

The Geography of Nature Access Opportunities

Jonathan E. Knight | Master's Report | 2012
Landscapes of Learning

THE GEOGRAPHY OF NATURE ACCESS OPPORTUNITIES

by

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A REPORT

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abstract

Experiences in natural environments are perceived as a human necessity. Additionally, prior studies show that nature access has emotional, cognitive, and psychological benefits for children. Nature is defined as a space comprised mostly of vegetation that allows an individual to escape common surroundings. Access is defined as the ability to interact with high-quality nature by walking or biking in close proximity to one's place of residence.

This geospatial analysis employs Geographic Information Systems (GIS) technology and site analysis to assess whether or not socioeconomic factors, and their relationship to housing choice, affect a child's access to nature. The study includes measures of socioeconomic status and how these factors influence a child's access to nature within parks and school facilities. The results show that including qualitative factors enhances the traditional model of measuring "distance as access." There was no inequality in access found in the study area when qualitative factors are included. The project implication is that communities can focus public resources and planning efforts in areas lacking access to nature for children. This leads to geographically less segregated neighborhoods and improved equity in nature access across a community.

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I am thankful for the tremendous education I have received at K-State from every professor in the Department of Landscape Architecture/Regional and Community Planning. There are too many to list here unfortunately. Thank you all for the tremendous skills, knowledge, and experiences that will serve me well in the future as I embark on my planning career.

Finally, I would like to thank all members from the "Landscapes of Learning" Master's Report group. Every member brought forward a unique perspective and new ideas for each of us to explore throughout the research process. Each has supported and influenced this project in their own way.

Dedication

This is dedicated to my loving family: Allyson, Patrick, and especially Mom and Dad. Your support, guidance, and love throughout my life cannot not go unrecognized.

To Mom and Dad: Thank you for instilling in me the importance of an education. Thank you for being examples of how hard work and dedication pay off. Thank you for your encouragement and willingness to allow me to explore the natural world as a child. It has shaped me perhaps more than you know. Thank you for the last 23 years. I would not be here without you.

"To affect the quality of the day, that is the highest of arts."

-Henry David Thoreau

front matter.

FOREWORD + PREFACE

Foreword

The Landscape Architecture/Regional & Community Planning graduates of 2012 are the first class to participate in a collaborative studio process leading to completion of their individual master's reports. Seven of these graduates chose to work under the topic Landscapes of Learning. The interests of the group were broad: biophilia, access to nature for children, childhood development and special needs, ecological interpretation, participatory design, public play spaces, and landform as art. The common conversation centered around big questions: How can all children have access to nature for learning through play? What creates a rich, outdoor environment for all kinds of children and young adults?

A formative experience in my understanding of landscapes for learning occurred in 2008-2010, when I helped create a learning garden at a local elementary school. One hundred eighty people built the school garden over eighteen weekends. The garden was handmade. Raised planters were built by Boy Scouts and a kind dad with a miter saw. A talented landscape contractor helped build a 14-foot long limestone bench. The Parent-Teacher Organization's unofficial 'dad of the year' made it a family affair — his siblings, mother, father, and children all returned to the garden site for many weekends of work.

Sadly, the garden existed for just 153 days. The voting public passed a bond for school renovation and the elementary school received funds for a beautiful building expansion. The garden turned out to be too difficult to stage around during construction.

The learning garden had become a talisman to me. In it, I saw a kind of landscape I had never made in a professional firm. The garden was decidedly humble and handcrafted, made of creamy Kansas limestone and native plants bought or donated and dug in a few at a time. The garden was 'quiet' aesthetically: native wildflowers and grasses, crushed stone paths, tree shade, planters with compost-rich soil. The garden was designed for diverse experiences: learning across the grades and curriculum, quiet time, and play. There was always a puddle somewhere, reflecting leaves and strands of switchgrass. During the fall it was completed, 4th graders would run to the side of the garden intern at recess to ask if they could help weed, or mulch, or rake. When the news sunk in that the garden was gone, I looked at its photographic ghost in satellite imagery. How could so many people want something, work so hard to make it happen, and yet it could not survive?

The humble learning garden had answered a creative drive for me. I had wanted to make social sculpture: to bring a socially-significant place to life beyond words and images. The garden's absence opened me to questions about landscapes of/by/for learning.

The 2012 Landscapes of Learning studio became a forum for these questions. Seven master of landscape architecture and master of regional and community planning students selected the studio as the crucible for their final year's projects. The graduate student researchers conceived of their bond as a colloquium, where each shared information freely to raise the expertise of all.

Though each student defined his or her own project, all projects engaged the community of Manhattan, Kansas (the setting for Kansas State University); and all projects questioned what we as future landscape architects and planners assume about landscapes for children. In nine months' time, a diverse set of

projects took shape to address a range of questions:

If we assume access to nature to be beneficial to children, are some children denied access due to socioeconomic status and its impact upon housing choice?
Jonathan Knight, Wichita, Kansas

In a neighborhood with no parks, can an oversized middle school property serve a joint use for school and neighbors?
Shuang Hao, Manhattan, Kansas / Suihua, China

How can an elementary school in a flood plain landscape meet diverse schoolyard needs while also interpreting the hydrologic cycle for children?
Laura Weatherholt, Tulsa, Oklahoma

How can a schoolyard be designed to be a therapeutic environment for all children, with an emphasis on benefiting those children with autism?
Chelsey King, St. Peters, Missouri

How can planners and landscape architects improve community participatory design methods for determining what children need and desire in a school landscape?
Kweku Addo-Atuah, Accra, Ghana

Contemporary schoolyards often lack creative expression. How can humanities research serve as evidence for the design of a functional schoolyard that is also a sculptural work of art?
Rebecca Melvin, Seattle, Washington

In the temperate Midwest United States, interiorscapes are seldom a feature of public schools. How should an interiorscape be designed to integrate the natural and built environment within an existing high school?
Sukaina Fakhraldeen, Kuwait

The reports address landscapes of learning at a range of scales: from city planning to interior scale. The projects also exhibit a great variety in conceptual approach: from personal and poetic design driven by humanities knowledge to participatory design process including nearly one hundred students. What is not evident in the list of questions is the interrelationship between projects. The individual report which follows will provide a point of reference. The individual researcher's goals will be made clear, but will also be linked to a collective annotated bibliography made by the studio. Some reports refer to the work of other students, as several projects were interdependent, but each report is original work, completed by the individual author.

As a whole, the 2012 Landscapes of Learning master's reports do not focus narrowly upon the most popular topics of the day: encouraging active play and control of childhood obesity. Instead, our holistic approach demonstrates creative and scholarly inquiry representing a breadth of themes in contemporary discourse about experiential learning environments for children.

Assistant Professor Katie Kingery-Page
Major Professor to the Landscapes of Learning Students
April, 2012

Preface

Henry David Thoreau once wrote, "to affect the quality of the day, that is the highest of arts." I held onto this quote for many years and I was always searching for the profession that would allow me to follow Thoreau's prophetic words. It took me until my first year of college, where I found a profession called "planning," that I found my answer. Planning is many things, but at its heart, it's about making great communities, leading to citizens with happier, healthier, and more productive lives. It's about helping people's dreams become a reality. Planners have a responsibility to be a source of inspiration and to provide ideas about what might be and ought to be. This project is about access to nature for children: how it might be and what it ought to be.

This is a project 23 years in the making. The reflection of my own nature experiences has led to the instigation of this project. The defining characteristic of my own nature experiences is access. Without easy access, I would not have had childhood nature experiences leading to later childhood experiences. The project is grounded in my personal journey of nature experiences throughout my childhood (for example, Figure P.1 and P.2); I have experienced firsthand the importance of nature in a child's life. I do not believe I would hold the same life values, ethics, and morals without positive nature experiences. Nature experiences shape the way we see the world, our appreciation for it, and our appreciation of life. Childhood memories and experiences lend a unique lens toward the world.

Now that I am older and have greater mobility, I have scaled half of Colorado's 14,000 foot peaks in some of the most pristine, beautiful wilderness in the country. I have captured wilderness through photography. I have hiked both far and near, with many accompanying memories. I have golfed in some of the most beautiful locations the country has to offer. I am confident these later experiences would have been unlikely to occur if it were not for early nature experiences.

Figure P.1 | *Author, Age 3*



Society, culture, and nature are linked in many ways. Everything we create is derived from nature's harmony. We seek it for inspiration and we copy it in design. We are seeing the world around us becoming more chaotic and complex. We can look to the harmony of nature to guide us back. It's this harmony that allows whales and sharks to live in the same ocean; harmony that allows tornados and rainbows to appear in the same fields; harmony that allows the body and mind of all living beings to function as one.

This project is about how early nature experiences shape a realization and appreciation for life and our place in a vast harmonic universe. It's about how communities should be designed and how nature should be considered in an increasingly complex and chaotic physical world. It's about how nature allows us to appreciate life's moments—good and bad—even more.

This project is about the nexus between nature and planning. About how a profession can uphold the ideals of what might be and ought to be in a person's life. It's about how planning, through consideration of nature, can affect the quality of the day.



Figure P.2 | *Author, Age 4 in Colorado*

Project Goals::Personal

- Reconcile personal experiences of nature
- Gather additional knowledge about Manhattan community
- Communicate interests and skills related to spatial analysis, recreation planning, and school planning

Project Goals::Professional

- Contribute planning knowledge to the Manhattan community
- Show how GIS systems can contribute to solving spatial planning problems
- Demonstrate how geography, economics, and planning interact across scales

Project Objectives::

- Determine whether socioeconomic factors influence access to nature in Manhattan, Kansas
- Analyze need of nature access in Manhattan community
- Research how nature benefits elementary and middle-school aged children
- Complete unique research project in the area of environmental planning and infrastructure provision
- Provide examples of communities with high access to nature achieved through planning
- Suggest how school planning and design could be used to mitigate low neighborhood/community access to nature

Reader Expectations

This report is primarily the exploration of a set of theories and planning practice ideologies. As such, scholarly work and scientific inquiry processes heavily support it. However, the intended audience of this text is not scholarly, so efforts have been taken to speak plainly about the theoretical principles explored and technical analysis techniques used.

The intended audience of this text is policymakers, planners, educators, and parents. It could serve as an information source and guide for policymakers and planners. It could guide recreation planning. It can help parents and educators understand the importance of access to nature and the opportunities and constraints of this access in the study area. This report is also a call to action, helping decision-makers and other stakeholders see the inherent importance of nature access for children.

Following is a brief description of the document and the information contained within each chapter.

Chapter 1 ("Introduction") introduces the project and the related study topics, and questions of interest for the study.

The book continues with a description and presentation of the processes and conceptual thinking required to execute the document (Chapter 2: "Project Inception"). This section is intended to show readers the relationship between parts of the book and the origins of the final project. It provides a basic understanding of where the project started and where it will finish. Chapter 3 ("Theoretical Exploration") explores the theoretical groundwork of the project. Research assumptions are based upon literature review.

Chapter 4 ("Building a Project Foundation") provides essential information regarding the project's context, location, study population, and project scale.

Chapter 5 (MHK: Past, Present, Future) analyzes the study area's physical, cultural, and social past, present and future. It includes key statistics and graphs helping readers to further understand the project's context and study populations. It shows basic relationships between variables of interest.

Chapter 6 ("Methodology Construction") summarizes five precedent studies, helping to inform the study's methodology. The specific methodology and variable measurement follow the precedent studies. The chapter documents a critical step in the process of the project. The five precedent studies and the methodology inform the analysis and findings.

Chapter 7 ("Analysis and Findings") presents the study's findings and analyzes them with regard to the study question and study population.

Following the project analysis and findings, conclusions are expressed in Chapter 8 ("Conclusions"). Policy implications and recommendations inform future development in the study area. The generalizability of the study is analyzed. Finally, the chapter concludes with acknowledgement of study limitations and directions for future research.

chapter one.

INTRODUCTION

Project Dilemma

There is duality in the 21st century human experience. Many people live in vast metropolises with great efficiency—from breathtaking engineering accomplishments, vast and complex transportation systems, to complex information systems and physical infrastructure systems. Cities are great feats of human creativity and ingenuity, of progress and development. We live amongst mind-numbingly complex systems. Urban cities are the center of 21st century human existence. On the other hand, we bond evolutionarily and instinctually with other living systems through thousands of years of evolution and human migration, movement, and living circumstances. The biophillia hypothesis suggests such a connection (Wilson 1984).

Therefore, on one hand we dominate nature with our great industrial accomplishments; on the other, we yearn for its psychological and emotional benefits suggested by environmental psychology theory and experiential learning theory. As Charles Lewis reiterates, "Our magnificent cities are nourishing for only a favored few. For the rest, our culture is one of ever-increasing stress… I believe that part of the reason for these increasing symptoms of dysfunction is due to the fact that we have severed connections with our evolutionary roots. They represent a mismatch between innate physiological and neurological needs and the results of technical prowess. As a species that lived most of its life surrounded by elements of nature, within recent history we have transformed our habitat into high-density cities of brick, stone, glass, concrete, and asphalt. Our ancient selves are out of sync with what has recently been created. The drastic changes in how we live have not had time to be absorbed into the systems that slowly evolved within us" (Lewis 1996, 130). As Manhattan continues to grow and thrive, it should do so with acknowledgement of how humans act and feel within complex civilizations and the perceived importance of a connection to nature.

The duality presents a complex dilemma for planners. Planners often consider urban-centric planning and design as the epitome of an effective planning paradigm (Campbell 1996; Duany & Plater-Zyberk 2001; Kunstler 1994). However, an urban lifestyle is one that can be largely absent of nature access. Additionally, the world's population is becoming more urban and for the first time ever the human population is more urban than rural (United Nations 2010). There is tension between 21st century population trends, planning paradigm trends, and nature access.

> *As a species that lived most of its life surrounded by elements of nature, within recent history we have transformed our habitat into high-density cities of brick, stone, glass, concrete, and asphalt. Our ancient selves are out of sync with what has recently been created.*
>
> -Charles A. Lewis

Thesis

There is an unequal distribution of opportunity in experiencing nature in our current land-use planning regime. There may exist varying opportunity for connection to nature by a child based on a combination of their socio-economic living circumstances and the surrounding physical environments in Manhattan, Kansas. City and parks planning in Manhattan should uphold the charge of ensuring the health, safety, and general welfare by ensuring all children have the ability to connect with nature.

Research Question

Do socioeconomic factors, and their influence on housing location choice, affect a child's ability to access high-quality nature?

Questions of Interest

Where do children live?
Where do various races live?
Where are household values highest/lowest?
Who has greater access to high-quality public nature?

Do socioeconomic factors, and their influence on housing location choice, affect a child's ability to access high-quality nature?

I plucked my newly found berry sustenance from the tree with little concern of my shirt color. Like most children, I was concerned only with collecting as many berries as possible in the shirt, folded like a basket. I would have made a great winter preparation companion to a squirrel. I tasted a few, then continued to collect the small red berries invading the area, like a bird collecting twigs for a nest. Of course, the bird has a goal in mind. I did not. Instead, I continued to collect, perhaps to eat or perhaps just to pile up for no good reason. Regardless, I continued with little observation of my increasingly red-stained shirt.

Mom wasn't happy when I returned with my new find stuffed into my white shirt. Perhaps too much nature is a bad thing? Nah. I remember the experience, I don't remember the shirt.

chapter two.

PROJECT INCEPTION

Research Process

The research process for this master's report was non-linear and constantly evolving. One inquiry led to another. Occasionally one inquiry sparked a distinct line of thought. Together, the numerous paths contribute to an ever-increasingly cohesive research process (Figure 2.1). The final product is a reflection of a long period of synthesis and evolving thought (Creswell, 1998). Rarely was one step completed without revision or changes as the project progressed. Project components reflect a process where components were consistently revised and changed to reflect the holistic project goals and objectives.

The research process began with a question map (Figure 2.2, right), outlining particular lines of theoretical or practical thought. Through this exercise, generalities were made of potential theories to explore. Thus, the question map process revealed broad topic areas to explore further. Eventually, with aid of the question map, a refined project philosophy and process were discovered.

The project philosophy (Figure 2.3) represents the core components of the project. The significance of human life

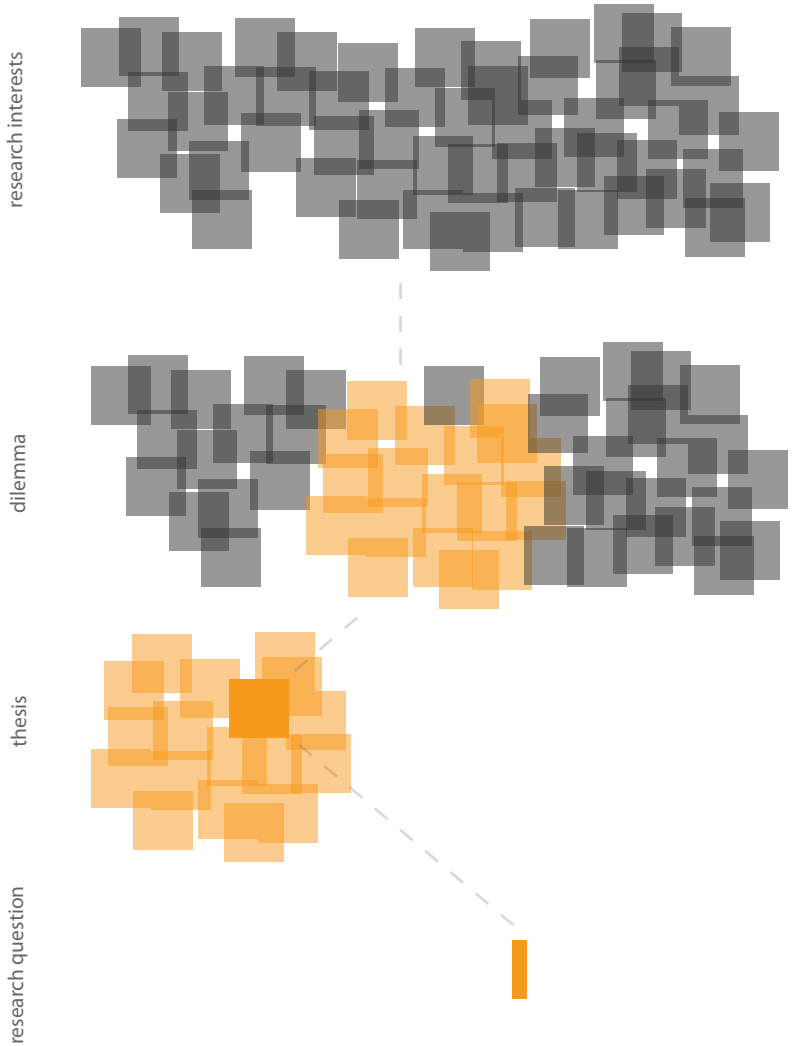


Figure 2.1 | *Progression of Conceptual Thinking*

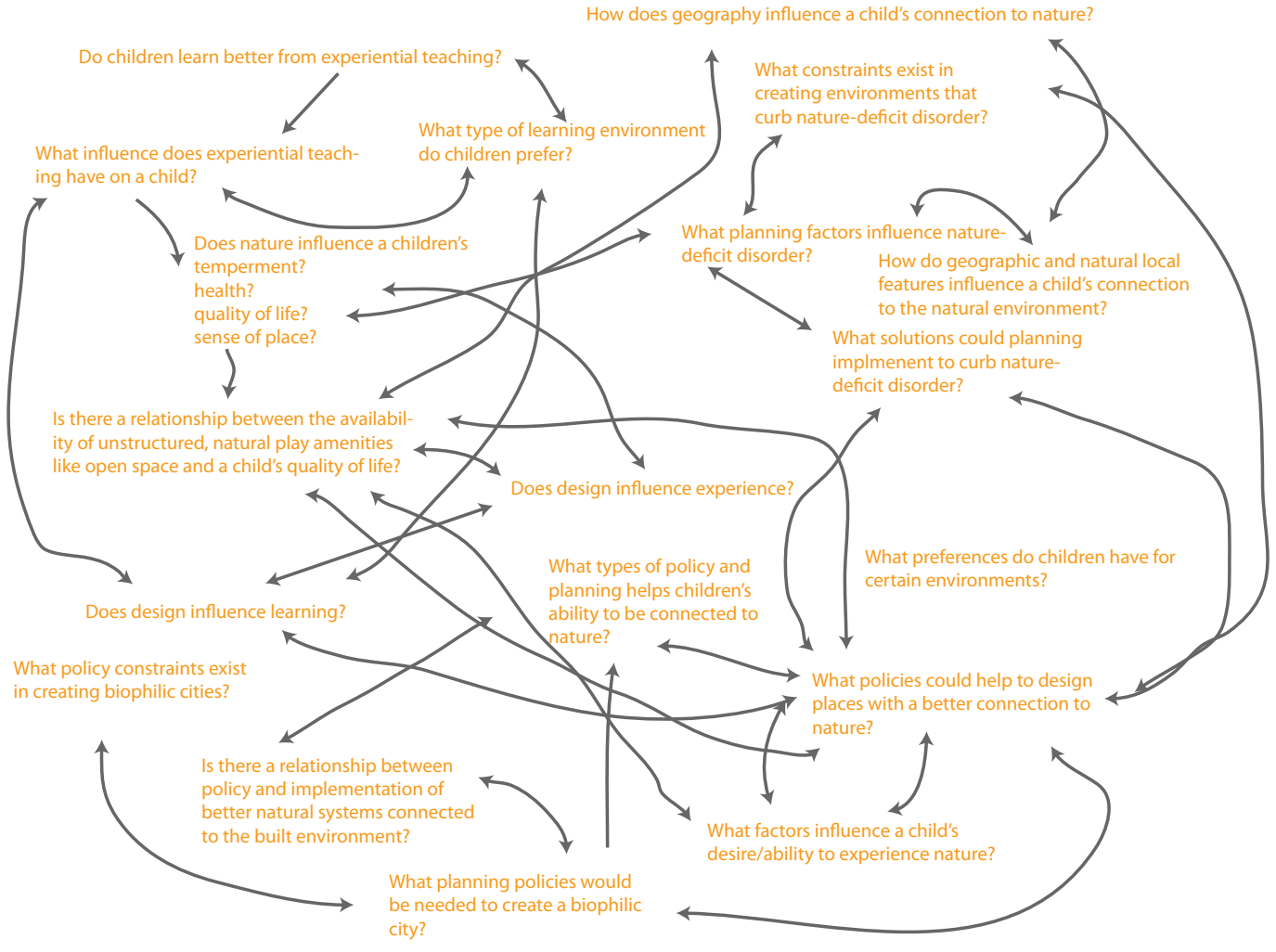


Figure 2.2 | *Question Map*

experiences and what impacts certain thoughts, feelings, and memories as one moves throughlife is an underlying motivation for the study. The project dilemma reflects these thoughts with respect to current development and population trends. This project argues that one of the key elements to a positive human experience is opportunity for experience nature—that one's experiences in nature provide one with an important lens to life's experiences (Wilson 1984; Louv 2008). From there, the research departs from theory into planning practice. Perhaps there are roadblocks to nature opportunities, specifically how access varies from person to person based on geographic location, influenced by socio-economic factors and housing. This breeds a testable question. After analysis, project findings contribute to planning policy and theory.

The spiraling form of Figure 2.3 emphasizes the ever-evolving refinement of research questions and project scale as the project moves from theoretical space to practical application.

Figure 2.4 communicates more specifically the factors and procedure for completing the study. The project begins within a theory space asserting the benefits of nature access using three tenants: the biophilia hypothesis, environmental psychology, and human health and well-being. This informs theory about how socio-economic factors and housing choice influence the ability for various people to interact with, and benefit, from nature.

The project then moves from theory to practical application of the study.

The project ends with planning policy recommendations and implications based on the study results. In turn, this re-informs the theory space.

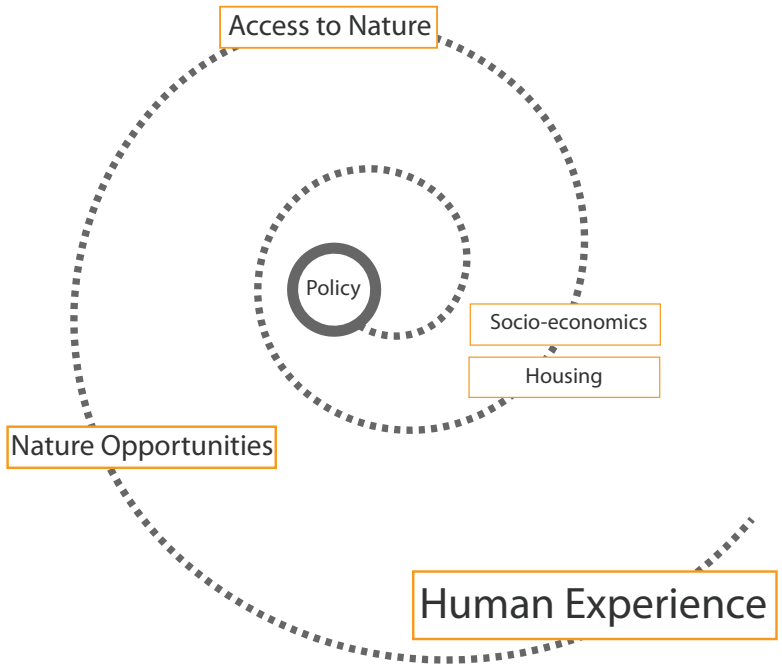


Figure 2.3 | *Project Philosophy*

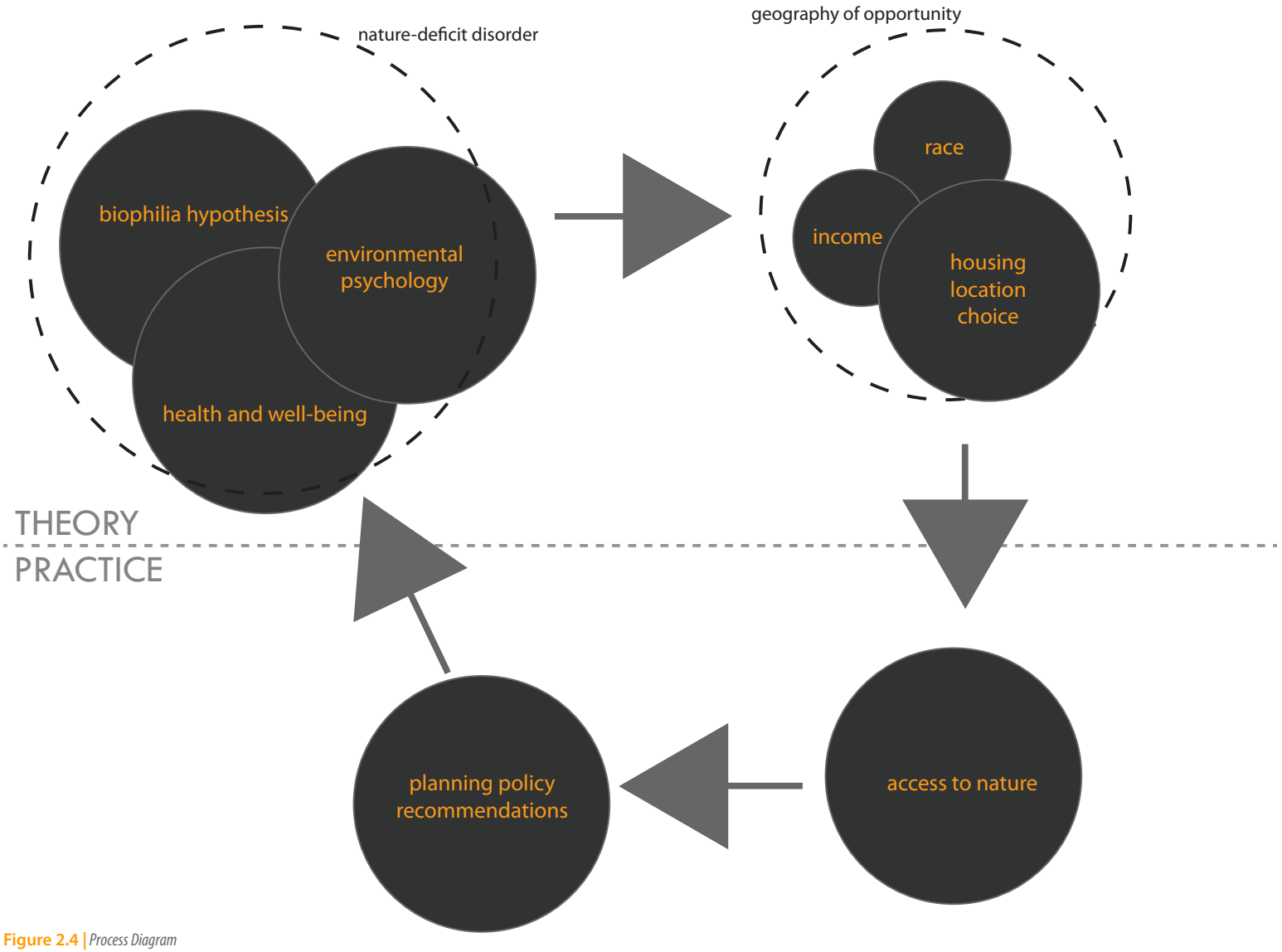


Figure 2.4 | *Process Diagram*

I was deep inside my castle, protecting it from the impeding attack by the fluffy army outside its walls. I crouched inside my castle with my faithful second-in-command at my side. We discussed quite seriously the tactics that were necessary to ward off the approaching enemies. Eventually our plan of defense was put into action. We bombarded the enemies with green, sticky grenades, successfully spreading them back into the trees. We hid behind our four-foot high castle walls for some time before an attempted escape. Unfortunately, a second wave of army combatants approached. Out of green, sticky grenades, my second-in-command and I resorted to other means of attack including brown sticks of TNT.

It only took a cylindrical pile of Fall leaves, hedge apples, and sticks to germinate seeds of creativity—against a group of squirrels. I was the king of my Nature Castle.

chapter three.

THEORETICAL EXPLORATION

Nature and Humanity

This section lays the theoretical foundation for the purpose of this research study. The purpose of the research study is to measure accessibility and equity in opportunities to experience nature by children. Several theoretical tenants bound the project: biophilia & biophobia, environmental psychology research on children, and the associated geography of opportunity for accessing public provisions. These concepts bound the practical application of determining to what degree various socio-economic backgrounds and its relationship on housing choice affect a youth's ability to have experiences in nature.

The literature cited and described was selected as the most relevant literature from a pool of literature summarized by the Landscapes of Learning Master's Report Group (Appendix B). The literature most important to this project is visualized as a set of four topics found in Figure 3.1.

The positive contribution of nature to the enterprise of human life is widely cited (see Kellert & Wilson 1993; Louv 2005; Strife & Downey 2009; Wilson 1984). Humans have developed a long relationship to their surrounding natural environment. For ninety-nine percent (99%) of human existence humans were hunter-gathers, finding the necessities of life: food, shelter, and water by roaming the landscapes of pre-modern civilization (Kellert & Wilson 1993). It is only within the last few hundred years that we have progressed from hunter-gathers to one of an urban, sedentary lifestyle. We are seeing human manufactured change to the environment in an unprecedented amount in the history of the human species (Saunders, 1999). As Gullone (2000) proclaims:

"Technology has enabled us to plough and pave the most unlikely landscapes, to travel and communicate across unforeseen distances, and to technologically produce and manipulate material goods and sentient beings, including ourselves…we go on advancing with the blind assumption...[we have] unlimited capacity to adapt to the environment, no matter how far removed it is from that in which we evolved" (294).

Following the Industrial Revolution, in the 19th and early 20th century, designers and planners began to consider the use of nature for restorative purposes (Ulrich et al. 1991). Frederick Law Olmsted specifically cited nature as an effective restorative device for the industrial worker in New York City in his 1865 design of Central Park. Evidence and support of nature's benefits towards humans has since persisted. Numerous studies support the conclusion that nature in our built environment provides various benefits. The next four sections describe the theoretical literature supporting this proposition.

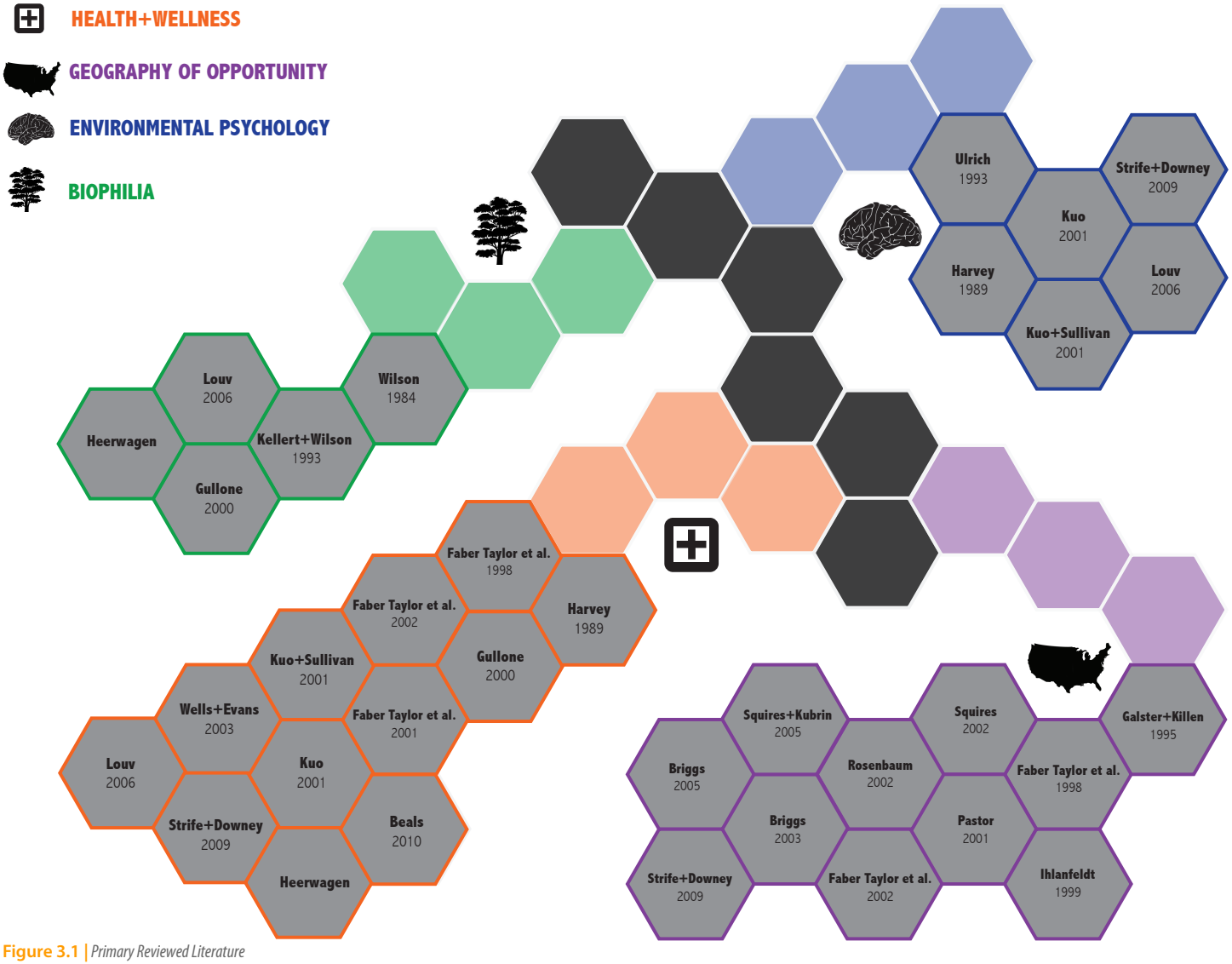


Figure 3.1 | *Primary Reviewed Literature*

Biophilia

Coined by Edward O. Wilson in a 1970s New York Times article, biophilia describes "the innate tendency of human beings to focus on life and lifelike processes" and "connections that human beings subconsciously seek with the rest of life." This tendency is hypothesized as resulting from the genetic and evolutionary processes throughout human history (Kellert & Wilson 1993; Wilson 1984). Wilson argues that humans are evolutionarily connected to other living systems through thousands of years of coexistence. "Life of any kind is infinitely more interesting than almost any conceivable variety of inanimate matter" (p. 84). As such, biophilia arises from a complex set of rules that, when taken apart and tested individually, then aggregated together, forms the basis of the term "biophilia" (Kellert & Wilson 1993). Associated keywords to this concept can be seen in Figure 3.2.

