Three trends are occurring today in the United States which inspired this research. First, America is growing increasingly urbanized. Today, more Americans are living in cities than in rural environments, and this pattern is predicted to continue for the foreseeable future. Urban living has benefits, but there are also challenges for city residents including pollution, traffic, and crime. As social scientists, we need to improve our understanding of urban dwellers’ relationship with their natural environment just as biophysical scientists are focusing more and more on the impacts of urban development on the natural world. Second, Americans are spending less time recreating outdoors. There has been a documented decline of participation in nature-based recreation, likely being replaced by an increase in use of electronic media during people’s leisure time. Less contact with nature has consequences for people, perhaps especially for city dwellers who spend the majority of their time surrounded by the built environment of concrete and asphalt. It is likely that reliance on electronic entertainment has played a substantial role in decreasing amounts of physical activity. Lastly, Americans are becoming more sedentary. Today, the number of Americans who report getting no physical activity is about equal to the number who report getting
regular physical exercise during their free time. Rising rates of obesity for adults and children in the U.S. have raised considerable concerns among medical and public policy professionals.

The purpose of this research was to examine how small-scale urban nature parks are affecting city residents in Portland, OR. I looked at three elements of Portland residents’ relationship with urban nature parks. First, I looked at whether there was an association between individual physical and psychological health and park use. Prior research has revealed that people who spend time recreating outdoors tend to be more physically active than people who do not. These observed higher levels of physical activity are associated with improved physical health. Time in nature settings has also demonstrated a positive effect on psychological well-being, such as reduced anxiety and improved ability to concentrate. Second, I examined whether having a nature park in their community had an effect on Portland residents’ sense of neighborhood health. Previous research suggests that having natural areas in urbanized areas directly contributes to city residents’ sense of a stronger, healthier community. Green space in cities has been associated with not only higher levels of reported satisfaction with the neighborhood, but also with higher property values, and with higher levels of retail spending. Third, I employed a social psychological model of attitude formation to evaluate Portland residents’ attitudes about their nature parks. Attitudes are particularly important for natural resource managers to understand and account for in policy decisions since management of natural resources often engages the public’s
sense of personal freedoms and concerns over government regulations. Furthermore, because people in cities are so closely in contact with urban green space on a regular basis, inclusive and responsive policy requires that managers take account of public attitudes. I collected the data relating to these three elements of the relationship between urban residents and their nature parks in Portland because it is the largest city in Oregon.

I obtained the data through a general population survey, randomly distributed to residents in the Portland metropolitan area during the fall of 2010. I conducted customary social science statistical analysis, including linear regression, to assess the relationship between Portland nature parks and personal and community health. To evaluate my sample’s attitudes, I used the tripartite model of attitude formation originally developed in social psychology research. Because I was working with latent factors of attitude formation, I used structural equation modeling to assess the relationship of the observed variables to their latent factors, and the relationship among the latent factors.

My results largely agree with those of other researchers, though I approached the question of physical health and nature recreation slightly differently. For my work on physical health, rather than ask about physical activity and infer health outcomes, I asked directly about physical health. I tested two hypotheses. One hypothesis was that there would be a positive association between self-reported physical health and park
use, and the other tested for a positive association between park use and psychological health. My hypothesis for the physical health-parks relationship was partially supported. I tested two physical health variables, and found that one, which described overall health, did reveal a statistically significant relationship to park use. The other, relating to role limitations due to physical health problems, did not have a significant relationship to park use. My second hypothesis asserted that there would be a positive relationship between psychological health and park user status. This hypothesis was not supported, but I did find indications of an association between psychological health and park use.

The second element of the relationship between city residents and urban nature parks related to neighborhood health. My results from this analysis were consistent with prior research findings which tend to support a positive association. I tested whether parks close by respondents homes (a fifteen to twenty minute walk), and parks farther away (no more than a ten minute drive away from home) were positively associated with self-reported neighborhood health. I found that both levels of proximity were positively associated with perceptions of neighborhood health. Because prior research suggests that one of the ways that neighborhood green spaces promote stronger communities is through the social interactions that occur in parks among neighbors, I also tested whether park-related social interaction was positively associated with community health ratings. In testing for a mediating effect of social interaction on the relationship between parks and neighborhood health, I found that park-related social
interaction had a partial mediating effect on neighborhood health ratings for both parks within walking distance and within driving distance. In testing for moderation, I found that the moderation effect of social interaction was present only for parks within walking distance.

The third and final element of the relationship between urban nature parks and city dwellers was attitudes about urban nature parks. I employed a model of attitude formation originally proposed in the social psychology literature. The tripartite model argues that an attitude is formed through three precursors: the cognitive, the affective, and the behavioral components. I also included an additional variable for social networks which I proposed would act as a moderating variable on the relationship between the other components and park attitude. My results for the entire, combined sample of both park users and nonusers indicated that both the cognitive factor and the affective factor have a significant association with attitude formation, while the behavioral component did not. The model for the combined sample also showed that social networks had a statistically significant, inverse relationship with attitudes. I conducted a test for attitude differences between groups (users and nonusers), and found a statistically significant difference. I also tested for a moderating effect of social networks on the other attitude formation components, but that relationship was not supported. Finally, I conducted comparisons between the two groups to assess any differences in the attitude components between users and nonusers. Side-by-side comparisons revealed that both users’ and nonusers’ attitudes were significantly
influenced by the affective component. Perceived outcomes of park use was not predictive of attitude for either group. The values component (on an anthropocentric-biocentric scale) was significant for users, but not nonusers. Nonusers attitudes were also significantly impacted by the behavioral component (i.e., behaviors related to parks), and by social networks. Social networks were not predictive of users’ park attitudes.

The research I have presented herein provides support for the hypotheses that time spent in natural settings is associated with better physical and psychological health and that community green spaces contribute to satisfaction with one’s neighborhood. I also found that attitudes about parks differed between users and nonusers, yet both groups valued them as benefits in the urban environment. Since my sample size was insufficient to make generalizable statements about Portland’s population, my results are suggestive, but are consistent with prior research. My research results can help urban natural resource managers and city decision-makers make more inclusive decisions by incorporating an understanding of city residents’ relationships to urban nature parks. The results of my research on personal and community health support the position that urban green space fulfills an important function by providing valuable public health benefits, and promoting healthier, more “livable” communities. My results indicate that, for my sample, social interaction at parks was positively related to neighborhood health. Such a positive association suggests that parks could be leveraged to build community cohesion which ultimately leads to benefits like
increased sense of safety and happier residents. My results pertaining to park attitudes can help managers develop more targeted public outreach campaigns. For instance, I found that for park nonusers, social networks were a statistically significant predictor of park attitudes. This result implies that park staff and managers could benefit by identifying community organizations and business associations that might be conduits to reach nonusers. Through such information pathways, park managers could disseminate information about urban nature parks that could attract current nonusers.

Urban nature parks are not the sole answer to building healthier communities and people. They cannot alone reverse social ills that many urban neighborhoods contend with routinely. However, the scientific data do support the idea that urban natural spaces like nature parks are positively associated with personal and community health. With careful participatory planning that includes a substantial public input component, urban natural resource managers could develop urban nature parks as part of a city’s green infrastructure that not only provides valuable ecosystem services like cleaner water and reduced energy consumption, but also provides for nature-based recreation experiences that promote healthier, happier city residents.
Urban Natural Parks in Portland: Nature, Networks, and Community Health

by

Joshua W.R. Baur

A DISSERTATION

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degree of

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APPROVED:

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Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

____________________________________
Joshua W. R. Baur, Author
I would like to express my sincere gratitude to the Forest Ecosystems and Society department for providing the funding that allowed me to conduct my research. I would also like to thank Dr. Jo Tynon, Dr. Randy Rosenberger, and Dr. Bo Shelby for providing funding through teaching and research assistantships. I am grateful to my committee members for all their guidance and support and especially to Jo Tynon for her grace, patience, and kindness.

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I would like to dedicate my dissertation to my mother, Erna H. Baur, and father, Dr. Mario E. Baur. They pointed me in this direction, but never pressured. I wish they were here today for me to express my love and gratitude.
CHAPTER 1
DISSERTATION INTRODUCTION

The story of cities in America, and open spaces within them, is a story about people and their relation to each other and to the natural environment (Schneider, 1979). From the European immigrants to our modern city dwellers, people have been attracted to concentrated settlements because they offered opportunities for work and wealth, trade, amusement and recreation. They have also been places that have witnessed inequality and suffering throughout their history.

Similar to biological systems, cities in the U.S. are constantly changing, constantly in flux. Not static, monolithic figures on the landscape, they are very much like living entities. We think of cities as being “born,” growing, experiencing vibrancy in their youth and, in some cases, eventually decaying and putrefying. Unlike biological systems though, the processes that cities undergo are not “natural” or inevitable. They are entirely the product of human imagination, creativity, and drive, for good or ill. A city can, on the one hand, be a testimony to that greatness that humans can inspire and achieve. A city can, on the other hand, be a dismal failure resulting from human weakness. The more typical reality of a city falls somewhere in between the extremes of success and failure. Most cities exhibit a complex mixture of good and less desirable qualities that lift some people and sink others. And whatever their positive or
negative qualities, they are places where, increasingly, people will decide, or be forced, to settle and live as human populations continue to grow worldwide.

This dissertation focuses on city open spaces, an integral component of city design for centuries (Taylor, 2009), and the services that open spaces can provide to improve health, well-being, and quality of life for urban dwellers. I looked at a particular type of city green space, urban nature parks, in Portland, OR, and relationships urban residents have with them. I examined the relationship between urban nature parks and residents’ self-reported physical and emotional health. A growing body of evidence suggests that access to parks and other recreation spaces in cities is associated with increased physical activity, which tends to promote better physical health (Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006; Rosenberger, Bergerson, & Kline, 2009). Researchers have also found that time spent in areas with natural features is linked to improved psychological health (Hartig, Mang, & Evans, 1991; Kaplan & Kaplan, 1989); as such I included analysis on Portland residents’ psychological health in relation to urban nature parks. Natural spaces in cities appear to impact individual health, and they are also linked to healthier, more livable neighborhoods (Altschuler, Somkin, & Adler, 2004). Therefore, I evaluated the association between urban nature parks and community health in Portland as well. As the third focus of my research, I looked at Portland residents’ attitudes about their
parks by using a model of attitude formation that has been used in social psychology research to evaluate public attitudes about ecological issues.

Before discussing my research, a brief review of the history of American cities and city open spaces and parks will be helpful to better understand today’s city dwellers’ relationship with urban nature parks. These introductory comments are not meant to provide the reader with an exhaustive discussion of the history of U.S. cities and urban parks. I provide a brief overview of very complex topics so that the reader will have some context for my research. The texts referenced in this introduction are readily available and can provide the reader with comprehensive expositions of the history of American cities, and urban parks and open spaces. The works cited herein make clear that cities are complex and constantly changing creations. The contributions that open spaces have made within cities has changed over time, but much about urban parks has remained consistent.

