area – Describes an area in a park that contains plants and landforms that are remnants of or replicate undisturbed native areas of the local ecology. Can include grasslands, woodlands and wetlands.
Nordic/Ski Area	Designated area specifically for skiiing, cross-country, or other winter sports.
Open Turf	Open Turf – A grassy area that is not suitable for programmed field sports due to size, slope, location or physical obstructions. Primary uses include walking, picnicking, Frisbee, and other informal play and uses
Open Water	Open Water – A body of water such as a pond, stream, river, wetland with open water, lake, or reservoir.
Other-Active	Active component that does not fall under any other component definition. If passive, consider passive node.
Passive Node	Passive Node - A place that is designed to create a pause or special focus within a park, includes seating areas, passive areas, plazas, overlooks, etc.
Picnic Grounds	Picnic Grounds - A designated area with several, separate picnic tables.
Playground, Destination	Playground - Destination – Playground that serves as a destination for families from the entire community, has restrooms and parking on-site. May include special features like a climbing wall, spray feature, or
Playground, Local	Playground - local–Playground that is intended to serve the needs of the surrounding neighborhood. Generally doesn't have restrooms or on-site parking.
Public Art	Public Art – Any art installation on public property.
Racquetball	Racquetball – Outdoor courts designed for racquetball.
Restroom	Restroom - A separate structure that may or may not have plumbing. Does not receive a neighborhood or community score. This is scored in the Comfort and Convenience section.
Ropes Course	Ropes Course - An area designed for rope climbing, swinging, etc.
Shelter, Group	Shelter – Large/Group– A shade shelter with picnic tables, large enough to accommodate a group picnic or other event for at least 25 persons with seating for a minimum of 12.
Shelter, Group with Restroom	Shelter – Large/Group– A shade shelter with picnic tables, large enough to accommodate a group picnic or other event for at least 25 persons with seating for a minimum of 12 - includes restroom facility.
Shelter	Shelter – Small/Individual– A shade shelter with picnic tables, large enough to accommodate a family picnic or other event for approximately 4-12 persons with seating for a minimum of 4 .
Shelter with Restroom	Shelter – Small/Individual– A shade shelter with picnic tables, large enough to accommodate a family picnic or other event for approximately 4-12 persons with seating for a minimum of 4 - includes restroom facility.
Shooting Range	Shooting Range– A designated area for practice and competitive firearms shooting activities. Meets safety requirements and has appropriate targets and shelters.
Shuffleboard	Shuffleboard - Outdoor courts designed for shuffleboard.
Skate Feature	Skate Feature – A stand-alone feature in a park. May be associated with a playground but is not considered
Skate Park	Skate park – An area set aside specifically for skateboarding, in-line skating, or free-style biking. May be specific to one user group or allow for several user types. Can accommodate multiple users of varying abilities. Usually has a variety of concrete features and has a community draw.
Sledding Hill	Sledding Hill - An area designated for sledding use that is free from obstacles or street encroachment.
Structure	Structure - A separate structure used for maintenance, storage, etc. Does not receive a Neighborhood or
Tennis	Tennis courts –One regulation court that is fenced and has nets.
Tennis Complex	Tennis Complex –Regulation courts that are fenced and have nets. Placed in a group of 8 or more courts.
Track, Competition	Track, competition – A multi-lane, regulation sized track appropriate for competitive track and field events and available for public use. Community component.
Trails, Primitive	Trails - primitive– Trails, unpaved, that is located within a park or natural area. That provides recreational opportunities or connections to users. Measured per each if quantity available.
Trails, Multi-use	Trails-multi-use– Trails, paved or unpaved, that are separated from the road and provide recreational opportunities or connections to walkers, bikers, roller bladers and equestrian users. Located within a dedicated ROW. May run though a park or parks but is not wholly contained within a single park. Can be a
Trailhead	Marker, post, sign or map indicating location, intersection, beginning or end of trail.
Volleyball	Volleyball court - One full-sized court. Surface may be grass, sand, or asphalt. May have permanent or
Water Feature	Water feature – A passive water-based amenity that provides a visual focal point. Includes fountains, and
Water Access, Developed	Water Access - Developed - Includes docks, piers, boat ramps, fishing facilities, etc. Receives quantity for
Water Access, General	Water Access - General - Measures a pedestrian's general ability to have contact or an experience with the water. Usually receives quantity of one for each park.

Modifiers include the following items, each of which is assigned as single rating of 0 (not existing), 1 (below expectations), 2 (meets expectations), or 3 (exceeds expectations) for the entire site;

- Design & Ambience – A subjective assessment of the overall aesthetics and appeal of the site.
- Drinking Fountains – Are adequate opportunities for drinking water present and adequate for the size of the site and its intended use?
- Seating – Are opportunities for seating present and adequate for the size of the site and its intended use?
- BBQ Grills – Are facilities for outdoor grilling present and adequate for the size of the site and its intended use?
- Dog Station – Are dog waste pickup bags and disposal bins present and adequate for the size of the site and its intended use?
- Security Lighting – Is security lighting present and adequate for the size of the site and its intended use?
- Bike Parking – Are bike racks present and adequate for the size of the site and its intended use?
- Restrooms – Are restrooms present and adequate for the size of the site and its intended use?
- Shade – Is protection from the sun present and adequate for the size of the site and its intended use?

- Connect to Trails – Are trails that extend beyond the site connected to the site?
- Park Access – Is the site easily and safely accessed on foot from adjacent neighborhoods?
- Parking – Are facilities for automobile parking present and adequate for the size of the site and its intended use?
- Seasonal Plantings – Are annuals and/or other seasonal floral displays present and adequate for the site's intended use?
- Ornamental Plantings – Are flowering trees, shrubs, and/or perennials present and adequate for the site's intended use?
- Picnic Tables - Are facilities for outdoor dining present and adequate for the size of the site and its intended use?

Appendix F – Sample Grasp®-IT Audit Data

This appendix includes sample materials from the GRASP-IT® audit process. Data is collected from multiple sources, including GIS files and field audits, then submitted to agency staff for review and checking. Once finalized and approved, the data is formatted into a single document referred to as a GRASP® Atlas for reference, in addition to the GIS and Microsoft Access files.

DESIGN CONCEPTS
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fax 303.664.5313
www.dcla.net

September 13, 2011

Doug McRainey
Parks Planning Manager
Town of Cary Parks, Recreation & Cultural Resources
P.O. Box 8005, Cary NC. 27512-8005

Dear Doug,

The following document contains the Inventory Approval Packet for the Town of Cary Parks, Recreation, and Cultural Resources Master Plan. The documents and map represent data compiled during the initial data collection and field visits conducted in May. This document addressed edits and comments supplied during the Inventory Review Process. During this final review, please examine the following for accuracy:

- Park Name, Ownership, Class

Park Name	MacDonald Woods Park
Ownership	
Class	Park
Address	
Inventory Date	10-Jun
D&A	2
Drnk. Fountains	2
Seating	2
BBQ Grills	
Dog Station	
Security Lighting	
Bike Parking	2
Restrooms	
Shade	2
Connect to Trails	2
Park Access	2
Parking	1
Seasonal Plant	
Ornamental	2
Picnic Tables	2
Other	
Comments	small park with nice playground, street parking only
GIS Acres	14.1
GISID	P23

- Park boundary

DESIGN CONCEPTS
Community and Landscape Architects

- Component type

GISID	Comp	N	C	QTY	Lights	Shade	Comments
31	Public Art	2	2	1			Bowstring Vines
68	Basketball	2	2	1	N		
69	Open Turf	2	2	1			
70	Playground, Local	3	3	1			
71	Natural Area	2	2	1			
509	Picnic Grounds	2	2	1			

GISID = each component receives an individual identification number
Comp = Component / Asset

- Component location

- Evaluation (score) of component condition

GISID	Comp	N	C	QTY	Lights	Shade	Comments
31	Public Art	2	2	1			Bowstring Vines
68	Basketball	2	2	1	N		
69	Open Turf	2	2	1			
70	Playground, Local	3	3	1			
71	Natural Area	2	2	1			
509	Picnic Grounds	2	2	1			

N = neighborhood score
C = community score
QTY = quantity
Lights = Y/N (may be left blank)
Shade = generally not used
Comments = specific to component
Note: Restrooms and Structures are not scored as components. Restrooms are scored as comfort and convenience features. Indoor facilities are scored separately.