Empirical literature and analysis describing the converse (negative) claims made by the biophilia hypothesis can prove helpful when trying to analyze the positive state of biophilia. The inverse of biophilia is called "biophobia". The basic argument for "biophobia" is that human evolution took place in natural environments with both rewards and dangers. Thus, an individual's ability to recognize, learn, and adapt to natural hazards was favored in evolution compared to those who did not (Kellert & Wilson 1993; Louv 2005; Wilson 1984).

In Wilson's (1984) groundbreaking text, he conveys the relationship humans have with such creatures as snakes and their mythical adaptation—the biblical serpent. He explains how large numbers of people have inordinate fears of such creatures and have recurring nightmares related to them (Wilson 1984). How, in a culture mostly devoid of contact with such creates, can we have a conditioned response to fear and tense in the presence of one? Human nature is biased towards certain forms and the brain and nervous system's responses are conditioned for certain creatures and spaces (Wilson 1984; Kellert and Wilson, 1993). The bias we show towards certain creatures is "exemplified so strikingly in fear and veneration of the serpent" (Wilson 1984, p. 101). Such fears and biological reactions to snakes and serpents lead us into the empirical findings clarifying the serpent tales from Wilson.

Empirical literature supports the claims that humans prefer certain environments over others, the essence of the biophilia hypothesis. Wilson (1984) presents this evidence. He calls our preference the "savanna gestalt" – a mix of the Africa savanna, topographic relief (hills, mountains, plateaus), and lakes and rivers. "When people are confined to crowded cities or featureless land, they go to considerable lengths to recreate an intermediate terrain, something that can be called the savanna gestalt" (p. 111).

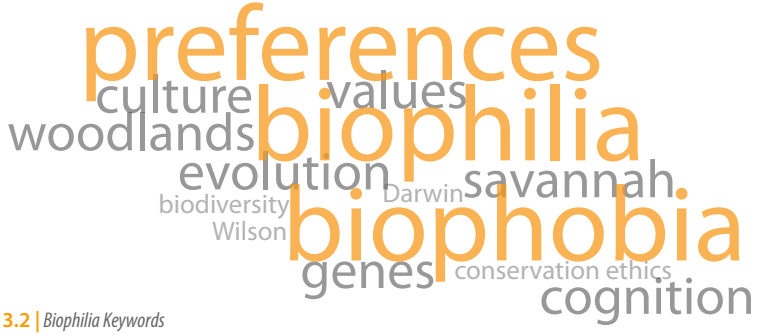


Figure 3.2 | *Biophilia Keywords*

There is still only casual evidence to support the biophilia hypothesis. More work needs to be done to substantiate the biophilia hypothesis. However, Gullone (2000) concludes "there is substantial evidence to suggest that, as a species, our modern lifestyle may have strayed too far from that to which we have adapted. There is also support for the proposal that including elements of nature or of our species' ancient life style into our modern lifestyle may serve to enhance our psychological well-being."

Health and Wellness

Health and wellness is a broad sub-topic that encompasses a variety of ideas (see Figure 3.3).



Figure 3.3 | *Health and Wellness Keywords*

Since the United States began to urbanize and urban areas here have sprawled outward for nearly a century, there is now a reduced availability and direct contact with nature (Louv 2005). There is strong evidence that children are spending more time indoors and less time outside in nature (Chawla 2006b; Davis 1999; Hofferth & Sandberg 2000; Louv 2007; Pyle 2002). In fact, preferences for video games or watching TV has increased so much that the Kaiser Family Foundation and the Centers for Disease Control found that a child is six times more likely to play a video game on a typical day than to ride a bike (Cauchon 2005). Related studies show that an average American child spends more time watching television (1,023 hours per year) than in school (900 hours per year; Sharif & Sargent 2006) and that the amount of "screen time" (computer, television, videogames) that children experience per week directly correlates with their measure of body fat (Louv 2005). Considering such sedentary behavior, it's not suprising that "50% of school-age children and adolescents in the United States are overweight" (Berk 2005). A large body of literature supports the idea that children are no longer experiencing nature as strongly as in the past (Chawla 2006b; Faber Taylor & Kuo 2006; Gaster 1991; Hofferth & Sandberg 2000; Kellert 2002; Louv 2005; Pyle 2002; Wells & Lekies 2006, cited in Strife & Downey 2009). This lack of nature experiences may be causing much health, cognitive, and emotional problems in today's youth.

Diminished contact with nature has been linked to childhood health trends including depression, cognitive disabilities, obesity, diabetes, hypertension, attention-deficit disorder (ADD), and attention-deficit hyperactivity disorder (ADHD) (Louv 2005). Because of growing evidence, researchers are beginning to ask how nature may play into such health and psychological problems. Several studies (see Frumkin 2005; Frumkin & Louv 2007; Louv 2005) have found a significant link between decreased outdoor activity in nature, increased time inside, and rising childhood obesity. These results, in turn, support the findings

by a study from the Center for Disease Control (2007) which found that a lack of time in nature is linked to physical health risks such as "coronary heart disease, hypertension, Type 2 diabetes, stroke, sleep apnea, respiratory problems, and even some cancers" (Centers for Disease Control 2007 cited in Strife & Downey 2009). These health trends show the startling relationship between diminished time in nature and human health.

Environmental Psychology

Additional literature supports the conclusion that access to nature has psychologically restorative effects. That is, experiences, time spent, and simply views of nature, help mitigate daily emotional problems like stress (see Figure 3.4 for relevant keywords).

A lack of natural connection may be producing more cognitive and mental health problems in young children, as well. Strife & Downey (2009) found a number of studies (Frumkin & Louv 2007; Kellert 2005; Louv 2005; Petty et al. 2005) that show "an unprecedented number of children currently experience acute mental and cognitive disorders that may be tied directly to physical inactivity and lack of exposure to the natural world" (105). Childhood



Figure 3.4 | *Environmental Psychology Keywords*

depression, something unheard of before the last decade, is now rifling its way to youth as demonstrated by the National Institute of Mental Health. They estimated that 2.5% of all children and 8.3% of all adolescents have a form of clinical depression (Birhaher Ryan & Williamson et. al 1996).

As mentioned earlier, ADHD has become "one of the most prevalent neurobehavioral disorders among children" (Strife & Downey 2009; Center for Health, Environment, and Justice 2001). More than two million school-age children have ADHD (Faber Taylor et al. 2001). Spending on ADHD medication for preschoolers increased by 369% (Louv 2005) in the years from 2000 to 2003. There is startling evidence that children have diminished activity in nature are suffering serious cognitive and psychological health problems (Faber Taylor, Kuo & Sullivan 2001, 2002; Faber Taylor, Wiley, Kuo & Sullivan 1998; Grahn, Martensson, Lindblad, Nilsson, & Ekman 1997; Petty et al. 2005; Wells 2000; Wells & Evans 2003).

Empirical literature supports that time access to views of nature reduces outbreaks of anger and violence (Kuo and Sullivan 2001), induce self-discipline in children (Faber Taylor, Kuo & Sullivan 2002), and are mentally restorative (Kuo 2001). Additionally, vegetation such as trees and shrubs are important elements in landscapes for natural, experiential play (Faber Taylor, Kuo, & Sullivan 1998). Barren grass-scapes are not effective for inciting restorative play experiences.

Nature can help mitigate ADHD and other mental health problems. Also, the literature suggests that nature plays a role in psychological well-being. However, certain elements must exist in order to provide such experiences (Faber Taylor, Kuo, & Sullivan 1998).

Taken as a whole, the literature review supports the claim that access to nature is an important consideration for children development. A child's health and well-being and psychological development are, in part, dependent on experiencing nature.

Geography of Opportunity

Galster & Killen (1995) proposed the term 'geography of opportunity' to refer to the various ways in which geography influences individuals' opportunity (Figure 3.5). Further, where someone lives has direct relationship to social and economic opportunities (Rosenbaum 1995).

In Rosenbaum's (1995) landmark research effort, The Gautreaux program, used a quasi-random design. All participants came from the same low-income city neighborhood and chose where to live during the course of the program. Some moved to middle-income white suburbs while others chose low-income black urban neighborhoods. Although they have a choice, housing and apartment availability means the sample is quasi-random.

The results show that the adult suburban movers had higher employment but not different wages or hours worked compared to urban movers. Suburban mover youth do better in education and if they do not attend college are more likely to have jobs with good pay and benefits. Suburban dwellers are much more likely to interact with whites and slightly less likely to interact with blacks.

The Gautreaux program study supports the basic premise behind the "geography of opportunity" concept. That is, where someone lives has an important impact on social and economic prospects and opportunities. Effective housing strategy can lead to gains in employment, education, and social integration.

As Rosenbaum's study suggests, the geography of opportunity concept is largely one of social and economic opportunities. The concept has yet to be expanded to such opportunities as access to nature. This project aims to measure how the geography of opportunity concept could be translated to an environmental opportunity.

Figure 3.5 | *Geography of Opportunity Keywords*



Research Assumptions Based on Literature

- Humans are genetically and evolutionarily predisposed to be attracted to natural settings.
- Nature provides numerous psychological and cognitive benefits.
- Nature benefits health and well-being by providing a restorative environment.
- Passive exposure to nature allows children to learn about nature.
- Where someone lives has various social, economic, and physical opportunities.

Their orange and black wings were saturated in the late evening sun. It was as if the sun was trying to help signal their presence on the aging Oak. I noticed. The normally deep green tree was akin to a Christmas tree, accented with tiny, fluttering red-orange ornaments. I quietly approached the tree, trying not to startle my serene visitors. It seemed they were used to the attention they received—few made an escape. I was happy for that, as a closer inspection was necessary.

It seemed as if each leaf housed a new butterfly tenant, a far superior tenant than those I normally saw on this tree. Yes, I was guilty of bug discrimination. Up close, the creatures seemed shy, quiet, and reserved as they went about their collective business yet boastful of their physical attributes, seemingly flapping their wings with a higher frequency as I approached.

I began to slowly draw my arm up, as if to swat a fly, hoping the potential victim is oblivious to the lifting punishment. In this case, the aim was not of a pesky fly, but to not disturb hundreds of beautiful creatures as they rested from their cross-country migration. I was worried the movement of my arm would cause a snowball effect of mass butterfly immigration. There was a sense of nervousness and apprehension in my movements as I began to touch the surprisingly soft wings of one tree visitor. What bad nature karma could result for a person who disturbs such a serene natural scene? I just couldn't help myself.

I never saw the magnificent migrating butterflies return to that tree en mass. Karma sucks.

chapter four.

BUILDING A PROJECT FOUNDATION

Physical Context

The project is located within the City of Manhattan, Kansas (Figure 4.1). Manhattan is the county seat and largest city of Riley County. It is the home of Kansas State University, a 23,000 student land-grant university, the largest employer in the city.

The project measures quality and access to 27 publically accessible parks and 10 public school sites (Figure 4.2).

Study Population

The study population is children ages 5-14 (elementary and middle-school aged children) located within Manhattan, KS.

Scale

The project uses three scales and informs a larger theoretical scale (Figure 4.3, page 41). First, the project analyzes access to nature at a community scale, including all neighborhoods and areas within the City of Manhattan. Second, the project moves to a neighborhood scale by analyzing parks and school nature access opportunities with the assumption that a child cannot move freely within a community. Instead, their immediately local neighborhood parks, schools, and other nature access

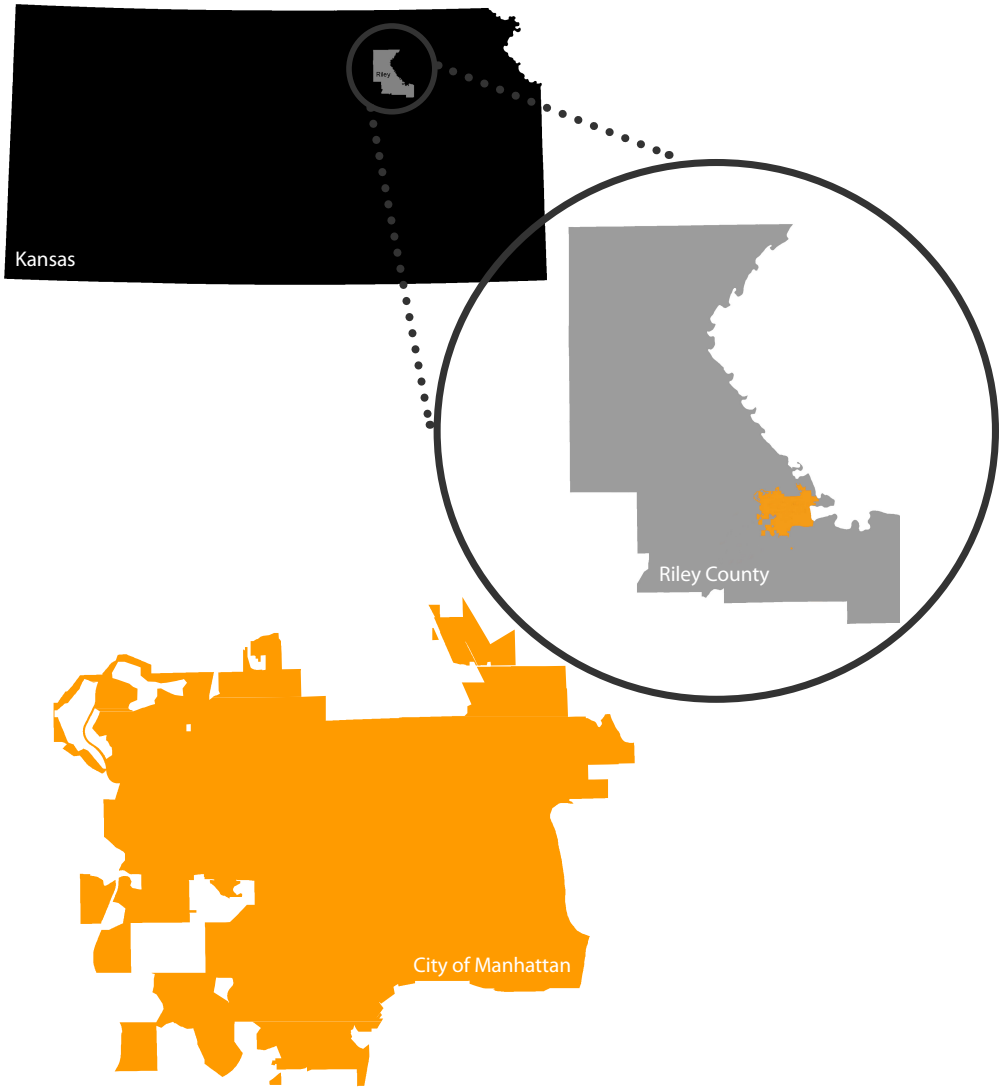


Figure 4.1 | *Project Physical Context*

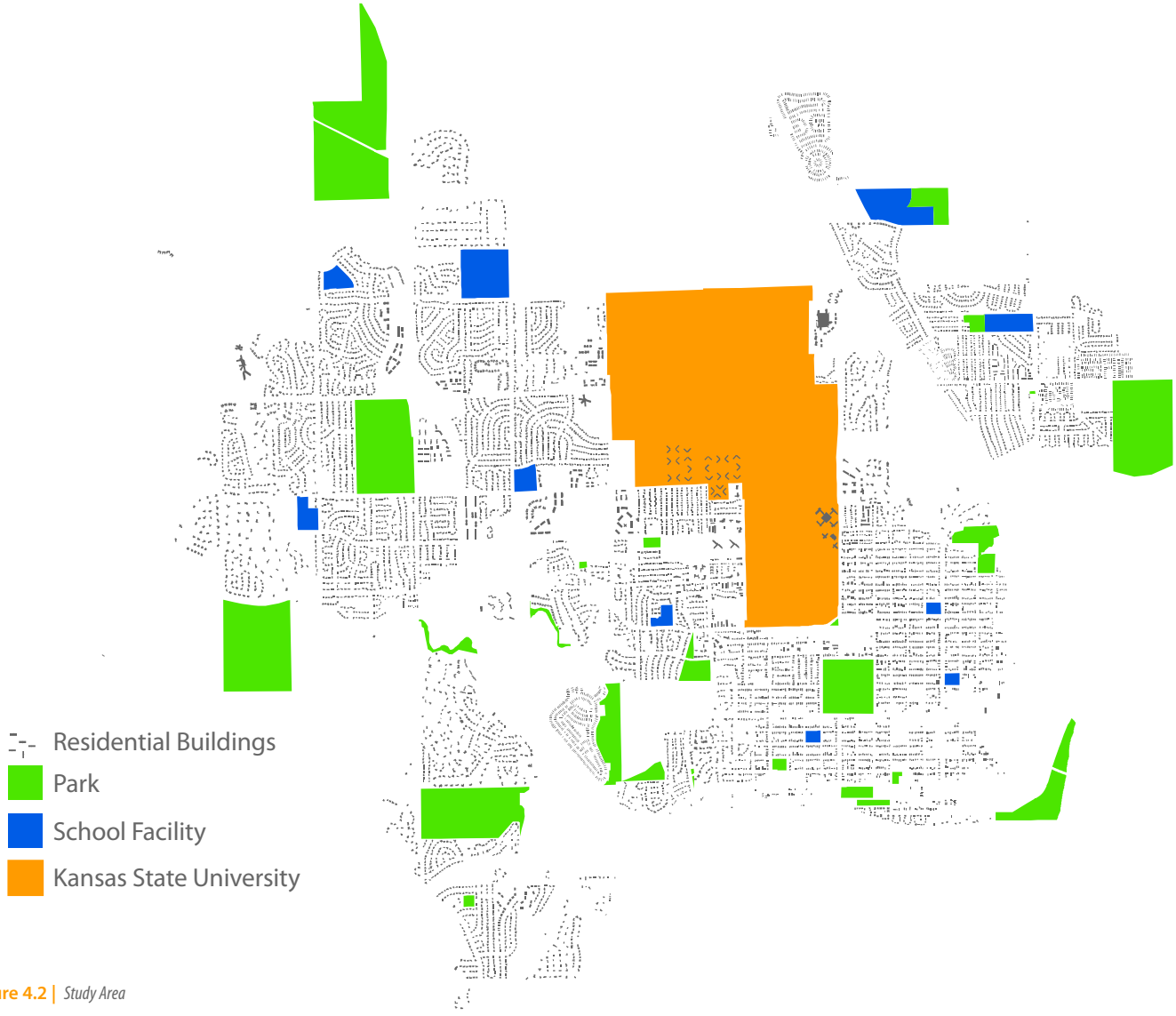


Figure 4.2 | *Study Area*

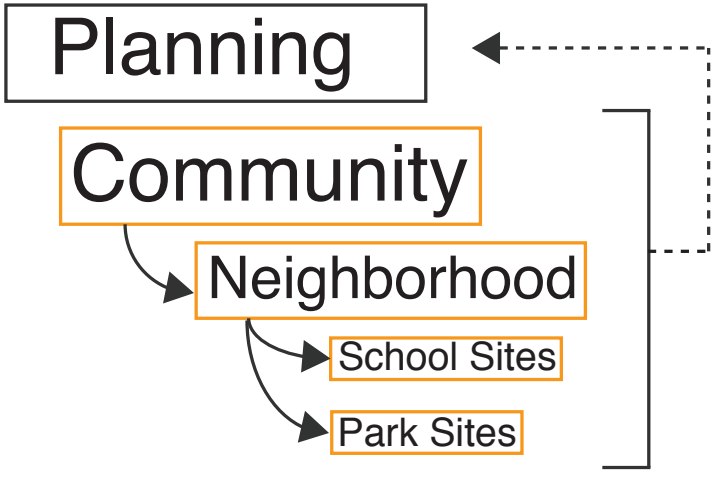


Figure 4.3 | *Project Scale*

opportunities constitute their available access opportunities. Finally, the project analyzes quality of nature of parks and schools, so it is also at a site scale. Taken together, the project analyzes access to nature at three scales, moving from the community level as an initial level and moving to a site level in order to accurately measure quality of nature in the study area. These three scales inform the generalized, theoretical scale of planning theory.

The study intends to measure the accessibility of nature within a child's everyday living environments. That is, it is a key project assumption that children require "nearby nature" (Louv 2006) to fully benefit from it. This study does not intend to measure how children access parks space with their parents or with access to a car. This opens a host of methodology and measurement issues.

Children's access to nature should be independent of transportation factors. Personal mobility limitations require children to access nature within a small radius. The project uses ½ mile to measure accessibility.

Project Relevance

The project lies within the realm of school planning and recreation planning. Planners and designers should address the use of nature in the siting and design of school grounds and the holistic planning of parks and open space within communities. If this does not happen, inequity in access may result. The implication of this project is that communities can focus public resources and planning efforts in areas lacking access to nature for children. This may lead to geographically less segregated neighborhoods and improved equity in nature access across a community. School planning and recreation planning can ensure all children have access to nature.

Defining Nature

Ask any scholar or professional their definition of nature and the answers are likely to vary widely. Indeed, scholarship has defined nature in a variety of ways: from the pristine wilderness to the most engineered park and play spaces. Some see nature in each and all environments in between. Like so many things, most people would say "I know it when I see it". However, operationally defining nature is an important step in this research.

In doing so, an emphasis is placed on a child's point of view towards nature. For a child, nature is found in a variety of places or objects such as a pet, a tree, a dandelion, a seashore, or a vacant lot (Louv, 2008). Nature should feel as if it is absent of adult design or adult agenda (Maudsley, 2005). This section will briefly discuss the range of nature definitions and then will operationally define nature for use in this project, keeping the child's point of view in mind.

When defining a word, analyzing the dictionary definition is an obvious first step. Nature is defined in the Cambridge dictionary as:

All the animals, plants, rocks, etc. in the world and all the features, forces and processes that happen or exist independently of people such as the weather, the sea, mountains, reproduction and growth.

This modern definition has particular ideas that are extended by Tuan (1978) when defining nature. Nature is anything that has not been made by human beings. Thus, the "natural environment" comprises all living and non-living things that occur naturally (Lester & Maudsley 2007). In its purest sense, nature is an environment not resultant of human activity, thus contrasting the notion of the "the built environment". The Wilderness Act of 1964 defines nature as pure wilderness where "the earth and its community of life are untrammeled by man and where man himself is a visitor who does not remain" (Wilderness Act of 1964 Sec. 1c in McCleary 2009). The 'Wild About Play' project provides a description of how one might see wilderness areas:

Wild spaces are green outdoor places where some areas are growing wild. They may be completely natural such as ancient woodland or be mixed in with artificial elements such as urban parks. Wild spaces come in many different shapes and sizes, and can be large or small, wet or dry, open or enclosed, near or far, tall or short, messy or tidy, green or brown… Wild spaces are: country lanes, hedgerows, woodland, city farms, grassland, beaches, heathland, gardens, rivers, shrubs, verges, ponds, fields, hills, parks, trees, farmland, sand dunes, village greens, muddy hollows (Wild About Play 2004).

However, more than 95% of the earth is under direct human influence and only 3% of the surface is set aside for parks or other protected areas (Baskin 1997). For most of human civilization we have not held a distinction between natural and mandmade environments (Tuan 1978). It was largely during the industrial revolution in the 1800s and 1900s that we began to value the "order and harmony represented through the natural world, and the chaos and disorder of human works" (Lester & Maudsley 2007, 3). It was during this period that we began to separate the natural environment from the human designed.

We are witnessing rapid technological change at a pace unprecedented in history (Gullone 2000). This technology enables us to inhabit and adapt in previously inhospitable landscapes. We have the ability to adapt and to change the natural environment for the benefits of humans, but this technological revolution has drastically altered the face of the earth (Lester & Maudsley 2007) and presents a challenge for defining nature.

Because we cannot disregard the fact that humans have had an irreversible effect on much of earth's land surface, Kaplan (1989) defines nature as a place that has primarily vegetation. It is usually green but could include other colors as when the trees are changing or in brown or white such as a mountainous landscape. Importantly, Kaplan suggests

that human-intervention may occur so its absence is not crucial. Therefore, in addition to "wilderness" defined above the operational definition of nature can include things like parks, playgrounds, or even vacant lots (Kaplan, 1989). This definition makes nature more attainable for most children, as access to wilderness is unlikely to occur for a child in even the most rural United States settlements.

There is a continuum of nature definitions within the literature, with consideration for the human-environment influence (Figure 4.4). On one end is the pristine, natural areas untouched by humans (wilderness) and on the other end are highly conceived and manufactured environments like a playground (human-designed space). This research works under the assumption that both wilderness and man-made natural environments can help feed our starving biophilic predisposition. Louv (2008) proposes that nature represents: "…natural wildness: biodiversity, abundance – related loose parts in a backyard or a rugged mountain. Most of all, nature is reflected in our capacity for wonder" (9).

Kaplan and Kaplan (1989) posit that nature is most beneficial for health, well-being, and learning. This is known as the Attention-Restoration theory (ART). ART contains four components: Being Away, Extent, Fascination, and Compatibility. Following is a brief description of each component:

• Being Away (escape) – a need to get away from what is ordinarily present, generally not preferred. Kaplan (1995) recognized that escape requires a "conceptual rather than a physical transportation." Simply taking problems somewhere else is unlikely to be restorative (Lester & Maudsley 2007).

• Extent (a new context) – a new extent of space, either physically or otherwise, imagined or real. Kaplan (1995) that a place must be "rich enough and coherent enough so that it constitutes a whole other world"

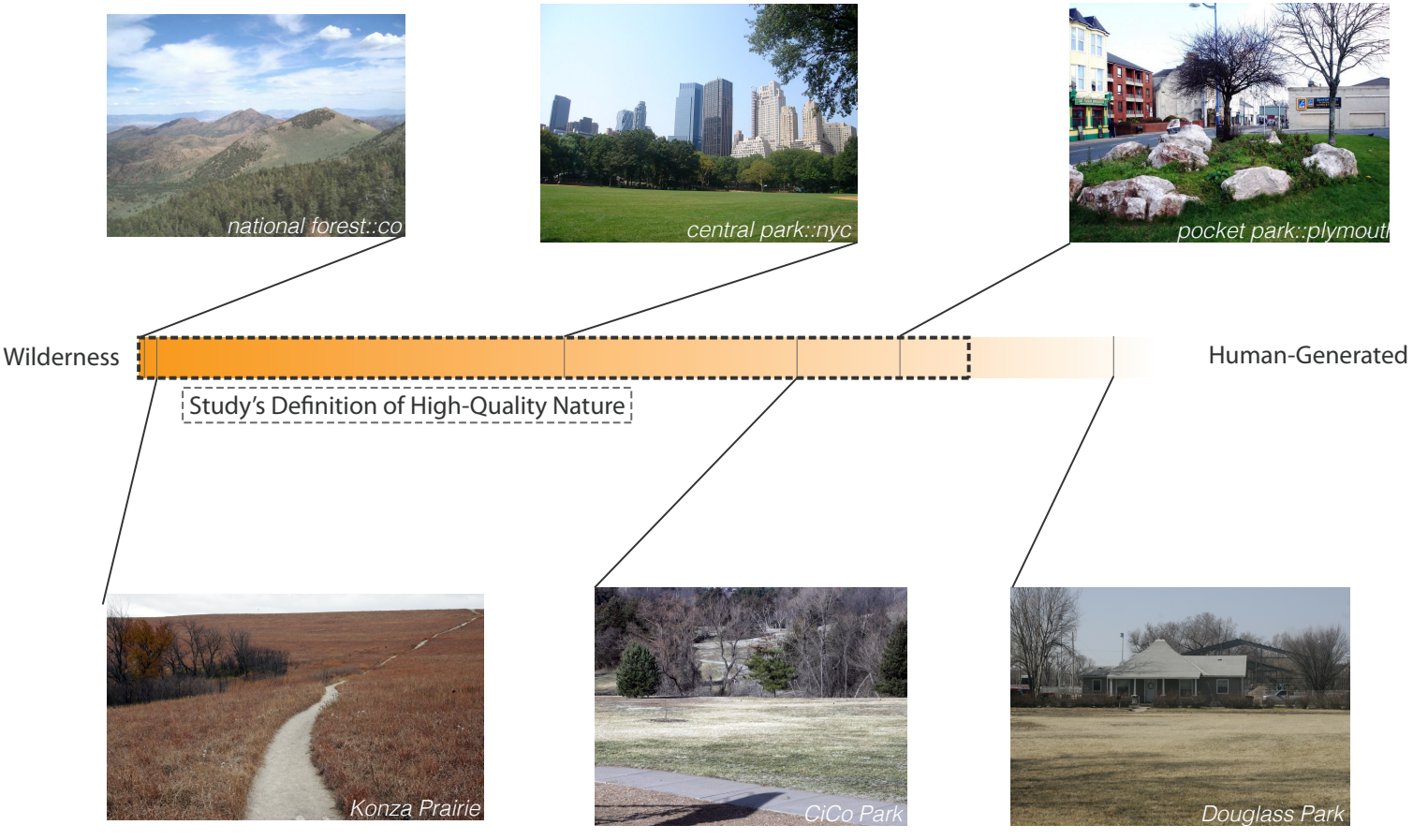
• Fascination – there must be a source of intrigue or interest.

• Action and compatibility – There should be nexus between the given natural space and one's purposes, interests, and abilities (Lester & Maudsley 2007).

Kaplan and Kaplan (1989) argue that a number of spaces could have these benefits, but the literature supports the conclusion that nature spaces are most prominent in restorative benefits. The authors focused on wilderness space, but they acknowledge that "nearby natural settings" may serve a similar (if somewhat less intensive) purpose.

It is important to note that this research defines restoration as not only the mitigation of stress, but to include all physical, cognitive, and emotional processes that the natural environment may enhance and improve. Therefore, this research does not focus merely on stress or stress-reduction. Rather, it uses the four principles of ART as a way to further define the properties of a natural area likely to have physical, cognitive, and emotional benefits for children. A blank patch of grass in a yard is unlikely to be a restorative environment even if it has some characteristics of nature. Instead, a natural environment, either wild or man-made is beneficial if it allows someone to escape, to feel as if they have been transported to a new location, are fascinated by that space, and the natural space fits the person's interests or purpose in using that space.

Figure 4.4 | *Nature Continuum*



With the definitions in mind an operational definition of nature can be established. In this report, **nature is defined as a space comprised mostly of vegetation that allows an individual to escape common surroundings, to feel as if in a new environment, have some element of fascination or intrigue, and have compatibility with the subject's desired purposes or interests.** Thus, when considering access to nature opportunities, a back/front yard with no additional features is not considered a natural environment, as it is unlikely to fit the latter criteria of that definition due to extent limitations. On the other hand, a backyard with some established tree grove or riparian area would constitute access to the natural environment. A sample of environments that consitute high-quality nature in this study are seen at right.







Figure 4.5 | *High-Quality Nature*

I wasn't supposed to be there. My parents warned me the of the dangers, but I didn't listen.

I climbed higher, the conglomeration of sap built up as if I had put my hand on a flytrap, fingers barely able to move apart to execute the next precarious move. The bark formed a honeycomb pattern. It peeled at the corners, chipping away as I tested a handhold or foothold, falling gracefully to the brown layer of pine needles below. The roughness of the bark made it more difficult each limb, as tiny bits of bark and needle began to wear away the skin on my palms and fingers, occasionally drawing a bit of blood. But not enough to stop—I had to reach my goal for reasons unknown.

As the branches thinned, I began to look for a safe spot to take in the view. Upon finding a last hearty branch able to support my weight, I was able to turn around, viewing the landscape from above for the first time that I can remember. The perspective fascinated me. "Bird's have a great view of our world," I thought. I was being presented with a new world of patterns, colors, and lighting. There was a sense of isolation, yet I was far more in-tune with my surroundings. I was a fly on wall of the world. I was viewing the world as an outsider, but seeing things with far more clarity and intrigue.

Childhood requirement: Don't listen to your parents at least once.

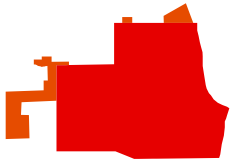
chapter five.

MHK: PAST, PRESENT, FUTURE

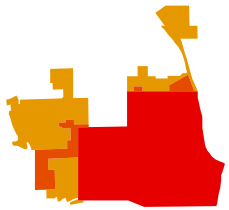
Figure 5.1 | *Growth Pattern of Manhattan*



Original Plat - 1925



1926 - 1940



1941-1955

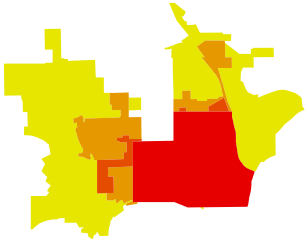
Past

On April 27, 1855 two groups—the Cincinnati and Kansas Company—left Cincinnati aboard a steamboard, bound for Kansas. The plan was to found a community in the Kansas territory. Because the venture was funded by New York investors, the land company insisted on the name Manhattan for the new community. The steamboat was halted by sandbars near present-day Manhattan, where a town was already being established. The previous settlers in the area welcomed the Cincinnati arrivals, convinced them to stay, and re-named the community Manhattan.