**Looking Back**
Cities are first and foremost about people. They represent dense concentrations of people, living and working together, in a compact arrangement. The first cities in America were little more than towns and villages established to promote commerce and support religious observance (Glaab & Brown, 1976; Bass Warner, 1972). New England towns of the 17th century were completely decentralized organizations, while
simultaneously being the most heavily planned communities America would ever contain. Puritan settlements on America’s east coast were organized through a fusion of religious ideology and the tradition of the English village. Puritan settlers brought with them from England clear ideas of the basic needs of human society that allowed one to live a good life (e.g., piety, commerce and property, and hierarchy) and, for a brief time, Puritan settlers were able to organize themselves successfully without a central government, elected legislative body, law enforcement, civic administrators, unemployment relief, or social programs for the old, sick, or needy (Bass Warner, 1972). The English tradition of networks of social connections that sustained political, social, and economic organization and prosperity without a strong centralized government was deeply ingrained in the colonists’ cultural background. Their strong tradition of social connections led Puritan colonists to believe that it was not only beneficial, but necessary, for people to live in cities and towns to ensure piety and civility, and prominent citizens (typically, wealthy businessmen) and religious leaders harshly criticized those who eschewed towns for a frontier lifestyle (Glaab & Brown, 1976). Cities were seen as righteous and godly places, where civilization, education, business, and piety were fostered, and stood in direct opposition to the wilderness colonists saw around them as a place of darkness, evil, and beastliness (Nash, 2001).

Another English tradition that the colonists brought with them across the sea was the idea that open spaces in settlements were desirable. The idea of the “Garden City” had
been one that guided development of some English cities, and influenced the colonists’ notions of a proper settlement. The English Garden City was of modest size, with an ample green belt surrounding the city, and areas of greenery preserved within the city limits (Glaab & Brown, 1976). The Garden City idea, with its ample green spaces roughly equivalent to parks, was partly grounded in the English “parc” tradition (Taylor, 2009). English “parcs” were originally large private tracts of land stocked with animals, in which nobles and the wealthy would hunt. Portions of these tracts of land, privately owned by the aristocracy, were eventually opened up to public use. The tradition of parks and public open space in medieval England was grounded in traditions found in even earlier civilizations. The very first “city” parks appeared in ancient Greece. The Greeks had public plazas in cities called agora (or agorae, plural) that contained trees and fountains, and were used for public gatherings and meetings. Around 700 B.C., Assyrian nobles practiced hunting and riding in natural reserved areas, and the Persians and civilizations in Asia Minor (550 – 350 B.C.) reserved open spaces for hunting and other outdoor activities (Taylor, 2009).

The American colonists’ conceptions of city green space had its roots not only in the English “parc” tradition, but also from landscaped gardens which appeared in England in the early 16th century (Taylor, 2009). The basic design of an English landscaped garden featured a large open green area, ringed by sparsely planted trees. By the 17th century, public parks, like London’s Hyde Park (1652), which were designed in the
landscape garden tradition, were opened to public use for a fee. English settlers in 17th century America arrived with these cultural ideas and traditions of landscaped gardens, parks, and the Garden City in mind (Glaab & Brown, 1976). The influence of the English park tradition is identifiable in Massachusetts, for instance, where governor John Winthrop acquired private land from a Reverend Blackstone to create America’s first public park, the Boston Common, in 1634 (Taylor, 2009). The Common, in its early days, would not be recognized as a park by our modern definitions. It was used for multiple purposes including grazing and public executions, but by the 1720s, Boston city officials had ordered planting of numerous trees in the Common and, by 1830, the Common was designated as a park and no longer used for other purposes such as livestock pasture.

Within about two generations, populations grew beyond the original Puritan settlements, as sons and grandsons inherited land of their own on the periphery of towns (Bass Warner, 1972). Cities grew as their populations expanded through reproduction and immigration and, by the mid-1700s, settlements had become, by population standards, what we would today recognize as cities. Cities with large seaports like Boston and New York, for example, had populations of over ten thousand. Philadelphia was the major hub of commerce in the east and had a population of eleven thousand by 1730 (Glaab & Brown, 1976).
These growing cities were the engine of westward expansion. A popular misconception is that cities followed agriculture, but the reverse is true (Glaab & Brown, 1976). Cities like Pittsburgh, St. Louis, Cincinnati, and Louisville were all founded before there was significant agriculture in those regions. Huge tracts of land were cleared to provide raw materials, including lumber and agricultural land, for growing cities. Land and resources, however, were not distributed equally among the populace. The English and Puritan tradition of hierarchy as a natural and desirable order meant that the wealthy and powerful elites in America enjoyed substantial preference in obtaining the choicest tracts of land (Bass Warner, 1972). Westward expansion was in the first instance an expression of land speculation by the wealthy elite, who depended upon the military to remove the native populations, and then upon agricultural and commercial success to ensure new cities not only survived, but prospered, which in turn meant that wealthy families prospered through their investments in land (Glaab & Brown, 1976). One of the consequences of city expansion is that common open areas within cities that were once used only as pasture for livestock, could, following expansion, be used as public open space and town greens for people (Taylor, 2009). In New Haven, CT, for instance, the city center green founded in 1641 for pasture, continued to expand and develop so that by 1790, the city enacted bylaws to plant trees for shade and for urban ornamentation. Philadelphia, too, set aside Cherry Gardens as a city green space in the 1760s. In New York in 1785, there was a call to set aside the southern tip of Manhattan as a city park,
though at that time, common green spaces in cities were still commonly used for multiple purposes including pasture, public meetings, executions, burial grounds, and work houses for the poor. New York city planners rejected the Manhattan park idea because they felt that the land held more value for future development than it did as pasture or park, and further believed that by virtue of the easy access to the coast, city residents enjoyed ample exposure to a natural environment. Throughout the end of the 1700s and into the mid-1800s, American cities continued to expand with especially rapid growth after 1840 (Glaab & Brown, 1976). By 1860, there were one hundred and one cities in America with populations that exceeded one hundred thousand, with New York and Brooklyn boasting a combined population of one million.

The first century of rapid urbanization in the U.S. took place between 1820 and 1920, largely fueled by technological innovations like the steam engine, agricultural machinery, social organization innovations like the nation-state and joint stock companies (precursors to corporations), and improvements in medicine and sanitation which helped to promote previously unseen increases in urban populations (Glaab & Brown, 1976). Transportation innovations and improvements, starting with horse-drawn street cars later replaced by electric street cars, and finally the appearance of the personal automobile in 1910 all helped to fuel rapid urbanization and city expansion (Bass Warner, 1972). City leaders and wealthy business elites were constantly in competition to increase the prestige and wealth of their cities, and used trade, land
speculation, and the railroads to accelerate urban expansion. But life in cities was rife with hardship and disease disproportionately affecting the poor even as cities expanded and wealthy elites prospered. There was rampant corruption among city officials, crushing poverty, overcrowding in poorly built and dangerously cramped dwellings, disease, crime, and pollution (Glaab & Brown, 1976; Bass Warner, 1972; Taylor, 2009). Much of this suffering was caused by poor city planning which in the mid-1800s to early 1900s promoted mobility and expansion, and ignored designing for healthy and livable communities (Bass Warner, 1972). In the late 1800s, most plans for city layout and growth were originally designed to include ample green and open space, but typically such garden areas were never built and instead city centers were often crowded with high density housing that wealthy elites could afford to escape but poor and working class residents could not.

In response to the often wretched living conditions in cities for many, and to the changing nature of labor, which had shifted from skilled craftsmanship to routinized assembly line manufacturing, in the late 1800s labor movement advocates and city legislators recognized the need and value of recreation for working people (Fairfield, 2010). Since the early 1800s, politicians and wealthy elites had been calling for more urban parks as a means to help civilize the working classes, and as a means of social control through morally uplifting and tranquilizing recreation (Taylor, 2009). Elites reasoned that parks contained works of art that exposed the masses to culture in a
pastoral setting, were sources of open space that promoted health and eased the sense of crowding, civilized the lower classes by exposing them to middle class values and tastes, improved attitude towards work, improved water supply and property values, and muted class conflict. Eventual changes in labor law resulting from the union movement would improve safety and job conditions for the working class, and also increase working class leisure time in the late 1800s and early 1900s (Fairfield, 2010).

The working day was reduced to eight hours for most people, so that workers now had more leisure time, which, to the dismay of “respectable” citizens, they often spent drinking in saloons. The working classes also preferred more physical types of recreation, instead of the more sedate recreation that the “cultured” elites preferred while spending time outdoors.

Though many city planners and social welfare advocates believed parks would alleviate class conflict, often the different preferences between the wealthy and the working classes caused considerable conflict and discord among the different park users (Taylor, 2009). When New York’s Central Park was finally completed in 1857, it was intended to promote positive social behavior and discourage other types of working class behavior like drinking that were seen as destructive by elites. The park was heavily monitored and supervised by a cadre of park officers who quickly punished bad behavior in an effort to force lower classes to conform to the elite’s values of social decorum. During the middle to late 19th century, cities in America
were constructing large signature parks like Central Park, though critics argued that a single, large, centrally-located park would not provide benefits to all city residents since many would be unable to get to the park. The heavy influx of immigrants in the late 1800s renewed park advocates’ calls for larger numbers of smaller parks in neighborhoods, but it would be decades before city planners would pay attention to this plea. Cranz (1982) has labeled this period (1850 – 1900) in urban park history as the Pleasure Ground period. Pleasure Ground period parks were primarily meant to promote health and social reform, tended to be large (like New York’s Central Park), and were often set at the edge of a city and, again, were often inaccessible to the poor living in high density tenements in the urban core.

Not only preoccupied with parks as a means to enculturating the poor and working class, elites in American cities were also encouraging park construction as a way to compete with European landscaped gardens and city parks, which they perceived as the indicators of social and cultural sophistication (Taylor, 2009). American elites felt a sense of inferiority to their European counterparts’ cultural attainment, and so took pride in wild landscapes which America had and Europe lacked (Nash, 2001), but also sought to create cultured, pastoral spaces in their cities. Originally urban green space for outdoor activities in America was primarily furnished not by parks, but by cemeteries, which fulfilled the elite preference for large, pastoral settings (Taylor, 2009). In fact, cemeteries were the model for city parks and, before 1857, rural and
urban cemeteries were still larger green spaces than any American city park. Many elites, like Fredrick Law Olmstead, favored parks in cities for their restorative powers, for their ability to pacify the harried city dweller, and also for their democratizing power. Olmstead felt that urban parks allowed the wealthy and working class to mingle freely, and thereby helped to alleviate social tensions among the classes (Rybczynski, 1999).