DESIGN CONCEPTS
Community and Landscape Architects

- General Comments

Park Name	MacDonald Woods Park
Ownership	
Class	Park
Address	
Inventory Date	10-Jun
D&A	2
Drnk. Fountains	2
Seating	2
BBQ Grills	
Dog Station	
Security Lighting	
Bike Parking	2
Restrooms	
Shade	2
Connect to Trails	2
Park Access	2
Parking	1
Seasonal Plant	
Ornamental	2
Picnic Tables	2
Other	
Comments	small park with nice playground, street parking only
GIS Acres	14.1
GISID	P23

Any final edits to the dataset will be addressed and corrected. Your approval and sign off on this document will allow us to proceed forward with the analysis of the data. We appreciate all your time and effort in reviewing this dataset.

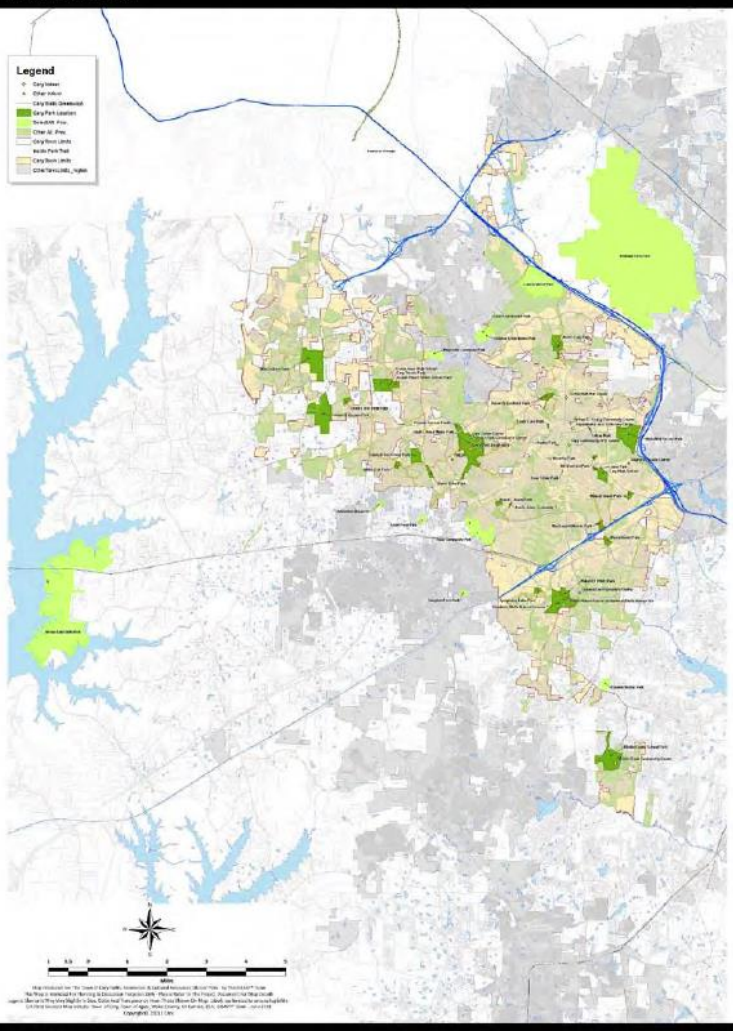
Sincerely,

Robby Layton
Principal and Landscape Architect

Town of Cary, NC

Inventory Approval Packet
September, 2011

TOWN OF CARY, NORTH CAROLINA
PARKS, RECREATION & CULTURAL RESOURCES
MASTER PLAN



SYSTEM MAP **RESOURCE MAP: A**

GRASP
DESIGN CONCEPTS GREENPLAY

Annie L. Jones Park

Cary, NC Inventory Approval
Sep 09, 2011

18 of 173

N

Park Name	Annie L Jones Park
Ownership	Town of Cary
Class	Park
Address	1414 Tarbert Drive, 27511
Inventory Date	10-Jun
D&A	2
Drnk. Fountains	2
Seating	2
BBQ Grills	
Dog Station	
Security Lighting	2
Bike Parking	2
Restrooms	1
Shade	2
Connect to Trails	3
Park Access	2
Parking	2
Seasonal Plant	
Ornamental	2
Picnic Tables	2
Other	
Comments	some upgrades like safety surfacing and a new planting scheme would bring this park up to a level with Cary's other parks. Nothing wrong with this park but it seems dated compared to Cary's other parks
GIS Acres	9.8
GISID	P22

GISID	Comp	N	C	QTY	Lights	Shade	Comments
26	Ballfield	2	2	1			
27	Tennis	2	2	6			
28	Basketball	2	1	1			limited value for community
29	Playground, Destination	2	1	1			mulch, limited value for community
30	Trailhead	2	1	1			limited value for community
179	Basketball	2	1	1			limited value for community
488	Shelter, Shade	2	1	1			by tennis courts, limited value for community
489	Restroom			1			

Appendix G – Testing of the GRASP®-IT Audit Tool

To test the GRASP®-IT audit tool, two volunteer auditors rated 12 parks in Cary, NC. The auditors were graduate students from NCSU College of Design. They were trained in the use of the tool and conducted their ratings on a single day (May 5th, 2014).

Sample selection and test audits for GRASP®-IT audit tool tests.

Cary, NC was chosen for the test because it is convenient to NCSU and because ratings from the city's parks master planning process, conducted in 2011, were available for use as the gold standard. A total of 12 parks were selected for the test. The sample parks were chosen from among all of Cary's parks based on size and the variety of features found within them. The 12 parks were large enough to contain a number of park features but small enough to allow for multiple sites to be audited within the time available for the test. The goal was to audit as many parks and as many features as practical in order to have as large a sample as possible of both characteristics for individual parks and total number of park features. Smaller sites would have allowed for more sites to be audited, but would have limited the number and variety of features observed, while larger parks would have limited the number of total parks visited due to the time taken to observe each one.

Table 1 shows the sampling frame of all possible parks in Cary and which ones were chosen for the test audits. The volunteer auditors were trained by having them each rate a single park that was not one of the 12 parks included in the test. I was the trainer. I provided the audit form and other materials, including instructions and examples, and reviewed these

with the auditors, then coached them as they rated the park. The auditors were allowed to discuss their ratings with each other and ask questions of the trainer during the training audit. A similar process was used to train the auditors in Montgomery and Prince George's Counties (I was the auditor in Cary and Tulsa). The auditors who were trained in those cases were administrators and staff technicians from the two county park agencies.