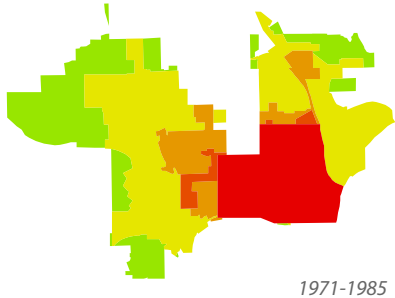
Fort Riley, founded in 1853, is a U.S. Army instillation with a current day-time population near 25,000. As Fort Riley has expanded throughout its history, it has brought many young families to the area, many of them choosing to live in nearby Manhattan. Figure 5.1 and Figure 5.2 trace the physical development of Manhattan.

The second major factor shaping the development and history of Manhattan is Kansas State University. Kansas State Agricultural College, later changed to Kansas State University, was founded in 1863 under the Morrill Act. It was the first land-grant institution in the United States. The university has since become Manhattan's largest employer, home to 1,251 academic staff.

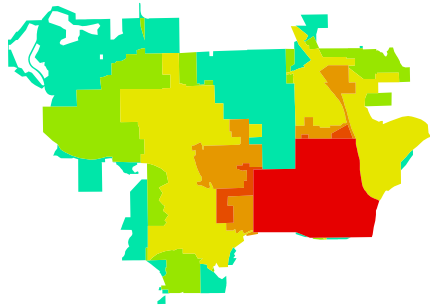
The early history of Fort Riley and Kansas State University still drive the economy, housing, and development trends today (Figure 5.3, 5.4, 5.5 on pages 50 and 51). Both are known for bringing in, and retaining, many young families and children in Manhattan.



1956-1970



1971-1985



1986-2000

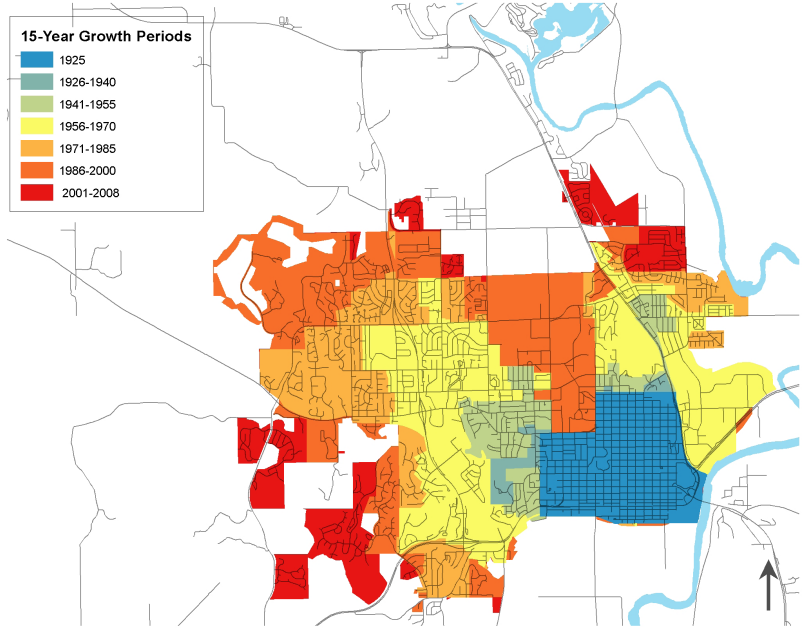


Figure 5.2 | *Growth Pattern of Manhattan Summation*

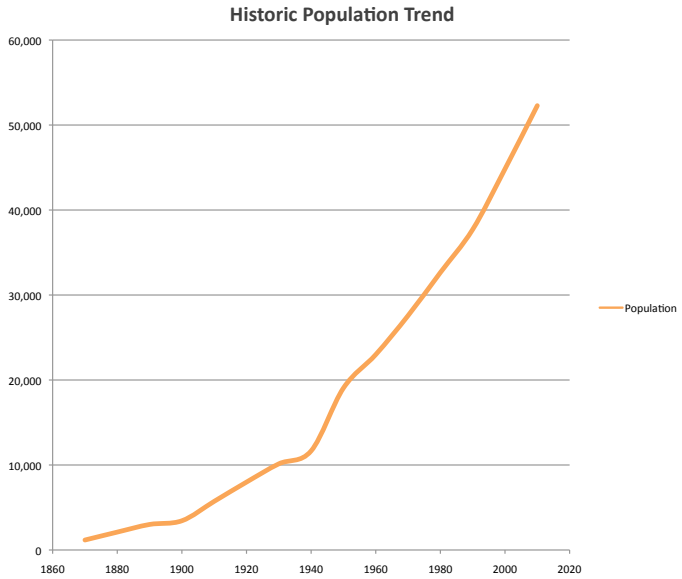
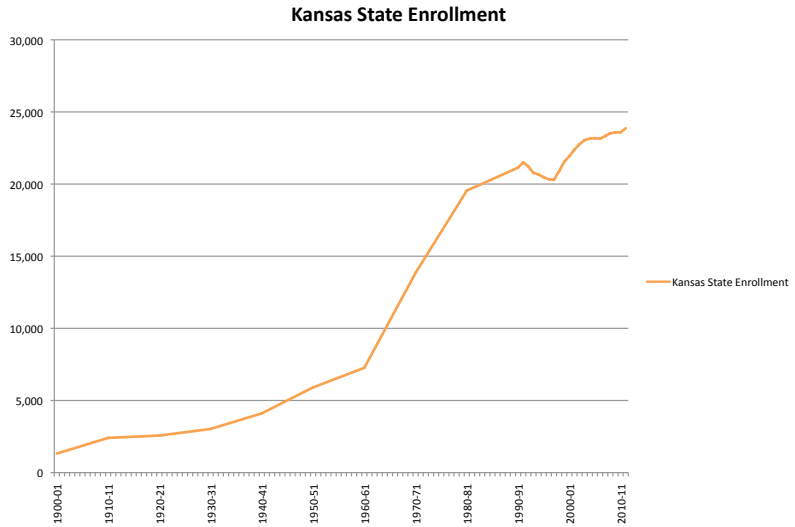


Figure 5.3 | *Historic Population Growth*

Figure 5.4 | *Kansas State Historic Enrollment*



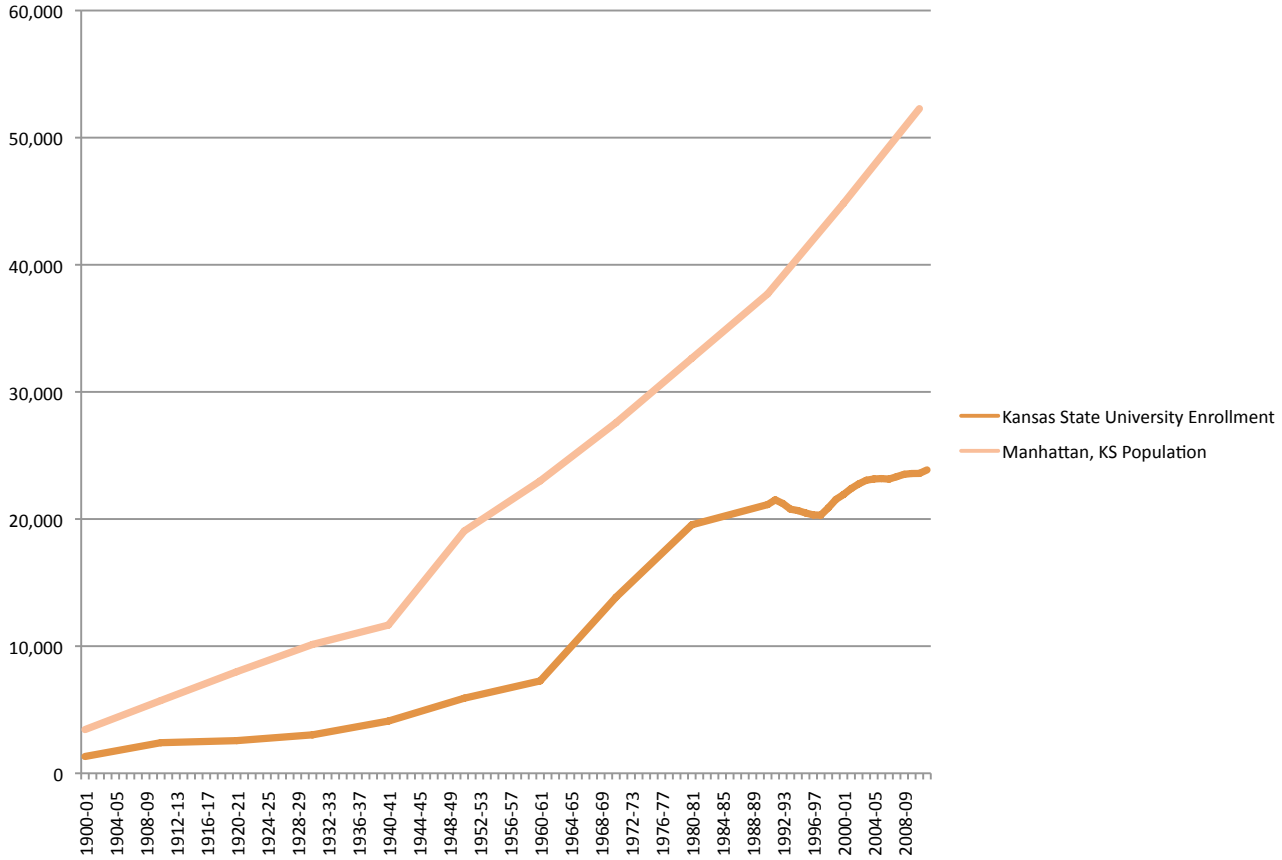


Figure 5.5 | *Comparing Population Growth to Kansas State Enrollment*

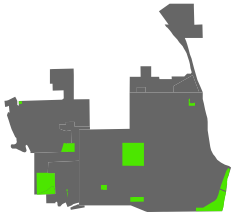
Figure 5.6 | *Nexus of Parks and Development*



Original Plat - 1925



1926 - 1940



1941-1955

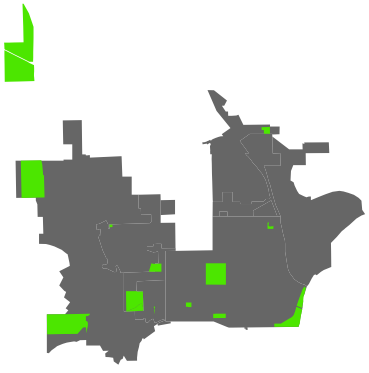
Parks History Brief

Two years after Manhattan incorporation in 1857, 45 acres were reserved for City Park. In 1859, City Park was incorporated in the first city plat. The plat showed three additional parcels of land for city parks, bringing the total park acres to 80 acres. Due to the large acquisition of lands, the 80 acres of park space remained until about the 1930s. During the 1930s, the city purchased and dedicated an additional 96.1 acres of park land. From the late 1930s until 1947, most park acquisition and expansion was placed on hold because of World War II and lack of park funding. Thanks in part to the State of Kansas Enabling Act of 1945, which gave the city the right to establish a tax for parks and recreation, there was an addition of 211.5 acres between 1947 and 1970 (Flowers 1987).

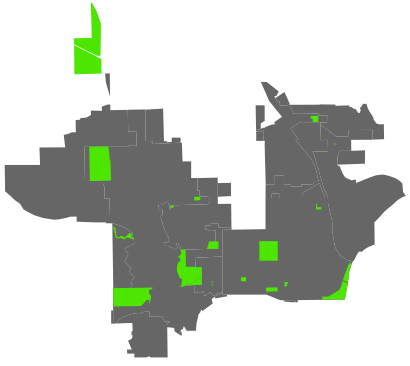
The original park developments have a unique history. Both settlement groups set aside, in perpetuity, several blocks of land for schools and parks. The downtown schools like Wilson, Roosevelt, Bluemont are located on these lots. "Most people in the city didn't know this until recently when the school board wanted to sell a school and discovered that the land was inalienable (could not be sold)" (personal communication, Bonnie Lynn-Sherow, 2011). The land acquisition and development history of parks in Manhattan creates a unique relationship between the school system sites and park development.

Parks Development History

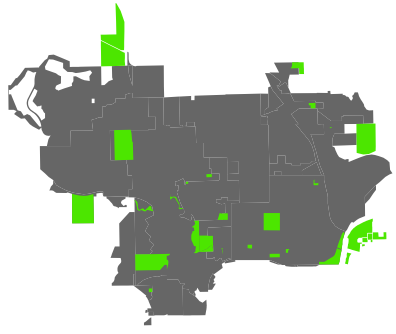
The development of parks by 15 year increments in Figure 5.6 traces the development of the park system and development from the original platting through 2000. Based on this analysis, it appears the development of parks was appropriately considered as city property and developments for many years. From 1956 until today, the number of annexations has slowed. This could effect the study results.



1956-1970



1971-1985



1986-2000

Present

Manhattan is a quintessential college town, with nearly half the full-time population being comprised of students. The enrollment in Fall 2011 was 23,863. The 2010 U.S. Census shows Manhattan's population to be 52,281. These figures include both the student population from Kansas State University as well as Fort Riley soldiers and their families residing in Manhattan.

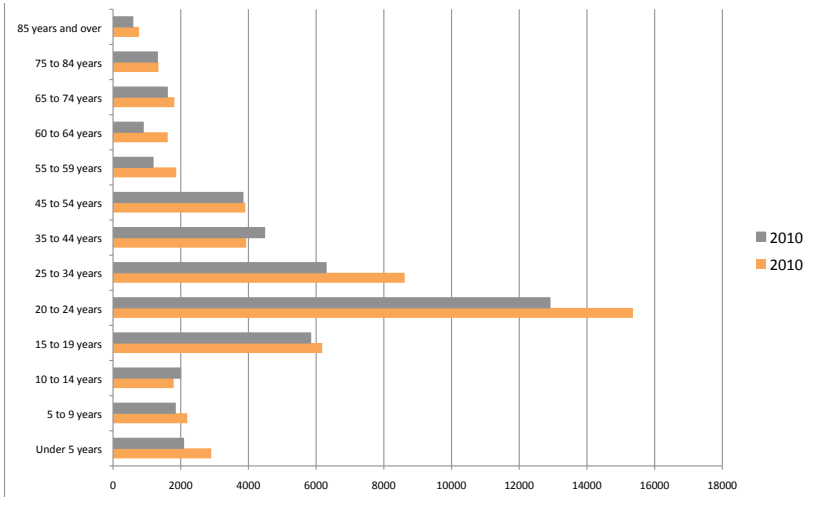
The demographic cohort of ages: 20-24, 15-19, 5-9, and under 5 have grown from the year 2000 to 2010 (Figure 5.7). The large number of 20-24 year olds can be attributed to Kansas State. Although many graduates leave Manhattan, a portion of graduates stay, increasing the possibility of young children in Manhattan and the number of families (Table 5.1). The growing children cohorts shows that Manhattan should be considering the public services that children need most, like parks and school facilities.

As of Fall 2010, there were 27 park facilities in Manhattan; 21 park facilities are maintained and owned by the City of Manhattan Parks and Recreation Department. There are 10 public elementary and middle school facilities, serving over 4,000 students (Figure 5.8).

Table 5.1 | *Family Characteristics*

2010 Family Household Characteristics			
		Total	Percent
Family Household		9466	-
With own children under 18		4202	44.39%
Male householder, no wife present		627	6.62%
With children under 18		254	2.68%
Female householder, no husband present		1644	17.37%
With children under 18		1095	11.57%

Figure 5.7 | *Age Cohort Growth Trends*



Figures 5.9, 5.10, 5.11, 5.12 and Table 5.2 on the following two pages provide important information for the school facilities in Manhattan. Figure 5.10 provides the economic composition of each school facility. Figure 5.11 provides racial composition of each school facility. Table 5.2 shows enrollment figures for the elementary and middle school facilities.

Figure 5.12 shows the location of each park with associated information located to the right.

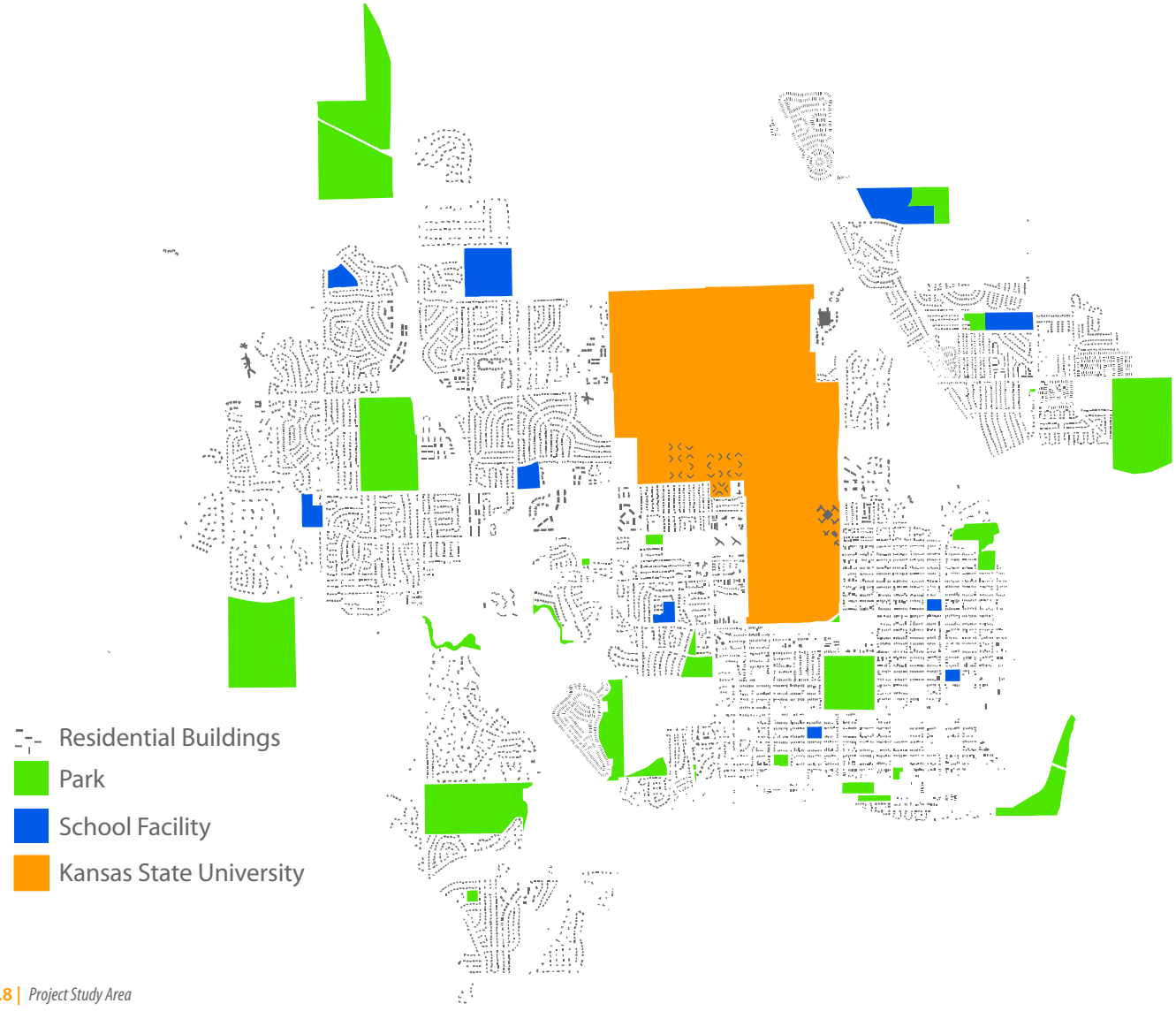


Figure 5.8 | *Project Study Area*

Elementary and Middle School Sites

1. Frank V. Bergman
   Elementary School
2. Amanda Arnold
   Elementary School
3. Susan B. Anthony
   Middle School
4. Marlatt
   Elementary School
5. Lee
   Elementary School
6. Theodore Roosevelt
   Elementary School
7. Woodrow Wilson
   Elementary School
8. Bluemont
   Elementary School
9. Northview
   Elementary School
10. Dwight D. Eisenhower
    Middle School

Figure 5.9 | *School Site Locations*

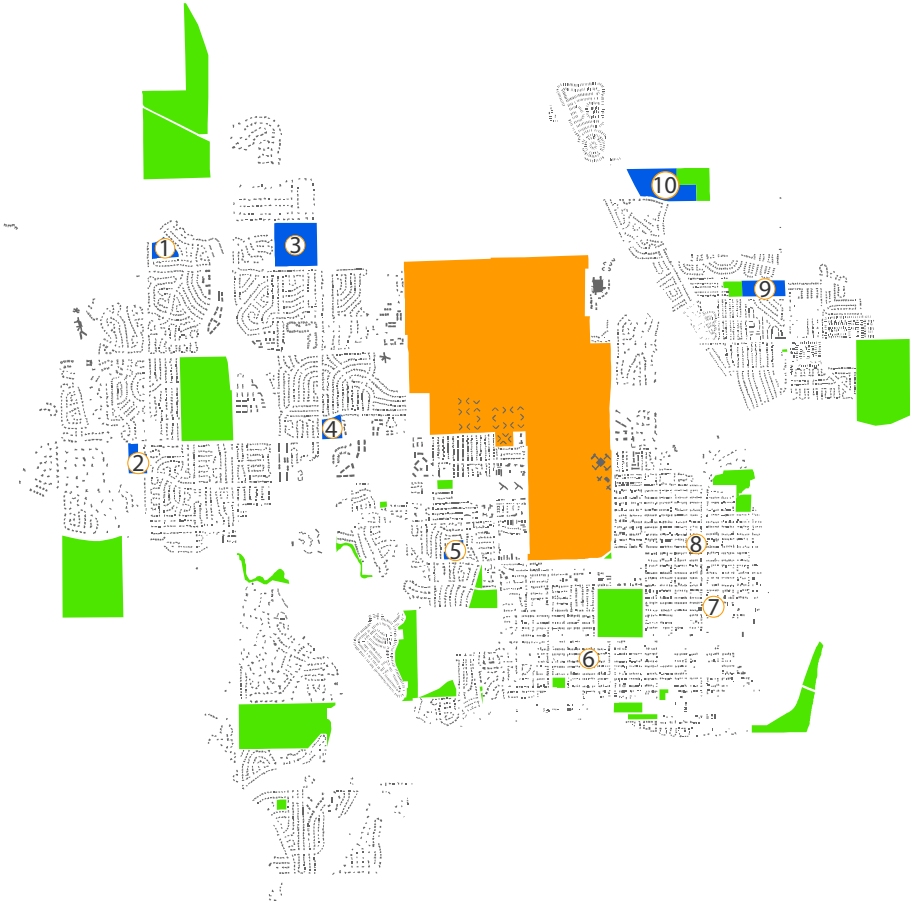


Table 5.2 | *2010 USD 383 Enrollment*

	Enrollment
Bergman	477
Amanda Arnold	521
Susan B. Anthony	477
Marlatt	409
Lee	315
Theodore Roosevelt	293
Woodrow Wilson	366
Bluemont	275
Northview	612
Dwight D. Eisenhower	360
TOTAL	**4105**

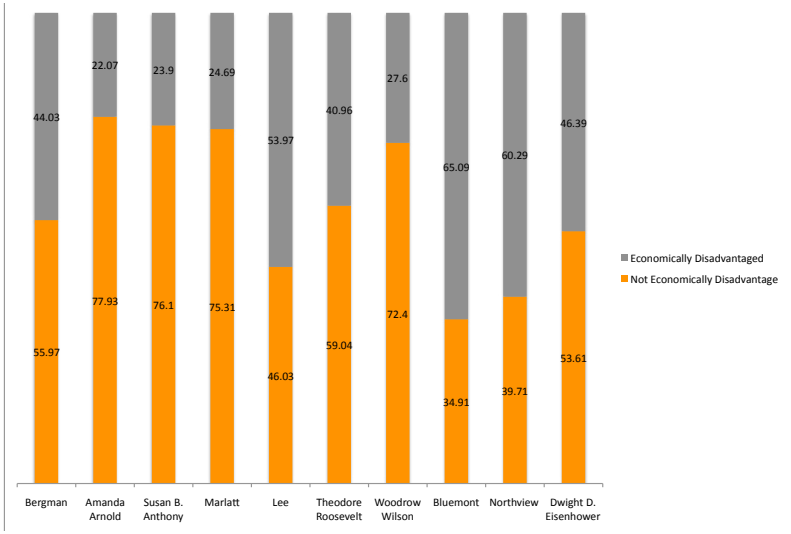
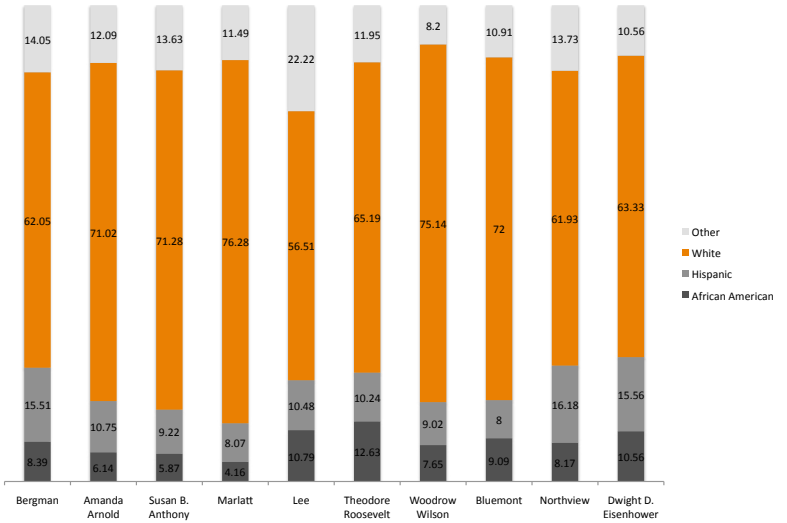


Figure 5.10 | *Economic Composition - USD 383 schools*

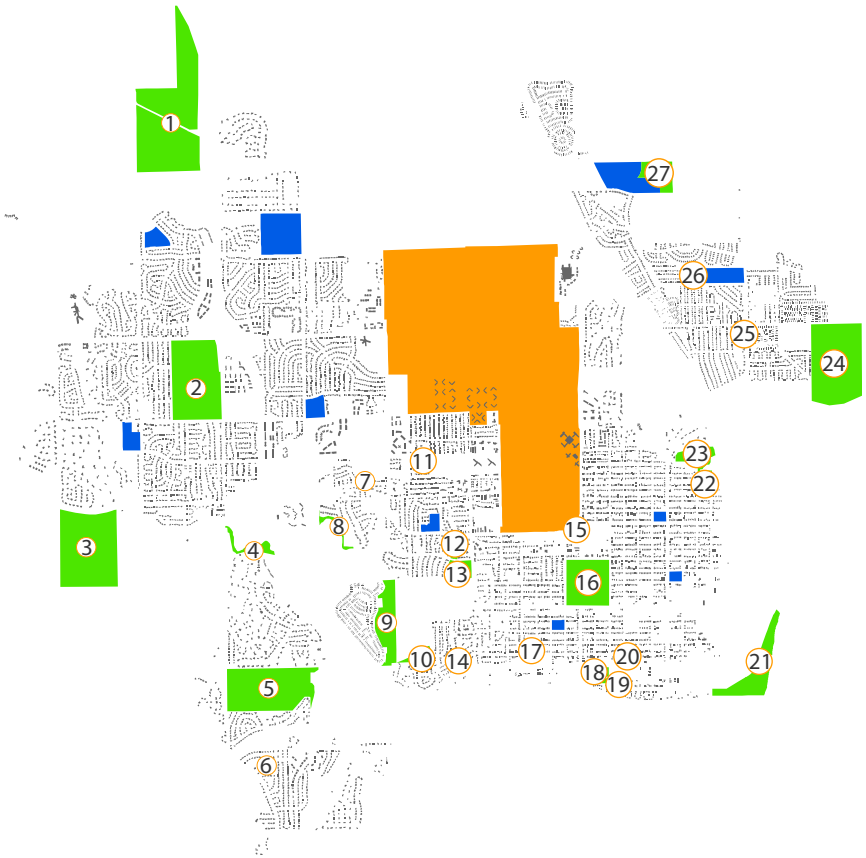
Figure 5.11 | *Racial Composition - USD 383 schools*



Park Sites

1. Marlatt
2. CiCo
3. Frank Annenburg
4. Briarcliffe
5. Warner
6. Stagg Hill
7. Cedar Acres Natural Area
8. Spencer
9. Wildcat Creek Linear
10. Sunset Neighborhood
11. Pioneer
12. Yorgensen
13. Girl Scout
14. Westwood Natural Area
15. Triangle
16. City
17. Longs
18. Griffith
19. Sojourner Truth
20. Douglass
21. Southeast
22. Goodnow
23. Bluemont Hill
24. Northeast Community
25. Harbour
26. Northview
27. Eisenhower Baseball Complex

Figure 5.12 | *Park Facility Locations*



1
Dedicated: 1940
Acres: 75.5

2
Dedicated: 1979
Acres: 97

3
Dedicated: 1988
Acres: 104

4
Dedicated: 1974
Acres: 7.3

5
Dedicated: 1956
Acres: 82

6
Dedicated: 1995
Acres: 2

7
Dedicated: 1952
Acres: 0.8

8
Dedicated: 1987
Acres: 4

9
Dedicated: 1973
Acres: 30.6

10
Dedicated: 1933
Acres: 6.6

11
Dedicated: 1974
Acres: 2.8

12
Dedicated: 1934
Acres: 1.9

13
Dedicated: 1934
Acres: 9.8

14
Dedicated: 1950
Acres: 0.5

15
Dedicated: 1966
Acres: 0.5

16
Dedicated: 1857
Acres: 45

17
Dedicated: 1857
Acres: 2.7

18
Dedicated: 1936
Acres: 5.6

19
Dedicated: 1996
Acres: 3

20
Dedicated: 1975
Acres: 1.5

21
Dedicated: 1951
Acres: 32

22
Dedicated: 1938
Acres: 20.4

23
Dedicated: 1938
Acres: 13

24
Dedicated: 1997
Acres: 79

25
Dedicated: 1983
Acres: 0.3

26
Dedicated: 1956
Acres: 5

27
Dedicated: 1997
Acres: 20

Future

The future of Manhattan is bright. General population growth has been steady for the past 15 years. However, two factors will play into an even faster growing population. First, Manhattan's selection as the future site of the Department of Homeland Security's National Bio and Agro-Defense Facility (NBAF) means high-paying, high-quality jobs will be coming to Manhattan. Second, the continued expansion of Fort Riley army base means a large number of families may be moving to Manhattan. Kansas State continues to increase its enrollment and has done so for nearly 15 years. All of these will provide increasing population, including many young professionals and their families. Manhattan's population has been projected to increase by nearly 40% in the next 20 years, from 52,000 to nearly 70,000 people (Figure 5.13).

This growth puts increased pressure for providing public services, including high-quality parks and school facilities, as well as retrofitting existing parks and school facilities.

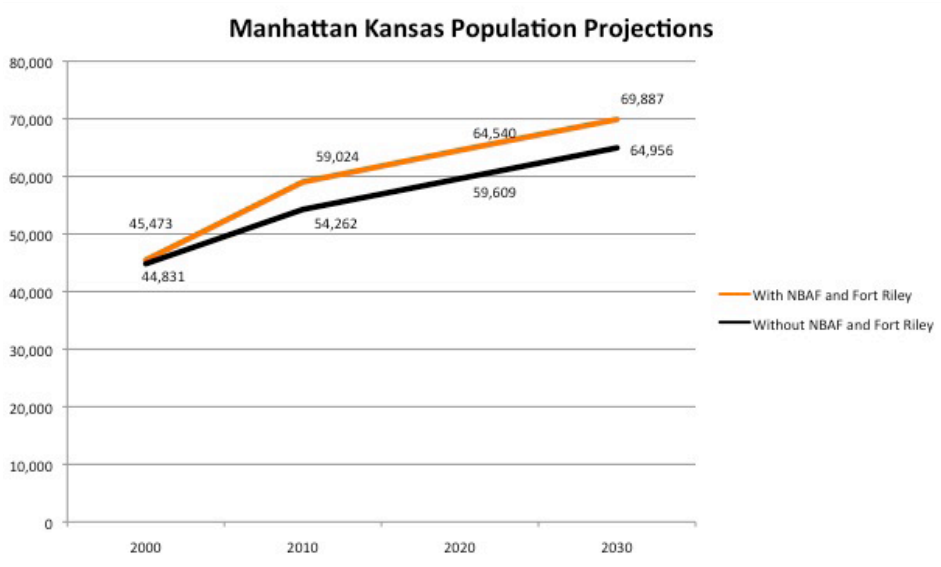


Figure 5.13 | *Future Population Growth*

It felt like I had a paper bag over my head and my legs felt like I had stuck them in the oven—muscles burning—as if poorly following a recipe. This recipe didn't feel very good. I was trying hard to conceal my pained effort and heavy breathing. I didn't want my climbing partner to worry because his son was too tired to continue, forcing him back down with me, foiling his plans of a summit.

I didn't quite understand what I was getting myself into when I agreed to accompany my dad on his trip to Colorado to climb a "14er." I love Colorado and had great memories hiking and camping. The thought of climbing a mountain seemed like a great idea. "How naïve," I thought to myself. My labored breathing never seemed to falter after we got above treeline at 12,000 feet and I wondered when, or if, I would reach the top.

Time is relative when climbing a peak. What seemed like a 30-minute destination turned into an hour. What appeared to be a quick summit push turned into laborious haul with frequent rest stops. When resting, I made an effort to look towards the valley and views, not toward the top. "That way," I thought to myself, "passerbys will think I'm enjoying the view." Truthfully, I was wondering why I was up far enough to enjoy the view. My time was better spent enjoying a leisurely round of golf.

Eventually, we accomplished the goal at hand. We were sitting on the summit of Colorado's second highest peak at 14,443 feet. Partially snow-capped mountains greeted me at eye level. Framing these precarious, jagged mountain peaks were luscious forests and high mountain lakes, accented with deep blue sky above. From 14,443 feet there were glints of life—cars—flickering in the sun as their operators moved about their daily tasks. They were so close, yet so far removed from one of the purest forms of nature experience. Worth it? My mind said "yes," my body said an emphatic "no."

The recipe for a pure nature experience: time-evaporating endless views, dramatic colors, unearthly textures, and a dash of sweat and pain. I have since reached the summit of half Colorado's 54 14,000 foot peaks. I guess the recipe grew on me.