At the dawn of the 20th century, life was still terribly challenging for the urban working classes who lived in cramped housing, often without plumbing or proper sewer systems (Bass Warner, 1972). Large parks on city peripheries did little to alleviate the persistent suffering caused by poverty, diseases, social inequality, and civil unrest in cities (Taylor, 2009). The often deplorable living conditions found in city centers precipitated the flight of the wealthy, usually White, residents to outlying suburbs (Glaab & Brown, 1976). The suburbs in fact, had been growing around cities for some time, supported by the growing availability of cheap electrical power, telephones and, perhaps most importantly, the personal automobile. Cars, and a changing ethos among wealthy city dwellers who grew weary of the congestion and stress of cities and longed to return to an imagined ideal of the simple, pastoral lifestyle they envisioned in the suburbs, helped accelerate the decentralization of cities like Detroit, Chicago, St. Louis, and Los Angeles in the 1920s (Glaab & Brown, 1976). During the early decades of the twentieth century, city parks were still
conceived of as places to reform working class tendencies, with reformers especially targeting working class children (Cranz, 1982). Parks like Pulaski Park in Chicago, Steward Park in New York, and San Francisco’s Funston Park offered highly structured forms of recreation, since reformers of the era felt that the working classes were incapable of engaging independently in beneficial forms of recreation. Children, in particular, were a focus, since activists and reformers felt that in order to produce future productive members of society one had to inculcate middle and upper class values of work and civility in children before they acquired the poor habits often ascribed to the working classes (Taylor, 2009). The term “leisure time” first appears in 1907 and connotes a gap in time that requires planning and filling to prevent anti-social behavior like drinking (Cranz, 1982). City reformers and rights advocates, mostly women and church goers at this time, sought to fill this new leisure time and improve the living conditions of the working class by providing open spaces in city centers that offered training in work habits for children, and hygiene and health instruction for adults (Taylor, 2009). These efforts met with little success, though, since the activities reformers encouraged children to engage in were unimaginative and restrictive, with the predictable result that the children didn’t participate (Fairfield, 2010; Taylor, 2009). The parks that planners and reformers were providing for the lower classes were also designed around upper class ideas of parks as quiet, peaceful, landscaped settings, while the working classes wanted to engage in active, vigorous physical activities like sports as well as the more restful “upper class” activities
(Taylor, 2009). City park designers, failing to understand working class desires, commonly developed parks that were sterile, uninspired areas with facilities that serviced only male-dominated sports. As a result, parks in working class neighborhoods often went unused. Working class people sought out the better designed parks in higher income areas instead. Unfortunately, this often lead to conflict because elites perceived of working class recreation as rowdy and uncivilized. Park managers sometimes responded by criminalizing working class activities that included drinking or playing sports on the grass.

Following WWII, cities in the U.S. changed considerably. The highly concentrated city center was disappearing in favor of diffuse settlement patterns in suburbs. During WWII, cities were still regarded as the centers of culture, with their museums, universities, and libraries (Fairfield, 2010). In 1950, 58% of the US population still lived in cities, but by 1960 this figure dropped to 49% with city populations growing by only 0.1% while suburban populations grew by 45% (Teaford, 1993). Though the decline in city centers had already begun prior to the second world war, their decay accelerated following WWII as returning veterans swelled city populations creating housing shortages, plentiful supplies of affordable cars permitted greater mobility, and the potential for land development profits and housing development policy encouraged sprawl.
New Deal construction projects put people to work building massive new housing tracts in the suburbs of cities like Chicago, Detroit, St. Louis, and Philadelphia (Fairfield, 2010). Real estate developers also recognized the potential for enormous profit in the growing post WWII population, and built planned communities like Leavittown in Pennsylvania (Teaford, 1993). Single family housing developments in the suburbs were attractive to returning veterans who wanted to start a family, who faced rising rental prices in city centers, and had access to low interest loans thanks to New Deal housing policy. Regrettably, housing policy was often enacted inequitably, heavily favoring White families with affordable home loan rates, and relegating most Blacks to deteriorating inner city centers. Further exacerbating difficult city living conditions for minorities, new highway construction to provide transportation routes for suburban Whites who could more easily afford cars cut through and splintered urban minority communities. Not only were middle class Whites moving to the suburbs, but businesses were also fleeing their previous locations in city centers to follow the consumers in the burgeoning suburbs (Teaford, 1993).

With their new homes and growing families, suburban consumers in the 1950s and 60s needed new furnishings, appliances, and other home products and they were not interested in traveling to crumbling downtown areas to shop (Teaford, 1993). Retailers responded to their reluctance to travel to city centers by opening their shops in new malls that were appearing in suburbs on the fringes of large cities like Chicago, Los
Angeles, and St. Louis. Downtown areas had another disadvantage in the new car age. They had been designed to rely on efficient public transit systems, so downtown areas often had narrow streets and a paucity of parking availability, conditions which were completely unsuitable in a new era of personal automobiles. Previously robust central city retail districts disappeared, with large, vacant department store spaces parceled into liquor stores and pawn shops (Teaford, 1993). Manufacturing jobs, and large military manufacturing operations also followed the popular flight to the suburbs, further depleting the historic vitality of now-crumbling downtown areas (Fairfield, 2010).

Market-based incentives and the pursuit of economic prosperity caused planners and politicians to focus public works efforts on the suburbs rather than in decaying downtown areas (Fairfield, 2010). Consequently, projects like parks and libraries rarely landed in low income city neighborhoods which had less economic and political clout, while more affluent and politically connected suburban communities were able to secure public funds for such projects. Initially, city decision-makers in the early 20th century had planned to have ample green space in high density city center housing areas, with hedges and tree-lined streets that were to be the substitute for parks and other green spaces. But after the explosion of personal car ownership in the 50s and 60s, city planners were forced to tear up and pave over what little green areas were available in city centers to widen streets to accommodate car traffic (Bass Warner,
1972). During this time, management and planning attitudes towards what parks remained were also changing.

After the 1930s, parks and recreation planners and designers had all but given up on the idea that city parks and open spaces could function as means of social control and civilizing people, and instead focused their efforts on providing uniform standards and services in public parks which, by this time, had shifted to function purely as recreation facilities (Cranz, 1982). These facilities paid little attention to green space or landscaping, and instead focused on active recreation such as basketball, tennis, or swimming. Hence, these types of “parks” were dominated by paved asphalt surfaces for ball courts, parking lots, and stadiums.

In the 1960s and 70s, when resources and families migrated to the suburbs, inner city areas were undergoing a crisis in which poverty, riots, crime, and public health care challenges were a constant struggle for residents and city officials. The traditional mainstay of urban middle class employment, manufacturing work, and retail businesses had abandoned central downtown districts for the suburbs. And, poorly educated inner city populations were unable to secure work with the only large employers that remained in city downtowns: the white collar sectors of finance, banking, and advertising (Teaford, 1993). Large corporate entities like finance and advertising companies maintained their operations in glittering high rises in downtown
areas whose wealth stood in stark contrast to crumbling neighborhoods surrounding the glass and steel towers.

At the end of the 1970s and in the early 1980s, an improving economy in concert with concerns held by business and real estate interests, housing advocates, and political leaders, precipitated numerous urban renewal projects in blighted central city neighborhoods (Fairfield, 2010). Mayors of large cities like Cincinnati, Detroit, and Chicago, and city officials all across the U.S., with the help of federal subsidies made available through the Housing Act of 1949, were focused on urban renewal projects that took the form of refurbishing old, abandoned buildings for new retail space, tearing down dilapidated structures, and renovating buildings to mimic the appearance of the malls that had captivated suburban consumers (Teaford, 1993).

Though business and civic leaders enthusiastically supported them, urban renewal projects’ ability to improve living and economic conditions in cities was questioned by housing and civil rights advocates (Fairfield, 2010; Teaford, 1993). Many of the revitalization projects displaced minorities and poor families to make space for the interests of the wealthy. In Chicago, for instance, poor Black neighborhoods close to Lake Michigan were bulldozed and residents displaced to other blighted areas to make way for new housing with lake views for wealthy home buyers. In some cases, in Oakland, CA, for instance, residents in low income but vibrant and well-functioning
Black neighborhoods were dispossessed of their land and homes, and shuffled to dreary public housing projects in order to make way for urban redevelopment projects which primarily profited land developers. Unfortunately, it turned out that all the building and urban renewal proved only a temporary improvement, as economic conditions again slowed in the late 80s and early 90s, and once again inner city neighborhoods became vacant, and refurbished retail spaces were once again abandoned by middle and upper class residents and shoppers to be replaced by the familiar social ills of homelessness, poverty, and crime (Teaford, 1993).

The 80s and 90s witnessed the continued outward expansion of urban areas from their urban cores, as populations and cities continued to increase in size with suburbanization (Teaford, 1993). Today, the traditional settlement design of a central city district, surrounded by sparsely populated rural areas has been largely replaced with a highly dispersed form of urbanized settlement. Highly fragmented concentrations of people are now living within enormous, multi-county “metroplexes” like Riverside-San Bernardino in Southern California, or Nassau-Suffolk in New York. Cities of today are multi-centered urban chains with no real core area, so that an urban center and suburb distinction doesn’t really apply anymore in most highly urbanized regions. The traditional city-versus-suburb settlement has been replaced by gigantic, previously unknown urban complexes.
Cranz (1982; Cranz & Boland, 2004) argues that in response to this trend of widespread urbanization that was accelerating by the end of the 1960s, parks took on a new role as sources of open space, a role which persists today. City and park planners believed that by providing systems of open areas for recreation in cities, parks would help to alleviate some of the pressures of urban living, revitalize cities, and help to quell the violent expressions of social inequality that were erupting in cities like New York and Los Angeles. This Open Space System era (1960 – 1990s) was intended to provide emotional and psychological relief through play and access to arts and cultural events, and act as a response to the violent civil unrest occurring in major cities in the U.S. City officials, artists and designers, and civil rights activists believed that residents of heavily urbanized areas (especially in central city areas) including the poor, minority youth, and blue collar workers, would be the primary beneficiaries of areas with trees, grass, shrubs, water features, and play equipment for youth that stood in opposition to the sterile, athletic facilities from the previous era of park design (Cranz, 1982). During this era of park design, much smaller areas were targeted as potential open space. Streets and rooftops, abandoned railway lines, small plazas, and traditional parks in cities would all be linked as a system of open spaces in cities to help relieve the pressures inherent with urban living (Cranz & Boland, 2004). Today’s urban parks are still primarily serving as components in an open space system, though the role city parks play is again evolving in recognition of the need to promote sustainable cities.
Looking Forward

Today’s metroplexes can span hundreds of miles in all directions and demographic trends give every indication that cities will continue to grow as populations increase (Nechyba, 2004). Approximately 40 million acres in the coterminous U.S. were converted from rural to urbanized uses between 1982 and 2007 (U.S. Department of Agriculture, 2009). In 2009, about 84% of the U.S. population lived in an urban area (Office of Management and Budget, 2009). Alig, Klein, and Lichtenstein (2004) modeled urban development based on National Resources Inventory data from 1982 – 1997 and project a 79% increase in developed/urbanized area in the U.S. by 2025. This data strongly suggests that as the rural lifestyle vanishes, the urban world continue will continue to expand. And, though cities and multicity metroplexes, in many ways, challenge the well-being of residents and the environment (Schneider, 1979), they may also represent our best hope for a sustainable future in America if properly maintained and managed (Fairfield, 2010). Indeed, cities present “the most promising venue for a multicultural society” and, that “resource efficient cities also lessen our dependence on foreign oil, slow global warming, and preserve agricultural land and open space” (Fairfield, 2010, p. 270).