After the training, the auditors and I visited 12 parks together and completed audits of them. Even though I had performed audits of these parks in 2011 as part of the original GRASP® inventory that was part of a system master plan, I completed an audit as well. This was done in order to note any changes in the parks that had occurred since the original audit and to allow for a longitudinal test-retest analysis of the audit tool. The auditors and I each filled out our audit forms independently, without conferring with each other. The forms were filled out manually on paper, using clipboards. Each volunteer also had a copy of the component definitions and an instruction sheet to refer to as they conducted their audits. The field work took approximately seven hours, including the training time, traveling between parks, and stopping for lunch.

Table 1. Sampling frame and selected parks for test audits.

Sampling Frame of Parks for Validation Study

Location	Total Components	Size in Acres	CLASSII
Rose Street Park	2	0.6	Mini Park
Dorothy Park	1	0.8	Mini Park
Urban Park	2	1.2	Mini Park
Black Creek GW Trailhead	1	1.2	Special Use Facility
Heater Park	1	1.5	Mini Park
Annie Jones Greenway 1	2	2.7	Special Use Facility
Lexie Lane Park	3	2.7	Neighborhood Park
RS Dunham Park	12	5.6	Neighborhood Park
Lions Park	4	6.2	Neighborhood Park
Annie L Jones Park	12	9.8	Neighborhood Park
White Oak Park	8	11.8	Neighborhood Park
Walnut Street Park	11	12.7	Special Use Facility
Sears Farm Road Park	16	12.9	Neighborhood Park
Koka Booth Amphitheatre	7	14.1	Special Use Facility
MacDonald Woods Park	6	14.1	Neighborhood Park
Preston Soccer Fields	2	15.0	Special Use Facility
Green Hope Elemen School Park	12	15.4	Neighborhood Park
Davis Drive Park	10	15.7	Neighborhood Park
Marla Dorrel Park	13	17.5	Neighborhood Park
Cary Tennis Park	37	18.5	Special Use Facility
Robert V Godbold Park	18	24.6	Neighborhood Park
Harold D Ritter Park	9	34.7	Community Park
Cary High School	4	39.0	Special Use Facility
Davis Drive School Park	9	55.4	Special Use Facility
North Cary Park	19	60.8	Community Park
Green Hope High School	10	72.5	Special Use Facility
Hemlock Bluffs Nature Preserve	6	139.9	Special Use Facility
WakeMed Soccer Park	17	163.3	Special Use Facility
Middle Creek School Park	26	166.9	Community Park
Mills School Park	9	195.8	Special Use Facility
T E Brooks Park USA Baseball	23	224.3	Community Park
Fred G Bond Metro Park	42	274.9	Metro Park
Averages:	*11*	*51.0*	
Sites selected for test audits:	**Avg (11)**	**Avg (15.7)**	

After the audits were completed, I collected the audit forms from each volunteer and entered the data into Excel. The spreadsheets were printed out and checked against the audit forms for all of the data points on May 16th, 2014.

Among the items in the audits was the rating of a set of general characteristics for each site, referred to as modifiers. A total of 180 modifiers, representing 15 different characteristics, were rated among the 12 parks. A scale of 0-3 was used to rate the modifiers, in which 0 = “modifier not present,” 1 = “modifier below expectations for this park,” 2 = “modifier meets expectations for this park,” and 3 = “modifier exceeds expectations for this park.” The auditors were instructed that “expectations” meant what would be expected for that particular modifier at that particular park. For example, the expectation for the modifier “parking” would be different for a regional destination park than it would be for a local neighborhood park. This is similar to the process used in the GRASP®-IT inventories for the study areas, except that in this case the auditors did not have the chance to meet with local agency officials or other representatives to gain a deeper understanding of expectations. In the study area audits, the auditors were staff members who were familiar with local conditions, including public expectations.

The audits also included the rating of features present at each park, referred to as components. A total of 105 components were audited within the 12 parks. The components represented 27 defined component types. For the 105 components, two ratings were made for each component. The first was a “neighborhood score” that assessed the functionality of the component from the standpoint of someone living near the park (loosely defined as “within walking distance”) and the second was a “community score” that assessed the functionality of the component for someone living “across town” from the park. The rating scale was a three-point ordinal scale where 1 = “below expectations,” 2 = “meets expectations,” and 3 = “exceeds expectations.” The auditors were instructed that “expectations” meant what would

be expected for that particular component type at that particular location. For example, the expectations for the component called “ballfield” would be different for a regulation-play tournament field in a sports complex than for a “pick-up” field with a backstop for informal play in a neighborhood park. Descriptive statistics for the total of all observations are shown in *Table 2*. Total observations include those made by Rater#1, Rater #2, and myself as well as those in the final dataset from the original audit performed in 2011, which was considered the gold standard.

Table 2. Descriptive statistics for GRASP® validation test observations.

		Rater #1	Rater #2	Trainer	Gold Standard
N	Valid	371	372	372	372
	Missing	1	0	0	0
Mean		1.54	1.83	1.70	1.83
Median		2.00	2.00	2.00	2.00
Std. Deviation		0.86	0.84	0.84	0.81

Reliability tests.

Reliability was determined by the amount of agreement between observers. Percent agreement is the simplest and most frequently used index of agreement (Bedimo-Rung et al., 2006), but it can overestimate true agreement because it does not account for agreement between observers that may occur from chance or guessing. For this reason, Cohen’s Kappa values were also calculated. Percent agreement was calculated from the spreadsheet data. However, Cohen’s Kappa is considered less reliable when there is little variability among ratings (Kaczynski et al., 2012). Both percentage agreement and Cohen’s Kappa are provided, along with the standard deviations in *Table 3* to allow for a fuller understanding of

the results. Both interrater and intra-rater percent agreement were calculated in Excel. Exact agreement was used, whereby observers must agree exactly. Cohen's Kappa calculations were performed with SPSS.

Interrater agreement.

Interrater agreement is the agreement between the two volunteer auditors. Percent agreement was calculated from the number of times that the volunteer auditors agreed with each other on an item (i.e., assigned it an identical score) compared to the total number of items rated, expressed as a percentage. This was computed separately for modifiers and components, with the "neighborhood score" (N-Score) and the "community score" (C-Score) for components each computed separately. Cohen's Kappa agreement scores were computed in SPSS on the same sets of scores as the percentages.

For modifiers, the auditors agreed on 123 of 180 items, for exact agreement of 68%. For C-Scores, the auditors agreed exactly on 65 of 105 components, for an exact agreement of 62%. For component N-Scores, the auditors agreed exactly on 69 of 105 components, for an exact agreement of 66%. For N-Scores and C-Scores combined, exact agreement was 134 of 210 ratings, for an exact agreement of 64%. Interpretations of percent agreement values vary in the literature, but 70% is considered an acceptable level by some (Bedimo-Rung et al., 2006; Kaczynski et al., 2012). Others use a scale wherein less than 60% is considered "poor," 60% to 74% is considered "moderate," and 75% or above is "good to excellent."