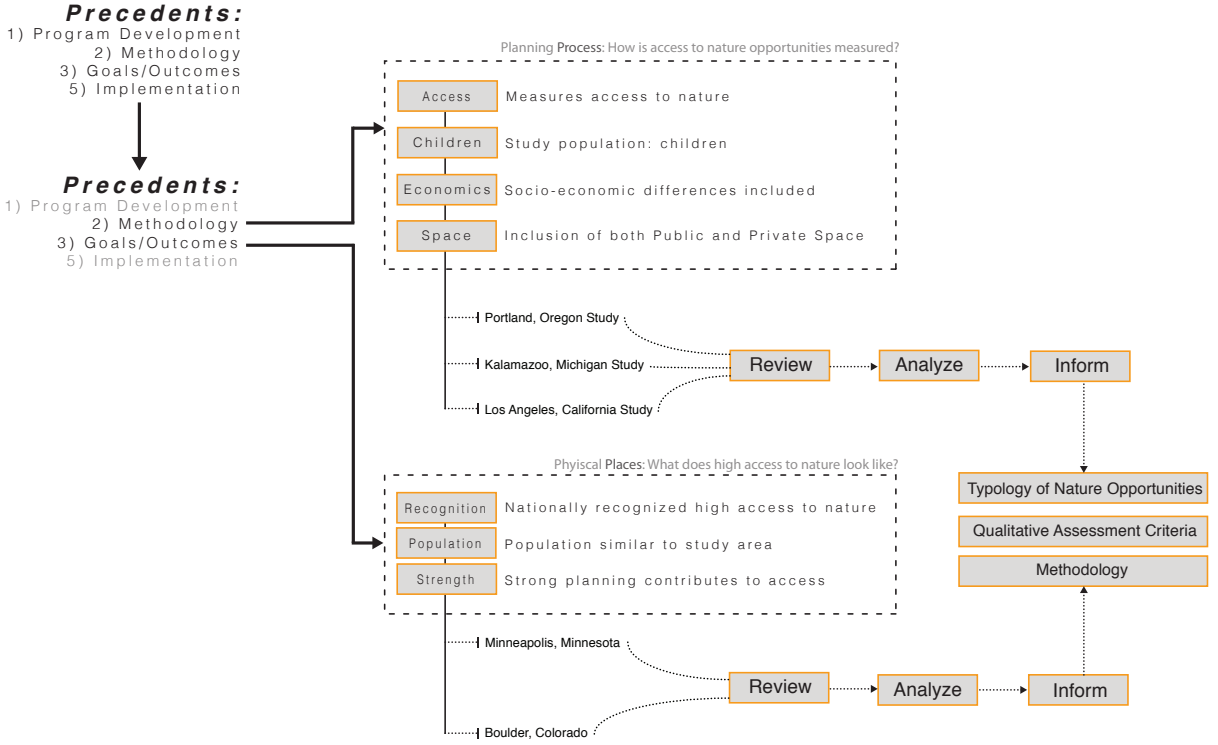
chapter six.

METHODOLOGY CONSTRUCTION

So far, the text has described the basic project foundation, the study area in detail, and theoretical considerations. This report now departs from background and theoretical considerations and moves to applied practice (i.e. measurement). The measurement of the theoretical basis of this project is methodologically challenging. Precedent studies have four main uses in planning and design: program development; methodology synthesis; goals/outcomes analysis; and implementation strategy analysis. Methods precedent studies were completed in order to scan practical, implemented projects and studies from across the country.

Figure 6.1 on the following page visualizes the process for selecting the precedent studies. The precedents of this project fit into the "methodology" and "goals/outcomes" categories of precedent studies. They are described as "place-oriented" and "process-oriented." This chapter provides an abbreviated summary of the precedent studies. Appendix C provides a thorough discussion of each precedent study.

Figure 6.1 | *Precedent Study Process*



Place-oriented precedents

The place-oriented precedent studies are located in Minneapolis and Boulder. See Appendix C for a detailed analysis.

Deciphering how other communities are finding success in helping children access nature is valuable. What does "high access" to nature look like? What elements should be included in an analysis of nature access? The first set of precedent studies answers these questions. This aids the development in assessing nature access.

Summary of Place-Oriented Precedents

The place-oriented precedents were beneficial by informing how areas known for high access to nature structure their systems. Additionally, it provided knowledge on the types of nature opportunities to measure and analyze in the Manhattan area. Does Manhattan have nature corridors? Does Manhattan have smaller neighborhood parks not included in the official parks system? These questions are rooted in the results of the place-oriented precedent analysis. In short, the place-oriented precedents provide a typology of nature access for use in analyzing Manhattan's nature opportunities.

The typology references the National Recreation and Park Association (NRPA) parks classifications.

The report acknowledges the varying levels of service and the different types of parks and open space provided by NRPA. However, following the literature on the benefits of a certain type of nature: high-quality nature—this report does not intend to measure accessibility based on the NRPA levels of service or measure their quality based on the varying types of services (e.g., basketball courts, tennis courts, Frisbee golf facilities). This project acknowledges that these types of services are important and required in public parks. However, this project aims to measure the availability of high-quality nature, following the definition of nature (see Introduction) and the benefits of nature (see Theoretical Expoloration). The next section develops assessment criteria in determining what elements constitute high-quality nature and how to measure it.

Figure 6.2 on the following pages describes the resulting typology of Manhattan's nature access, using the orange to denote how each park classification is used in this study. The text underneath denotes how it would be classified under the NRPA definitions.

Process-oriented Precedents

Process-oriented precedent studies are located in Portland, Oregon; Kalamazoo, Michigan; and Los Angeles, California. See Appendix C for a detailed analysis.

Measuring opportunities for access to nature is methodologically challenging. Various social and qualitative factors challenge the analysis of such issues. Three precedent studies analyzed how others have addressed methodological issues. They show how studies and local initiatives measured access to nature.

Summary of Process-Oriented Precedents

The process-oriented precedents were beneficial by informing methodology of this project. Reviewing and analyzing the three studies ultimately informs this study by providing incites into previous methodologies employed by other researchers and locally-sponsored programs. The review of the methodologies reveals strengths and weaknesses in each process-oriented precedent. However, taken as a whole, one can begin to see the methodological path to be taken in order to study how access to nature opportunities varies with socio-economic factors included. While these studies can be improved upon, there is a clear methodological direction these studies reveal. In sum, the process-oriented precedents provide assessment criteria and analytic strategy for the project.

Figure 6.2 | *Manhattan, KS Typology*

Large Neighborhood Parks
(community parks)



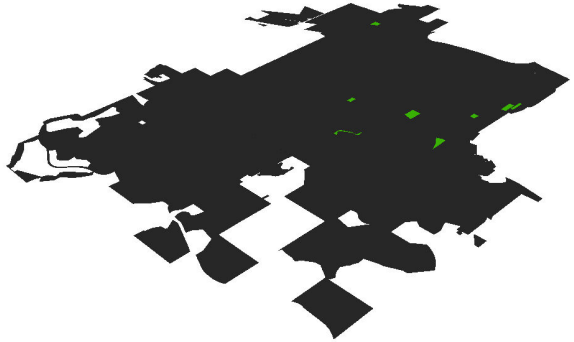
Kansas State University
(n/a)



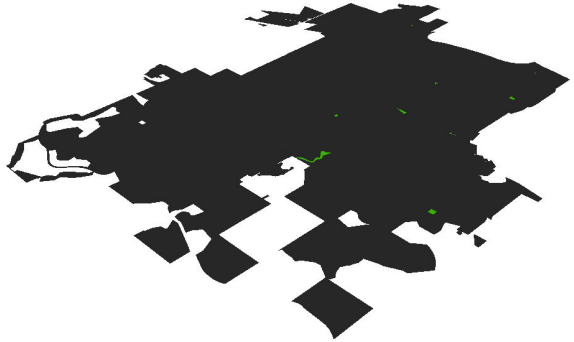
School Grounds
(school parks)



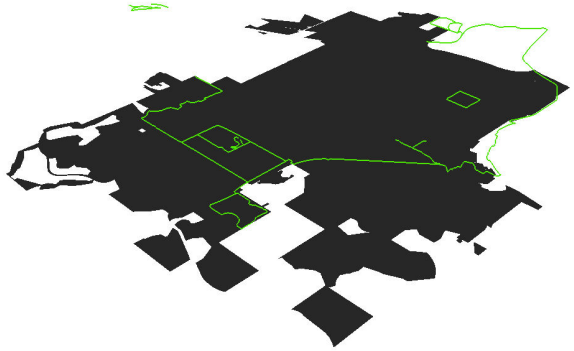
Small Neighborhood Parks
(neighborhood parks)



Pocket Parks
(mini-parks)



Linear Trail
(greenway)



Project Methodology

The central question this research addresses is:

Do socio-economic factors, and their influence on housing location choice, affect a child's ability to access high-quality nature?

Supporting questions to help answer the central research question were:
Where do children of various races live?
Where are household values highest/lowest?
What is the quality of public nature?
Where is the quality of public nature highest?
What other factors may contribute to access?

Analytic Strategy

Following the three process-oriented precedent studies, this study employs geospatial analysis using Geographic Information Systems (GIS) technology supplemented by site analysis to assess whether or not socioeconomic factors and their influence on housing choice affect a child's access to high-quality nature. The study includes measures of socioeconomic status (race and income) and how these factors influence a child's access to nature within publically accessible parks and school grounds. This follows the Portland and Los Angeles precedent studies.

Nature quality assessment criteria have been adapted from the Kalamazoo study for use in this study (Table 6.1). One factor has been removed from the Kalamazoo factors, following the operationalized definition of nature used in this study (see Chapter 4). The weight of some factors have been changed to reflect local conditions, especially climate factors.

Table 6.1 | *Assessment Criteria and Weights*

Assessment Criteria	Weights
Percent Developed (1-3)	
0-33%	3
34-66%	2
67-100%	1
Presence of:	
Wetland	3
Unmowed Grass	3
Forest	3
Garden	3
Tree Cover in Mowed Grass	3
Water	1
Playground	1
Universally Accessible	1
TOTAL POSSIBLE	21

Assessment Critieria

Percent Developed: the amount of undeveloped land compared to developed land. For example, the existence of buildings, large parking areas, and other paved areas detracts from the score.

• Wetland: An area, typically in conjunction with a river or lake, nearly level with the surrounding land, comprised of seasonal or permanent water and characteristic vegetation.

• Unmowed grass: Native grasses and grass that is allowed to grow naturally, without mowing or other intervention.

• Forest: Large expanse of trees and significant cover from sunlight. Block most adjacent land from view.

• Garden: A formal piece of ground used to grow flowers, fruit, or vegetables.

• Tree Cover in Mowed Grass: Trees in a lawn or manicured grass setting, allowing for shade from elements.

• Water: Lakes, ponds, or other stagnant water bodies.

Table 6.2 | *Summary of Project Data Sources*

	Data	Source
Quantitative	Race: Sex by Age (Age 5 – 14) African American/Black Alone Asian Alone Two or More Races White Alone	Census 2010 / Block Group level
	Occupancy: Housing Units	Census 2010 / Block Group level
	Single-Family, Owner-Occupied Total Value*	*Riley County Appraiser's Office (2011) / Parcel level*
Qualitative	Public School Facilities	Riley County GIS 2009 Checked against Parks and Rec website
	Public Park Facilities	Riley County GIS 2009
	Aerial Imagery	Riley County GIS 2009

*The property address (situs address) and the mailing address on file of the owner are the same, indicating owner occupied.

• Playground: Play equipment like swings, seesaws, or jungle gyms.

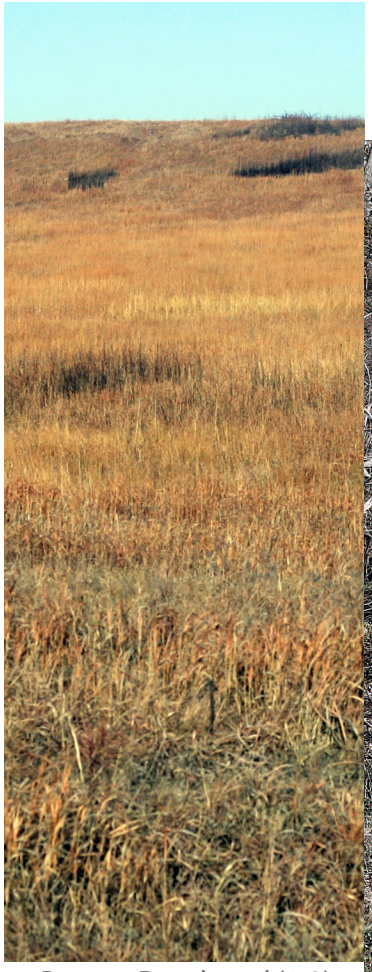
• Universally Accessible: Can children of all abilities access the environment? Is the location accessible by sidewalks, ramps, or other means? Is the location absent of adjacent steep slopes?

The maximum score of this system is 21 points. Figure 6.3 on the following pages provides a visual sample of each criteria.

The qualitative analysis was performed using publically accessible data (Table 6.2), including 2009 aerial imagery from Riley County's GIS server. Site analysis supplemented this analysis to reflect possible changes or to adjust for factors not seen through aerial imagery analysis.

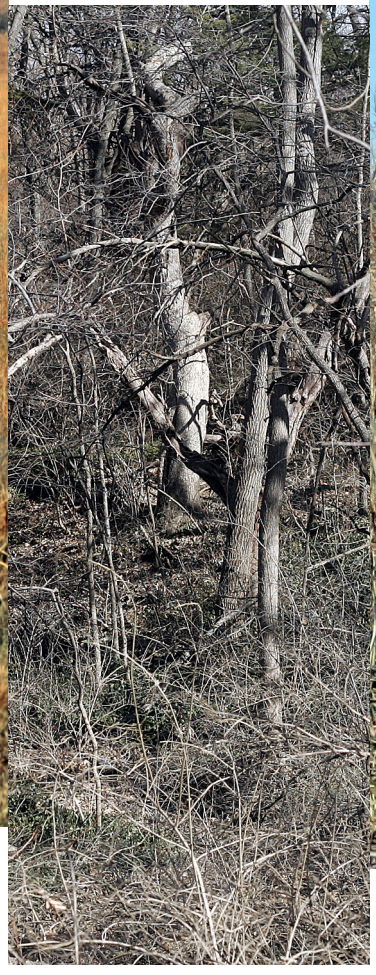
Description of Sample

Children ages 5-14 (elementary and middle-school aged) residing within the City of Manhattan as of the 2010 U.S. Census.



Percent Developed (1-3)

Forest (3)





Unmowed Grass (3)

Tree Cover in Mowed Grass (3)



Wetland (3)



Figure 6.3 | *Assessment Crtieria Illustrated*





Water (3)

Garden (3)





Playground (1)

Universally Accessible (1)



• Socioeconomic variables:

Three measures were used to assess the socioeconomic component. Race of children ages 5-14 was determined using 2010 Census Block level data using the following categories: White, Asian, African American or Block, or Two or More Races. These four categories comprise X% of children within the City of Manhattan. Block level data provides the smallest spatial unit, effectively locating presence of children in the study area.

Race of children ages 5-14 from 2010 Census Block data "Sex by Age" table including:

White
Asian
African American or Black
Two or More Races

The second socioeconomic variable was the use of publicly accessible appraisal values for single-family, owner-occupied* households within the City of Manhattan. This is used as a proxy for a household's income because household income is not publicly accessible information at a small enough scale for use in this study.

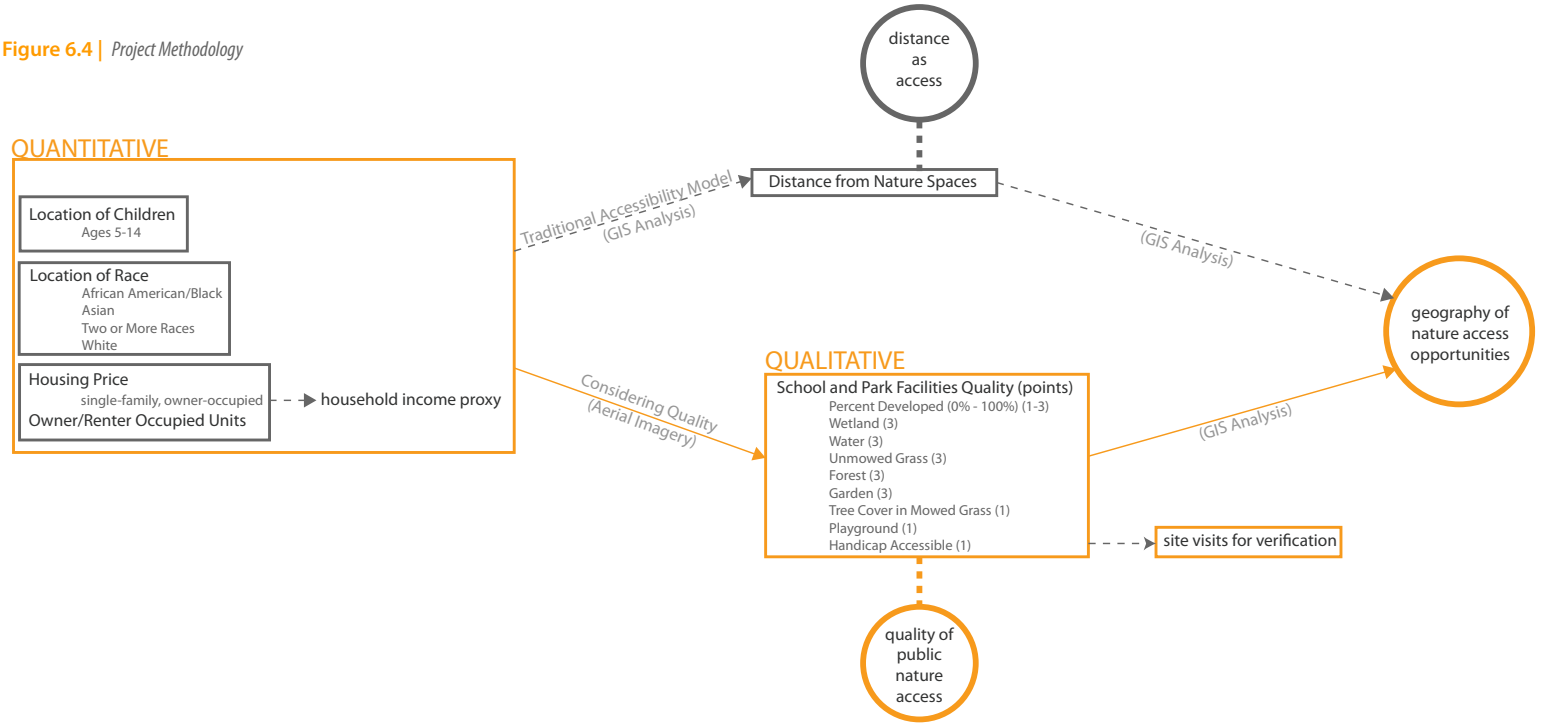
Total House Value = Land + Building ; For residential structures qualifying as Single-Family, Owner-Occupied from the Riley County Appraiser's Office.

A comparison of renter and owner-occupied units at the 2010 Census Block level are used a supplement to the Total House Value variable. Rental rates generally follow the value of single-family, owner-occupied units in an area.

Methodology Summary

The methodology employed in this study uses a combination of quantitative measures (socioeconomic status variables) and qualitative measures (quality of public spaces) to assess whether socio-economic factors, and their influence on housing location choice, affect a child's ability to access high-quality nature (Figure 6.4).

Figure 6.4 | *Project Methodology*



It was brisk fall morning at the nearby golf course. I was hoping to get out early and ahead of all the usual morning groups. I was walking my usual route, not expecting anything special. As I stepped around the corner of the clubhouse, I saw a magnificent view of the frost-laden greens and fairways adjacent to the clubhouse. The grass had been undisturbed by the maintenance crews and animals this particular morning. The white sheen reflected in the early sunlight as I walked around the side of the clubhouse. The 9th green's yellow flag unusually saturated in the morning light.

A strange since of uneasiness came over me as I approached the first tee box. It was as if I was about to disturb a still lake with a stone or I was about to bang the kitchen pots together to wake a sleeping friend. I was the wrecking crane of perfection. I reluctantly set my golf bag down and approached the crystalline surface. I announced my presence to the natural surrounding as the crunch of the grass emanating from beneath my golf spikes. I am here.

Although I had broken the perfection, I still walked gently around the teebox as I prepared to strike the first golf ball of the day. I intently picked a target and swung. The crack of the ball was louder than normal. Perhaps it was the lack of players on the adjacent putting green or the lack of golf carts whizzing around. It echoed through the trees, announcing my presence to the surroundings with a sharp and sudden noise. I am here.

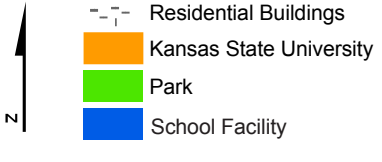
Some say golf courses are a waste of land. Others say golf is boring. I say they're both wrong.

chapter seven.

ANALYSIS + FINDINGS

Study Area

The analysis includes park locations, middle school and elementary school locations, and Kansas State University. There are 27 parks and 10 school facility locations (Figure 7.1).



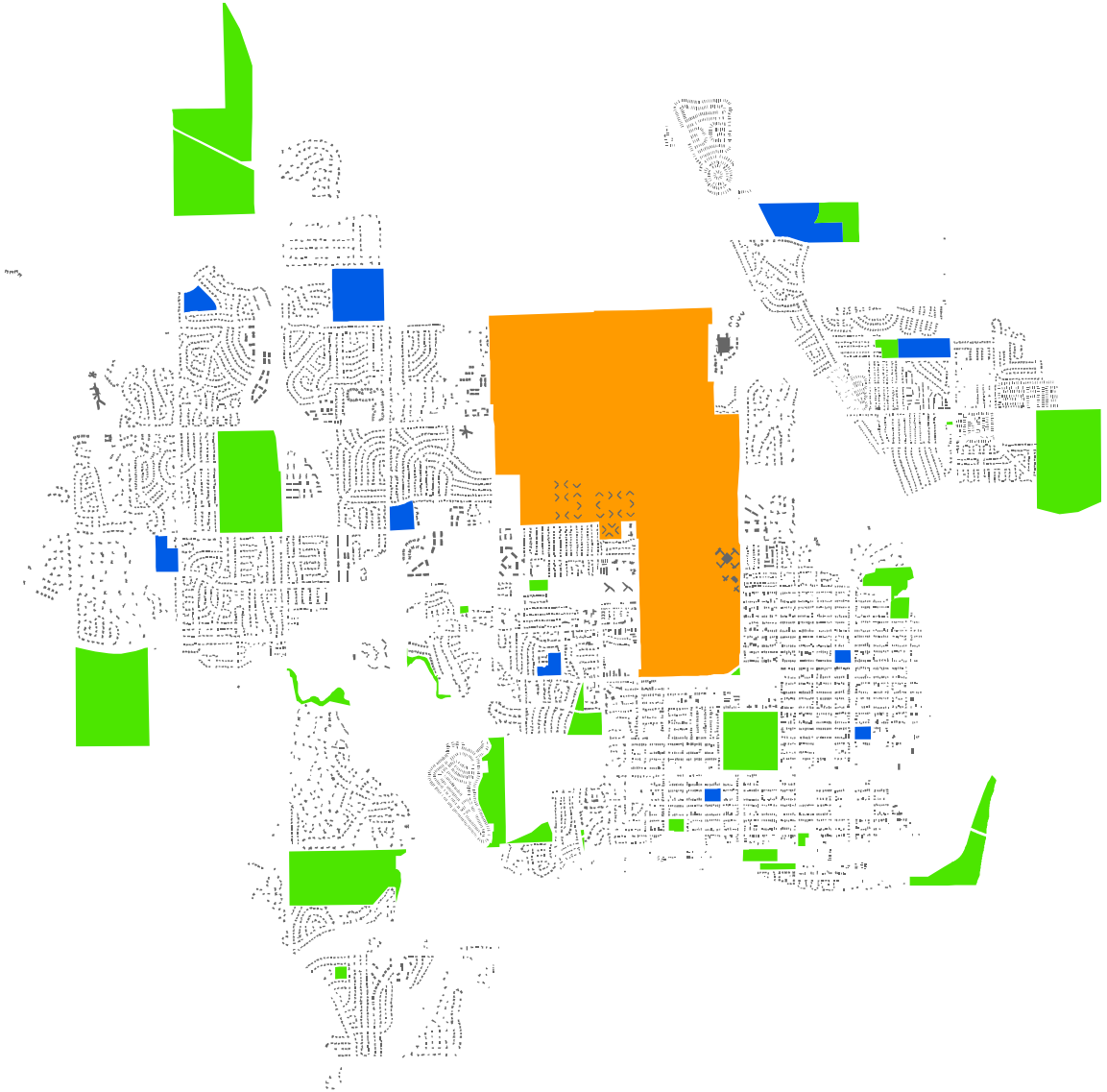
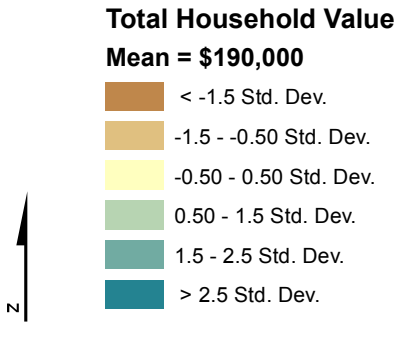


Figure 7.1 | *Study Area*

Income Composition of Manhattan

Like most cities, Manhattan's income is clustered in neighborhoods (refer to Figure 7.2). The largest high-income cluster is located in western Manhattan. The lower-income areas are located in the southwest. The grey areas without any coloring are either non-residential areas or renter-occupied units.

The standard deviation is a simple way to display the range of housing price in Manhattan. The areas above the average home price are shades of blue. The areas below the average home price are shades of brown. The highest income is geographically concentrated in the west central area. High-income owner-occupied units are also located in the southwest and northwest. The lowest incomes are concentrated in the northeast, southeast, and southwest. The area east of Kansas State University's campus is also lower-income. This is further indicated by relatively few owner-occupied units on the map.



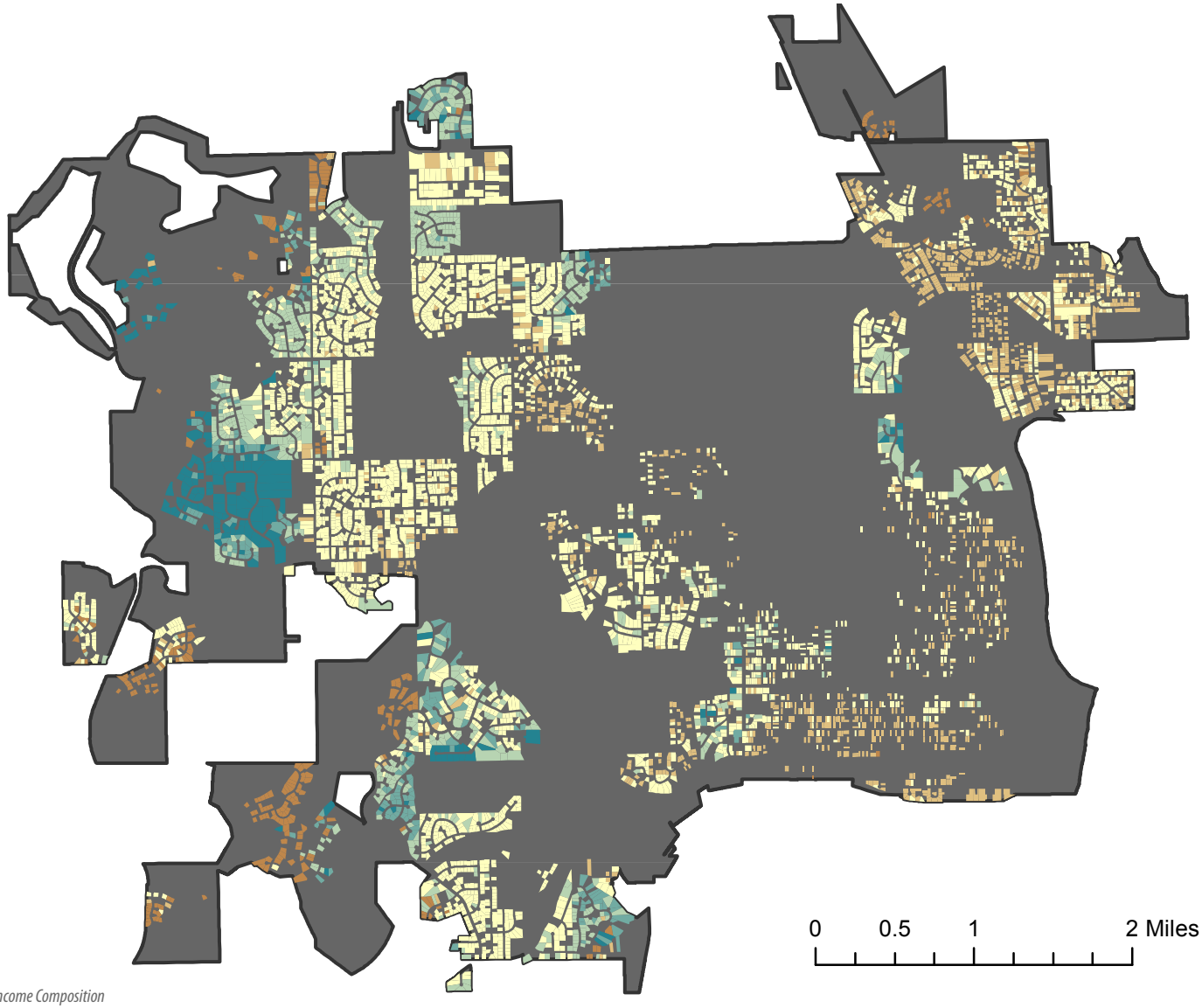
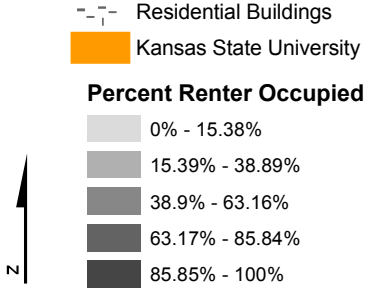


Figure 7.2 | *Income Composition*

Rental Composition of Manhattan

The renter-occupancy map (Figure 7.3) further highlights the high- and low-income areas within Manhattan. Generally, the percentage of rental units decreases further away from the university; although there are high rental rates in the northwest corner, as well.



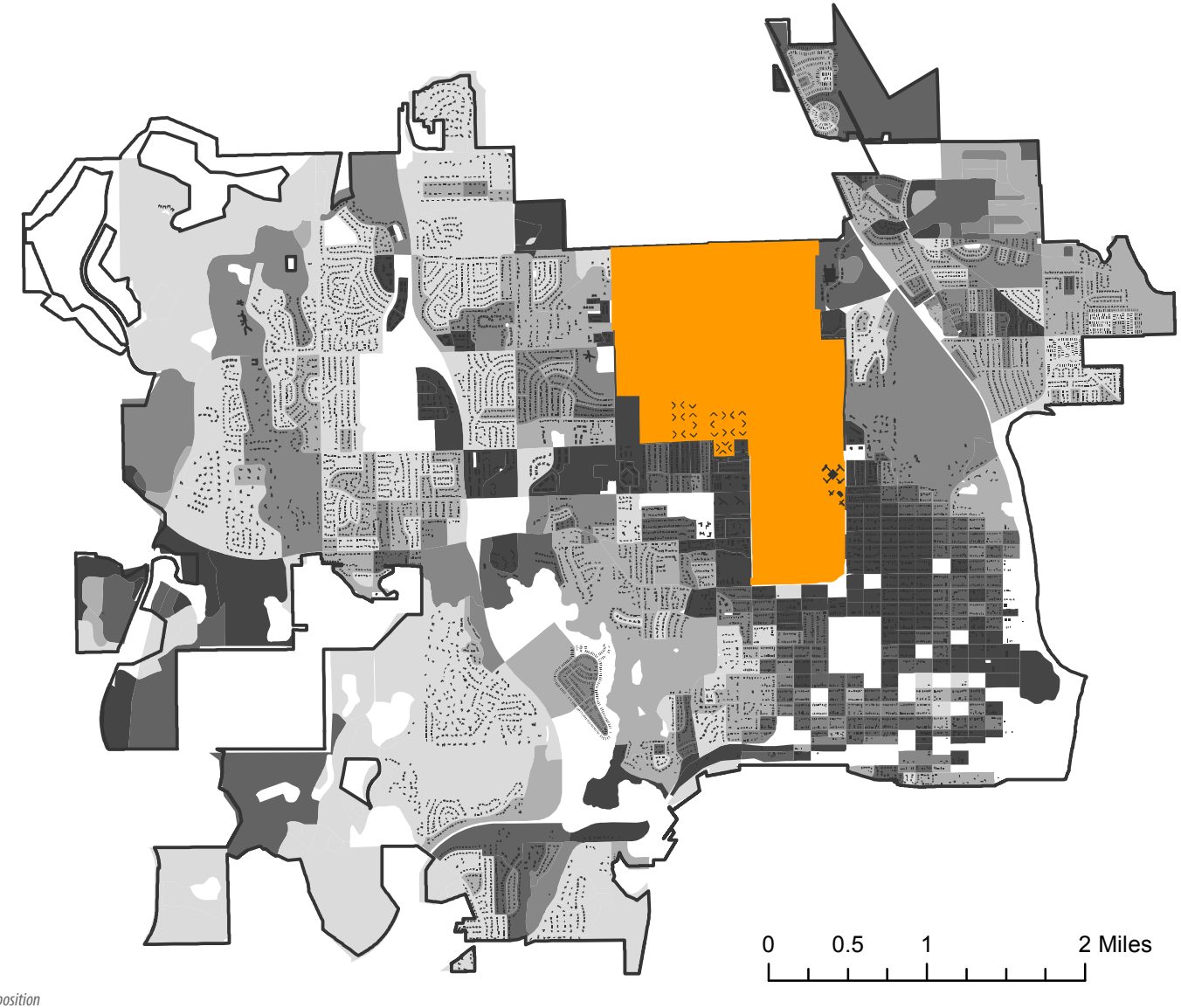
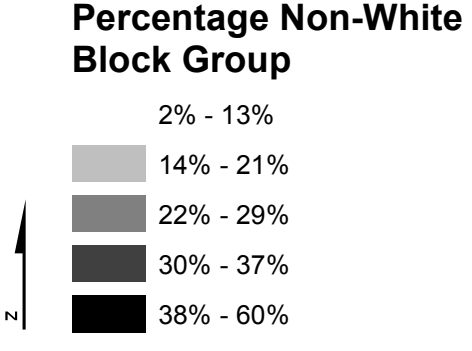


Figure 7.3 | *Rental Composition*

Racial Composition of Manhattan

The percentage of non-white children in Manhattan is spread throughout the city (Figure 7.4). There is little pattern as to the location of non-white individuals. The areas with the highest percentage of non-white children is near Kansas State University's campus. Other high areas include the northwest and southwest corner.