A multicultural America is cultivated through open spaces, including plazas, athletic areas, and verdant parks, since they are valuable resources for developing a stronger sense of community among city residents (Schneider, 1979). Public open spaces such
as urban nature parks promote the kind of casual, social interaction that has a democratizing effect on urban residents (Fairfield, 2010). At the end of the 19th and beginning of the 20th century, most people lived in densely packed, central city areas (Teaford, 1993), and though there were considerable challenges associated with this arrangement, interactions of many different classes of people on a daily basis had the effect of democratizing society, and often built strong connections among neighbors (Glaab & Brown, 1976). Today, in communities across America, neighborhood cohesion has eroded (Putnam, 2000). More and more people live in gated and low density planned communities on large lots, often don’t remain in the same home for long, and spend much of their free time in their cars. These phenomena conspire to prevent neighbors from casually interacting with each other and developing social bonds. Urban green spaces like parks provide the potential for improving a sense of community among city residents (Peters, Elands, & Buijs, 2010) through casual, social interaction similar to the kind that used to happen among neighbors on the street, at the local market, or across the garden wall. Urban nature areas provide a host of benefits and services, including ecosystem services (Tzoulas, Korpela, Venn, Yli-Pelkonnen, Kaźmierczak, Niemela, & James, 2007) which are growing increasingly important to consider given inevitable climate change challenges (Gill, Handley, Ennos, & Pauliet, 2007). Biophysical services urban green spaces produce will contribute to city sustainability to be sure, but researchers and policy makers should not overlook the value of the social components urban green spaces contribute as well.
Jacobs (1961) warns us, though, not to place unrealistic expectations on the “curative” powers of urban green spaces. A park, greenway, or urban forest will not miraculously restore neighborhood, community, or city vitality and prosperity. City officials and public welfare advocates mistakenly expected, for example, that parks would be effective forms of social control and a “civilizing” force for the working classes in the latter half of the 19th century and early 20th century. Nevertheless, current research on urban recreation and green space does suggest that the presence of parks and other green spaces in cities is associated with improved physical (Maas et al., 2006) and psychological health (Korpela, Ylén, Tyrväinen, & Silvennoinen, 2010), and greater satisfaction with community conditions (Kearney, 2006). Modern-day park planners, natural resource professionals, and city officials are better informed by scientific research and are now including considerably more public input in their planning strategies. This has resulted in parks and other green spaces that are responsive to neighborhood needs, designed and managed to embrace unique regional biophysical conditions, and present opportunities to promote vibrant community life. Combined social and biophysical research will continue to provide natural resource managers and city decision-makers with information that helps them make responsive and beneficial decisions.

A multidisciplinary research strategy is needed for resource managers facing the complexity of management in urban settings. Decision-makers are tasked with
balancing the development needs of growing urban populations with sustainable
design that supports ecological services and improves the quality of life for city
dwellers. The history of cities and green spaces in and around cities gives a clear
indication that residents and policy makers have expected parks and other urban green
spaces to fulfill various roles in response to changing urban living and working
conditions. In order for today’s municipal decision-makers and urban natural resource
managers to more effectively fulfill their responsibilities to city residents, they need
empirical data and scientific analyses of the relationship between urban public goods
like city nature areas and urban dwellers.

I conducted this research in order to gain a better understanding of the contribution
that urban parks make to modern urban quality of life in the context of three current
conditions. First, the U.S. is growing increasingly urbanized, with projections
indicating acceleration of this trend. The southeast has seen the highest percentage of
previously undeveloped land converted, but the west has also experienced rapid
growth and expansion (Hammer, Radeloff, Fried, & Stewart, 2007). According to
Hammer et al. (2007), during the 1990s, 61% of all new housing built in Oregon,
Washington, and California was built in natural areas surrounding urban centers.
Urban sprawl means that natural areas that were once located proximate to urban
dwellers become less accessible for many. Challenges associated with distance and
personal transportation, for example, present many people, especially those in low-
income urban core communities, with barriers to accessing parks and green spaces (Gobster, 2002; West, 1989). As cities continue to expand into surrounding natural areas, nature recreation areas that may have at one time been accessible for urban residents could be lost to development, and remaining natural areas are pushed farther and farther away from urban centers.

Second, the amount of leisure time Americans are spending engaged in nature-based recreation appears to be decreasing. A paper published in the Proceedings of the National Academy of Sciences noted that “all major lines of evidence support a pervasive decline in outdoor nature recreation” (Kareiva, 2008, p. 2757). Declining nature-based recreation may be due, in part, to increasing use of electronic media (e.g., video games, television, DVDs) during leisure time (Pergams & Zaradic, 2006, 2008). In Oregon, for instance, the number of visitors to national forests has recently fallen (Milstein, 2008). The repercussions of urban residents spending less time recreating in nature may not be trivial. Time spent in natural settings has both psychological and physical benefits (Kaplan, 2001; Peters, 2010; Rosenberger, Bergerson, & Kline, 2009) that may be especially important for city dwellers who are faced daily with the many challenges and stresses commonly associated with city living (e.g., traffic, noise, pollution, and crime). Time spent in natural settings has been linked to reduced stress (Chang & Chen, 2005), improved ability to concentrate (Kaplan & Kaplan, 1989), and physical benefits including improved health (Maas et al., 2006).
Finally, Americans are occupying their leisure time with sedentary pursuits. In 2009, about as many Americans reported engaging in no physical activity (32%) as those who reported engaging in physical activity regularly (34%) during their leisure time (U.S. Department of Health and Human Services, 2010). One of the consequences of Americans becoming less active is that they are getting fatter. In 2009, one third of adults over 20 in the U.S. could be classified as obese, a figure that represents a doubling of obese adults over the past 30 years (Centers for Disease Control and Prevention, 2009). Increasing levels of obesity among Americans present a host of health complications including coronary heart disease and some forms of cancer (Centers for Disease Control and Prevention, n.d.a). The increasing incidence of obesity also leads to rising public and private health care costs (Finkelstein et al., 2009).

The history of cities and city open spaces reveals that city parks and green spaces are not a panacea for the challenges that city residents and planners face. However, they can potentially be a strong contributor to public health policy designed to improve urban living conditions. The results of my research will add to the knowledge base on the contributions urban nature areas make to individual and community health. I hope that my efforts, added to the excellent work of my predecessors, will enable city planners and natural resource managers responsible for green spaces in and around
cities to make efficacious choices that benefit both the environment and people in America’s expanding urban areas.

**Dissertation Organization**

This dissertation is organized in chapters. Each of the next three chapters contains a separate paper that focuses on one area of my research. Chapter 2 reports my research results concerning physical and psychological health benefits associated with urban nature parks. The literature review provides background and discussion of prior research on the connections between outdoor recreation and individual health. A principal difference between my research and much of the work that precedes it is that I asked survey respondents directly about their physical and psychological health, rather than measuring levels of physical activity and inferring the resulting health improvements. My approach does not represent a criticism of prior work on physical activity and outdoor recreation. It is simply a different approach to understanding how urban nature areas affect urban individuals’ well-being.

Chapter 3 considers the community benefits of neighborhood green spaces, starting with a literature review of prior research, followed by a discussion of my analysis. I relied on individuals’ self-reports of community health obtained through a group of survey questions asking respondents about their interaction with neighbors. I included an analysis of community health in my research since city planners and public welfare
advocates have for some time suggested that parks and other urban open spaces provide a powerful tool for cultivating cohesion among neighbors (Taylor, 2009). I wanted to test this hypothesis by looking at a very specific kind of urban open space, an urban nature park. I focused on urban nature parks because of the multifaceted benefits they potentially provide. Urban nature parks have costs associated with them, of course, but they also appear to offer substantial benefits in the form of personal health and well-being, contact with nature, and serve as a source of community cohesion.

I discuss my research results concerning park attitudes in chapter 4. This chapter describes my application of a model of attitude formation that has been used in social psychology research and been applied in natural resource research. My literature review considers the model’s underlying theory which proposes that by examining the precursors to attitude formation, we can better understand how individuals form their attitudes about objects, ideas, or natural resource management strategies. These insights into attitude formation, in turn, help us to better comprehend intentions to engage in particular behaviors, which finally can help improve our ability to predict behavior. Understanding the public’s attitudes about, and behaviors toward, scarce natural resources is a key component for effective management of those resources. Municipal decision-makers and natural resource managers will likely be facing heavy pressures on city green spaces as urban populations continue to swell, so they need to
have a clear understanding of the social, as well as biophysical, issues associated with urban green space. Information and comprehension of public attitudes is an important contributor to decision-makers’ ability to effectively manage urban natural resources since people and green spaces in and around cities are in such close and persistent contact.

In the final, concluding chapter, I briefly discuss the outcomes of this research. This overview and discussion of my combined research results seeks to provide the reader with a broad consideration of the individual issues discussed in each chapter. Since each chapter contains its own concluding remarks, the overall conclusion for the dissertation is not intended to be a comprehensive discussion of all major points, but rather a cursory review and summary of the larger work.

I take this opportunity to explain that there is some redundancy in this dissertation. I chose the manuscript option so each of the chapters discussing my research is written as an individual paper intended for eventual submission to a refereed journal. Consequently, each chapter contains some information that will appear in the other chapters, as well. For example, methods section content of the individual manuscripts varies by survey question development, but not by survey administration. All data collected for this research comes from the same survey instrument, so my discussion of survey development and distribution does not vary by chapter. Additionally, the
discussion of the context for this research is repeated in the individual papers’ introductory remarks. The reader is invited to skip redundant information.
CHAPTER 2
URBAN NATURE PARKS AND INDIVIDUAL PHYSICAL AND PSYCHOLOGICAL HEALTH.

Introduction

In this paper the research tested a connection between physical and psychological health, and urban nature park usage for city residents. Urban nature parks were defined as areas whose primary attraction is outdoor recreation in natural and vegetated landscapes, with few or no buildings or other developed attractions (such as playgrounds or basketball courts). The main features found in these kinds of urban parks are open spaces with abundant vegetation and opportunities for activities like walking or hiking, off-road biking, or just relaxing in a natural setting. Two hypotheses were tested to examine the research question. The first hypothesis (H1) is that there will be a positive association between individuals’ physical health and urban nature park usage. The second hypothesis (H2) posits that there will be a positive association between emotional/psychological health and park usage. This approach represents a slightly different approach than much of the research which precedes it in that previous work has focused principally on a connection between recreation opportunities and physical activity.