For Kappa scores, interrater agreement was 0.45 for modifiers, 0.29 for C-Scores, and 0.32 for N-Scores. Reliability studies for similar audit tools have used a scale wherein values

of 0.40 or less are considered “poor” agreement, values from 0.41 to 0.60 are considered “moderate,” and values over 0.60 are considered “good to excellent” (Saelens et al., 2006).

Overall auditor agreement for all modifiers, N-scores, and C-Scores combined was exact on 257 of 390 items, for an exact agreement of 65%. Cohen’s Kappa was 0.42 for all scores combined.

Intra-rater agreement.

Intra-rater agreement reflects the consistency with which a rater rates the same items at different times. Intra-rater agreement was calculated by comparing the number of times the trainer agreed with the original audit that was conducted in 2011. The rationale for this is that the trainer was also the auditor for the original audit, which was reviewed by agency staff and others and adopted at the time of the master planning effort. For this study it was also considered the gold standard. Because those ratings were reviewed and adjusted by local officials and others before being finalized, it is possible that the rating that appears in the gold standard is not the one the trainer gave it in the original 2011 audit for some items. For example, in the case of playgrounds, the agency staff made edits that resulted in some playgrounds being downgraded to a lower score in the gold standard than what was assigned in the field audit. Another consideration is that approximately three years had passed since the original audit, so some things may have physically changed during that period. Also, some items were rated during the test that were not included in the original audit (restrooms are an example). For these reasons, some items were dropped from the intra-rater test, and the intra-rater agreement results may underestimate the true intra-rater accuracy.

With those caveats, the intra-rater exact agreement for modifiers was 125 of 180 ratings, or 69%. Intra-rater agreement for component N-Scores was exact for 71 of 98 items or 72% exact agreement. For C-Scores, exact agreement occurred on 67 of 98 items, for 68% exact agreement. For N-Scores and C-Scores combined, exact intra-rater agreement occurred for 138 of 182 ratings, for an overall exact agreement of 70%. Cohen's Kappa scores for intra-rater agreement were 0.489 for modifiers, 0.304 for C-Scores, and 0.226 for N-Scores. For all intra-rater items, including modifiers, N-Scores, and C-Scores, exact agreement occurred on 263 of 376 items, for an overall exact agreement of 70%. Cohen's Kappa for all intra-rater items combined was 0.426. As mentioned earlier, these are likely to underestimate true inter-rater accuracy for the reasons explained.

Intra-rater agreement and acceptability ranges were not reported for the studies referenced above (Bedimo-Rung et al., 2006; Kaczynski et al., 2012; Saelens et al., 2006), so it is not possible to compare the results here with those studies. Percent agreement is typically desired in the 70% and above range, which is the percentage observed for overall exact intra-rater agreement in this case.

Table 3. Reliability test for GRASP-IT® audit tool.

Reliability Test for GRASP®-IT Audit Tool

Interrater Agreement

	Modifiers	C-Scores	N- Scores	Total Observations
Feature Types - Interrater	15	27	27	69
Number of Ratings - Interrater	180	105	105	390
Interrater Agreement - %	68%	62%	66%	65% (components only)
Interrater Agreement - Cohen's Kappa	0.447	0.289	0.322	0.420

Intra-rater Agreement

	Modifiers	C-Scores	N- Scores	Total Observations
Feature Types - Intra-rater	15	25	25	65
Number of Ratings Intra-rater	196	98	98	392
Intra-rater Agreement - %	69%	68%	72%	70%
Intra-rater Agreement - Cohen's Kappa	0.489	0.304	0.226	0.426

Table 4. Reliability tests for modifiers.

Interrater Reliability Test for Modifiers

Parameter	Total Number Observed	% Interrater Agreement
BBQ Grills	12	100%
Parking	12	92%
Dog Station	12	92%
Drink. Fountains	12	83%
Park Access	12	83%
Restrooms	12	83%
Connect to Trails	12	75%
D&A	12	67%
Seating	12	67%
Picnic Tables	12	58%
Shade	12	58%
Bike Parking	12	50%
Seasonal Plant	12	50%
Security Lighting	12	42%
Ornamental	12	17%
Overall	**180**	**68%**

Intra-rater Reliability Test for Modifiers

Parameter	Total Number Observed	% Interrater Agreement
BBQ Grills	12	100%
Dog Station	12	100%
Picnic Tables	12	83%
Seating	12	83%
D&A	12	75%
Parking	12	75%
Drink. Fountains	12	67%
Bike Parking	12	67%
Park Access	12	67%
Connect to Trails	12	58%
Security Lighting	12	58%
Shade	12	58%
Ornamental	12	50%
Seasonal Plant	12	50%
Restrooms	NA	NA
Overall	**168**	**71%**

Table 5. Interrater reliability for specific components.

Interrater Reliability Test for Community Component Functional Scores			Interrater Reliability Test for Neighborhood Component Functional Scores		
Component	**Total Observations**	**% Agreement with Gold Standard**	**Component**	**Total Observations**	**% Agreement with Gold Standard**
Complex, Tennis	1	100%	Complex, Tennis	1	100%
Concessions	1	100%	Concessions	1	100%
MP Field, Large	3	100%	MP Field, Large	3	100%
Multiuse Court	2	100%	Multiuse Court	2	100%
Other, Active	2	100%	Other, Active	2	100%
Restroom	6	100%	Restroom	6	100%
Skate Park	1	100%	Skate Park	1	100%
Trail, Multi-use	1	100%	Trail, Multi-use	1	100%
Ballfield	2	100%	Basketball	15	93%
Volleyball	1	100%	Public Art	5	80%
Public Art	5	80%	Trailhead	5	80%
Trailhead	5	80%	Playground, Local	7	71%
Playground, Destination	5	80%	Shelter, Shade	6	67%
Shelter, Shade	6	67%	Shelter, Group	5	60%
Natural Area	8	63%	Open Turf	7	57%
Playground, Local	7	57%	Ballfield	2	50%
Loop Walk	4	50%	Loop Walk	4	50%
Trail, Primitive	2	50%	Natural Area	8	50%
Picnic Grounds	6	50%	Trail, Primitive	2	50%
Basketball	15	47%	Playground, Destination	5	40%
Open Turf	7	43%	Passive Node	3	33%
Shelter, Group	5	40%	Picnic Grounds	6	33%
Tennis	3	33%	Tennis	3	33%
Passive Node	3	33%	Dog Park	1	0%
Dog Park	1	0%	Educational Experience	1	0%
Educational Experience	1	0%	Shelter	2	0%
Shelter	2	0%	Volleyball	1	0%
All Observations	**105**	**62%**	**All Observations**	**105**	**66%**

Validity test.

Validity testing of this type of instrument is done by comparing the ratings of observers to an accepted "gold standard," which simply means "the best tool available at that time to compare different measures" (Claasen, 2005). The gold standard is a set of ratings performed by experts or otherwise accepted as the best measure available. In this case, the new inventory performed by the trainer on the day of the test was used as the gold standard,

rather than the previously adopted version from 2011. This accounted for rating changes made by Town staff after the audit and physical changes that had occurred at greenspace locations in the three-year period between the original audit and the test observations.

The method used by Bedimo-Rung et al. (2006) to test the BRAT-DO instrument was used to test the validity of the GRASP®-IT audit tool. This was done by totaling the number of observations with the correct response (i.e., matching the gold standard) and dividing by the total number of observations. Results are shown in *Tables 6* and *7*. While validity on individual items varies greatly, with some showing very low reliability, overall reliability is in the moderate to good range. Bedimo-Rung et al. used a standard of 70% as indicating sufficient agreement.