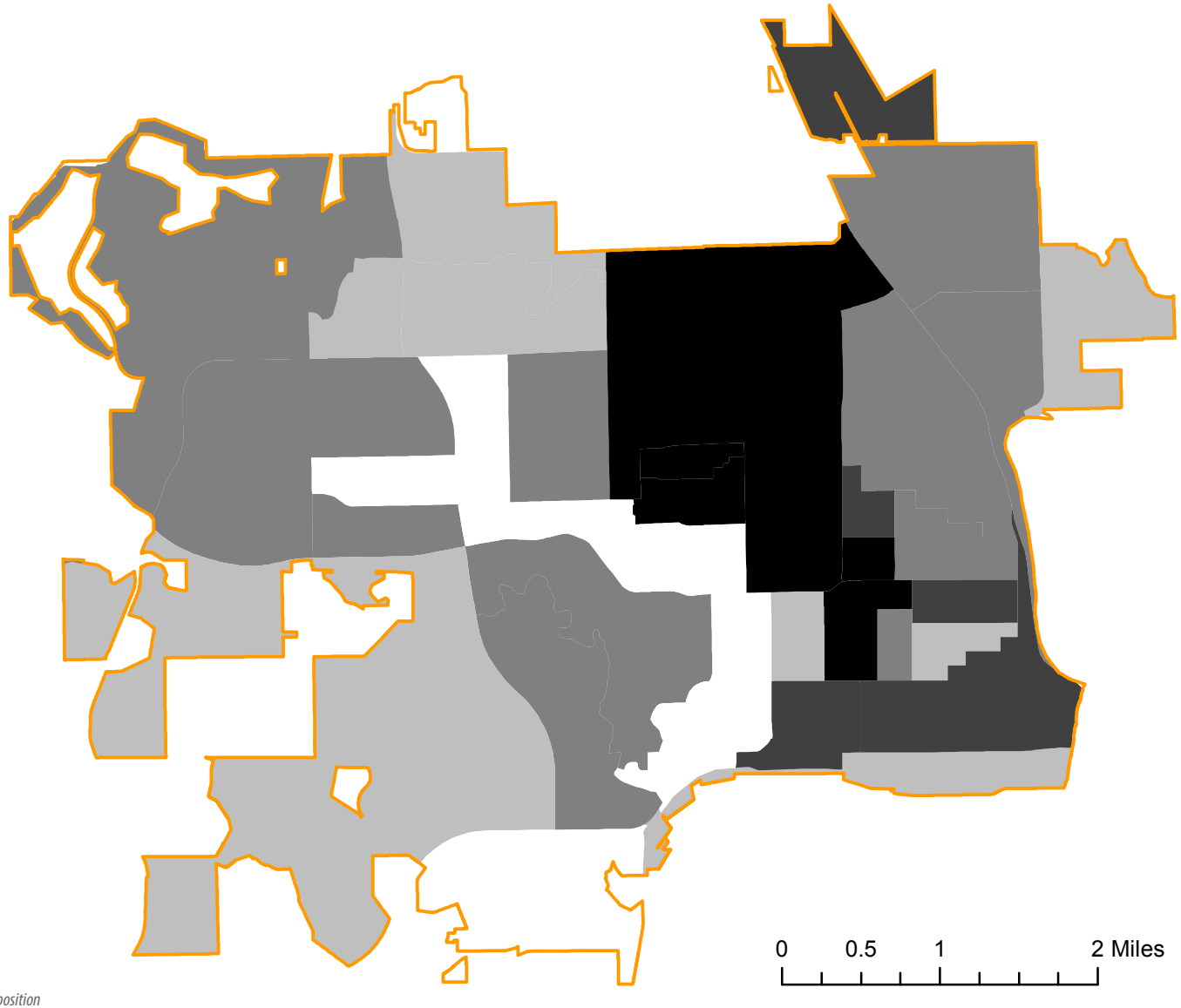


Figure 7.4 | *Racial Composition*

Examples of Qualitative Analysis

The following pages show two extremes for the qualitative analysis ratings, highlighting an example of a high-quality school and park and a low-quality school and park. This highlights the variation of quality in both parks and school quality in Manhattan. Qualitative analysis figures for each park and school facility, as well as photos highlighting the general characteristics are located in Appendix D.

Northview Park

Griffith Dr & Blaker St

Low-Quality Park

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

6









Warner Park

3704 Warner Park Cir

High-Quality Park

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 3
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

13









Lee Elementary

701 Lee St

Low-Quality School

Percent Developed (66-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 1
Handicap Accessible = 1

3









Amanda Arnold Elementary

1435 Hudson Ave



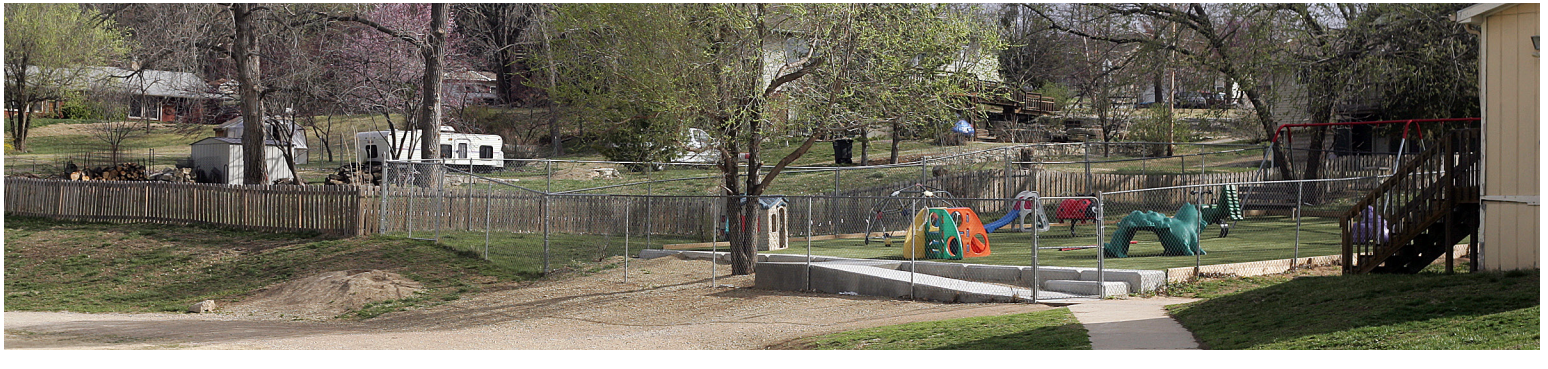
High-Quality School

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 3
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

10







Quality of Nature Spaces

Figure 7.5 at right provides the qualitative assessment of the nature spaces, both parks and school facilities. This is simply a visualization of the quality ratings, without any analysis performed.



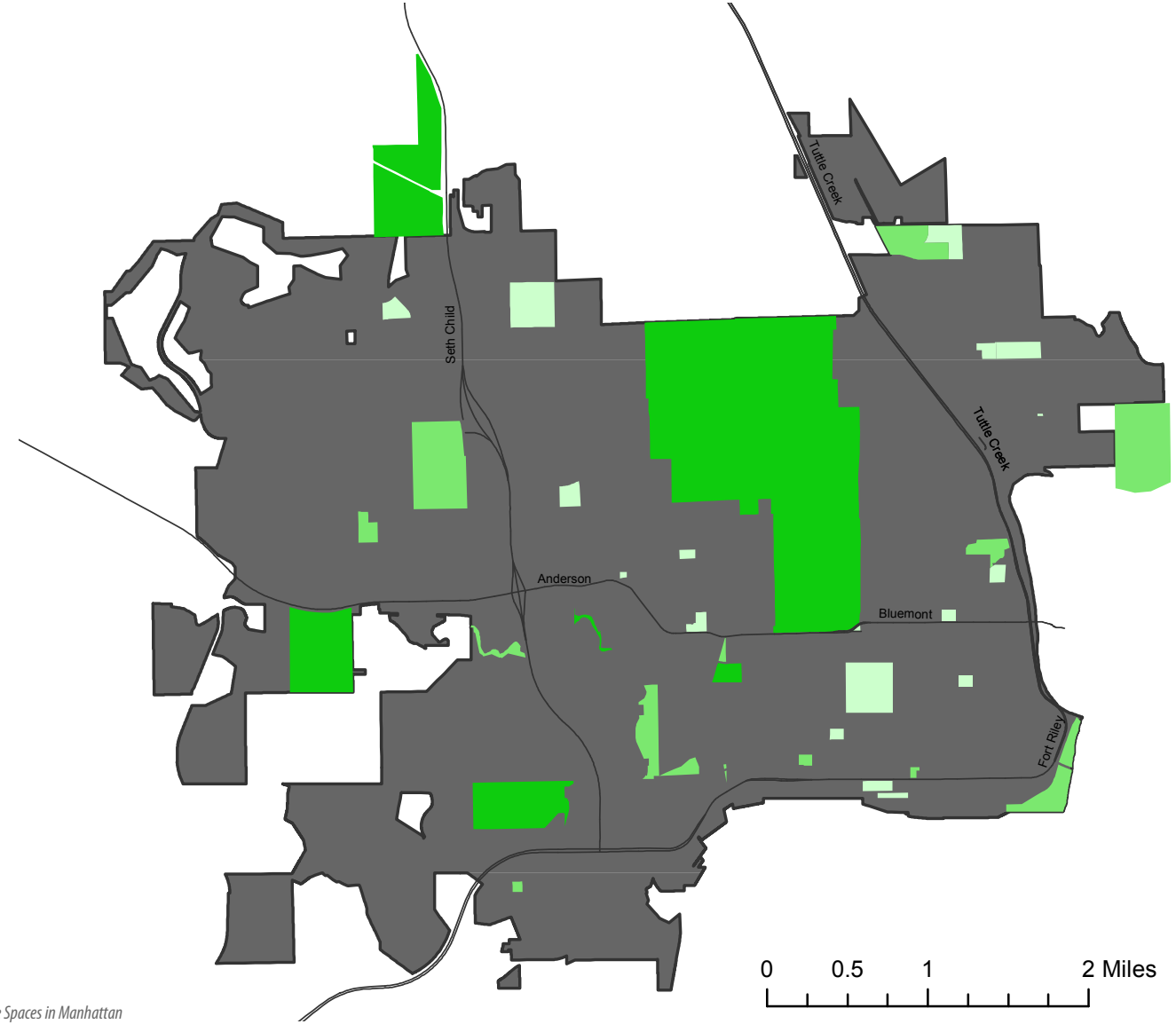


Figure 7.5 | *Quality of Nature Spaces in Manhattan*

Spatial Analysis

Analysis was performed using Geographic Information Systems (GIS) technology. GIS are a powerful tool, with the ability to analyze data spatially as well as statistically. It not only provides a visual representation of the data, but also records tabular data for use in spreadsheet or other statistical analysis software. This allows for statistical relationships to be established as opposed to simply relying on visual analysis. This helps provide more valid analysis results.

There were two techniques used in the analysis. The first is called Euclidean Distance. It used a distance of ½ mi. to visually and statistically represent the distance it takes to access the closest nature opportunity for each park in the typology. It answers the questions:

How far, on average, does a geographic area have to travel for nature access?

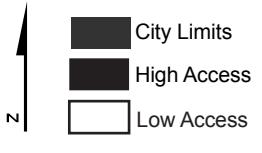
This only measure "distance as access." It does not incorporate the qualitative aspects of this study. Thus, the initial analysis follows the traditional approach of measuring access to nature using "distance to access" measurements. The second part of the analysis considers the qualitative component. It uses the Euclidean Allocation function to determine the quality of the closest nature opportunity for each park in the typology. Each geographic area can then be assigned an average qualitative score based on the Euclidean Allocation analysis. This analysis answers two questions:

What is the quality of the closest park with a distance limit of ½ mile?

What is the average accessible quality for a geographic area?

Visualization of "Distance as Access"

Figure 7.6 shows the distance of the nearest nature spaces within 1/2 mile. The darker the shading, the higher accessibility a nature space becomes. Areas in white are areas outside 1/2 mile of a nature opportunity.



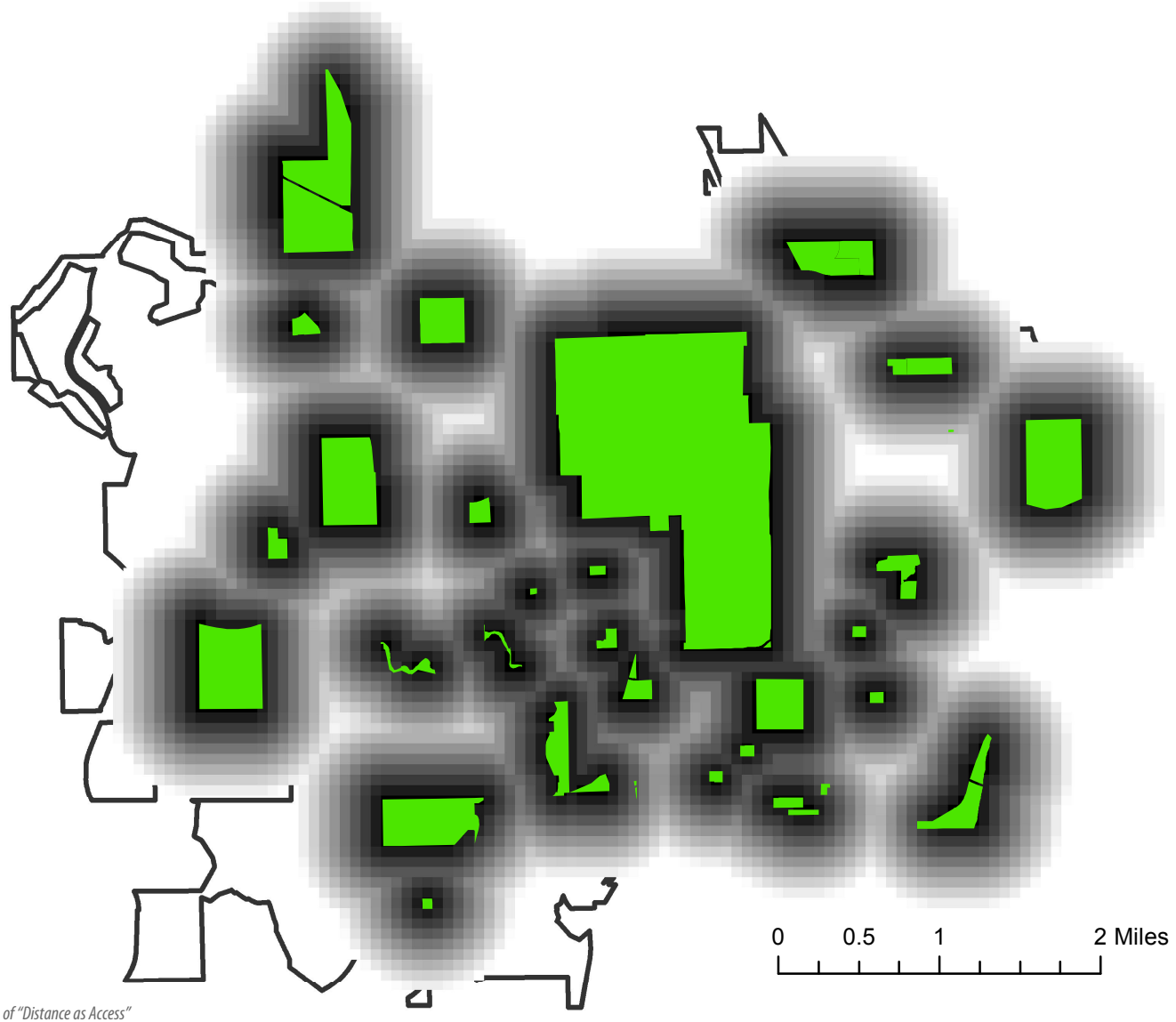


Figure 7.6 | *Visualization of "Distance as Access"*

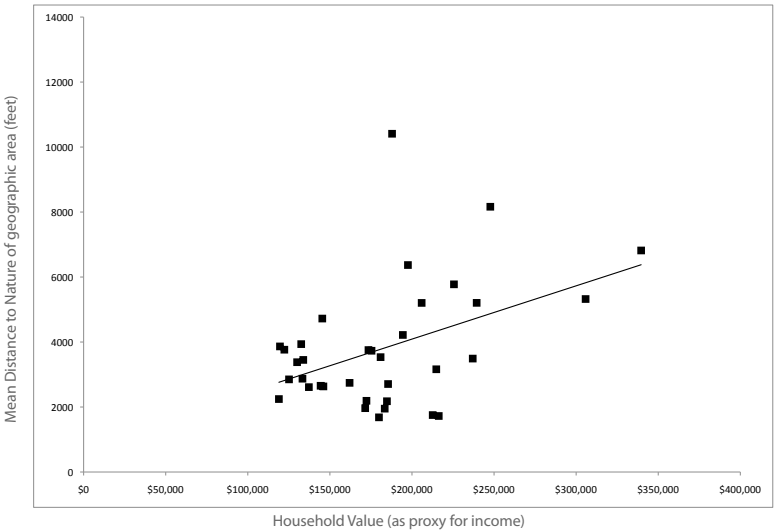
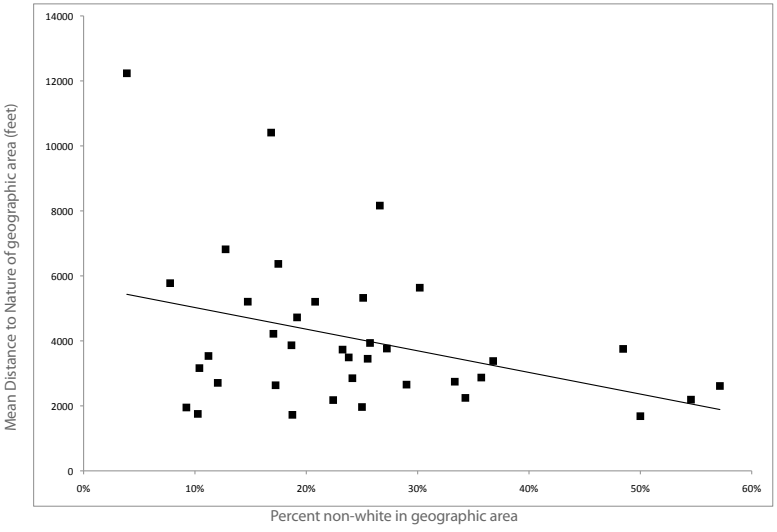


Figure 7.7 | *Statistical Correlation of Income and Distance*

Figure 7.8 | *Statistical Correlation of Race and Distance*



Distance as Access

Income: As a general pattern, the geographic areas with higher household incomes are located further to parks and school facilities in the study area (Figure 7.7).

Race: As a general pattern, the geographic areas with a higher percentage of non-white children are located closer to parks and school facilities in the study area (Figure 7.8).

Although potentially counterintuitive, this relationship does make sense, given the historic growth patterns of parks and development in Manhattan (as seen in Figure 5.6). Manhattan started with small homes on small lots with lower transportation accessibility. As years went by, with the introduction of cars, larger lots and higher mobility caused fewer smaller, densely annexed parks to be built. Larger parks more spread out were annexed as Manhattan grew.

There was also a focus given to active recreation like courts and other facilities as opposed to passive recreation, which this study's specific interest, following the definition of nature and assessment critieria.

Figures 7.9 and 7.10 visually show the areas with the highest and lowest acess to nature based on distance.

Spatial Analysis - Quality of Accessible Nature

So far the analysis has shown, as a general pattern, areas with lower income and higher percentages of non-white children are located closer to parks and school facilities. However, this study aims to extend this traditional model of "distance as access" as a measure of equity by using analysis that includes qualitative factors. Areas with lower incomes and higher non-whites may have good access, but perhaps their access is to poor quality parks and school facilities. This would help answer the research question by identifying who has access to high-quality parks and school facilities for passive enjoyment. The "Distance as access" measurements described previously tell only one part of the story. Including qualitative factors helps determine beyond just measures of distance who has access to high-quality parks and school facilities.

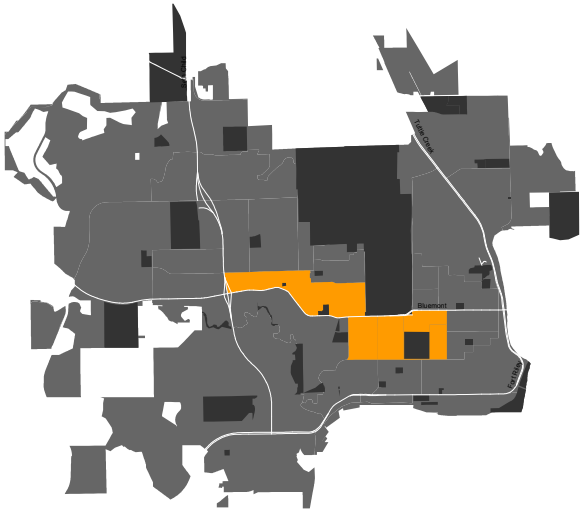
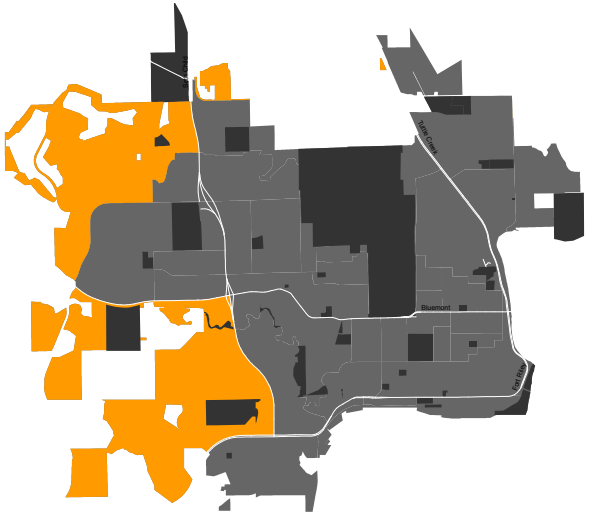


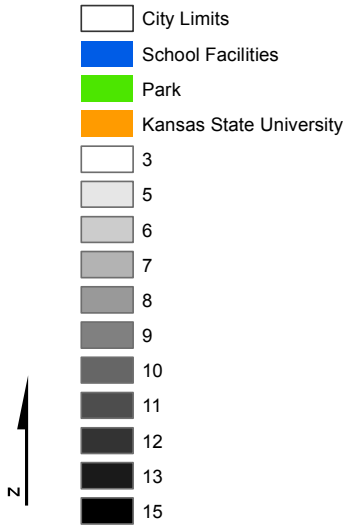
Figure 7.9 | *Best Access based on Distance*

Figure 7.10 | *Worst Access based on Distance*



Visualization of Quality

Figure 7.11 shows the quality of the nearest nature spaces within 1/2 mile. If more than one space is within 1/2 mile, the closest nature space is used.



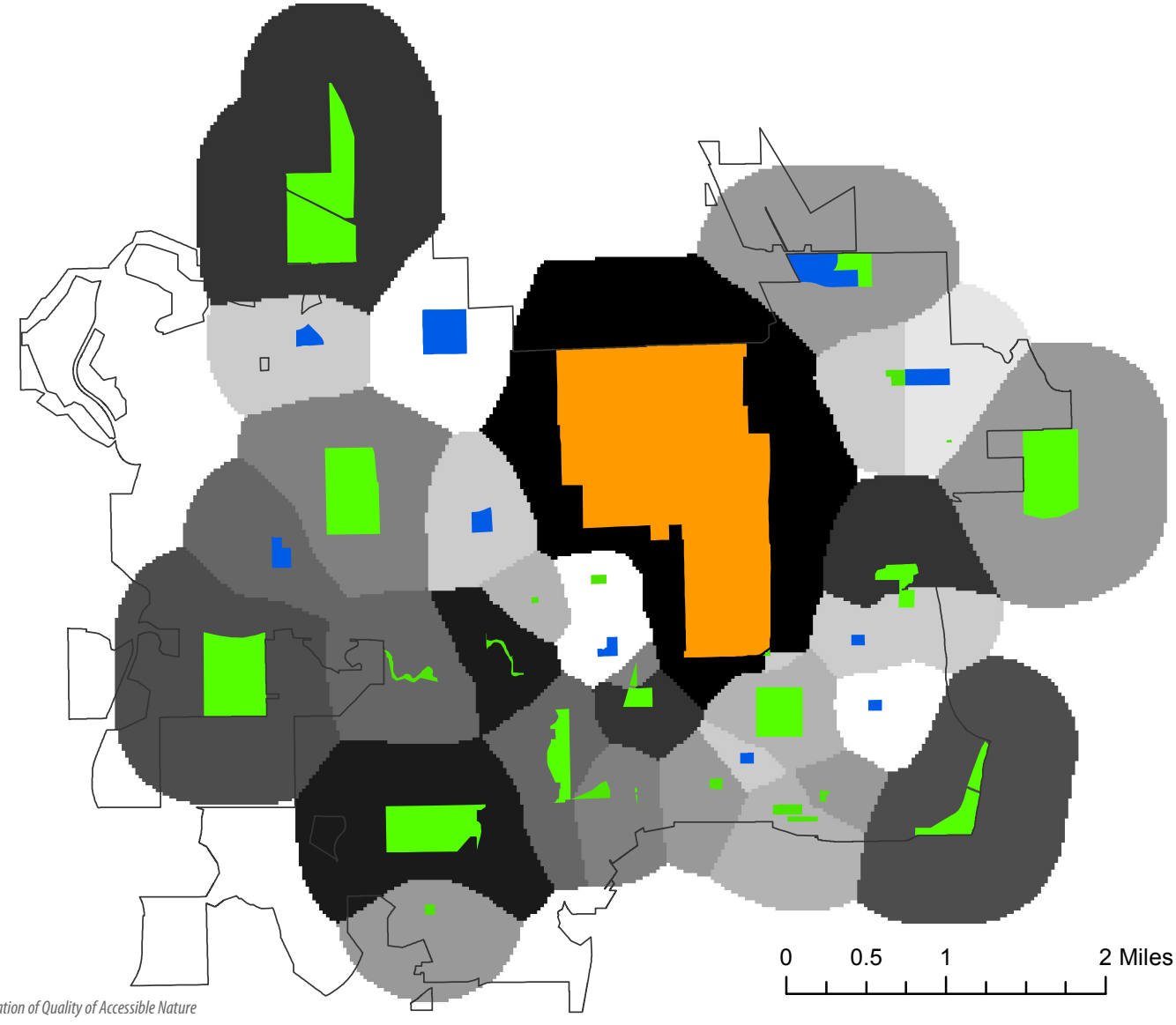
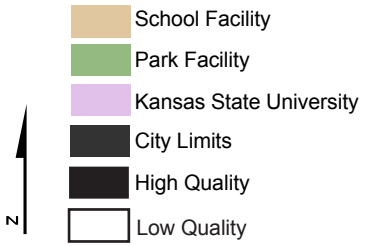


Figure 7.11 | *Visualization of Quality of Accessible Nature*

Visualization of Quality

Figure 7.12 uses an alternative measure of accessible nature quality. The darkest areas are where the quality of accessible parks is highest, whereas the lightest areas show where the quality of accessible parks is lowest. This analysis includes both the quality of spaces and density. Areas with a high-density of high-quality parks receives a darker color than an area with a low-density of low-quality parks or a high-density of low-quality parks.



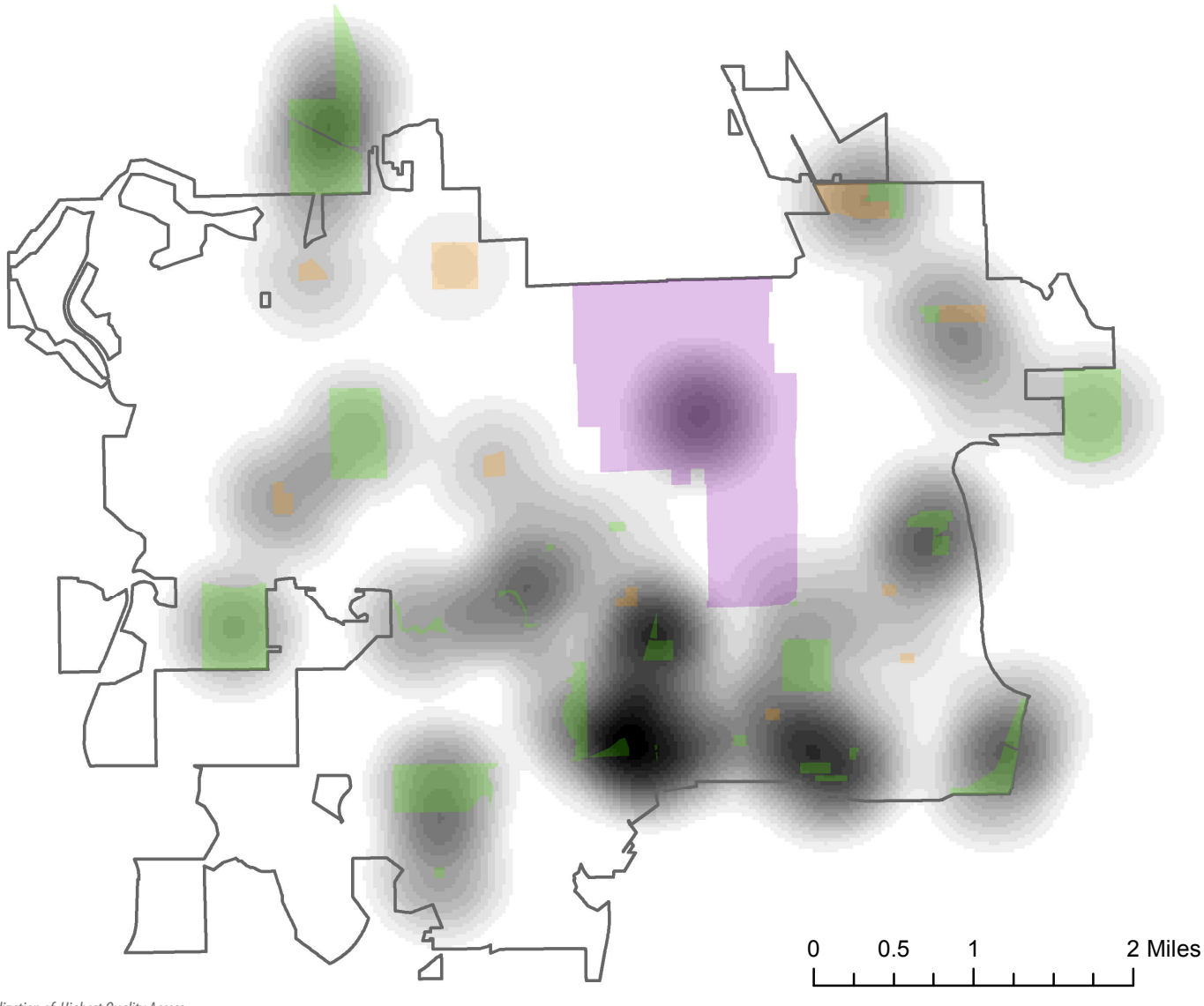


Figure 7.12 | *Visualization of Highest Quality Access*

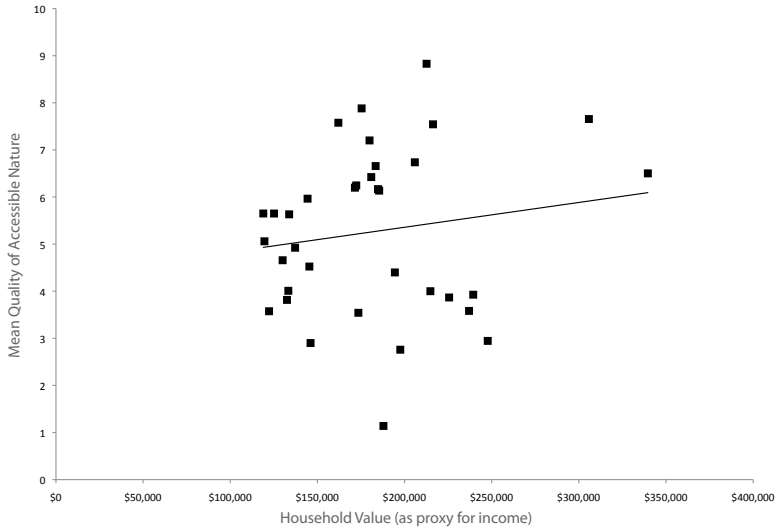
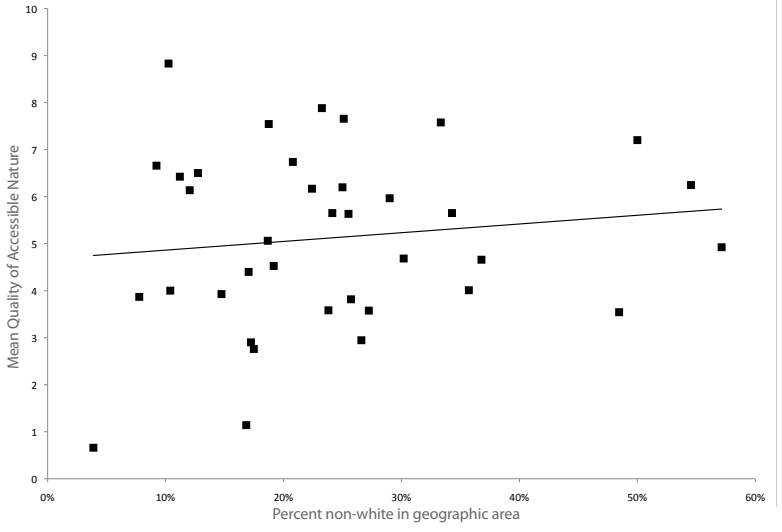


Figure 7.13 | *Statistical Correlation of Quality of Accessible Nature and Income*

Figure 7.14 | *Statistical Correlation of Quality of Accessible Nature and Race*



Quality of Spaces

The most important consideration in determining the variables' relationship to quality is how the slopes of the trend-lines change as quality is considered. The relationship between distance, and the two variables—race and income—is stronger than the relationship between quality and the two variables (Figure 7.13 and 7.14). If the quality trendline closely matched the distance trendline for each variable, the conclusion would be that lower-income and areas with higher-percentages of non-white have access to higher-quality parks and school facilities. However, the trendlines are flatter, showing less of a relationship between the two variables. This leads to the conclusion that the quality of accessible spaces does not change dramatically between the two variables in the study area. There is no inequality present.

Figure 7.15 and Figure 7.16 show the locations with the highest average quality and lowest average quality of accessible nature spaces.