Research identifies physical activity as a key factor in promoting good health. It reduces the risk of illnesses like cardiovascular disease, diabetes, osteoporosis and many forms of cancer and helps people live longer (Blair, Cheng, & Holder, 2001;
Exercise also improves immune system function, making us less susceptible to illness (Gleeson, 2007), and improves mental health as well (Saxena, Van Ommeren, Tang & Armstrong, 2005). Recreation and leisure researchers recognize the link between physical exercise and health and well-being, so many have examined a connection between parks and other recreation spaces, and physical activity. The underlying logic of their research is that if a there is a positive connection between parks/green spaces and physical activity, and if physical activity contributes directly to better physical and psychological health, then it follows that there is, in all likelihood, a health benefit for people using nature recreation areas.

Empirical results, in general, support the idea that nature recreation areas do indeed provide valuable opportunities for salubrious physical activity, as well as places for quiet reflection and relaxation. We are especially interested in the role that small-scale urban nature parks may play for urban dwellers’ health considering that they daily contend with the stresses of urban life (Howley, 2009), and often have limited access to restorative natural areas (Byrne, Wolch, & Zhang, 2009). But rather than asking about physical activity, we were interested in assessing direct physical and psychological health outcomes of urban nature park use. We believe that it is of considerable importance to better understand the impacts urban nature parks have on
city dwellers’ health and well-being in light of three trends occurring simultaneously in the U.S.

First, America is growing increasingly urbanized. An urban area is defined by the U.S. Census Bureau (2003) as a densely settled area which generally consists of a cluster of one or more block groups or census blocks of population density of at least 1000 people per square mile, surrounding block groups or census blocks with population density of at least 500 people per square mile, and less densely settled blocks that form enclaves or indentations or are used to connect discontinuous areas. Between 1982 and 2007 approximately 40 million acres in the coterminous U.S. were converted from rural to urban uses (U.S. Department of Agriculture, 2009). In 2009, about 84% of the U.S. population lived in an urban area (Office of Management and Budget, 2009). Alig, Klein, and Lichtenstein (2004) modeled urban development based on 1982 – 1997 National Resources Inventory data and project a 79% increase in developed/urbanized area in the U.S. by 2025. Growing urban populations have consequences not only for urban core areas, but also precipitate outward expansion, commonly referred to as urban sprawl, which consumes surrounding wildland-urban interface areas. The southeast has seen the highest percentage of previously undeveloped land converted, but the west has also experienced rapid growth and expansion (Hammer, Radeloff, Fried, & Stewart, 2007). According to Hammer et al. (2007), during the 1990s 61% of all new housing built in Oregon, Washington, and
California was built in natural areas surrounding urban centers. Urban sprawl makes natural areas that were once located proximate to urban dwellers less accessible for many living in urban cores. Challenges arising from a combination of distance and a lack of personal transportation, for example, present many people, especially those in low-income urban core communities, with barriers to accessing parks and green spaces (Gobster, 2002). As cities continue to swell and expand their borders into surrounding natural areas, nature recreation areas that were once accessible for urban residents may be lost to development, and remaining natural areas are pushed farther and farther away from urban centers.

Second, researchers suggest that Americans are spending less leisure time engaged in nature-based recreation. A paper published in the Proceedings of the National Academy of Sciences noted that “all major lines of evidence support a pervasive decline in outdoor nature recreation” (Kareiva, 2008, p. 2757). In Oregon, for example, visitor numbers in national forests have been falling since 2004 (Milstein, 2008). Declining visitation to outdoor recreation destinations may be partly due to increasing use of electronic media (i.e., video games, television, DVDs) during leisure time (Pergams & Zaradic, 2006, 2008). The price of urban residents spending less time recreating in nature may not be trivial. Time spent in natural settings has both psychological (Kaplan, 2001; Peters, 2010) and physical benefits (Rosenberger, Bergerson, & Kline, 2009) that may be especially important for city dwellers who are
faced daily with the many challenges and stresses commonly associated with city living (e.g., traffic, noise, pollution, crime). Time spent in natural settings has been linked to reduced stress (Chang & Chen, 2005), improved ability to concentrate (Kaplan & Kaplan, 1989), and physical benefits including improved health (Maas et al., 2006).

Third, Americans are occupying their leisure time with sedentary pursuits. In 2009, about as many Americans reported engaging in no physical activity (32%) as those who reported engaging in physical activity regularly (34%) during their leisure time (U.S. Department of Health and Human Services, 2010). This pattern of rising inactivity may be due, in part, to an increasing reliance on electronic diversions/media for entertainment (Berry, 2007; Maibach, 2007; Pergams & Zaradic, 2006, 2008). A direct consequence of less physical activity is that Americans are getting fatter. In 2009, one third of adults over 20 in the U.S. could be classified as obese, a figure that represents a doubling of obese adults over the past 30 years (Centers for Disease Control and Prevention, 2010). Increasing levels of obesity among Americans present a host of health complications including coronary heart disease and some forms of cancer (Centers for Disease Control and Prevention, n.d.a). The increasing incidence of obesity also leads to rising public and private health care costs (Finkelstein, Trogdon, Cohen, & Dietz, 2009).
The simultaneous incidence of these three trends presents individuals, and American society as a whole, with significant challenges. More and more people are becoming city dwellers, getting less exposure to natural settings, are exercising less, getting heavier and, consequently, placing a greater strain on their own bodies and increasing the burden on limited public health resources. In its *Healthy People 2010* report (U.S. Department of Health and Human Services, 2000), the HHS identified access to safe and convenient community open spaces as a critical factor in promoting physical exercise and better health. There does appear to be a relationship between parks and recreation spaces and physical activity (Witten, Hiscock, Pearce, & Blakely, 2008), which supports the proposition that there is a connection between public recreation space and good health. Exploring this connection can help assess what role urban nature parks have to play in public health strategies intended to improve and maintain city dwellers’ well-being. If our two hypotheses (that urban park usage is positively associated with physical health [H1], and psychological health [H2]) can be supported and they are considered together, they point to an intriguing possibility: that physical activity in a natural area may combine the positive effects of exercise with the beneficial emotional/psychological effects of contact with nature to create additive health outcomes greater than the two effects acting independently. We did not specifically test for an additive effect of “green” exercise that might produce health outcomes greater than exercising indoors only. However, if both our hypotheses can be supported, our results could be an indication of such an additive effect of “green”
exercise. We will return to this question in our concluding remarks. First, we present our review of relevant literature, followed by the description of our research.

**Literature Review**

Humans are drawn to natural settings which positively impact our well-being (Wilson, 1993). Recognition of this benefit has been a topic of interest for writers and philosophers in the U.S. for two centuries (Nash, 2001). Recreating in nature produces psychological and spiritual benefits as well as physical health benefits (Budruk, Virden, & Wasky, 2009). Enjoying such benefits by recreating in remote sites like national wildernesses and national parks has been a part of American culture for decades (Cordell, Betz, & Green, 2002; Johnson, Bowker, Bergstrom, & Cordell, 2004) but we must also consider that since more and more Americans are moving to expanding cities, *urban* parks and nature areas will have an increasing role to play in providing outdoor recreation for individual well-being (Woolley, 2006). Indeed, the “value of parks and tree lined streets near residences is particularly high…in densely populated urban areas” (Takano, Nakamura, & Watanabe, 2002, p. 916).

*Physical Activity in the Outdoors*

The rising incidence of health-related issues associated with less physical activity in the U.S. (Centers for Disease Control and Prevention, 2010; U.S. Department of
Health and Human Services, 2010) has inspired researchers in the medical, public policy, and recreation fields to focus on the connection between physical activity and outdoor recreation (Cohen, McKenzie, Sehgal, Williamson, Golinelli, & Lurie, 2007; De Bourdeaudhuij, Sallis, & Saelens, 2003; Giles-Corti, Broomhall, Knuiman, Collins, Douglas, Ng, Lange, & Donovan, 2005). Since increased physical activity results in improved health, through among other things, reductions in obesity and being overweight (Rosenberger, Bergerson, & Kline, 2009), the underlying logic behind this research is presumably that if outdoor recreation sites encourage exercise, then they should ultimately produce measurable improvements in people’s health.

Users of outdoor recreation areas commonly report that one of the main reasons for using an area is the opportunity to participate in physical activity and exercise (Budruk, Virden, & Wasky, 2009; Payne et al., 2005). City nature parks and other urban open areas provide such opportunities for physical activity (Payne, Orsega-Smith, Roy, & Godbey, 2005; Takano, Nakamura, & Watanbe, 2002). Urban green space such as parks may be especially significant for promoting physical activity since they are typically closer to people’s homes than other types of nature-based recreation sites such as national parks and forests. According to Godbey, Caldwell, Floyd, and Payne (2005), studies show that Americans’ free time tends to come in one to two hour increments during weekdays, not large chunks of free time during weekends. This strongly suggests that safe, attractive, and convenient urban green spaces that are
located nearby residential areas are likelier to be the primary source of beneficial outdoor experiences (Rosenberger et al., 2009). That proximity (defined as the area within a one half mile radius around a park [Mutter & Westphal, 1986]), higher numbers of parks, and park density have all been found to be associated with increased levels of physical activity points to the importance of convenience (Chad, Reeder, Harrison, Ashworth, Sheppard, & Schultz, 2005; Diez Roux, 2007; Kaczynski, Potwarka, Smale, & Havitz, 2009). Though important, park proximity does not by itself guarantee increases in physical activity (Giles-Corti & Donovan, 2002; Kaczynski et al., 2009).

While it is the case that park availability and physical activity are often associated, parks do not always promote physical activity since many people enjoy relaxing and other passive behaviors while using urban parks (Floyd, Spengler, Maddock, Gobster, & Suau, 2008). Sometimes people who live close to outdoor recreation spaces, like parks, are actually less active than others who live farther away from outdoor recreation opportunities (Witten et al., 2008). Though the convenience of a nearby park likely plays a role in people becoming more active, park amenities and desirable features (e.g., ample walking and biking trails, attractive views/vistas, water features) are sometimes more important influences on the likelihood of physical activity than proximity (Cohen, Ashwood, Scott, Overton, Evenson, & Staten, 2006; Kaczynski, Potwarka, & Saelens, 2008).
Research results may not always confirm a positive association, but urban parks and other open spaces have, in general, been shown to promote physical activity. Kaczynski and Henderson (2007), for instance, conducted an extensive literature review of articles published between 1999 and 2005 that addressed physical activity and parks and recreation settings. They found that 40% of the articles they reviewed reported some degree of connection between availability of green space and physical activity and 18% of the articles reported only a weak or non-significant association between the presence of parks and higher incidence of physical activity.