Table 6. Validity test for modifiers.

Validity Test for Modifiers

Parameter	Total Observations	% Agreement with Gold Standard
BBQ Grills	24	100%
Dog Station	24	96%
Restrooms	24	92%
Parking	24	88%
Drink. Fountains	24	83%
Picnic Tables	24	75%
Bike Parking	24	71%
Connect to Trails	24	63%
Park Access	24	63%
Seasonal Plant	24	63%
D&A	24	58%
Seating	24	54%
Shade	24	54%
Security Lighting	24	50%
Ornamental	24	42%
Overall Agreement	**360**	**70%**

Table 7. Validity test results for component functional scores.

Validity Test for Community Component Functional Scores		
Component	**Total Observations**	**% Agreement with Gold Standard**
Complex, Tennis	2	100%
Concessions	2	100%
Multiuse Court	4	100%
Restroom	12	100%
Skate Park	2	100%
Volleyball	2	100%
Ballfield	4	75%
Loop Walk	8	75%
Basketball	30	73%
Playground, Destination	10	70%
Public Art	10	70%
MP Field, Large	6	67%
Passive Node	6	67%
Shelter, Shade	12	67%
Trailhead	10	60%
Picnic Grounds	12	58%
Open Turf	14	57%
Playground, Local	14	57%
Dog Park	2	50%
Educational Experience	2	50%
Natural Area	16	50%
Other, Active	4	50%
Shelter	4	50%
Shelter, Group	10	50%
Tennis	8	50%
Trail, Multi-use	2	0%
Trail, Primitive	6	0%
Overall Agreement	**214**	**64%**

Validity Test for Neighborhood Component Functional Scores		
Component	**Total Observations**	**% Agreement with Gold Standard**
Complex, Tennis	2	100%
Concessions	2	100%
MP Field, Large	6	100%
Multiuse Court	4	100%
Restroom	12	100%
Skate Park	2	100%
Basketball	30	97%
Public Art	10	90%
Playground, Local	14	86%
Open Turf	14	79%
Loop Walk	8	75%
Passive Node	6	67%
Picnic Grounds	12	67%
Shelter, Shade	12	67%
Natural Area	16	63%
Shelter, Group	10	60%
Trailhead	10	60%
Dog Park	2	50%
Educational Experience	2	50%
Other, Active	4	50%
Playground, Destination	10	50%
Shelter	4	50%
Tennis	8	50%
Trail, Primitive	6	50%
Volleyball	2	50%
Ballfield	8	38%
Trail, Multi-use	2	0%
Overall Agreement	**218**	**73%**

Conclusions from the validation testing.

Results of the tests show that the reliability and validity of the GRASP®-IT audit tool overall may be considered as within the acceptable range for research purposes. Caution should be used in applying it to specific measures that did not perform well in this test. It should be noted that only subjective assessments in the tool were tested. Because the process for identifying the existence of locations and features in the GRASP® methodology does not

rely upon the audit tool, objective measures--i.e., the presence or absence of greenspace locations and features within them--were not a part of the test. The audit process begins with a list of greenspace locations and components provided by the sponsoring agency. These are geocoded using a variety of approaches that vary from one study location to another, typically including a combination of existing data, geocoding from aerial imagery, and field location during the audit process. The audit process can be used as a ground-truthing exercise for the existing data, but it is primarily intended to capture characteristics of features once they have already been identified and located.

Improving the GRASP®-IT audit tool.

Based on the literature and interviews with the volunteer auditors, these results could be improved with additional training and with better training materials, including scoring criteria in the definitions for modifiers and components and providing examples to represent different scores. Also, based on this test, certain changes to the GRASP®-IT audit tool could be made to improve reliability. The three-point scale used to assess some items (actually a four-point scale when zero is included) could be changed to a dichotomous scale, which would probably yield more consistent results. The ratings could be changed from a three-point rating of functionality to a dichotomous rating of adequate versus inadequate. For example, the parameter "seating" could be assessed as adequate versus inadequate for a given greenspace location.

Finally, it should be noted that the test conditions differ from the real-world application of the GRASP-IT tool in that in actual use, the audit is performed after a series of meetings, discussions, and field visits between the auditor and local residents and agency

staff to better define and understand what the expectations are within the community and to agree upon general assumptions to guide the assignment of scores. Those things were not feasible in the testing of the audit tool. If included, it may have raised the level of agreement between the auditors.

For the GRASP® data used in this current study, it should be noted that I performed the audits in two of the study locations (Cary and Tulsa), and agency staff conducted the other two audits (Montgomery and Prince George's Counties) after I trained them.

Appendix H – Statistical Analysis of GRASP® Composite Indicators

Ratings from the GRASP®-IT audit can be used to conduct a wide variety of analyses of greenspace systems (Layton & Penbrooke, 2014; Penbrooke, T., 2007). Many of these analyses make use of composite indicators or indices. A composite indicator is "a quantitative or a qualitative measure derived from a series of observed facts that can reveal relative positions (*e.g.*, of a country) in a given area" (OECD, 2008, p. 13). A composite indicator is formed by compiling individual indicators into a single index on the basis of an underlying model in order to "measure multi-dimensional concepts which cannot be captured by a single indicator" (Ibid, p. 13). Use of composite indicators has been documented in a number of studies (e.g., Brownson et al., 2009; Kaczynski et al., 2016). Popular examples of composite indicators include Walk Score® and the Trust for Public Land's ParkScore®.

Statistical Analysis of the GRASP® Composite Indicators

While none of the environmental variables proved significantly related to either of the research questions in the final multiple regressions for the research questions posed in the study, several variables were significant when examined in single one-on-one analyses with the dependent variables. Two were significant in relation to both dependent variables in the bivariate analyses: *GRASP® Value of Nearest Park*, and *GRASP® Walk Value* at the subject's address. Both of these are composite indicators, determined through the GRASP® methods explained in Chapter 4 of the main text. This prompted further examination of these composite indicators to see how the factors from which they are derived operate to generate GRASP® values.

Both *GRASP® Value of Nearest Park*, and *GRASP® Walk Value* are derived from four characteristics that are assessed with the GRASP®-IT audit tool. The basic unit of measure is an individual component within a greenspace. The presence or absence of components is part of a GRASP® score. Where no components exist, the GRASP® score is zero. In practice, components are located within parks, greenways, and other greenspace locations, but it is theoretically possible to have a GRASP® score made up of components that are not located within a greenspace parcel. However, greenspace parcels are considered components themselves, so wherever there is a greenspace parcel, there is at least one component.

First, a functionality score is assigned to each component. This score is then modified by two characteristics associated with the component--the presence/absence of lights for night use and the presence/absence of shade canopy--which are combined into a single coefficient. Characteristics of the parcel within which the component is located are used to create two additional coefficients that modify the component score. The first is a value created by adding up the assessed values for 15 amenity measures known as Comfort and Convenience Modifiers, and assigning a coefficient based upon the sum. The second is a single parameter for the overall subjective quality of the site, known as Design and Ambience (D&A). Applying all of the coefficients to the functional score of a component results in a total score for the component, as illustrated in *Figure 4.6* in the main text of the dissertation. Because, as explained in Appendix D, there are two different functionality values assigned to each component, one for the neighborhood perspective and one for the community-wide perspective, there are two total scores for each component--one for the

Component Total Neighborhood Value (Comp_Total_N_Value) and one for the Component Total Community Value (Comp_Total_C_Value). The Comp_Total_C_Value was not used in this study. It is used in the GRASP® methodology to determine a system-wide index for all features within a GS system, and other purposes related to the overall GS system. The focus of the study presented here was on GS that is in proximity to an individual's home.