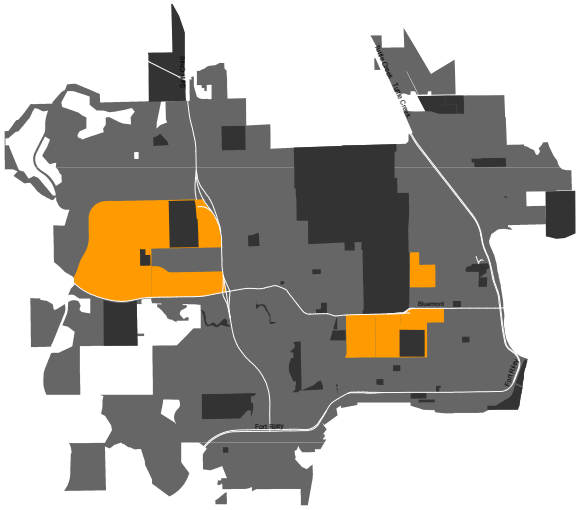
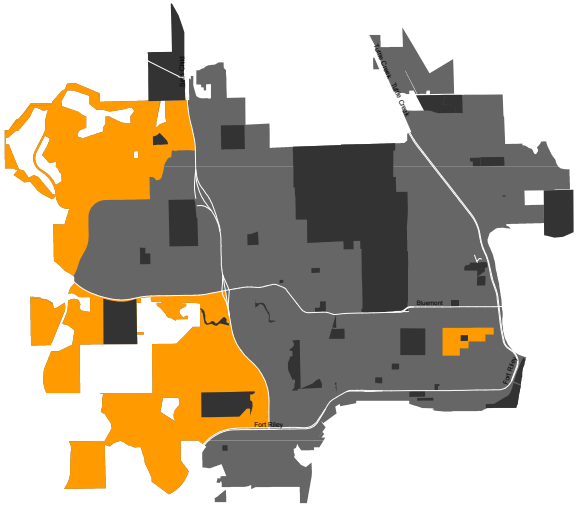


Figure 7.15 | *Highest Average Quality of Nature Access*

Figure 7.16 | *Lowest Average Quality of Nature Access*



Study Findings

Access to nature is closer for low-income areas and areas with a greater percentage of non-whites. However, when considering quality of the accessible spaces, there is no relationship between the income or race of a geographic area. Thus, there is no inequity present in the study area. As a general pattern, low-income areas and areas with a high percentage of non-white residents have access to similar quality nature spaces.

I tried to ignore it. But I just couldn't; I knew I couldn't for much longer. The warmth of my sleeping bag cocoon was all I desired at that moment, but the gravity of the situation was too much to ignore. It was time to escape the tent and face the biting nighttime cold so I could sleep soundly the rest of the night. I slowly unfurled to peek my head outside the sleeping bag filled with the warm air of my breath. The ice crystals that are typically sparkling brilliantly white as the moonlight hit our tent were absent. "No moon tonight," I thought. The biting cold increased two-fold as I opened the tent fly to retrieve my boots which had become rock hard sitting under the tent fly. After securing the boots, the final step before relief was standing up, easier said than done for someone 6'4" and whose been lying on the cold, solid ground for four hours. I managed to complete this final task after more effort than I care to admit.

What greeted me as I stood up from the tent was a sight I'll never forget and one where words can do little justice (but I'll try anyway). Millions of brilliantly twinkling stars shined down on me as clear and recognizable as the type you are reading. I found the North Star, then the Milky Way, and possibly a few planets, but I'm no astrologist. Yet it doesn't take a degree in astrology for stars to take your breathe away. The feelings rushing through me ranged from awe and astonishment to realizations of insignificance. On one hand, it was one of the most beautiful sights I have ever seen, there is nothing quite like seeing a cosmic array so brilliantly. Yet it reminded me we are all such a meager blip on the cosmic radar. I am nothing, me and this tent. But in that reminder of mortality, I felt something far outweighing the feeling of being nothing. The feeling was that of life.

Regardless, it sure beat the view from inside the nearby campsite Port-a-John.

chapter eight.

CONCLUSION

The Value of Parks in the Community

Parks and school facility grounds are an important part of children's quality of life. They provide restorative environments for children. They provide a place for children to escape family and school life, while providing a place to explore, discover, and play. It has been shown they have numerous psychological and physical health benefits (see Chapter 3: "Theoretical Exploration").

Parks and school facilities should be designed or re-designed to reflect their importance in a community, but especially from the standpoint of children because nature spaces have particularly important impact on a child's development, physical health and emotional well-being. Planners should recognize that parks and school facilities are an important element of a child's quality of life and should carefully plan developments and plans around this fact. Regional and community planners should carefully consider the use of natural environments in the design and planning of communities' public amenities—both their location and quality. However, planners and designers should go a step further than simply providing an opportunity. A nature opportunity should be a high enough quality for a child to feel compelled to interact with it. The provision of high-quality parks and the design of school facilities should be pushed in public policy and design review standards. Nature and the built environment should not be a dichotomous choice. The development of nature opportunities should support the built environment and neighborhood development plans.

Historical Patterns Influence Access

The results show that historical patterns have influenced the accessibility of nature in Manhattan. There is lower access to high-quality nature spaces in the more recent developments. Cars and single-family home ownership rose after World War II. These single-family lots typically had their own private yards. It is likely that development of public nature spaces were seen as insignificant and devalued.

Planning for Future Parks in Manhattan

It is recommended that future development of nature access in Manhattan should consider the following six recommendations:

Policy Recommendation #1: Equity in the Current Park System

The current system of nature opportunities appears to be fairly equitable in its ability to provide high-quality nature access to children across areas with high- and low-income and high- and low-concentrations of non-white children. Equity and the development of high-quality parks and school facilities should continue to be considered, measured, and planned accordingly.

Policy Recommendation #2: Development of Pocket Parks

There were relatively few pocket parks identified in the study area and many of them were clustered in one area. Providing an acre or two of nature is quite sufficient for a child (Louv 2008). Yorgenson Park's one acre is just as beneficial as Warner Park's 82 acres. The City or Parks and Recreation Department doesn't necessarily need to allocate more money by annexing large areas with lots of amenities or retrofitting areas by spending money to annex additional land or upgrade spaces. Pocket parks and the development of "nearby nature" access is an important step for the development of a cohesive nature opportunity system

and one that provides easy access. The development of pocket parks reduces potential public expenditures by annexing or including in the provision of developments a requirement to set aside one or two acres for a park. Pocket parks are easy to develop, cost little, but can provide a perfectly acceptable size and quality of a nature opportunity if planned and designed correctly.

Policy Recommendation #3: Recognize the Importance of School Facilities

School facilities can provide an important nature opportunity. School facility landscapes in Manhattan are generally low quality based on the qualitative analysis. Public investment through school grounds beautification grants (e.g., 21st Century Community Learning Centers, Lowe's Charitable Educational Foundation) or other public funding sources can help to enhance the natural qualities of these sites. The siting and design of future school facilities should consider the surrounding context and should attempt to provide high-quality nature access opportunities for future children.

Policy Recommendation #4: Access of Nature Opportunities

Indicated by this study, distance to parks is only one measure of true accessibility. Other factors contribute to an ability to access nature opportunities. Nature opportunities should be easily accessible by walking, biking, public roads, or trails. Establishing easily accessible parks for children requires an acknowledgement of the physical context of the area, surrounding land uses, and travel possibilities. Additionally, the Linear Trail should continue to be developed with designated access points because the Linear Trail helps access and connectivity to nature spaces throughout the City.

Policy Recommendation #5: Public Outreach and Planning Advocacy

Planning does not consider just the physical environment. A planner's role can also be one of social advocacy and outreach. Planners, through public outreach, can provide important information and share the numerous benefits of nature access. This can be accomplished through presentations in schools that educate children about local nature opportunities. The Parks and Recreation Department or City can sponsor a series of Public Service Announcements that communicate the benefits of nature and local opportunities. Planners can also provide information on where the highest quality and most accessible nature is for a particular area or neighborhood through pamphlets, fliers, and other informational handouts. The newly created City of Manhattan website could serve as an excellent portal for such information. Planners should especially advocate the numerous opportunities that parents or children may not consider as an opportunity. For example, Kansas State University is the highest quality nature space in Manhattan, but rarely is it considered a nature amenity. Recognizing such discrepancies can help children experience nature amenities in Manhattan.

Policy Recommendation #6: Future Development of Nature Spaces

Long-term planning efforts should focus on the rehabilitation of existing low-quality spaces and creation of public nature spaces in regards to equity, access, and quality. Nature spaces should provide natural elements that enhance the ability for children to interact with passive recreation spaces, providing physical and mental benefits. For example, the use shade trees, natu-

ral grass, and wetlands in the siting and design of opportunities.

Policy Recommendation #7: Future Development of Housing

Emphasize the planning and development of housing that is accessible to a variety of nature opportunities through subdivision regulations and review that consider the use of nature elements, including the effectiveness of providing high-quality nature opportunities. Future public investment should focus on the rehabilitation of existing parks and school facilities and the acquisition of additional nature opportunities to ensure that current and future residents have equitable access to high-quality nature opportunities from a variety of housing locations.

Study Limitations

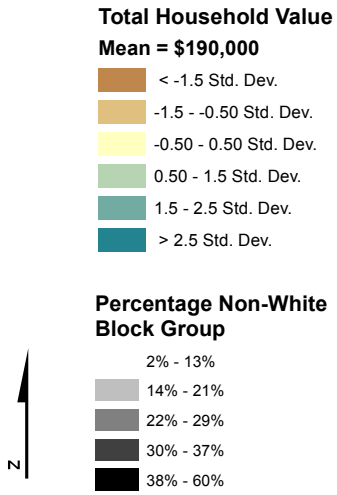
Researching human experiences is difficult. This study has taken a quasi-qualitative approach to answering the research question. The study used quantitative methods with qualitative inputs to measure equity, access, and quality of nature spaces. This qualitative aspect hinders the generalizability of the study. The subjectivity of analyzing qualitative elements of nature opportunities means the results are difficult to replicate.

The study also does not include density factors in analyzing accessible nature spaces due to time constraints and to keep the scope of the project manageable. It does not analyze the difference between a geographic area with a higher density or lower density; rather, it simply uses Census demographic numbers for a specified geographic area.

It should be acknowledged that nature does not necessarily have to be accessed publically. The study does not include other accessible nature opportunities like those in private spaces or undesignated nature spaces. The inclusion of private areas or areas that are publically accessible, but are not designated as a park, would likely have a significant effect on the study results. However, due to time and methodological difficulty, these spaces were not included.

Limitations - Other Factors

Other factors like traffic volumes (Figure 8.1 and 8.2) and sidewalk gaps (Figure 8.3 and 8.4) factor into how accessible various geographic areas are to nature access opportunities. Although part of the original analytic strategy, it was found that including such factors is difficult and muddles the results of the spatial analysis and statistical correlation used in measuring both distance to nature and quality of nature. The study acknowledges that other factors exist in determining access, but this is outside the scope and time frame of this report.



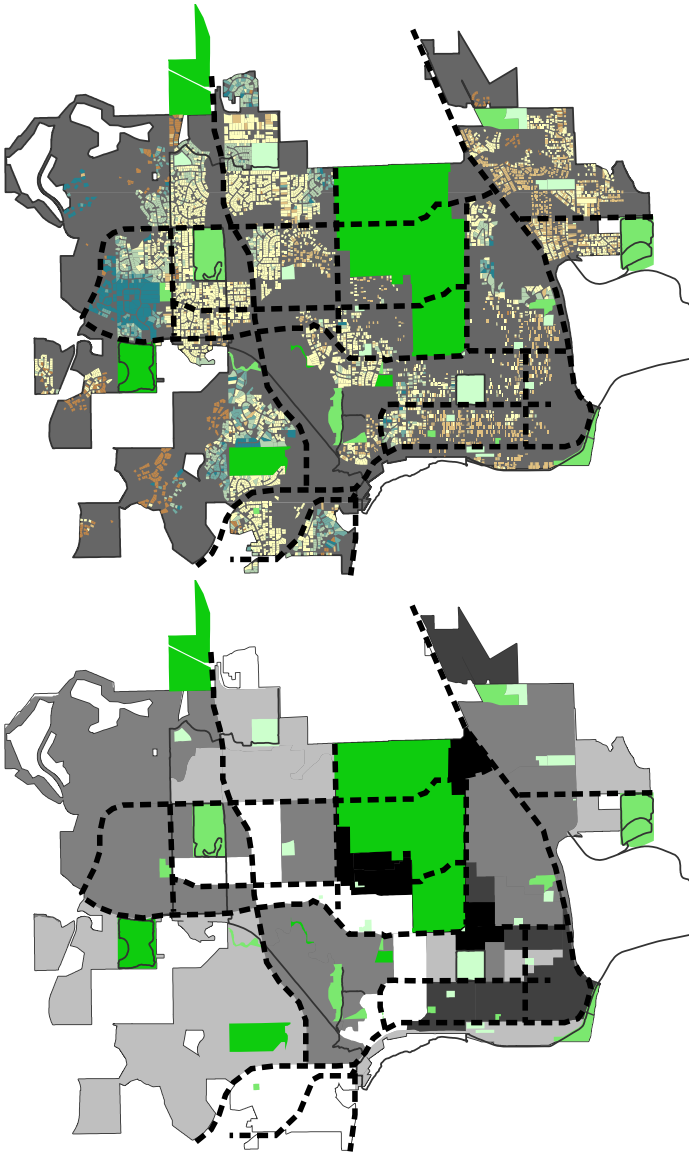


Figure 8.1 | (top) *Income and Traffic Volumes*
Figure 8.2 | (bottom) *Race and Traffic Volumes*

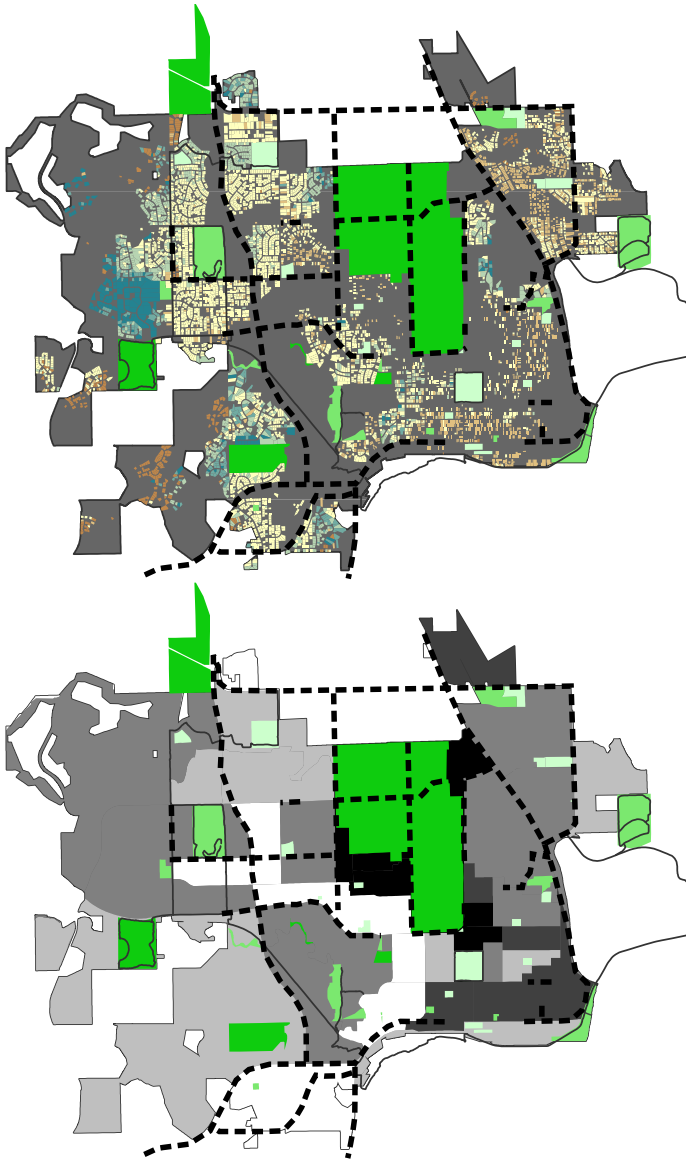


Figure 8.3 | (top) *Income and Sidewalk Gaps*
Figure 8.4 | (bottom) *Race and Sidewalk Gaps*

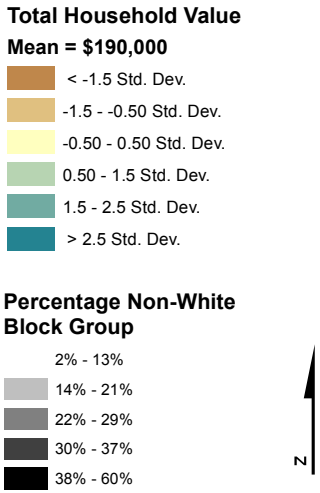
Directions for Future Research

Future research should consider the inclusion of private and undesignated nature areas. This sophisticated approach will produce a much more meaningful analysis of who has access and where it occurs. Including physical barriers and other hindrances like sidewalk gaps and traffic volumes will also be meaningful.

Ethnographic studies providing primary data directly from children will also enhance the results from this study. First-hand data can inform how children access nature, where they go for access and the perceived quality of access from a child's point of view. Although the definition of nature used in this study attempts to handle these perceptions, a more in-depth understanding will be beneficial in understanding the nuances behind this phenomenon. Additionally, ethnographic studies may help to derive how traffic volumes, sidewalk gaps, and other physical factors influence accessibility.

Future research should consider access and equity in a more urban context, where larger differences in income and race exist. This will provide an important comparison across a larger scale, different development pattern, and a larger sample of data.

Studying more specifically how growth patterns influence the accessibility of public nature would be a valuable addition. Are there positive contributions of historical growth patterns to nature access? This study has only briefly touched on the historical patterns and how it has influenced the study results.



Conclusion

Parks and school facilities provide numerous benefits for children and nature opportunities, serving as one of the most important public infrastructure elements to make cities livable and memorable by increasing quality of life. The process-oriented precedent studies, particularly the Los Angeles study, show that nature opportunities are not always equitably distributed. The provision of public nature opportunities is a fundamental responsibility to decision-makers including public officials, planners, and designers. This study reveals that considering simple "distance as access" measures does not show the entire relationship of nature access and equity. By including quality as a unit of measurement the traditional model can be enhanced, showing that equity issues do not exist in Manhattan. It also considers that nature access for children is more than just parks. Schools and other locations can also provide a high-quality nature experience. Future policy and decision-making should acknowledge these factors as Manhattan continues to grow.

I realize I am lucky. Not every child has had such profound, thought-provoking, and memorable nature experiences like me. But every child deserves these experiences. No, every child needs these experiences. Nature experiences have helped shape my philosophical viewpoint. They have helped me form bonds with family and friends. Nature experiences have offered respite from an increasingly stressful global landscape. They have helped me understand my relationship to other living systems. They have given me jaw-dropping, awe-inspiring moments. But most of all, nature experiences have helped me a more important experience—the experience of life—more fully.

This is not the end, but only the beginning. This book represents the end of one chapter of my life, but the start of a new chapter—a new journey. A journey in which I will strive to ensure that every youth has access to quality nature experiences. Experiences that shape their life as much as nature has helped shape mine.

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appendix a.

GLOSSARY OF TERMS

Glossary of Terms

access - *the ability to interact with high-quality nature by walking or biking in close proximity to one's place of residence*

biophilia - *the innate tendancy to focus on life and life-like processes*

ecological design - *design with regard for natural processes*

environmental psychology - *how your physical environments affects cognititve processes and emotions*

environmental stewardship - *responding to a responsibility to respect and protect the environment*

equity - *no group or neighborhood has less access to high-quality nature*

experiential learning - *learning through the process of interacting*

geography of opportunity - *The effect race and income have on housing choice, and thus, location. Determined by child's housing type and school neighborhood characteristics. (e.g, single-family, low-income)*

health and wellness - *how the physical environment affects the quality of physical and mental health*

nature - *An area comprised of comparatively high levels of vegation and natural elements, typically green that is accessible by walking or biking.*

restorative environments - *spending time in nature helps people cope with daily life stress*

socio-economic status - *in this study it is operationally comprised of race and income*

appendix b.

LANDSCAPES OF LEARNING LITERATURE

The literature cited in Chapter 3 ("Theoretical Exploration") is based on a larger pool of resources compiled by the Landscapes of Learning Master's Report group. Please find additional annotated literature citations found in the K-State Research Exchange, *Landscapes of Learning Collection*.

You may click the URLs provided below or search the K-State Research Exchange for "Landscapes of Learning Collection."

K-State Research Exchange

http://krex.k-state.edu/dspace/

Landscapes of Learning Collection

https://krex.k-state.edu/dspace/handle/2097/13625

appendix c.

PRECEDENT STUDIES

Precedent Study :: 01

[Study Type] Process / **Place**

[Study Area] Boulder, CO

[Precedent Criteria]

- [x] Nationally recognized
- [ ] Similar population
- [x] Planning led to success

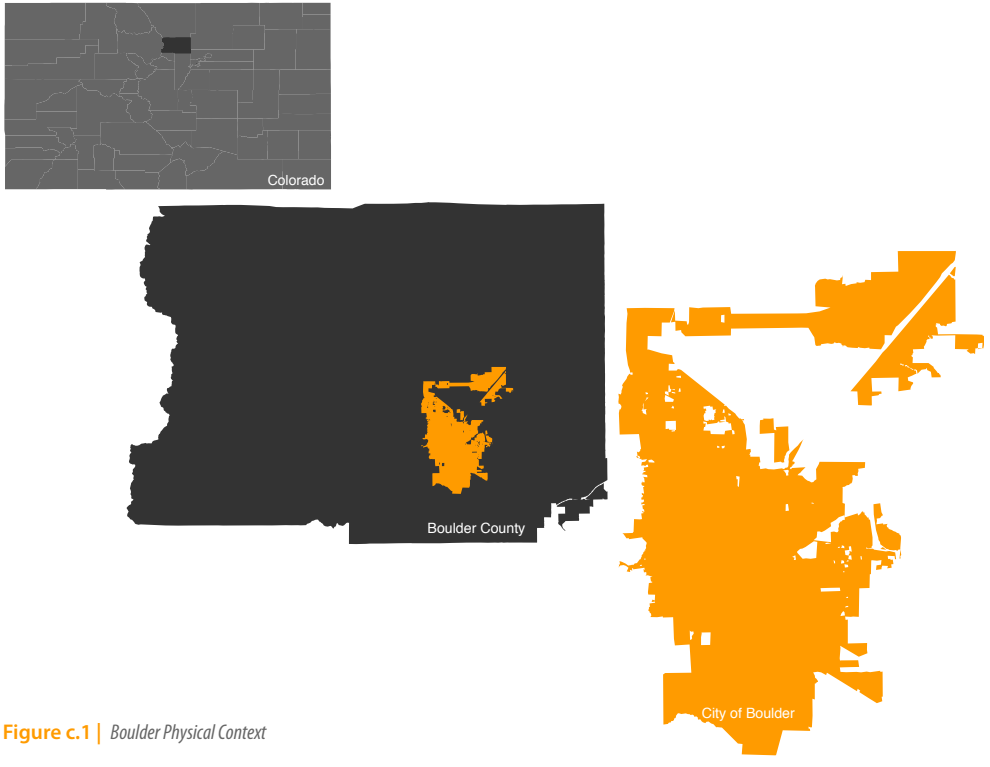


Figure c.1 | *Boulder Physical Context*

Context

The City of Boulder (Figure c.1) frequently acquires top rankings in health, well-being, quality of life, education, and public art.

In Boulder, 14.8% of the residents are under the age of 18.

Boulder is the first city to impose a sales tax for the purpose of funding and maintaining open space acquisitions.

Natural Elements:

Boulder is surrounded by more than 36,000 acres of recreational open space, conservation easements, and nature preserves.

Park systems includes 44 parks and large network of open space system accessible by biking or walking.

Includes 800 acres maintained turf and 200 acres natural land.

Park acreage per 1000 residents: 455

Major Components

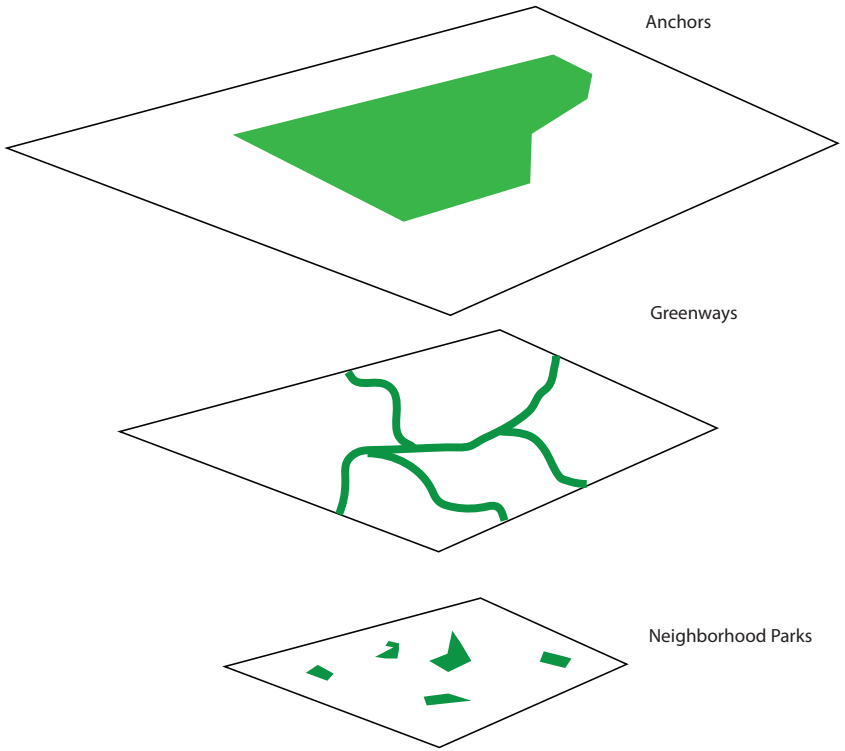
The Boulder park system has three main components (Figure c.2). The following pages will describe and analyze each component in detail.

Anchors

The anchors provide key nature opportunities in Boulder (Figure c.3). A greenbelt formed by mountains surrounds the city of Boulder. The boundary formed by the greenbelt, known as Mountain Parks. This serves two functions: it limits sprawl and provides 130 miles of maintained trails and spans 6,500 acres.
The 540 acre Boulder reservoir, located in Northeast Boulder, functions as a second open space anchor by providing wildlife habitat and human recreation opportunities. The reservoir is surrounded by mostly undeveloped, natural areas.

Valmont City Park and Central Park also serve as open space anchors. Valmont Park's 132 acres makes it the largest in Boulder. Boulder Central Park is centrally located in the city and is adjacent to the farmers market central location in the city.

Figure c.2 | *Boulder Nature Typology*



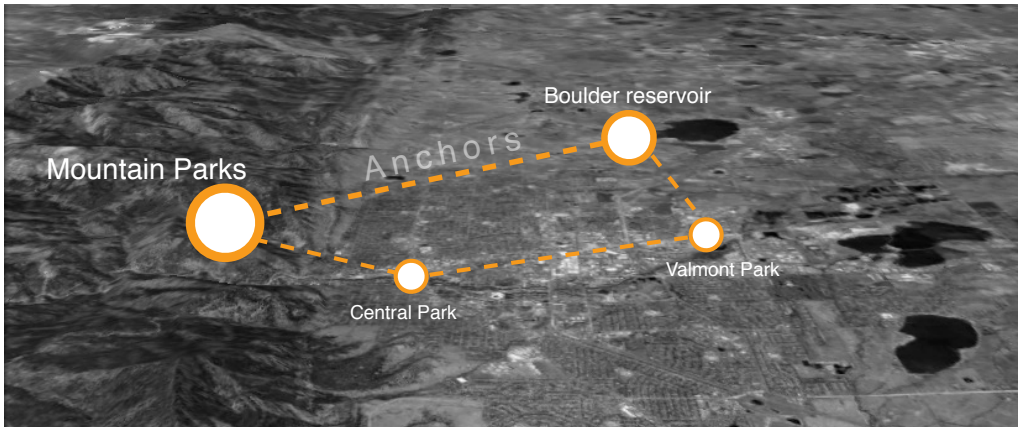


Figure c.3 | *Boulder Anchors*

Greenways

The Boulder Greenways System (Figure c.4) is a network of natural corridors through the city providing alternate transportation routes, while also providing opportunities for recreation and cultural experiences. The greenways work to protect riparian, floodplain, and wetland areas, enhance stream water quality through buffer zones, and provide storm drainage.

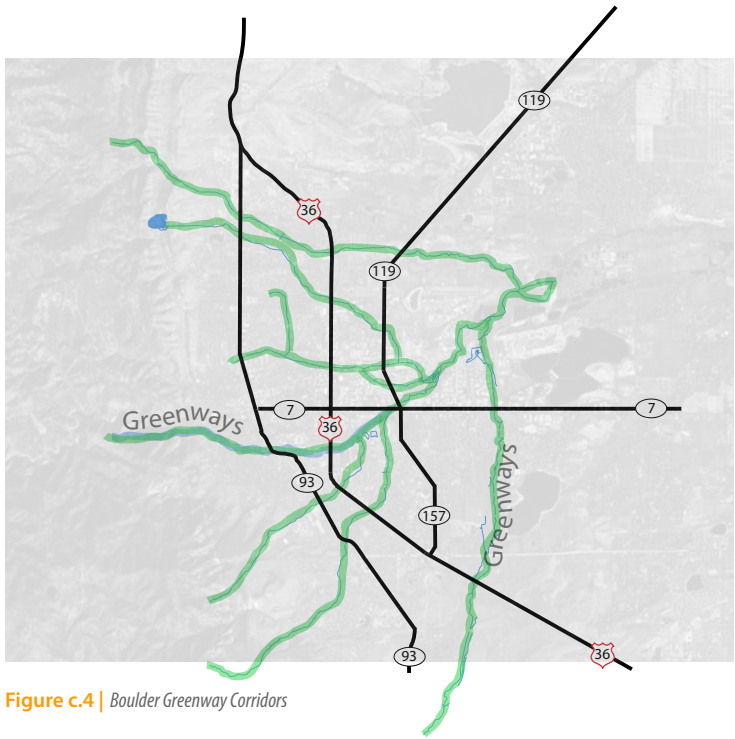


Figure c.4 | *Boulder Greenway Corridors*

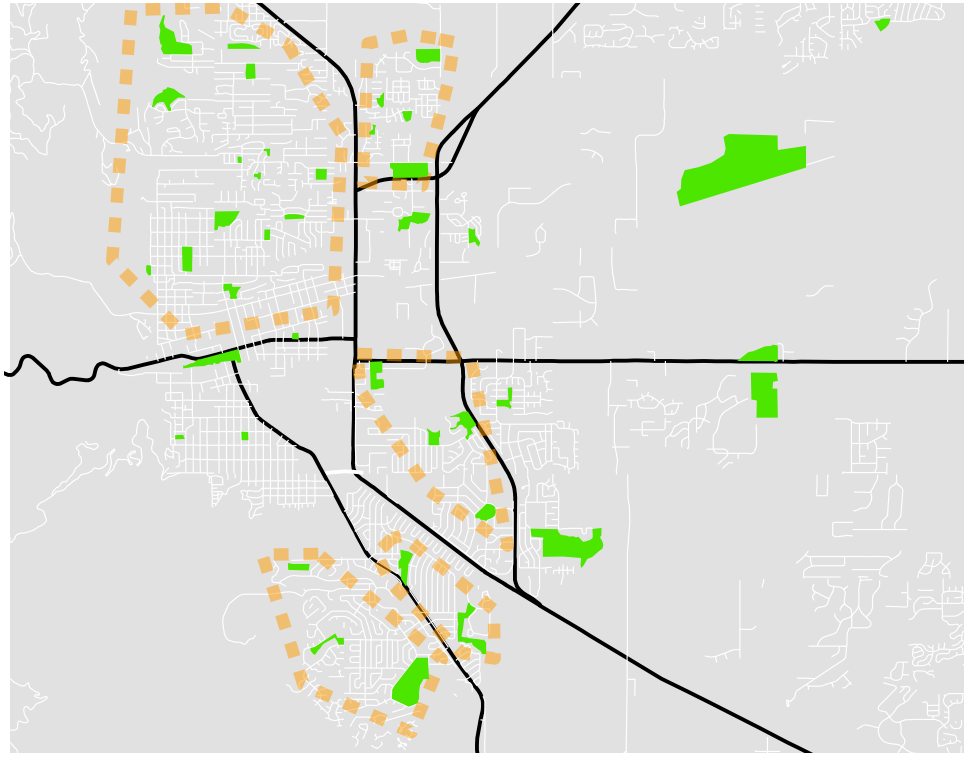


Figure c.5 | *Boulder Neighborhood Parks*

Neighborhood Parks

As of 1996, Boulder had over 434 acres at 50 sites devoted to urban parks, shown in Figure c.5 (OSMP Visitor Master Plan). These parks include Harlow Platts Park, East Boulder Community Park, and Foothills Community Park, which are large community parks. There are also pocket parks.

One especially notable park is Chautauqua Park, which contains recreational amenities and historic relics from 1878. Chautauqua Park also includes trailheads for several Mountain Parks trails, serving as an important connection in the open space system.

Application of Study

The most striking aspect of the Boulder, Colorado public open space system is its multi-use nature. Multi-use paths are the hallmark of a system with both access to nature and also access to alternative forms of transportation. The parks do not exist in isolation. Providing connectivity through the greenways network is an integral component that makes Boulder successful in providing access to nature opportunities for its residents. Trails, bike paths, and sidewalks are link Boulder's park system.

The smaller-scale neighborhood parks are likely to be important for children and others with limited mobility in the city.

Providing a coherent network of parks, smaller neighborhood parks, and large-scale anchor attractions, like the Mountain Parks near the Flat Irons, helps Boulder be successful in providing access to nature.

Boulder has obviously capitalized on its geographic location, but good access to nature opportunities in Boulder is far more than just being close to the mountains.