Outdoor Recreation Spaces and Physical Health

A significant portion of research on the relationship between outdoor recreation and well-being has understandably focused on physical activity. This is a sensible strategy because data on physical activity may be easier to collect and may be less prone to measurement error than self-reported health data. A smaller proportion of the research on the benefits of outdoor recreation has considered the direct connection between health, well-being, and parks and green space recreation (Payne et al. 2005). Available data points to urban parks, green spaces, and other outdoor recreation facilities playing an important role in encouraging and maintaining good physical health which ultimately contributes to the quality of life for urban residents (Payne et al., 2005; Sugiyama, Ward Thompson, & Alves, 2009). Measuring physical health can be
challenging and costly, so researchers who have examined a relationship between personal health and parks have commonly relied on respondents’ own perceptions of their health (de Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003). Researchers have found that parks and other urban green spaces are associated with higher self-reported physical health and general well-being scores (Maas et al., 2006; Payne et al. 2005; Takano, Nakamura, & Watanbe, 2002).

Life span is an arguably less error-prone indicator of good health than self-reported health, and it appears that parks and urban open space are positively associated with longevity (Maas, Verheij, de Vries, Spreeuwenberg, Schellevis, & Groenewegen, 2009; Takano, Nakamura, & Watanabe, 2002). Poudyal, Hodges, Bowker, and Cordell (2009), for example, conducted a study looking at neighborhood characteristics and longevity. They found that the presence of natural amenities were positively associated with longevity after controlling for other variables. In particular, they found that areas that contained accessible state and national parks, outdoor recreation facilities, and proximity to undeveloped areas like forestland or rangeland, were associated with longer life expectancy than areas lacking such natural amenities. This connection between longevity and natural space, added to research results revealing a positive association between outdoor recreation and higher levels of reported physical health (Payne et al., 2005), corroborate findings that outdoor recreation spaces promote increased physical activity which is associated with positive health outcomes.
The opportunity for physical exercise outdoor recreation areas provide is among the benefits recreationists appreciate (Budruk, Virden, & Wasky, 2009), but they also enjoy spiritual and psychological benefits including spiritual renewal, relief from stress, and improved mood during and after nature experiences (Herzog & Strevey, 2008; Kaplan & Kaplan, 1989; Mayer, McPherson Frantz, Bruehlman-Senecal, & Dolliver, 2009; Payne, et al., 2005; Velarde, Fry, & Tveit, 2007).

Outdoor Recreation and Psychological Benefits

There is reason to believe that human evolution created in people an innate calming response to nonthreatening natural scenes (Ulrich, Simons, Losito, Fiorito, Miles, & Zelson, 1991). Indeed, “it is not too great a speculation to suggest that some unthreatening natural settings, such as the water and forested settings…might elicit a parasympathetically dominated response similar to a mild, eyes-open form of ‘relaxation response’ or wakeful, meditation-like state” (Ulrich et al., 1991, p. 226). Grahn and Stigsdotter (2010) proposed eight perceived sensory dimensions of a natural setting preferred by people: serenity, space, nature, richness in species, refuge, culture (evidence of human presence), prospect (views or vistas), and social. They found that the nature and refuge dimensions were the most strongly preferred by people that were under stress and conclude that this is evidence of the restorative capacity of natural areas. People commonly report a sense of renewal, of stress relief,
and of increased levels of happiness after being immersed in a natural setting (Budruk, Virden, & Wasky, 2009; Korpela, Ylén, Tyrväinen, & Silvennoinen, 2010; Ryan, Weinstein, Bernstein, Warren Brown, Mistretta, & Gagné, 2010).

The positive psychological effects of nature may be experienced even by simply viewing nature through a window, or through short experiences with natural settings (Velarde, Fry, & Tveit, 2007). Kaplan (2001) studied the effects of nature on a sense of well-being and residential satisfaction. Kaplan looked at several elements, including the restorative effects of views of nature in making a person feel relaxed and effective. Kaplan hypothesized that the micro-experiences (short duration exposure to pleasant nature views through a window) of natural settings would promote a sense of relaxation and tranquility. Kaplan found that views of nature were associated with a sense of effective functioning and being at peace. Particular elements of natural views were differentially associated with types of mental condition. Views of gardens and flowers were associated with the feeling of effectiveness and neighborhood satisfaction, while views of trees were more strongly associated with feeling restored and ability to concentrate.

Time spent immersed in a natural setting, or even in momentary contact, creates positive impacts on people including higher levels of reported happiness, improved ability to accomplish complex tasks, and lower levels of anger or anxiety (Hartig,
Mang, & Evans, 1991). Studies continue to confirm the beneficial and restorative effects of exposure to natural settings on psychological and emotional well-being (Hartig, Evans, Jamner, Davis, & Garling, 2003). Levels of self-reported vitality also seem to increase in association with being outdoors in natural settings (Ryan et al., 2010). Ryan et al. (2010) suggest that there is a “positive impact of being outdoors and around natural elements on subjective vitality, above and beyond the effects of physical activities or social interactions that can take place in natural settings” (p.167).

In fact, the use of pleasant green spaces was once a common practice in treating those suffering from mental illness and nervous exhaustion (Wilson, Ross, Lafferty, & Jones, 2008). According to Wilson et al. (2008), though using green spaces as treatment tools for mental illnesses lost prominence, the practice has recently gained more attention with the growing awareness of the restorative effects of contact with nature. The ability of natural settings to reduce stress, restore concentration, elevate moods, and generally promote a more positive mental state continues to receive empirical support (Korpela et al., 2010; van den Berg, Koole, & van der Wulp, 2003).

There is some evidence too, that the mere presence of green space in cities has a greater impact on a sense of well-being than degree of urbanization (Maas et al., 2006). This suggests that even in highly urbanized environments, availability of green space has the potential for a significant positive effect on city residents’ sense of well-being and quality of life (Hur, Nasar, & Chun, 2010; Van Herzele & Wiedemann,
2003). The fact that urban green spaces have been found to be associated with improved health has led researchers to suggest that urban planning designs should include a significant green space component to help improve the quality of life for city residents (Groenewegen, van den Berg, de Vries, & Verheij, 2006; Maas et al., 2006).

Research Objectives
We wanted to investigate the health impacts urban green space may have on city residents. We focused on a specific type of green space, parks that were entirely, or almost entirely, natural (natural landscapes, few or no buildings or improvements). We asked residents of Portland, OR, about their physical health, their psychological/emotional health, and their park use habits. We wanted to test whether a discernable difference in self-reported physical and psychological health exists between park users and nonusers in a highly urbanized American city.

Methods

Sampling
For this study, we targeted residents over the age of 18 living in the Portland, OR, metropolitan area. Cities included in the study were Beaverton, Clackamas, Durham, Forest Grove, Gresham, Happy Valley, Hillsboro, King City, McMinnville, Milwaukee, Portland, Tigard, Troutdale, and Wilsonville. We obtained a list of names
and mailing addresses from the Oregon Department of Motor Vehicles (OR DMV) for all persons at least 18 years of age in possession of a driver’s license or state identification living in the Portland metro area. We randomly selected a sample of one thousand names from the OR DMV list containing over 700,000 names.

Survey Distribution

In fall 2010, we distributed a mailback questionnaire to recipients using a modified version of Dillman’s Total Design Method (Dillman, 2007). Our initial mailing contained a cover letter, the questionnaire, and a self-addressed postage paid return envelope. Three weeks after the first mailing, we mailed a reminder postcard to the entire sample. Several weeks after we mailed the reminder postcard, we sent the third and final mailing consisting of the same cover letter, questionnaire, and return envelope to those who had not responded by the time of the final mailing. An identical version of the questionnaire was also available on-line. We constructed the on-line version of the questionnaire using a web-based service freely available to Oregon State University students and faculty through the business school. The on-line questionnaire contained questions identical to those in the paper version. Instructions on how to access and complete the on-line version were included in the mailed cover letter. A full set of instructions for questionnaire response was also part of the on-line questionnaire. Fifteen out of the 1000 people we attempted to contact by mail had addresses which were not valid. There were 184 usable surveys (169 paper and 15
Health Questions

We adapted the health reporting questions from the SF-36 survey developed by Ware and Sherbourne (1992). Ware and Sherbourne constructed the SF-36 survey as a generic measure of general health status. The SF-36 survey questions have their roots in health monitoring instruments in use since the 1970s and 1980s, including the General Psychological Well-being Inventory and the Health Perceptions Questionnaire (Ware & Sherbourne, 1992). In order to avoid taxing respondents, we used a subset of the SF-36 questions. The questionnaire for this study contained items to assess general physical health as well as more specific health-related issues. One of the physical health variables consisted of a single item metric that asked respondents to report how their health was in general. Available responses were on a Likert-type scale, from “1” (Poor) to “5” (Excellent). The second physical health metric was as an index of seven items asking how often in the past month physical health problems had limited a respondent’s ability to accomplish various tasks (e.g., in the past month, how often have physical health problems caused you to cut down on the amount of time you spent on work or other daily activities?) or do certain activities like walk several blocks. Ware and Sherbourne refer to these items as measuring role limitations due to physical health problems. Available responses were on a Likert-type scale, from “1”
(Very often) to “5” (Never). Reliability analysis confirmed that all items in the index were appropriate to retain (Table 2.1).

Because we were also interested in measuring psychological health differences between park users and non-users, we asked respondents about their emotional/psychological health. Again, using a subset of questions from the SF-36 survey (Ware & Sherbourne, 1992), we constructed the psychological health metrics as two index variables. The first psychological health index captured information on role limitations due to psychological or emotional challenges and the other was a measure of mental health and vitality. The index variable on role limitations consisted of three questions asking how often in the past month negative emotions or feelings (like sadness or anxiety) had interfered with respondents’ ability to accomplish certain tasks from “1” (Very often) to “5” (Never) on a Likert-type scale. Reliability analysis demonstrated that all items be retained (Table 2.2).

<table>
<thead>
<tr>
<th>Physical health problems caused you to...</th>
<th>Mean</th>
<th>SD</th>
<th>Correlation</th>
<th>Alpha If Item Deleted</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut down time on work/daily activities</td>
<td>4.07</td>
<td>.98</td>
<td>.80</td>
<td>.94</td>
<td>.95</td>
</tr>
<tr>
<td>Accomplish less than wanted on projects</td>
<td>3.96</td>
<td>.94</td>
<td>.85</td>
<td>.94</td>
<td>.95</td>
</tr>
<tr>
<td>Limited activities in work/daily life</td>
<td>3.96</td>
<td>.97</td>
<td>.88</td>
<td>.94</td>
<td>.94</td>
</tr>
<tr>
<td>Limited ability to do vigorous activities</td>
<td>3.61</td>
<td>1.24</td>
<td>.88</td>
<td>.95</td>
<td>.94</td>
</tr>
<tr>
<td>Limited ability to do moderate activities</td>
<td>4.10</td>
<td>.95</td>
<td>.87</td>
<td>.94</td>
<td>.94</td>
</tr>
<tr>
<td>Hard to walk several flights of stairs</td>
<td>4.24</td>
<td>1.12</td>
<td>.83</td>
<td>.94</td>
<td>.94</td>
</tr>
<tr>
<td>Hard to walk several blocks</td>
<td>1.35</td>
<td>.48</td>
<td>.81</td>
<td>.94</td>
<td>.94</td>
</tr>
</tbody>
</table>

*a. Items on five-point scale from 1 = very often, to 5 = never*
The mental health and vitality index consisted of eight questions asking (e.g., how often in the past month respondents felt nervous or anxious, full of pep, had been a happy person, etc). Again, Likert-type scale responses ranged from “1” (Very often) to “5” (Never). Reliability analysis supported retaining all items in the index (Table 2.3).