As explained in Section *4.5.2.3.4.2*, the variable *GRASP® Value of Nearest GS* is simply the total of the Comp_Total_N_Values for all components at the park. The variable *GRASP® Walk Value* is derived by assigning the Comp_Total_N_Value for a component to a 0.333-mile radial buffer around it and overlaying similar buffers for all components in the dataset, as shown in *Figures 4.7* and *4.9*. The resulting GIS map is then queried to determine the total value of all buffers that overlie a given point on the map. In this study, that point is the geocoded residence address of the participant. Since both of these variables make use of Comp_Total_N_Values from the GRASP-IT audit, an analysis of the variables that make up a Comp_Total_N_Value was examined using multiple linear regression. The entire set of components from the inventory at each study area location was combined into a single dataset with all components from all study areas for purposes of statistical analysis. A total of 6,218 components are included. Descriptive data for the combined dataset is shown in *Table 1*.

Table 1 Descriptive statistics for components dataset from SPSS.

Descriptive Statistics

	Mean	Std. Deviation	N
Comp_Total_N_Value	4.9281	1.96661	6218
Functional_Score_N	1.994	.4185	6218
D&A	2.023	.4200	6218
Comfort_Convenience_Mod	1.148	.0560	6218
Light_Shade_Modifier	1.053	.1642	6218

To check for multicollinearity, a correlations table was run on the variables in SPSS (*Table 2*). The highest correlation (R = .365) is between the variables D&A and Comfort & Convenience and is not expected to produce multicollinearity.

Table 2 Correlation matrix for component variables.

		Functional_Score_N	Light_Shade_Modifier	Comfort_Convenience_Mod	D&A
Functional_Score_N	Pearson Correlation	1.000	-0.005	0.008	.105**
	Sig. (2-tailed)		0.720	0.532	0.000
Lights & Shade	Pearson Correlation		1.000	.176**	0.006
	Sig. (2-tailed)			0.000	0.626
Comfort & Convenience	Pearson Correlation			1.000	.365**
	Sig. (2-tailed)				0.000
D&A	Pearson Correlation				1.000
	Sig. (2-tailed)				
**. Correlation is significant at the 0.01 level (2-tailed).					

The results when the variables are entered simultaneously into the SPSS linear regression model are shown in *Table 3*. The model predicts 93.3% of the variation between Comp_Total_N_Values, and is significant at the $P < .000$ level. The standardized betas and R-square values show the relative contributions of each variable towards the variation in Comp_Total_N_Values. The greatest effects are from D&A and Functional_Score_N, which are roughly equal, followed by the Lights & Shade variable, which contributes about a third as much as the first two, then Comfort & Convenience, which contributes a relatively small

amount towards the final score. Looking back at the validity testing for the GRASP®-IT audit tool in Chapter 4, these results suggest that priority should be given to improving the reliability of the D&A and Functional_Score_N variables, since they contribute the most to the Comp_Total_N_Value that is used in a number of ways in the application of GRASP® in the practice realm.

It should also be noted that the two variables that have the strongest effects on the Comp_Total_N_Value, D&A and Functional_Score_N, are both subjective rather than objective assessments. Taken together, they account for a majority of the R-square change for Comp_Total_N_Value. This means that GRASP® values utilizing the Comp_Total_N_Value are, to a degree, measures of subjective rather than objective characteristics of greenspace. These measures that incorporate subjective values were the only characteristics of greenspace that showed significant correlations with the dependent variables in the bivariate regressions for the research questions in this study, yet the normative measures typically used for greenspace allocation, as identified in the literature, are quantitative. This suggests that the role of subjective assessments in greenspace policy and planning may be worth further investigation.

Table 3 Coefficients for GRASP® variables.

	N	P- Value	Standardized Beta	R-square
Functional_Score_N	6218	0.000	0.529	0.280
Lights & Shade	6218	0.000	0.433	0.188
Comfort & Convenience	6218	0.000	0.138	0.019
D&A	6218	0.000	0.553	0.306
Dependent Variable: Comp_Total_N_Value				

Descriptive Statistics for GRASP® Variables in the Dataset

Table 4 provides a comparison of the GRASP® data from composite indicators that were derived for each of the study areas locations. These data were aggregated to form a single master dataset for the statistical analyses performed in the study. *Table 5* shows frequencies for the GRASP® Component Scores assigned during the GS audits. *Figure 1* shows the distribution of final component values after all modifier values have been applied.

Table 6 is intended to examine correlations between two GRASP® composite indicators that incorporate subjective assessments and the objective (quantitative) measure that is also incorporated into the composite indicators. This was done to look for redundancy and multicollinearity between the composite indices and the Total Components measure.

Table 4 Comparison of GRASP® data for study locations

Location	Total GRASP® Value of System (1)	GRASP® Index (2)	Avg. Total GRASP® Value per Site (3)	Avg. GRASP® LOS per Service Acre (4)	% of Study Area with GRASP® LOS (5)
Cary	2843	20	66	221	97
Montgomery County	13,462	14	27	710	100
Prince George's County	11,800	14	22	169	93
Tulsa	5,535	14	30	111	87

Notes:

(1) From tables in the master plan reports. This is the cumulative GRASP®Modified Component Value for all components in the geodataset for that location after modifier scores have been applied.

(2) From the master plan reports. A number calculated by dividing the total GRASP® score by the population, in thousands.

(3) From the master plan reports.

(4) From master plan reports. A value that is generated in the GRASP®process from overlaying service area buffers for all components and calculating an average value for all of the resulting polygons formed by the overlay process.

(5) From master plan reports. This is the percentage of the study area that lies within the 1-mile buffer of one or more components. Put differently, it is the portion of the study area that falls within a 1-mile straight-line distance of an inventoried component.

Table 5 Frequency table for GRASP® Component Functional Scores in the Dataset.