Precedent Study :: 02

[Study Type] Process / **Place**

[Study Area] Minneapolis, MN

[Precedent Criteria]

- [x] Nationally recognized
- [ ] Similar population
- [x] Planning led to success

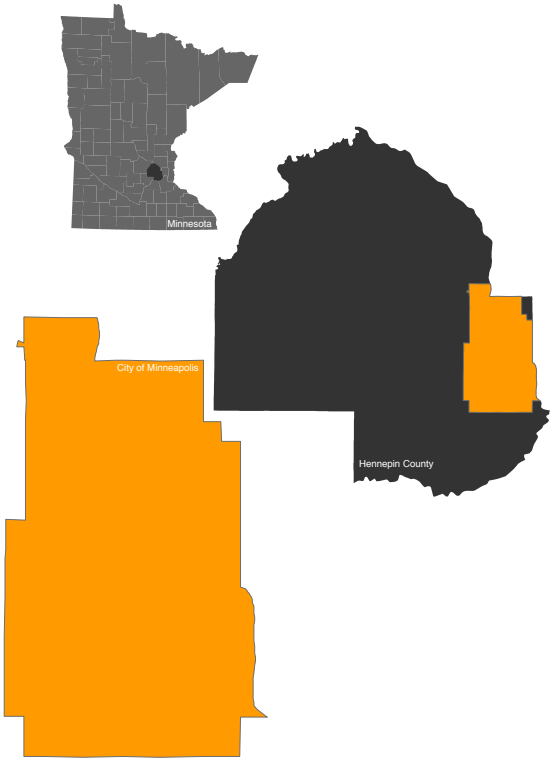


Figure c.6 | *Minneapolis Physical Context*

Context

In the early 1880s, forward-thinking officials established the Minneapolis (Figure c.6) park system. The Minneapolis Parks and Recreation Board (MPRB) system retains much of its original traits, including an independently elected park board, as well as the authority to levy taxes when expansions or improvements are necessary.

Minneapolis Parks and Recreation Board received a 4-star rating in 2000 from Trust for Public Lands and was described as the "closest to park nirvana."

Natural Elements:

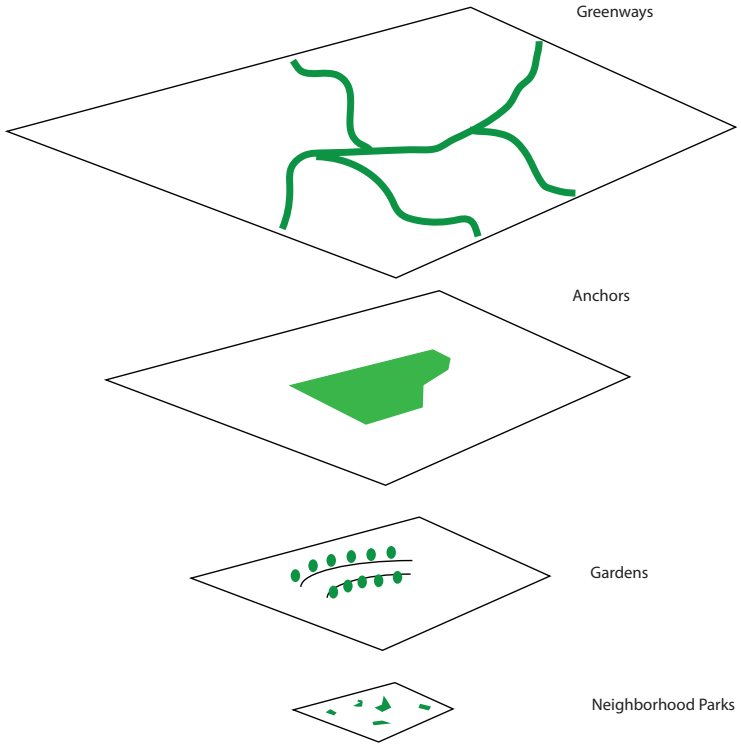
Minneapolis has a total of 6,732 acres of land and water for use.

82 park properties, including local and regional parks, playgrounds, golf courses, gardens, picnic areas, biking and walking paths, nature sanctuaries.

55-mile Grand Rounds National Scenic Byway. The keystone of the Minneapolis park system is its 49 full- service neighborhood recreation facilities.

Park acreage per 1000 residents: 16

Figure c.7 | *Minneapolis Typology*



Major Components

The Minneapolis park system has four main components, as shown in Figure c.7. The following pages will describe and analyze each component in detail.

Greenway Corridors

The Minneapolis parks system is unique in its character. Rather than large open space parks or trails, much of the Minneapolis public park system is comprised of a series of lakes, river tributaries, and rivers with green connective corridors between each water feature component (Figure c.8).

Anchors

The connective corridors terminate at large lakes within the Minneapolis city limits. These lakes act as anchors to the greenbelt connective corridors providing a focal point for users of the linear park system (Figure c.9)

Theodore Wirth Park is the largest regional park with 759 acres including park space, walking and hiking trails, off-road biking, and an 18-hole and par 3 golf course.

Lake Harriet, one of the most picturesque lakes in the Chain of Lakes, is a

67 acres park with 344 acres of water. It includes biking and walking trails, and a variety of water activities.

Gardens

Minneapolis has a number of gardens located in the city, as shown in Figure c.10. These gardens provide visitors a direct connection to nature. Although probably not readily accessible to children, these are an integral part of the nature access opportunities in Minneapolis.

The country's oldest public wildflower garden is the Eloise Butler Wildflower Garden and Bird Sanctuary located in the northwest portion of Minneapolis.

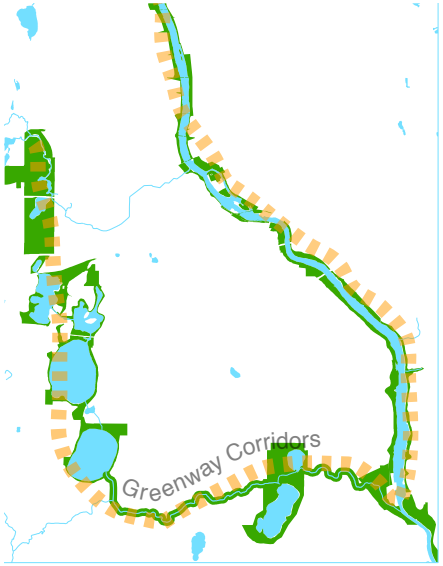


Figure c.8 | *Greenway Concept*

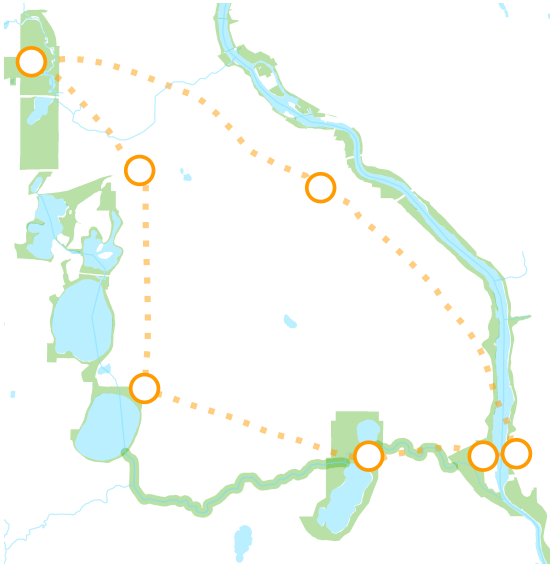
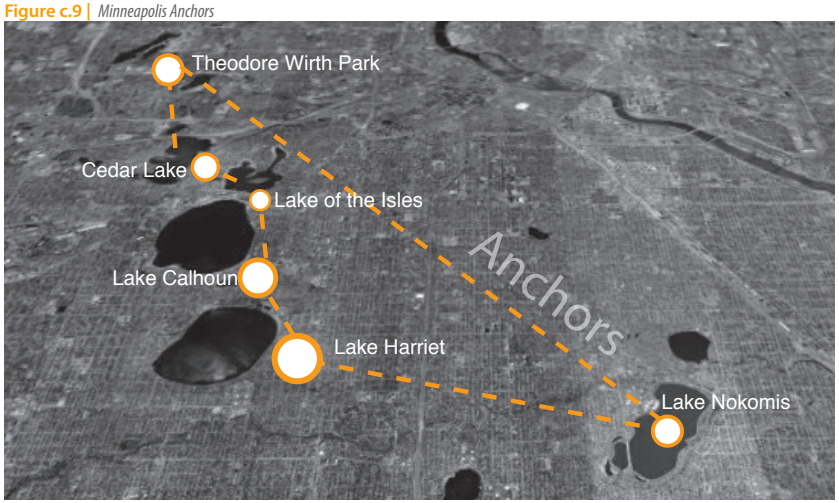


Figure c.10 | *Large Garden Locations*

Figure c.9 | *Minneapolis Anchors*



Neighborhood Parks

Neighborhood parks (Figure c.11) are an important component in the Minneapolis parks system. Neighborhood parks play an important role in the hierarchy, moving down in scale and quantity from the greenways and anchors of the system.

Neighborhood parks in Minneapolis provide formal and informal green spaces for city residents; some quite small and some are many acres in size.

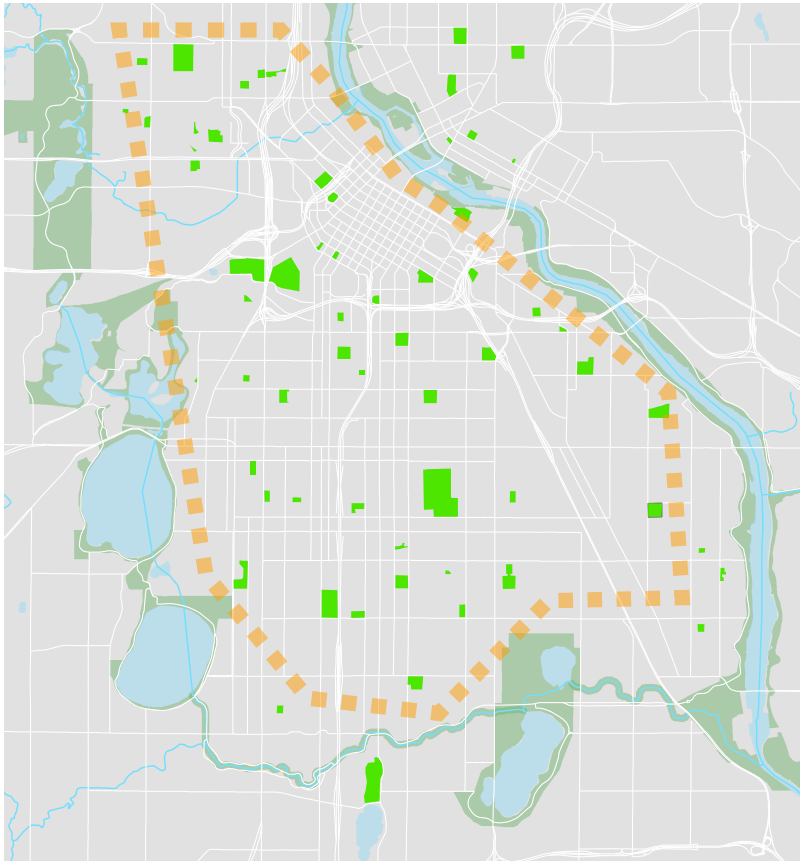
Application of Study

Minneapolis is a mecca for parks and recreation planning. It has a comprehensive, coherent network of trails, green corridors anchored with lakes, and a number of formal gardens. These elements infuse nature to the everyday surroundings.

The most interesting aspect is that most of the natural amenities are not large parks or open spaces; rather small corridors. This appears to allow a larger number of people to have access. No matter where you live, you can access the network easily.

Minneapolis' geologic past helps it immensely, however the planning and development of the parks system is nearly unrivaled. The comprehensive thought of the greenways, gardens, and planning around the anchor lakes puts Minneapolis ahead of most cities in the country.

Figure c.11 | *Neighborhood Parks*



Precedent Study :: 03

[Study Type] Process / **Place**

[Study Area] Portland, OR (Figure c.12)
[Study Name] Access to Parks and Nature

[Precedent Criteria]

- [x] Measures access to nature
- [ ] Study population: children
- [x] Socio-economic measures

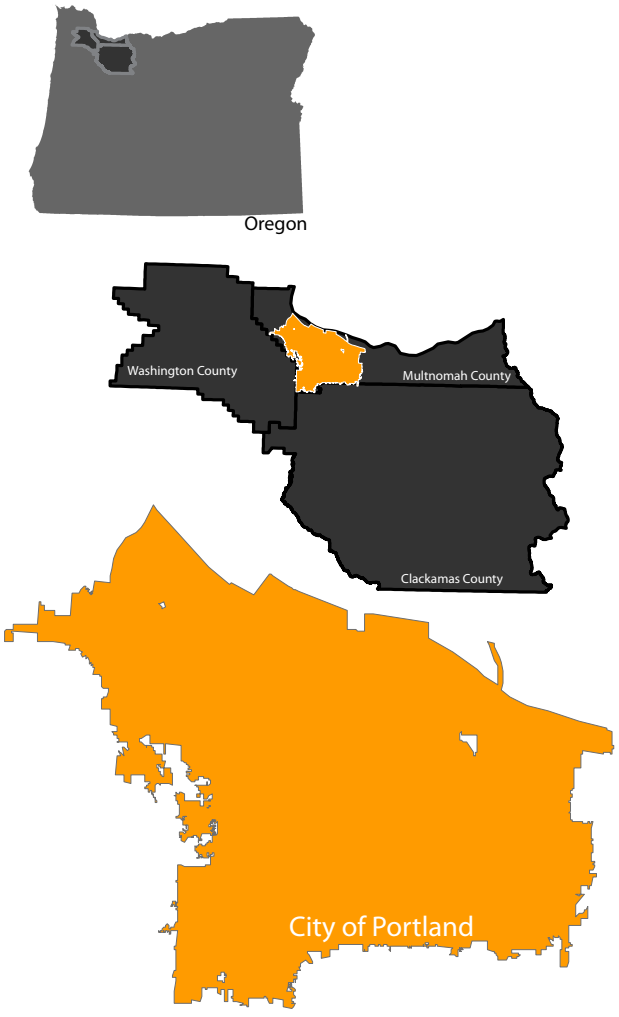


Figure c.12 | *Portland Physical Context*

Portland History

Portland has a storied history of protecting open space and natural habitat. Parks and open space planning dates back to a 1903 report by John Charles Olmsted. In the 1970s, Mayor Tom McCall established several legislation measures to preserve open spaces (Senate bill 100, Senate Bill 101), implementing a growth boundary for development. In 1995, voters in the Portland metropolitan region passed a regional bond measure to acquire valuable natural areas for fish, wild- life, and people. Ten years later, more than 8,100 acres of ecologically valuable natural areas had been purchased and permanently protected from development. Portland's urban growth boundary has been a revolutionary tool in preserving natural amenities.

Portland is home to the largest wilderness park within city limits in the United States. It is also home to the smallest park, Mill Ends Park (a two-foot diameter circle).

Project Background

Greater Portland Pulse is a partnership that uses dialogue and data to encourage coordination between various entities. They show where the region is successful and where it is lagging behind.

Significance

Access to nature is a core value of the Portland area. In various polls, it is commonly regarded as one of things residents value living in the Portland area. Everyone should be able to experience nature daily (Portland Pulse 2011). This project sets out to spatially analyze these core values and associated degrees of access. The percentage of the population with neighborhood access to nature provides a practical measure if all people can and will connect to the natural environment regularly.

Project Elements

The project uses GIS, Census Data, and local data to spatially measure a critical social value of planning: health and well-being. The study used three ways to determine access:

• Percentage of the population within one- quarter mile walking distance of dedicated open space

• One-half mile walking distance to a public park, trail corridor, or natural area

• One-quarter mile of natural habitat (public or private).

Methodology

Portland Pulse used GIS technology and three components of the natural environment to determine access in the Portland area. The three elements were (Portland Pulse 2011):

• Dedicated open space includes public or private land dedicated to or zoned for an open space use. This designation includes all open space in Metro's Parks and Open Space Inventory.

• Public park, trail, or natural area excludes public open space without universal access, such as most public school yards, undeveloped parks, public concession facilities like PGE Park, the Oregon Zoo, and the Washington County Fairgrounds.

• Natural area is defined as Metro's 2005 regional habitat inventory. The inventory excludes major water bodies like the Columbia and Willamette rivers, forest

patches of fewer than two acres, but includes all wetlands and habitat areas along the rivers. Attempts were made to exclude all developed or paved areas.

2010 Census block centroids were used to determine the percentage of people living in proximity to natural habitat. Calculations were made using GIS.

Findings

In 2010, 68.9% of people inside the region's urban growth boundary (not including Clark County) lived within a quarter mile of natural habitat. Of people of color, 64.1% lived within a quarter mile of natural habitat (Portland Pulse 2011).

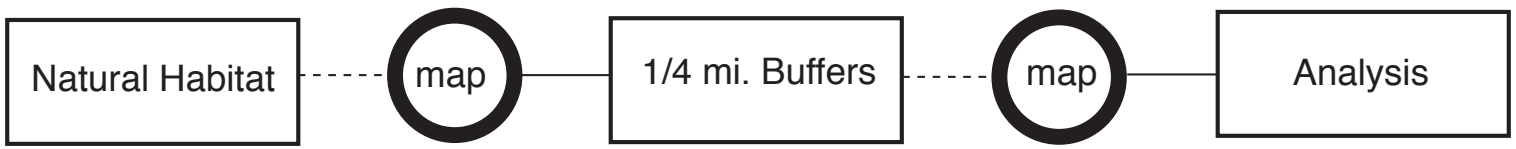
Application of Study

Portland Pulse benefits this study in several ways; but there are limitations, as well. Figure c.13 outlines the process.

Pros: First, the project is one of the few studies measuring "access to nature" the Author has found. Second, the methodology employed emphasizes private and public space, which is an important component of my project. Third, the study provides a methodology appropriate for the intended and study and provides an example of using GIS as a measurement and visualization tool. Finally, the study includes socio-economic measures and analysis.

Cons: The study does not specifically target children. There may be limited availability of data sources in Manhattan in order to replicate Portland Pulse project data.

Figure c.13 | *Portland Project Methodology*



Precedent Study :: 04

[Study Type] Process / **Place**

[Study Area] Los Angeles, CA (Figure c.14)
[Study Name] Parks and Parks Funding

[Precedent Criteria]

- ☒ Measures access to nature
- ☒ Study population: children
- ☒ Socio-economic measures

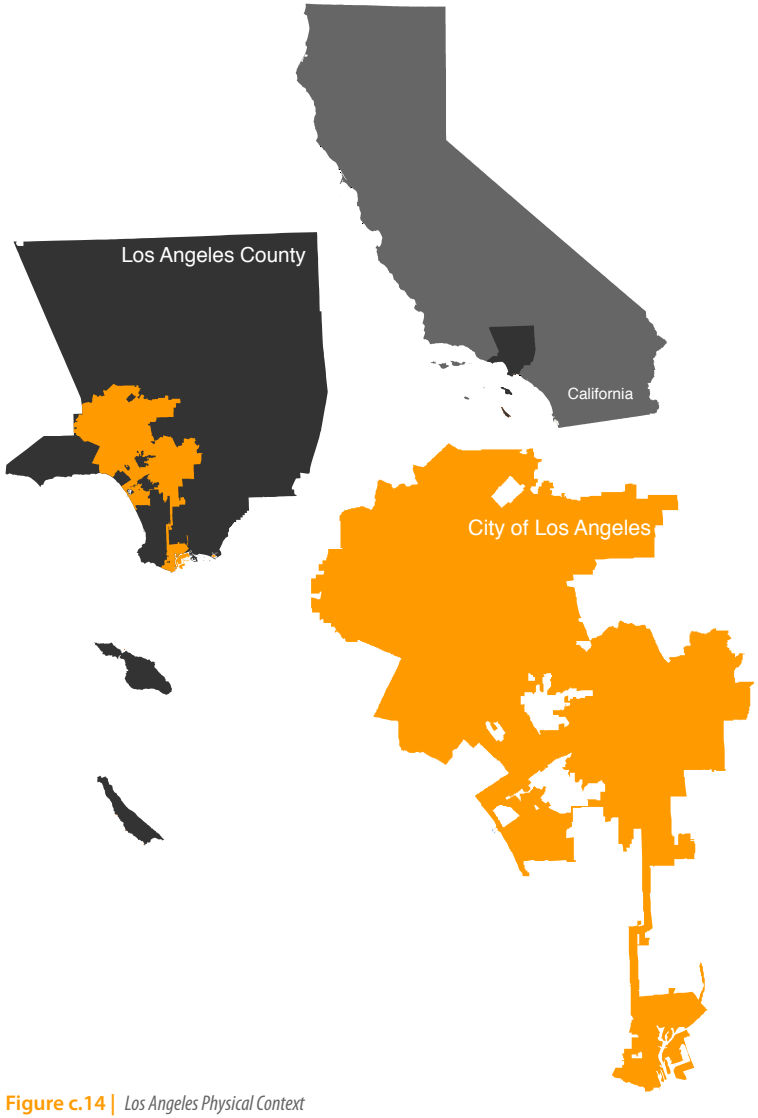


Figure c.14 | *Los Angeles Physical Context*

Los Angeles History

The history of Los Angeles is one of planning malignancy. Los Angeles was conceived as a place of low-density homes each with its own private space. Thus, civic leaders set aside "extraordinarily modest amounts of land for open space and park/recreational purposes" (Wolch 2002).

Los Angeles is the most diverse cities in the United States (Wolch 2002) with high proportions of Hispanic and African American populations. A shortage of park spaces has been perceived as an environmental justice issue. Discrimination in housing and employment, ongoing environmental racism in the location of industrial facilities, and inequitable distribution of urban services, mean that lower income households and communities of color are apt to be relegated to 'park-poor' neighborhoods, while wealthier districts are more likely to include parks and greenbelts provided by public funding.

Project Background

In 1996, Los Angeles voters passed the park bond measure, Proposition K, to increase and enhance park and recreation space in the city. The study used information on the distribution of existing parks in the City of Los Angeles and census data, to provide a statistical analysis of access to park space for children and youth populations, and by residents according to their race/ethnicity and socioeconomic status. The study also provides a mapping of Proposition K allocations by location to reveal the extent to which Proposition K has increased access to parks for those study populations (children, low-income) most in need.

Project Elements

The study employed four elements in order to complete their analysis (Wolch 2002):

• Census 2000 geographic data for census tract boundaries, demographic statistics, streets, city boundaries, and zip codes and 1990 data on income and poverty

• Los Angeles park polygon shape file

• Government Park Websites

• Round 1 and 2 granted and rejected proposals from Los Angeles City Commission on Children, Youth, and Their Families.

Methodology

The analysis used a geospatial database, using Geographic Information System (GIS) mapping software. The study calculated accessibility indices for various population subgroups in the city, produce associated maps, and created statistical summaries based on the maps and associated data. Residents living within one-quarter mile of a park edge were defined as having 'access' to a park.

Findings

The study found that low-income and concentrated poverty areas as well as neighborhoods dominated by Latinos, African Americans, and Asian-Pacific Islanders, endure dramatically lower levels of access to park resources than white dominated areas of the City. Even many white youth, however, have relatively poor access to parks. Those not living in proximity to the City's large open spaces tend to live in lower density sub-regions, making neighborhood resources less accessible generally. Indeed, across the board, less than 30 percent of the City's population has easy access to park space.

Significance

The study found that "low-income and concentrated poverty areas as well as neighborhoods dominated by Latinos, African Americans, and Asian-Pacific Islanders, endure dramatically lower levels of access to park resources than white dominated areas of the City" (Wolch 2002). However, even many white youth, have poor access to parks. White youth not living in proximity to the City's large open spaces tend to live in lower density areas. Housing and place of residence matters.

Application of Study

The project shows that access to nature varies by race and socioeconomic status. Their findings suggest that completing a similar study in Manhattan may be worthwhile.

Pros: The project measures "access to nature." Analysis of the methodology supports the conclusion that geospatial analysis may be the most appropriate planning tool to analyze the Manhattan parks and relationship to socio-economic and housing factors.

Cons: The study does not include private space in its calculations, which may be an important factor when assessing "access to nature" for children.

Precedent Study :: 05

[Study Type] Process / **Place**

[Study Area] Kalamazoo, MI (Figure c.15)
[Study Name] Leave No Child Inside

[Precedent Criteria]

- ☒ Measures access to nature
- ☒ Study population: children
- ☒ Socio-economic measures

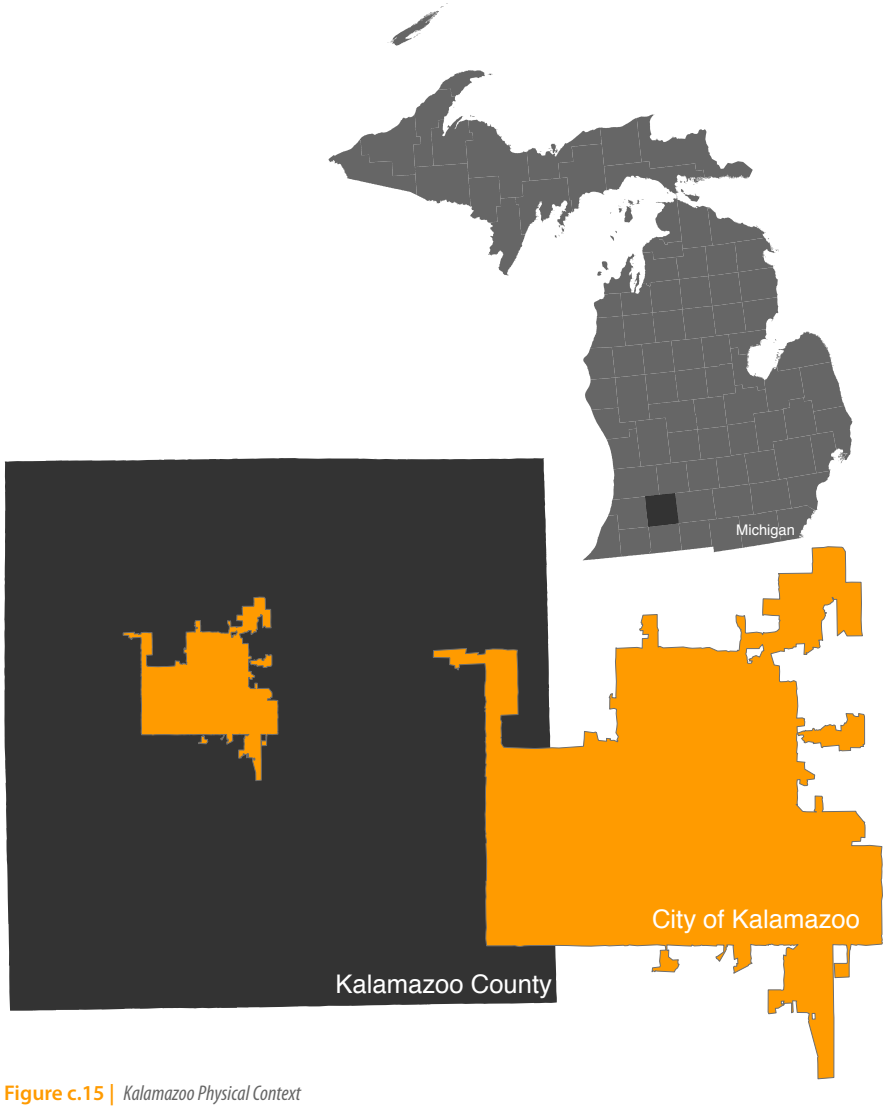


Figure c.15 | *Kalamazoo Physical Context*

Kalamazoo Context

The population was 76,000 in 2008. A little over 20% of the population is under the age of 18. About 13.6% of families and 24.3% of the population were below the poverty line.

Project Background

The project, structured in part around a Trust for Public Land initiative, is an interactive, community modeling process using GIS to identify priorities for planning and conserving parks and natural resources based on local input.

Project Elements:

The project uses spatial analysis to determine access based on three main elements:

• Vulnerability index based on demographic characteristics

• Assessment of public open spaces

• Identifying children within walking distance of public open spaces.

Methodology

The study employs a combination of qualitative and quantitative measures in assessing access to nature for school children (Figure c.16). The following pages describe and provide examples of the methodology employed in this precedent study.

Step 1: Create a vulnerability index by overlaying demographic characteristics.

•Identify block groups where children are most at need of nature opportunities

•Identify group most in need based on age range

Step 2: Assess public open spaces (parks + schools)

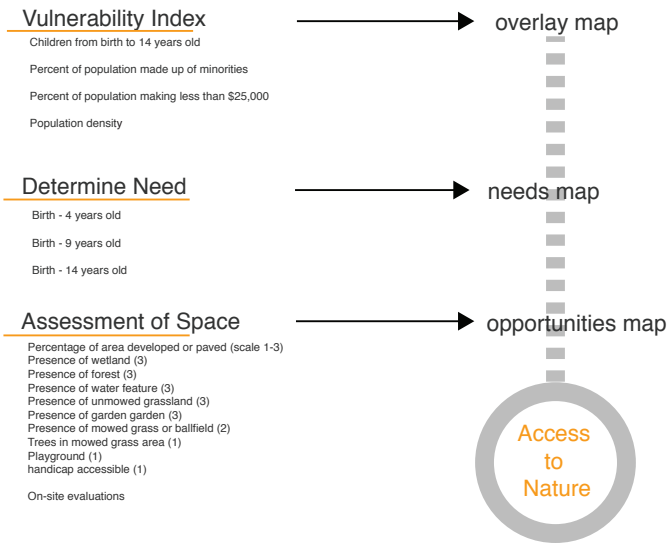
•Assess based on descriptions of park spaces in local park plans and materials and use GIS data and imagery.

•Rate Spaces: Excellent - Very Good - Good

Step 3: Identify children within 1/4 mile (10 walking distance) of open spaces.

•Use GIS to create buffers around each park and school in order to determine the population living within a walking distance.

Figure c.16 | *Kalamazoo Study Methodology*



Significance

The study could be an appropriate methodology for the research questions posed in this report. It provides a simple, yet effective solution to problems found in other methodologies.

Application of Study

The Kalamazoo study has pros and cons for the research questions of interest.

Pros: The study represents is yet another planning process using GIS technologies in determining accessibility of nature access opportunities. The study includes measures of school grounds as a component of quality nature measurement. This is a key component of the intended study and one that is lacking in other studies.

Cons: Does not include private spaces. Methodologically simple and the qualitative aspects of the "assessment of public spaces" may prove to yield inconsistent or inaccurate results. However, process appears to yield appropriate results.

Example Assessment:: Excellent Park

Percent Developed (0-15%) = 3
Wetland = 3
Water = 3
Unmowed grass = 0
Forest = 3
Garden = 0
Mowed Grass = 2
Tree Cover in Mowed Grass = 1
Grass = 1
Playground = 1
Handicap Accessible = 1

17



Example Assessment:: Good Park

Percent Developed (0-15%) = 3
Wetland = 0
Water = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Mowed Grass = 2
Tree Cover in Mowed Grass = 1
Playground = 1
Handicap Accessible = 1

8





Example Assessment:: Excellent School

Percent Developed (0-15%) = 3
Wetland = 0
Water = 3
Unmowed grass = 0
Forest = 3
Garden = 0
Mowed Grass = 2
Tree Cover in Mowed Grass = 1
Playground = 0
Handicap Accessible = 1

12



Example Assessment:: Good School

Percent Developed (50-75%) = 1
Wetland = 0
Water = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Mowed Grass = 2
Tree Cover in Mowed Grass = 1
Playground = 1
Handicap Accessible = 1

6

appendix d.