Table 2.2
Reliability analysis for role limitations due to psychological health index

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
<th>Item Total Correlation</th>
<th>Alpha If Item Deleted</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative feelings/emotions affected you by…</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut down time on work/personal projects</td>
<td>4.04</td>
<td>1.00</td>
<td>.85</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Caused to accomplish less than wanted</td>
<td>3.96</td>
<td>.94</td>
<td>.84</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Caused to be less careful on work/personal tasks</td>
<td>4.24</td>
<td>.85</td>
<td>.76</td>
<td>.91</td>
<td></td>
</tr>
</tbody>
</table>

a. Items on five-point scale from 1 = very often, to 5 = never

Table 2.3
Reliability analysis for mental health and vitality index

<table>
<thead>
<tr>
<th>In past month, how often have you felt…</th>
<th>Mean</th>
<th>SD</th>
<th>Item Total Correlation</th>
<th>Alpha If Item Deleted</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full of pep</td>
<td>2.42</td>
<td>.94</td>
<td>.56</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Nervous or anxious</td>
<td>3.51</td>
<td>.85</td>
<td>.57</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Down/nothing seems to cheer you up</td>
<td>4.19</td>
<td>.96</td>
<td>.62</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Calm and peaceful</td>
<td>2.28</td>
<td>.81</td>
<td>.66</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Blue/downhearted</td>
<td>3.91</td>
<td>.91</td>
<td>.69</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Worn out</td>
<td>3.18</td>
<td>.89</td>
<td>.59</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Happy</td>
<td>1.99</td>
<td>.84</td>
<td>.66</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Tired</td>
<td>2.84</td>
<td>.86</td>
<td>.57</td>
<td>.85</td>
<td></td>
</tr>
</tbody>
</table>

a. Items on five-point scale from 1 = very often, to 5 = never

To test our hypotheses of differences between users and nonusers, we created a dichotomous user/nonuser variable. We asked respondents whether they had used a nature park in the last month. Respondents who had visited a Portland metropolitan
area nature park in the past month were classified as park users. People who responded that they had not visited a nature park in the past month were categorized as nonusers. Other variables in our analyses included types of physical activity aside from park-based activities (e.g., walking, running, or biking on city streets), and customary demographic items such as years of education, income, age, and gender. We conducted OLS regression analyses, t-tests, and chi-square tests using Stata statistical software, version 11.2.

Results
Our sample had more women (56%) than men (44%). More people who reported using Portland area nature parks responded (75%) than those who said they had not used a nature park in the past month (25%). Because our sample was overwhelmingly White (86%), race/ethnicity was not included in our analysis (Table 2.4). Census Bureau figures indicate that in 2010 Portland’s population was 76% White (our sample, 86%), 7% Asian (our sample, 7%), 6% Black (our sample, 2%), 9% Latino/Hispanic (our sample, 2%), 51% female (our sample 56%), and 49% male (our sample, 44%) (U.S. Census Bureau, n.d.).
On average, respondents were college educated, somewhat older, with a mean age of nearly 51, and earned between fifty to seventy five thousand dollars annually (Table 2.5). Education and income variables were converted from categorical to quasi continuous variables to increase degrees of freedom in regression models. Income was originally in ranges (e.g., $24,000 - $35,000), so we used the midpoint of the range to assign a single dollar value for respondent income. Response categories for education were originally categorical (e.g., less than high school, college graduate), so we converted those categories into years of education. For example, where respondents reported having a bachelor’s degree, they were assigned a value of 16 years of education. Moderate physical activities were described as things like relaxed walking, cleaning the house, and gardening. Vigorous physical activities were described as activities such as jogging/running, playing basketball, or mountain biking. These definitions were based on descriptions found on the CDC website (Centers for Disease Control & Prevention, n.d.b).

<table>
<thead>
<tr>
<th>User status</th>
<th>User</th>
<th>Nonuser</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75%</td>
<td>25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>White</th>
<th>Asian</th>
<th>Latino</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>86%</td>
<td>7%</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>
To test our hypothesis, we ran a series of multivariate regressions to evaluate differences between users and nonusers on the two physical health and two emotional/psychological health variables.

**Physical health**

H1 is weakly supported by our analyses. We found a statistically significant relationship between the single item general health variable and park user status after accounting for demographic and physical activity variables, but not for the physical health index variable (role limitations due to physical health). Park user status was positively related to general physical health when accounting for role limitations due to emotional health ($\beta = .184, p = .010$, in Table 2.6), and after controlling for the mental health and vitality index as well ($\beta = .212, p = .005$, in Table 2.7). Level of

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education$^a$</td>
<td>16.0</td>
<td>16</td>
<td>2.9</td>
</tr>
<tr>
<td>Income$^{a,b}$</td>
<td>72.6</td>
<td>62.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Age</td>
<td>50.7</td>
<td>50</td>
<td>16.2</td>
</tr>
<tr>
<td>Hours at the park</td>
<td>2.7</td>
<td>1</td>
<td>3.9</td>
</tr>
<tr>
<td>Hours at the gym</td>
<td>5.1</td>
<td>2</td>
<td>7.5</td>
</tr>
<tr>
<td>Moderate activity</td>
<td>11.7</td>
<td>8</td>
<td>10.5</td>
</tr>
<tr>
<td>Vigorous activity</td>
<td>3.1</td>
<td>2</td>
<td>3.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Quasi continuous</td>
</tr>
<tr>
<td>b. Income in $1000s</td>
</tr>
</tbody>
</table>

Table 2.5

*Descriptive Statistics*
education and amount of weekly vigorous activity were also positively associated with general physical health (Table 2.6).

Table 2.6

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Zero order correlation</th>
<th>p - value</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>p - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park user</td>
<td>.320</td>
<td>&lt;.001</td>
<td>.390</td>
<td>.149</td>
<td>.184</td>
<td>&lt;.010</td>
</tr>
<tr>
<td>Emotional/role limitations</td>
<td>.333</td>
<td>&lt;.001</td>
<td>.327</td>
<td>.071</td>
<td>.308</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Weekly vigorous activities</td>
<td>.371</td>
<td>&lt;.001</td>
<td>.065</td>
<td>.017</td>
<td>.274</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Education</td>
<td>.296</td>
<td>&lt;.001</td>
<td>.057</td>
<td>.021</td>
<td>.184</td>
<td>.008</td>
</tr>
</tbody>
</table>

a. R² = 0.30, F (4, 160) = 17.28, p <.001. Health indicator = single question about general health, based on 5 point scale, 1 = poor to 5 = excellent
b. Emotional health index composed of 3 variables measuring role limitations due to emotional/psychological challenges, based on a 5 point scale, 1 = very often to 5 = never
c. In a typical week, how many hours do you spend doing vigorous physical activities (Ex: jogging/running, basketball, mountain biking)?

When the mental health and vitality index variable was included in regressing general physical health on user status (and other variables), the park-based activity of “relaxation and quiet reflection” was significant and negatively related to general physical health (β = -.181, p = .014) though this variable was not related to physical health in the zero-order correlation (r =.048, p = .53) (Table 2.7). We shall return to this result in the discussion below.
Emotional health

Of the multiple models tested, we found only one in which a statistically significant relationship between emotional/psychological health and park users was revealed (Table 2.8). In this case, after accounting for other variables, park user status was negatively related to emotional/psychological health ($\beta = -.184, p = .019$). This model employed the role limitations due to emotional/psychological problems index variable as the dependent variable, which showed a relationship to the general physical health variable as well as to income. Though we did find a relationship in one of the emotional health models, given the generally weak association between emotional/psychological health metrics and park use revealed in our models, our results do not adequately support H2.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Zero order correlation</th>
<th>$p$ - value</th>
<th>B</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$p$ - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park user</td>
<td>.320</td>
<td>&lt;.001</td>
<td>.448</td>
<td>.158</td>
<td>.212</td>
<td>.005</td>
</tr>
<tr>
<td>Emotional health &amp; vitality</td>
<td>.425</td>
<td>&lt;.001</td>
<td>.526</td>
<td>.093</td>
<td>.366</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Weekly vigorous activity</td>
<td>.371</td>
<td>&lt;.001</td>
<td>.066</td>
<td>.016</td>
<td>.280</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Education</td>
<td>.296</td>
<td>&lt;.001</td>
<td>.047</td>
<td>.021</td>
<td>.153</td>
<td>.023</td>
</tr>
<tr>
<td>Relaxation &amp; quiet reflection</td>
<td>.048</td>
<td>ns</td>
<td>-.325</td>
<td>.132</td>
<td>-.181</td>
<td>.014</td>
</tr>
</tbody>
</table>

a. $R^2 = 0.36, F(5, 159) = 17.60, p <.001$. Health indicator = single question about general health, based on 5 point scale, 1 = poor to 5 = excellent
b. Emotional health index composed of 8 variables measuring mental health and vitality, based on a 5 point scale, 1 = very often to 5 = never; respondent felt: full of pep and energy (reverse), nervous and anxious, down, calm (reverse), downhearted, worn out, happy (reverse), tired
c. In a typical week, how many hours do you spend doing vigorous physical activities (Ex: jogging/running, basketball, mountain biking)?

*Emotional health*

Of the multiple models tested, we found only one in which a statistically significant relationship between emotional/psychological health and park users was revealed (Table 2.8). In this case, after accounting for other variables, park user status was negatively related to emotional/psychological health ($\beta = -.184, p = .019$). This model employed the role limitations due to emotional/psychological problems index variable as the dependent variable, which showed a relationship to the general physical health variable as well as to income. Though we did find a relationship in one of the emotional health models, given the generally weak association between emotional/psychological health metrics and park use revealed in our models, our results do not adequately support H2.
We did not find a connection between our other physical health metric (role limitations due to physical health) and park usage. We suspect that the lack of a relationship to the physical role limitations variable can be accounted for by the fact that our sample reported being very active (Table 2.9).

Table 2.8
Regression analysis: Park use and psychological health

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Zero order correlation</th>
<th>p-value</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park user</td>
<td>-.076</td>
<td>ns</td>
<td>-.362</td>
<td>.153</td>
<td>-.184</td>
<td>.019</td>
</tr>
<tr>
<td>Physical healthb</td>
<td>.333</td>
<td>&lt;.001</td>
<td>.313</td>
<td>.071</td>
<td>.352</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Income</td>
<td>.237</td>
<td>.003</td>
<td>.003</td>
<td>.001</td>
<td>.194</td>
<td>.012</td>
</tr>
</tbody>
</table>

a. R² = 0.18, F (3, 149) = 11.23, p <.001. Psychological health indicator = index composed of 3 variables measuring role limitations due to emotional/psychological challenges, based on 5 point scale, 1 = very often to 5 = never
b. Physical health indicator = single question about general health, based on 5 point scale, 1 = poor to 5 = excellent

Both park users and nonusers reported high levels of moderate physical activity and time spent at the gym; physical activities that the CDC identifies as contributors to good physical health (Centers for Disease Control and Prevention, n.d.b). We found
that park users reported spending a significantly greater amount of time doing
vigorous physical activities ($t = 3.92$, $p < .001$, $r_{pb} = .29$), a variable that was also a
significant explanatory variable in our models assessing general health.