Functional Score Assigned in GRASP®-IT Audit Process	Frequency	Percent
0	24	0.4
1	492	7.9
2	5201	83.6
3	501	8.1
Total	6218	100

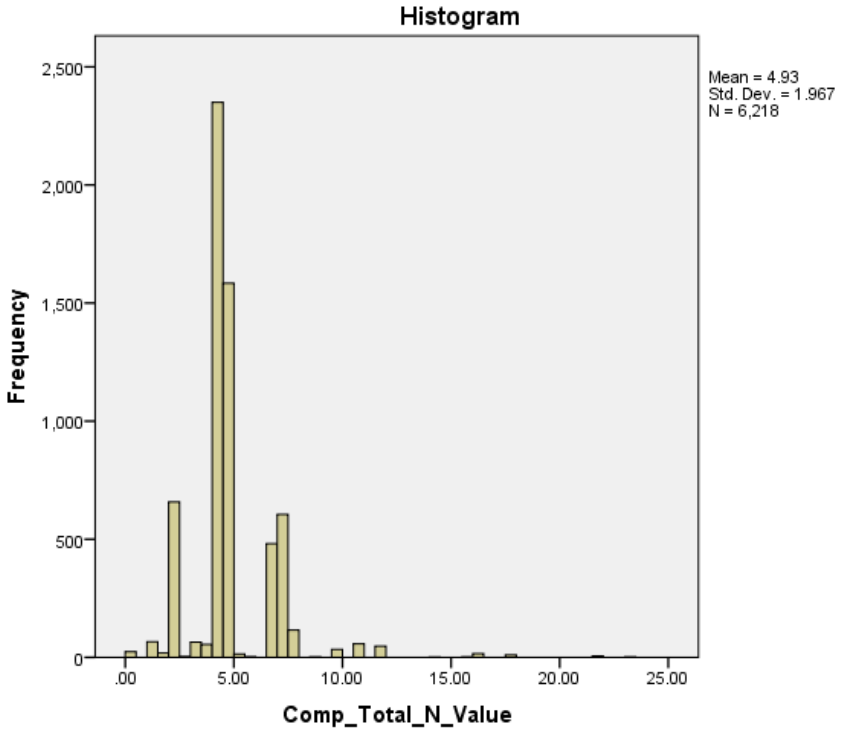


Figure 1 Frequency distribution for final GRASP® component values. *Comp_Total_N_Value* is the Modified Component Value given to a component in the GRASP®-IT audit (see Section *4.3.3.3.4.2*).

Table 6 Correlations for GRASP® values and total components.

		Total Components in Buffer
GRASP® Walk Value	Pearson Correlation	.374**
	Sig. (2-tailed)	0.000
	N	1333
GRASP® Score of Nearest	Pearson Correlation	.061**
	Sig. (2-tailed)	0.010
	N	1804

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix I – Correlations for All Variables