COMPLETE QUALITATIVE ANALYSIS

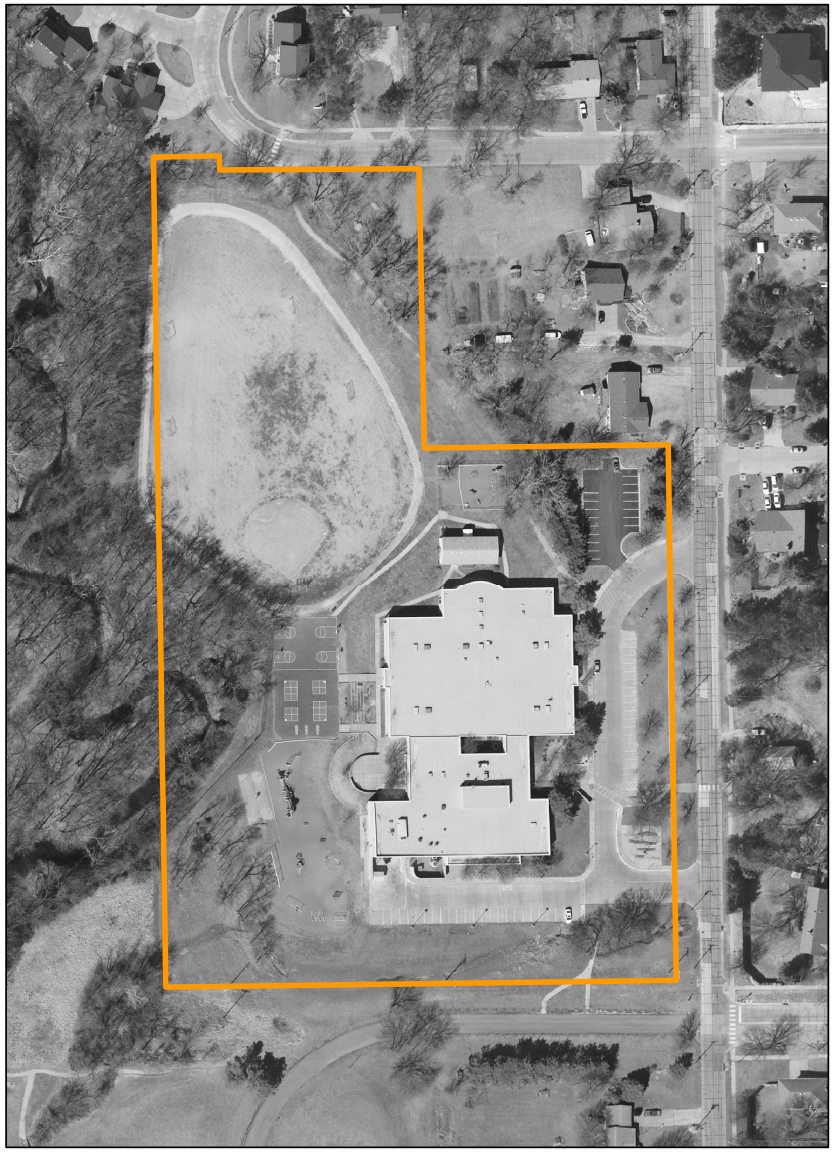
Amanda Arnold

Elementary School

Assessment Score

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

10







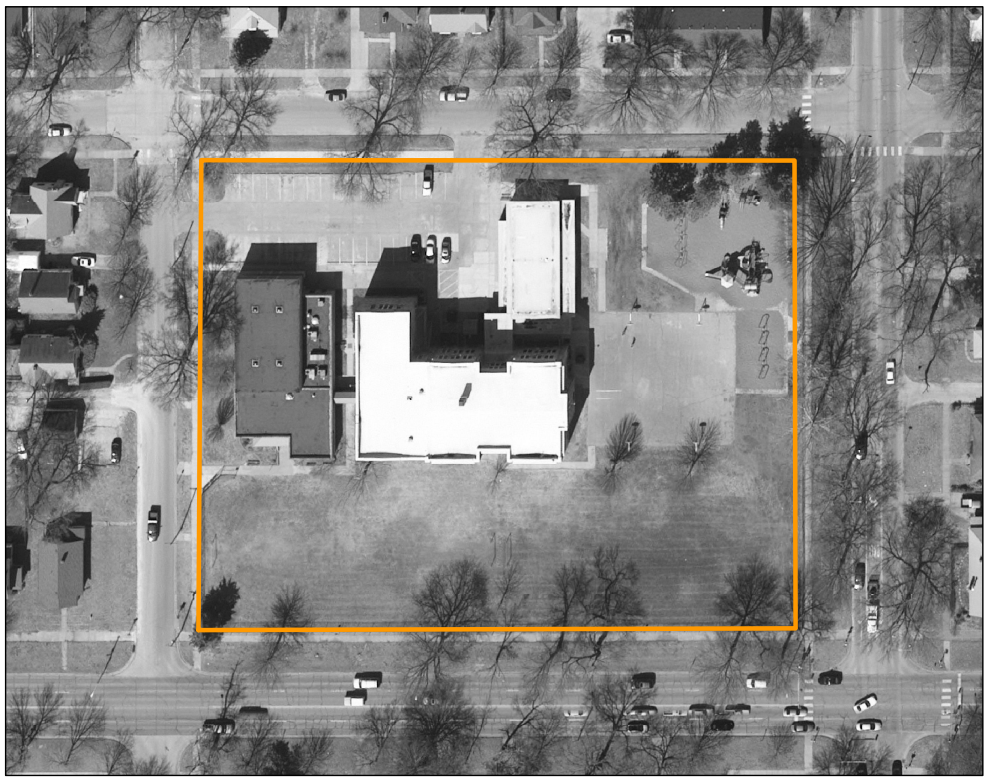


Bluemont
Elementary School

Assessment Score

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

6









Bluemont Hill

Park

Assessment Score

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 3
Garden = 3
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

12









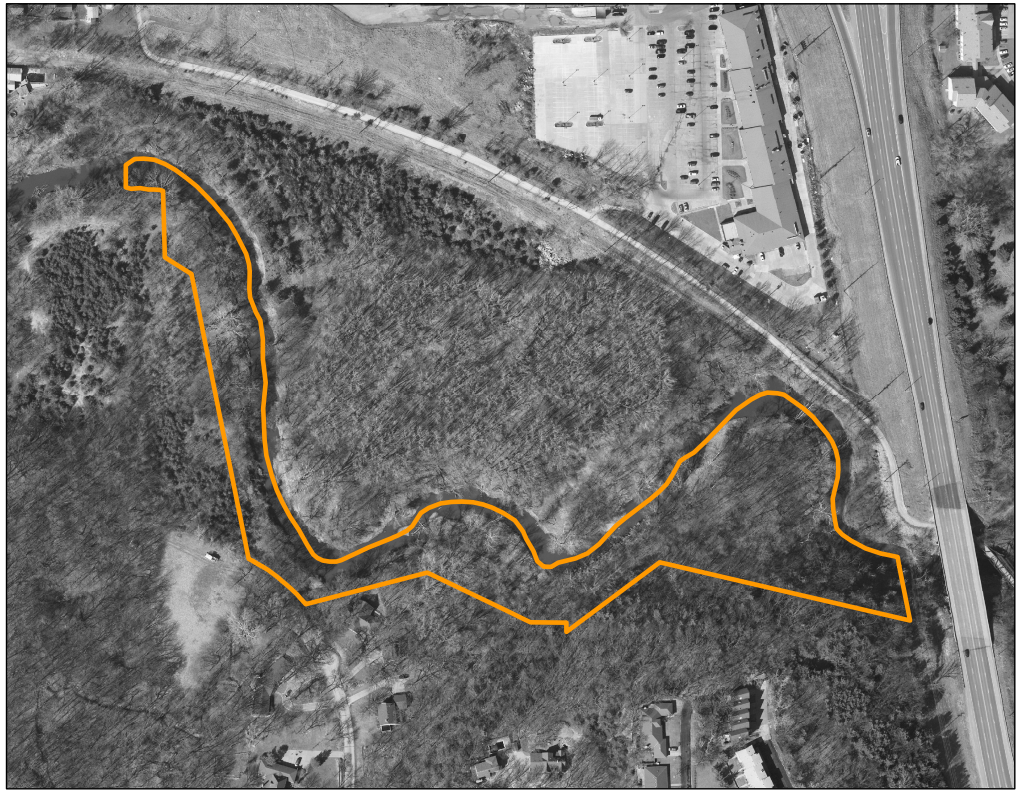
Briarcliffe

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 3
Unmowed grass = 0
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 1
Playground = 0
Handicap Accessible = 0

10









Cedar Acres Natural Area

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

7









CiCo
Park

Assessment Score

Percent Developed (67-100%) = 1
Wetland = 3
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

9









City
Park

Assessment Score

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

7







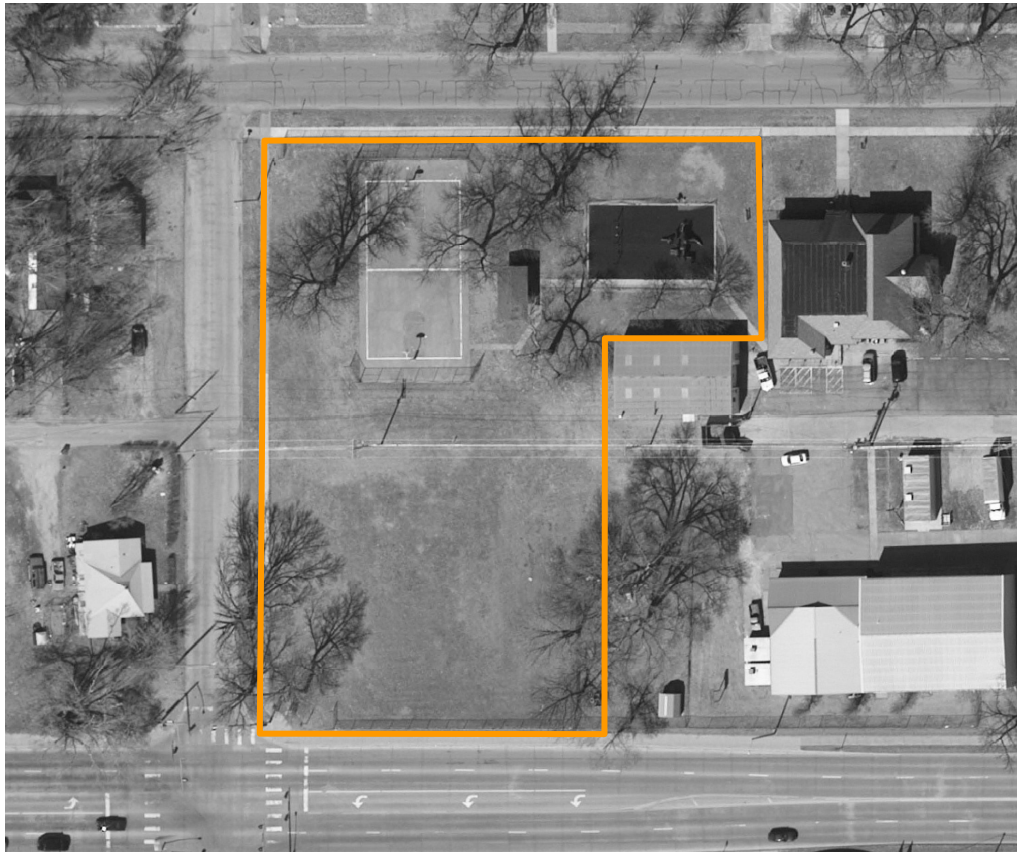


Douglass
Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

8







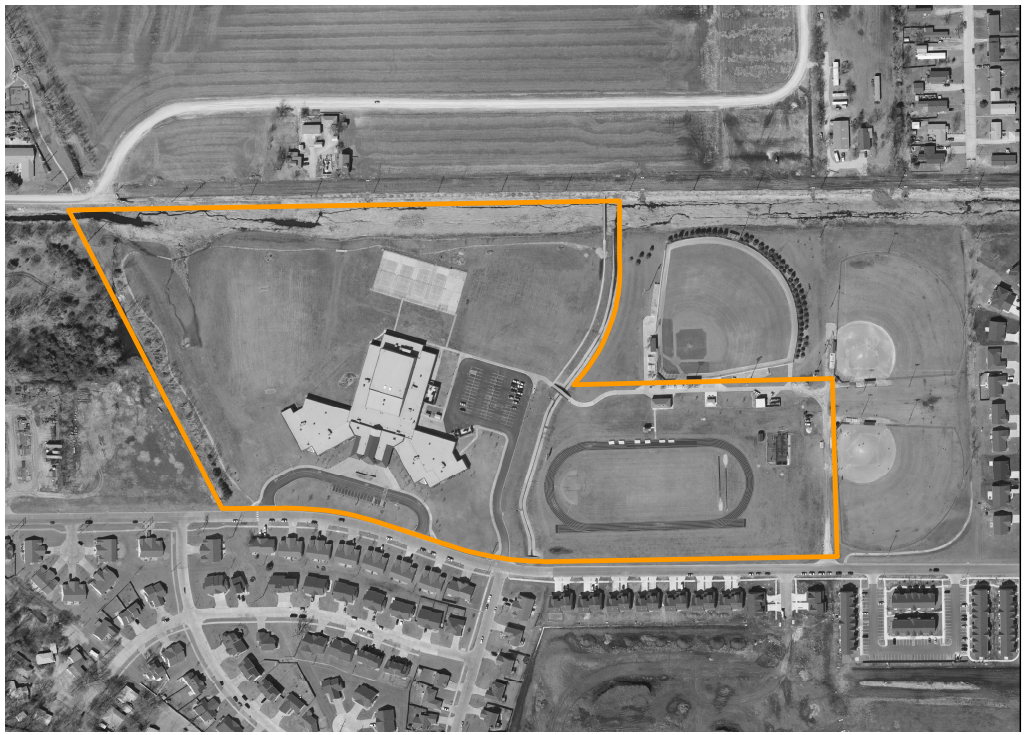


Dwight D. Eisenhower
Middle School

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 3
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 1
Playground = 0
Handicap Accessible = 1

8









Eisenhower Baseball Complex

Park

Assessment Score

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 3
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

8




375




Wayne Norvell
Baseball Field

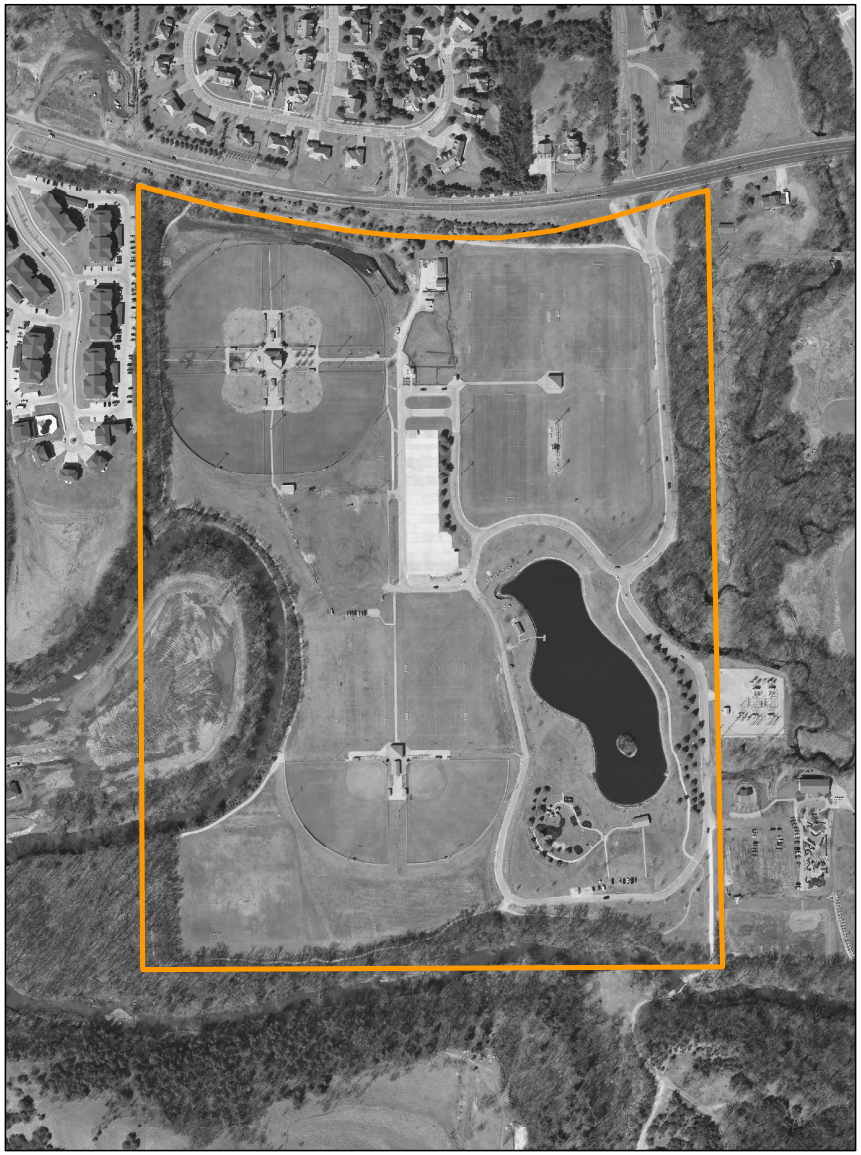
Frank Annenburg

Park

Assessment Score

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 1
Playground = 1
Handicap Accessible = 1

11









Frank V. Bergman
Elementary School



Assessment Score

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

6







Girl Scout

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 3
Unmowed grass = 0
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 0

12









Goodnow
Park

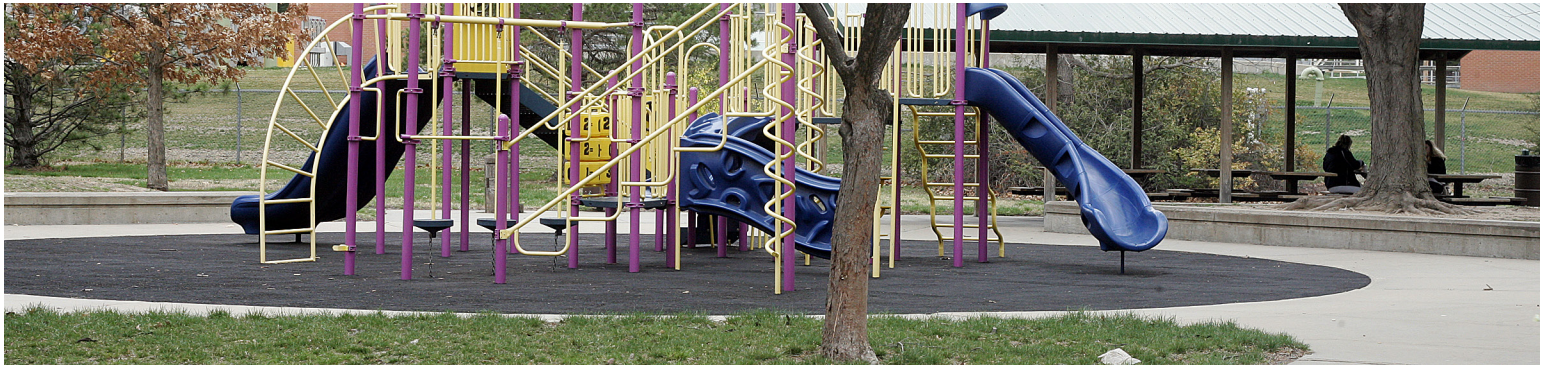
Assessment Score

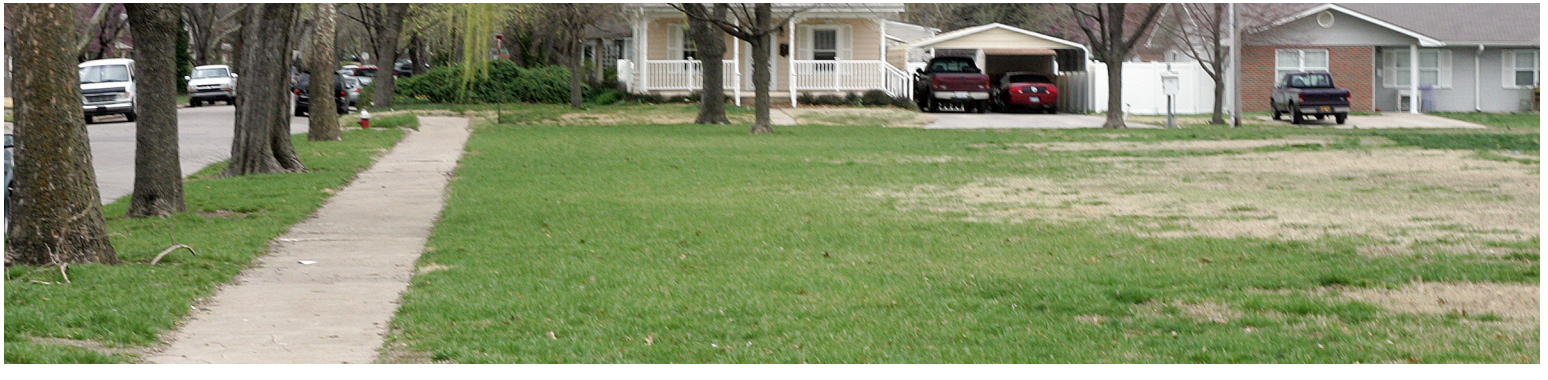
Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

6







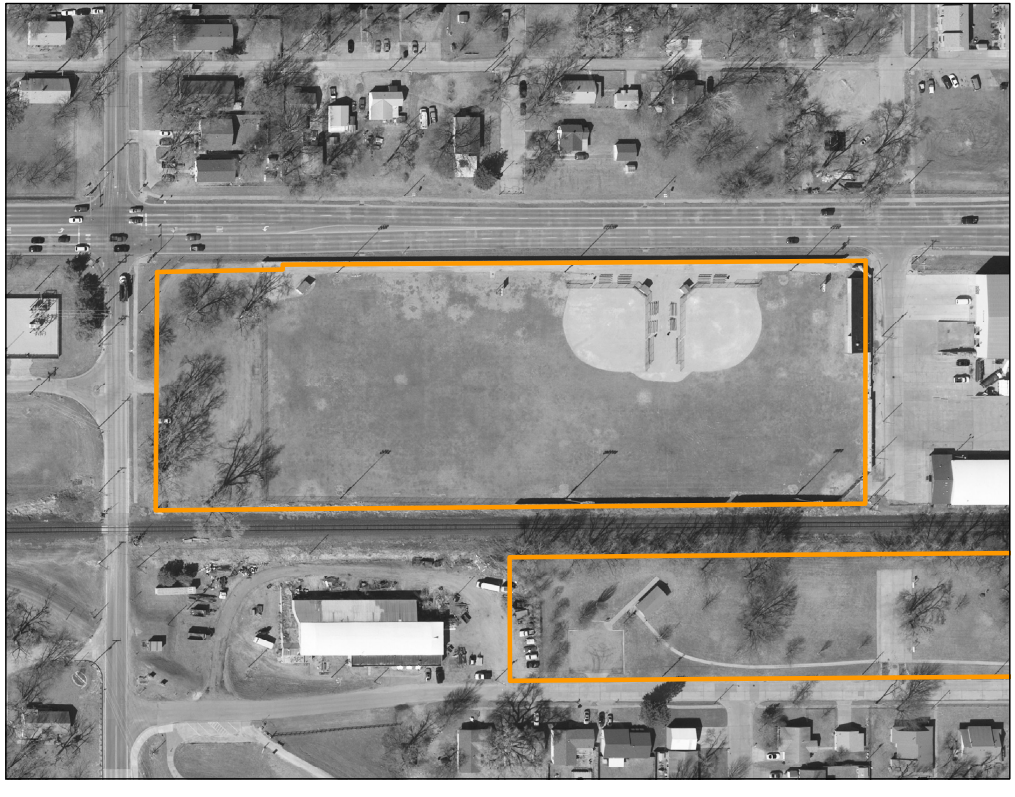


Griffith
Park

Assessment Score

Percent Developed (67-100%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

7









Harbour

Park

Assessment Score

Percent Developed (67-100%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

7









Kansas State
University

Assessment Score

Percent Developed (67-100%) = 1
Wetland = 3
Unmowed grass = 0
Forest = 3
Garden = 3
Tree Cover in Mowed Grass = 3
Water = 1
Playground = 0
Handicap Accessible = 1

15









Lee

Elementary School



Assessment Score

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 1
Handicap Accessible = 1

3







Long's
Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

8








STOP

Marlatt

Elementary School

Assessment Score

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

6









Marlatt

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 3
Unmowed grass = 3
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 0

12









Northeast Community

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 3
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 1
Handicap Accessible = 1

8







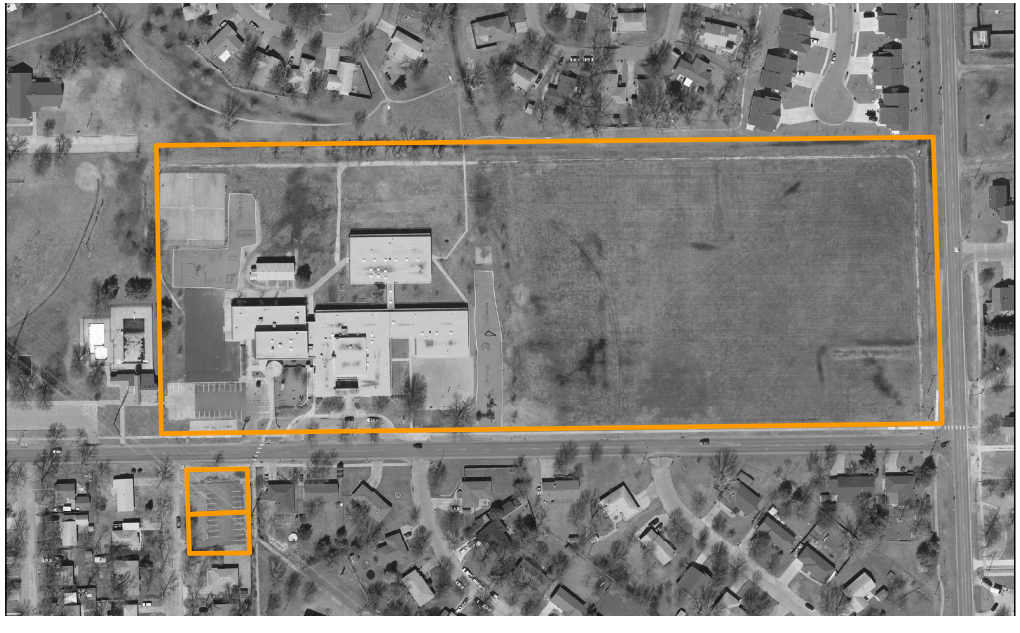

DON
HARBOUR
PLAYGROUND

Northview
Elementary School

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 1
Handicap Accessible = 1

5









Northview

Park

Assessment Score

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

6









Pioneer

Park

Assessment Score

Percent Developed (67-100%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 0
Handicap Accessible = 0

3









Sojourner Truth
Park

Assessment Score
Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

7






HTS



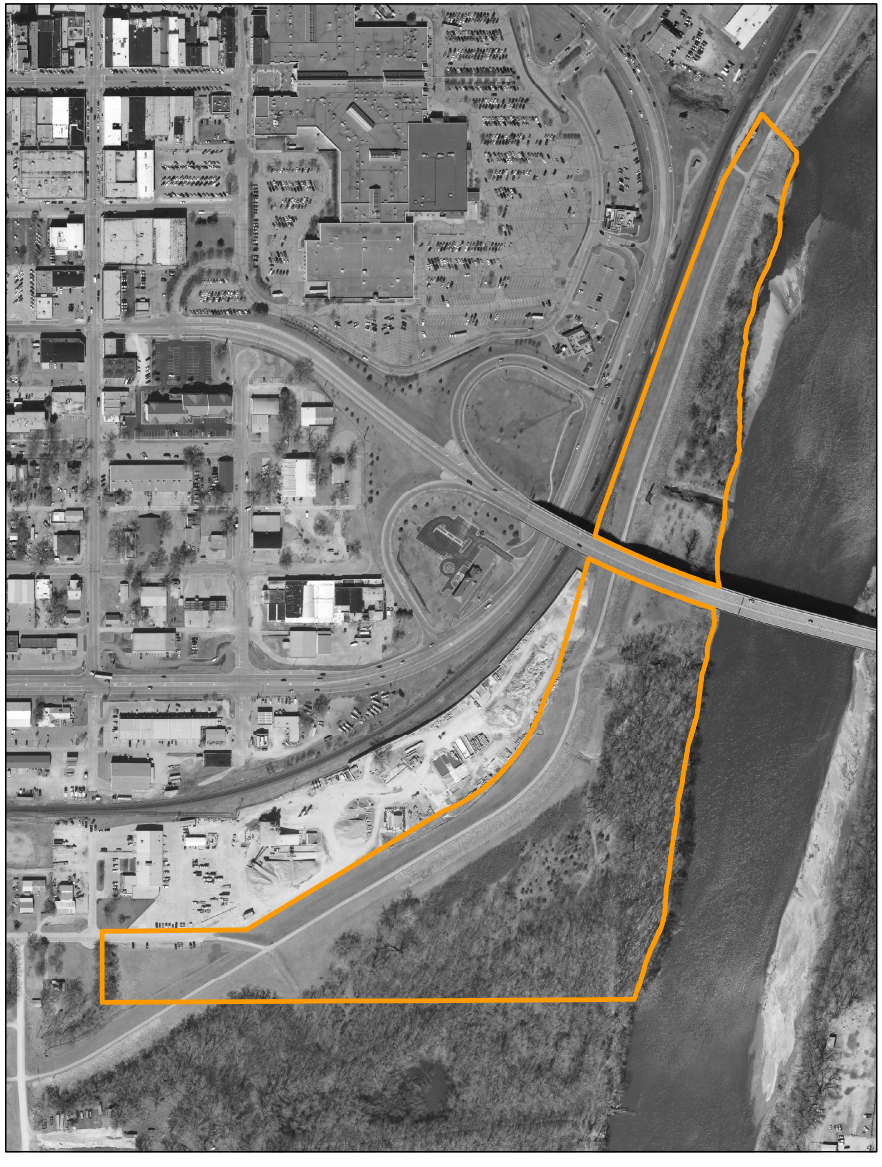
Southeast

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 3
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 1
Playground = 0
Handicap Accessible = 1

11







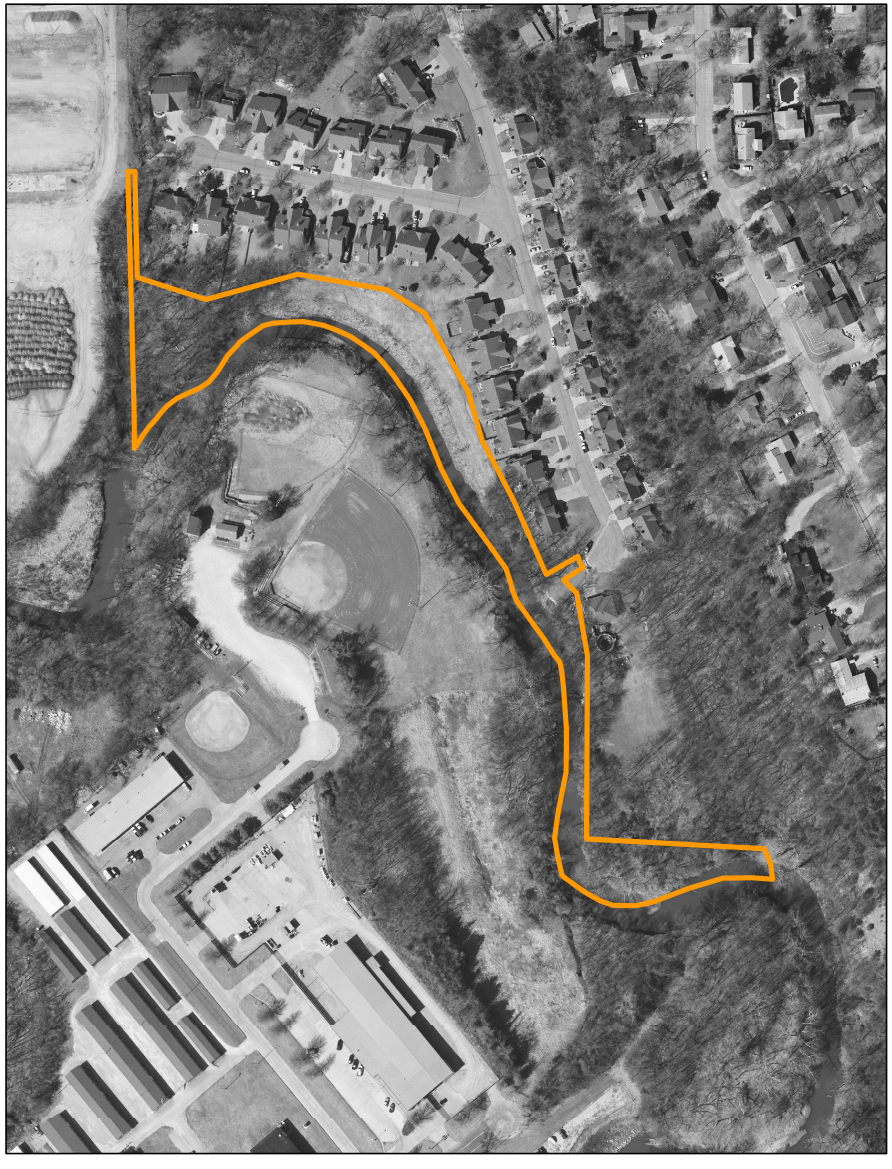


Spencer
Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 3
Unmowed grass = 3
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 1
Playground = 0
Handicap Accessible = 0

13









Stagg Hill

Park

Assessment Score

Percent Developed (34-66%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

8









Sunset Neighborhood

Park

Assessment Score

Percent Developed (34-66%) = 3
Wetland = 0
Unmowed grass = 0
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 0

9









Susan B. Anthony
Middle School

Assessment Score

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 0
Handicap Accessible = 1

3









Theodore Roosevelt
Elementary School

Assessment Score

Percent Developed (67-100%) = 1
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

6






SCHOOL
GROUNDS
CLOSED
DUSK-DAWN
AUTHORIZED
PERSONNEL ONLY



Triangle

Park

Assessment Score

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

6






SUPPLY
CONNECT



Warner

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 3
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 0
Handicap Accessible = 1

13









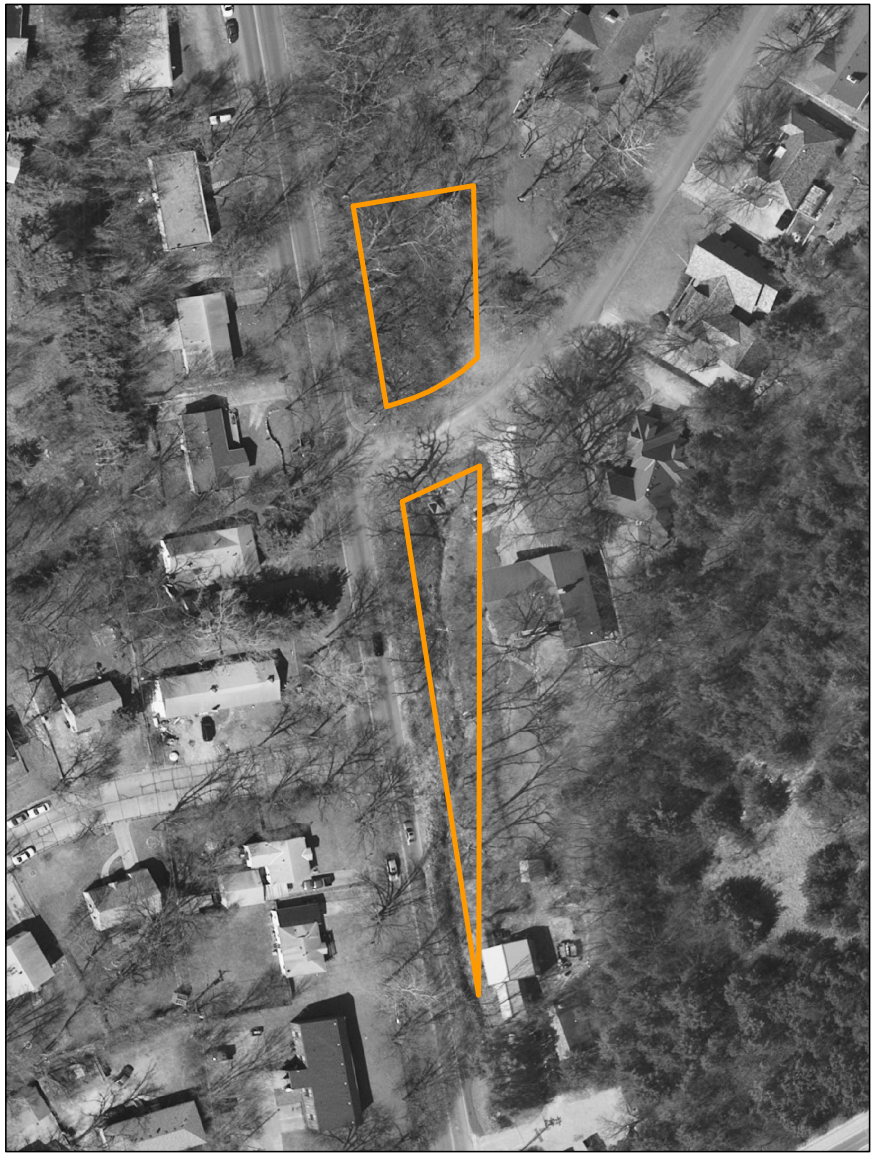
Westwood Natural Area

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 3
Unmowed grass = 0
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 0
Handicap Accessible = 0

9









Wildcat Creek Linear

Park

Assessment Score

Percent Developed (0-33%) = 3
Wetland = 0
Unmowed grass = 3
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 1
Playground = 0
Handicap Accessible = 0

10









Woodrow Wilson
Elementary School

Assessment Score

Percent Developed (34-66%) = 2
Wetland = 0
Unmowed grass = 0
Forest = 0
Garden = 0
Tree Cover in Mowed Grass = 3
Water = 0
Playground = 1
Handicap Accessible = 1

7









Yorgenson
Park

Assessment Score

Percent Developed (34-66%) = 3
Wetland = 0
Unmowed grass = 3
Forest = 3
Garden = 0
Tree Cover in Mowed Grass = 0
Water = 0
Playground = 0
Handicap Accessible = 0

9