Correlations

		Age in Years	Children in Home	Population Density	Gender	Importance Response	Income Category (HH)	Location	NonWhite_White	Total Over 55 in Home	Total People in Home	Times Used Response	Years in Community	DA of Nearest	Distance to Nearest (Miles)	GRASP Score of Nearest	GRASP Walk Value	Size of Nearest (Acres)	Total Components in Buffer	Overall GRASP Value	GS Acres in Buffer	Sites Intersecting Buffer
Age in Years	Pearson Correlation	1	-.406**	-.109**	-.128**	-.154**	-.142**	.017	.135**	.636**	-.297**	-.155**	.507**	-.080**	-.003	-.048	.038	-.019	.000	.019	.007	.014
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.476	.000	.000	.000	.000	.000	.001	.893	.052	.178	.432	.992	.435	.763	.560
	N	1686	1577	1683	1675	1118	1532	1686	1626	1592	1668	1016	1659	1683	1683	1674	1255	1683	1686	1683	1686	1686
Children in Home	Pearson Correlation	-.406**	1	.033	.067**	.130**	.166**	-.017	-.193**	-.401**	.693**	.105**	-.274**	.020	-.018	-.007	-.019	.004	.002	.004	.000	-.010
	Sig. (2-tailed)	.000		.179	.007	.000	.000	.482	.000	.000	.000	.001	.000	.418	.471	.770	.506	.869	.946	.866	.989	.675
	N	1577	1645	1642	1626	1087	1483	1645	1578	1631	1640	985	1618	1642	1642	1633	1251	1642	1645	1641	1645	1645
Population Density	Pearson Correlation	-.109**	.033	1	.041	-.032	-.093**	.063**	-.163**	-.097**	-.060*	-.006	-.054*	-.160**	-.134**	-.114**	-.079**	-.082**	.064**	.330**	-.025	.176**
	Sig. (2-tailed)	.000	.179		.089	.259	.000	.008	.000	.000	.012	.839	.024	.000	.000	.000	.004	.001	.007	.000	.283	.000
	N	1683	1642	1813	1755	1216	1598	1813	1699	1658	1755	1105	1747	1813	1813	1804	1333	1813	1813	1811	1813	1813
Gender	Pearson Correlation	-.128**	.067**	.041	1	.103**	-.080**	.031	-.047	-.097**	.002	.070*	-.068**	-.036	-.054*	-.024	.019	.028	.032	.048*	.008	.020
	Sig. (2-tailed)	.000	.007	.089		.000	.001	.188	.055	.000	.946	.021	.004	.136	.023	.307	.496	.236	.185	.045	.732	.391
	N	1675	1626	1755	1758	1173	1587	1758	1687	1641	1733	1066	1726	1755	1755	1746	1287	1755	1758	1754	1758	1758
Importance Response	Pearson Correlation	-.154**	.130**	-.032	.103**	1	.032	-.083**	.000	-.109**	.108**	.193**	-.121**	.030	-.002	.074*	.050	-.004	.005	.040	-.002	-.064*
	Sig. (2-tailed)	.000	.000	.259	.000		.295	.004	.992	.000	.000	.000	.000	.288	.955	.010	.159	.882	.856	.167	.934	.026
	N	1118	1087	1216	1173	1219	1095	1219	1139	1101	1183	1038	1160	1216	1216	1215	796	1216	1219	1216	1219	1219
Income Category (HH)	Pearson Correlation	-.142**	.166**	-.093**	-.080**	.032	1	-.296**	.100**	-.130**	.205**	.071*	-.082**	.083**	.046	.067**	.020	.014	-.051*	.151**	.025	-.018
	Sig. (2-tailed)	.000	.000	.000	.001	.295		.000	.000	.000	.000	.024	.001	.001	.065	.008	.500	.563	.041	.000	.314	.471
	N	1532	1483	1598	1587	1095	1601	1601	1562	1496	1583	997	1571	1598	1598	1590	1148	1598	1601	1598	1601	1601
Location	Pearson Correlation	.017	-.017	.063**	.031	-.083**	-.296**	1	-.236**	.094**	-.078**	-.015	.265**	-.245**	-.156**	-.315**	-.347**	.021	-.002	-.214**	.010	.086**
	Sig. (2-tailed)	.476	.482	.008	.188	.004	.000		.000	.000	.001	.618	.000	.000	.000	.000	.000	.366	.938	.000	.685	.000
	N	1686	1645	1813	1758	1219	1601	1816	1702	1661	1758	1107	1750	1813	1813	1804	1333	1813	1816	1811	1816	1816
NonWhite_White	Pearson Correlation	.135**	-.193**	-.163**	-.047	.000	.100**	-.236**	1	.065**	-.139**	.059	.180**	.097**	.110**	.135**	.113**	-.027	.028	.041	-.062*	-.101**
	Sig. (2-tailed)	.000	.000	.000	.055	.992	.000	.000		.009	.000	.060	.000	.000	.000	.000	.000	.260	.246	.095	.010	.000
	N	1626	1578	1699	1687	1139	1562	1702	1702	1595	1680	1031	1672	1699	1699	1690	1254	1699	1702	1698	1702	1702
Total Over 55 in Home	Pearson Correlation	.636**	-.401**	-.097**	-.097**	-.109**	-.130**	.094**	.065**	1	-.133**	-.109**	.401**	-.092**	-.033	-.038	-.022	-.011	.011	-.008	-.007	.018
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.009		.000	.001	.000	.000	.174	.123	.439	.657	.648	.759	.766	.461
	N	1592	1631	1658	1641	1101	1496	1661	1595	1661	1654	997	1634	1658	1658	1649	1254	1658	1661	1657	1661	1661
Total People in Home	Pearson Correlation	-.297**	.693**	-.060*	.002	.108**	.205**	-.078**	-.139**	-.133**	1	.092**	-.164**	.018	-.014	.027	-.026	.006	-.006	.025	-.002	-.009
	Sig. (2-tailed)	.000	.000	.012	.946	.000	.000	.001	.000	.000		.003	.000	.459	.552	.268	.357	.801	.792	.291	.933	.705
	N	1668	1640	1755	1733	1183	1583	1758	1680	1654	1758	1072	1721	1755	1755	1746	1276	1755	1758	1754	1758	1758
Times Used Response	Pearson Correlation	-.155**	.105**	-.006	.070*	.193**	.071*	-.015	.059	-.109**	.092**	1	-.038	.050	-.060*	.091**	.124**	-.025	.117**	.056	.053	.005
	Sig. (2-tailed)	.000	.001	.839	.021	.000	.024	.618	.060	.001	.003		.223	.099	.045	.003	.001	.400	.000	.061	.076	.871
	N	1016	985	1105	1066	1038	997	1107	1031	997	1072	1107	1056	1105	1105	1105	715	1105	1107	1105	1107	1107
Years in Community	Pearson Correlation	.507**	-.274**	-.054*	-.068**	-.121**	-.082**	.265**	.180**	.401**	-.164**	-.038	1	-.160**	-.108**	-.112**	-.087**	.019	.033	.095**	.041	.081**
	Sig. (2-tailed)	.000	.000	.024	.004	.000	.001	.000	.000	.000	.000	.223		.000	.000	.000	.002	.424	.167	.000	.087	.001
	N	1659	1618	1747	1726	1160	1571	1750	1672	1634	1721	1056	1750	1747	1747	1738	1285	1747	1750	1745	1750	1750
DA of Nearest	Pearson Correlation	-.080**	.020	-.160**	-.036	.030	.083**	-.245**	.097**	-.092**	.018	.050	-.160**	1	.095**	.600**	.230**	.173**	.023	-.215**	-.006	-.133**
	Sig. (2-tailed)	.001	.418	.000	.136	.288	.001	.000	.000	.000	.459	.099	.000		.000	.000	.000	.000	.334	.000	.792	.000
	N	1683	1642	1813	1755	1216	1598	1813	1699	1658	1755	1105	1747	1813	1813	1804	1333	1813	1813	1811	1813	1813
Distance to Nearest (Miles)	Pearson Correlation	-.003	-.018	-.134**	-.054*	-.002	.046	-.156**	.110**	-.033	-.014	-.060*	-.108**	.095**	1	.036	-.196**	.004	-.390**	-.227**	-.451**	-.580**
	Sig. (2-tailed)	.893	.471	.000	.023	.955	.065	.000	.000	.174	.552	.045	.000	.000		.129	.000	.876	.000	.000	.000	.000
	N	1683	1642	1813	1755	1216	1598	1813	1699	1658	1755	1105	1747	1813	1813	1804	1333	1813	1813	1811	1813	1813
GRASP Score of Nearest	Pearson Correlation	-.048	-.007	-.114**	-.024	.074*	.067**	-.315**	.135**	-.038	.027	.091**	-.112**	.600**	.036	1	.300**	.185**	.061**	-.045	.099**	-.119**
	Sig. (2-tailed)	.052	.770	.000	.307	.010	.008	.000	.000	.123	.268	.003	.000	.000	.129		.000	.000	.010	.057	.000	.000
	N	1674	1633	1804	1746	1215	1590	1804	1690	1649	1746	1105	1738	1804	1804	1804	1324	1804	1804	1802	1804	1804
GRASP Walk Value	Pearson Correlation	.038	-.019	-.079**	.019	.050	.020	-.347**	.113**	-.022	-.026	.124**	-.087**	.230**	-.196**	.300**	1	-.034	.374**	.046	.221**	.168**
	Sig. (2-tailed)	.178	.506	.004	.496	.159	.500	.000	.000	.439	.357	.001	.002	.000	.000	.000		.210	.000	.092	.000	.000
	N	1255	1251	1333	1287	796	1148	1333	1254	1254	1276	715	1285	1333	1333	1324	1333	1333	1333	1333	1333	1333
Size of Nearest (Acres)	Pearson Correlation	-.019	.004	-.082**	.028	-.004	.014	.021	-.027	-.011	.006	-.025	.019	.173**	.004	.185**	-.034	1	-.067**	.040	.225**	.021
	Sig. (2-tailed)	.432	.869	.001	.236	.882	.563	.366	.260	.657	.801	.400	.424	.000	.876	.000	.210		.004	.086	.000	.376
	N	1683	1642	1813	1755	1216	1598	1813	1699	1658	1755	1105	1747	1813	1813	1804	1333	1813	1813	1811	1813	1813
Total Components in Buffer	Pearson Correlation	.000	.002	.064**	.032	.005	-.051*	-.002	.028	.011	-.006	.117**	.033	.023	-.390**	.061**	.374**	-.067**	1	.194**	.471**	.515**
	Sig. (2-tailed)	.992	.946	.007	.185	.856	.041	.938	.246	.648	.792	.000	.167	.334	.000	.010	.000	.004		.000	.000	.000
	N	1686	1645	1813	1758	1219	1601	1816	1702	1661	1758	1107	1750	1813	1813	1804	1333	1813	1816	1811	1816	1816
Overall GRASP Value	Pearson Correlation	.019	.004	.330**	.048*	.040	.151**	-.214**	.041	-.008	.025	.056	.095**	-.215**	-.227**	-.045	.046	.040	.194**	1	.273**	.373**
	Sig. (2-tailed)	.435	.866	.000	.045	.167	.000	.000	.095	.759	.291	.061	.000	.000	.000	.057	.092	.086	.000		.000	.000
	N	1683	1641	1811	1754	1216	1598	1811	1698	1657	1754	1105	1745	1811	1811	1802	1333	1811	1811	1811	1811	1811
GS Acres in Buffer	Pearson Correlation	.007	.000	-.025	.008	-.002	.025	.010	-.062*	-.007	-.002	.053	.041	-.006	-.451**	.099**	.221**	.225**	.471**	.273**	1	.562**
	Sig. (2-tailed)	.763	.989	.283	.732	.934	.314	.685	.010	.766	.933	.076	.087	.792	.000	.000	.000	.000	.000	.000		.000
	N	1686	1645	1813	1758	1219	1601	1816	1702	1661	1758	1107	1750	1813	1813	1804	1333	1813	1816	1811	1816	1816
Sites Intersecting Buffer	Pearson Correlation	.014	-.010	.176**	.020	-.064*	-.018	.086**	-.101**	.018	-.009	.005	.081**	-.133**	-.580**	-.119**	.168**	.021	.515**	.373**	.562**	1
	Sig. (2-tailed)	.560	.675	.000	.391	.026	.471	.000	.000	.461	.705	.871	.001	.000	.000	.000	.000	.376	.000	.000	.000	
	N	1686	1645	1813	1758	1219	1601	1816	1702	1661	1758	1107	1750	1813	1813	1804	1333	1813	1816	1811	1816	1816

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).