After finding no difference between users and nonuser for moderate activity or time
spent at the gym, we looked for differences in other types of activities to help us
understand why the role limitations variable did not differ for each group (Table 2.10).
We found no significant differences between users and nonusers in reported
participation in other “non-park” activities. Respondents were asked to identify all
activities that they did (i.e., check all that apply on the questionnaire) in a typical week
that constituted the majority of their physical activity. The top three activities reported
were walking or jogging on the street, followed by housework, with gardening and
working out at the gym or at home tied for third most reported. These results are
consistent with those reported in Table 2.9, and clearly indicate that sample subjects
were, on average, very active which could account for the lack of association of park
user status and role limitations resulting from physical health problems.
We conducted a non-response bias check. We asked non-respondents a selection of questions in phone interviews. We compared respondent and non-respondent responses to the selected questions using the chi square tests and the Wilcoxon rank-sum test. Non-respondents did not differ from respondents in any of the variables with two exceptions. People who reported being Portland park users were more likely to respond to the survey than nonusers ($\chi^2 = 7.67$, $p = .006$, Cramer’s V = .45). Non-respondents also reported a higher score on a single community health question at the .10 level of significance ($z = 1.718$, $p = .0858$). We also performed a check for endogeneity (Appendix B) because our physical and emotional health metrics were

<table>
<thead>
<tr>
<th>Activitya</th>
<th>User</th>
<th>Non user</th>
<th>$X^2$</th>
<th>$p$ -value</th>
<th>$\varphi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking/jogging</td>
<td>User</td>
<td>88</td>
<td>26</td>
<td>.984</td>
<td>.321</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>48</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housework</td>
<td>Yes</td>
<td>79</td>
<td>32</td>
<td>1.903</td>
<td>.168</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>57</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gardening</td>
<td>Yes</td>
<td>62</td>
<td>22</td>
<td>.148</td>
<td>.700</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>74</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gym/home workout</td>
<td>User</td>
<td>62</td>
<td>22</td>
<td>.148</td>
<td>.700</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>74</td>
<td>23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Respondents check all that apply
used as both dependent and independent variables since research reveals that physical health affects mental health, and vice versa (Paluska & Schwenk, 2000; Wagner, Wolfe, Rotnitsky, Proctor, & Erickson, 2000). Our models did not violate the assumption of an uncorrelated error term.

Discussion
Our results partially support a connection between physical health and Portland’s nature parks. We found that park users reported higher scores on a single metric for general physical health after accounting for other variables, but we found no difference between urban nature park users and nonusers on a second physical health metric which measured role limitations due to physical health problems. Since both groups report high levels of activity in general, it is understandable that role limitations due to physical health problems were not reported more often by nonusers than park users. Our results did reveal a significant difference between park users and nonusers for vigorous physical activity (Table 2.9). We can speculate on reasons for the difference in level of vigorous activity between users and nonusers. It may be that a portion of park users’ vigorous activities are occurring in urban nature parks. It could also be that people who will tend to spend more time outdoors at a nature park are the same type of active outdoor enthusiast likelier to engage in vigorous activities like mountain biking, rock climbing, or field sports like soccer. If it is the case that people more likely to participate in various sorts of physically challenging activities are also
likelier to spend more time outdoors, we might expect to find the association that we did. People who choose other vigorous indoor activities like racquetball or basketball at the gym may also be those who will appreciate the challenge of a brisk run on urban nature area trails. Or, those who are drawn to challenging outdoor activities like mountain biking or white water rafting, may also, at times, seek out more sedate outdoor pursuits at their local nature park because they highly value and appreciate time in nature, for relaxing pursuits as well as challenging activities.

That we found no significant relationship between park use and emotional/psychological health was somewhat unexpected since others have found that time spent in natural settings has a restorative and recuperative effect (Grinde & Patil, 2009; Hansmann, Hug, & Seeland, 2007). We therefore anticipated seeing stronger evidence of a park use-mental health relationship. The psychological health model which employed role limitations due to psychological health as the dependent variable showed a negative relationship to park user status (Table 2.8). And the model in which general physical health (single item physical health question) was regressed onto the mental health and vitality index and other variables (Table 2.7) revealed evidence of the user mental health relationship in that relaxation and quiet reflection while at a park was significant. The results of these two models imply that people seek out natural spaces for relaxation, recuperation, and an opportunity to reflect when they are feeling poorly (Hartig, Kaiser, & Strumse, 2007). Grahn and Stigsdotter (2010), in
their study of Swedish city residents, found that the sensory dimensions of urban green space that were most strongly preferred by people under stress were Refuge and Nature. Their results support the hypothesis that urban residents find comfort and solace in pleasant green spaces when they are under duress. Our results, though they did not support our second hypothesis, are consistent with Grahn and Stigsdotter’s findings.

It is also possible that we did not find clearer evidence of a relationship between park use and emotional health because of a time horizon effect. That is, in other research on psychological effects of time spent in natural settings, impacts were measured immediately following exposure (e.g., Hansmann et al., 2007 and van den Berg, Hartig, & Staats, 2007). In our study, people were asked in general about emotional/psychological well-being, not immediately after exposure to nature. We suggest that a time-horizon effect, where the effects of time spent in a natural setting are felt immediately but become muted over time, may have limited our ability to detect any nature area impacts on psychological health. Research (Korpela et al., 2010; Ryan et al., 2010) clearly points to an effect of natural settings on visitors to green space, but it may be the case that an acute effect on emotional well-being is detectable only in the short term. This would be similar to the immediate after-effects of vacation time on well-being. After returning from a vacation, a person may still retain a level of relaxation and ease for a period of time, but the routines and stresses of work and daily
life eventually mute the emotional restorative effects of a vacation (Strauss-Blasche, Ekmekcioglu, & Marktl, 2000; Westman & Eden, 1997). We suggest that a similar process might occur for time spent in an urban nature setting.

On the other hand, Hartig, Mang, and Evans (1991) found that subjects who had been on a wilderness backpacking trip reported higher scores on tests of well-being in a later follow-up session than on scores collected immediately following their exit from wilderness. Hartig, Mang, and Evans suggested that this may be due to respondents feeling slightly down when suddenly reintroduced to civilization’s problems (e.g., traffic, crowds) after time in a serene wilderness setting. Their results point to a longer term effect which stands in contrast to our results. However, their subjects were completely immersed in a wilderness setting, so their subjects’ experiences were likely more intense than what might be experienced in a relatively shorter visit to a city nature area. It could also be that their subjects’ memories of their wilderness trip were triggered by participation in the study, whereas our survey respondents had no such trigger since our study did not relate to a particular trip to a natural setting. It is conceivable as well, that identifiable restorative benefits do persist over time, but our questionnaire simply failed to detect them or trigger salient memories in respondents. Or, our sample size was simply insufficient to capture the relationship. It is also possible that study participants classified as nonusers were experiencing benefits of urban greenery from sources other than nature parks. Tree lined streets and other
pleasant urban green spaces besides parks also have a positive effect on city dwellers (Erickson, 2006; Ignatieva, Stewart, & Meurk, 2011; Karmanov & Hamel, 2008; Matsuoka & Kaplan, 2007), so it may be that even though they were not using urban nature areas, respondents who did not use urban nature parks were still experiencing a level of beneficial influence on their psychological/emotional state from other forms of urban greenery.

Is There an Additive Effect of Green Exercise?

We questioned whether there is an additive effect of exercise in green areas in the introduction of this paper. Research points to a connection between physical exercise and physical health (Saxena et al., 2005) and psychological health (Warburton et al., 2006). But it may be the case that participating in physical activities in a natural setting could provide something more than exercising indoors (Coon, Boddy, Stein, Whear, Barton, & Depledge, 2011; Ryan et al., 2010). Researchers have found that contact with nature can reduce stress and anxiety (Ulrich et al., 1991). It does not stretch the imagination to propose that exercise outdoors has both psychological as well as physical benefits that may be additive. People who spend much of their time doing physical activities outdoors may be getting an added benefit that people who chiefly exercise indoors may be missing.
Pretty et al. (2005) found evidence of a synergistic effect between exercise and exposure to images of pleasant natural areas. Subjects were physically challenged in an experimental design that simultaneously showed them pictures depicting various levels of development or natural settings. Pretty et al. measured not only physical responses (using blood pressure for their metric), but also subjects’ self-esteem and mood. Subjects were organized into five different experimental groups who viewed different scenes while exercising: pleasant rural scenes, unpleasant rural scenes, pleasant urban scenes, unpleasant urban scenes, and a control group with no photos. Subjects who viewed pleasant rural scenes during exercise exhibited significantly lower blood pressure than those in the other groups. Those who viewed rural pleasant scenes also reported higher scores on subsequent self-esteem questionnaires. Those who viewed pleasant rural scenes while exercising also reported significantly more positive moods than those in the other experimental groups.

Mackay and Neill (2010) also found that exercise associated with natural settings had a positive effect on levels of anxiety. Using subjects from eight different pre-existing outdoor recreation groups (biking and running groups) in Australia, Mackay and Neill found that those who engaged in exercise in more natural environments reported significantly greater reductions in anxiety after exercising than participants in other exercise groups. Naturalness was subjectively defined by participants.
The results from our research are far from conclusive, but they do at least hint at an additive effect of exercise outdoors. Though we did not find any significant effect of park user status on psychological well-being, we did find significant differences in general health between groups. On average, our respondents reported being very active so we might have expected no differences in general health. However, respondents who were park users reported feeling better overall than those who were not park users. Park users’ higher levels of self-reported general health may be an indication of some sort of additional benefit of physical activities in an urban nature park. A true experimental design study would be necessary to adequately test this relationship though.

Conclusion
Our research results are suggestive of a connection between urban nature park usage and physical health. Our hypothesis that a connection exists between park use and physical health was supported for one of our physical health metrics (general health), but not for a second (role limitations due to physical health problems). These mixed results are likely due to the fact that our sample reported being very active. On average, park users did not differ from nonusers in levels of moderate physical activity or time spent working out at the gym or at home. Park users did report higher levels of vigorous physical activities which may be occurring at least, in part, at urban nature parks. Since the second health metric captured information on role limitations due to
physical health problems, it is probable that a sample of active people will not exhibit differences on role limitations.

Our second hypothesis was that users and nonusers would differ on levels of emotional/psychological well-being, but this was not supported. We did find a significant relationship between park users and psychological health in one model which used psychological health as the dependent variable. The relationship we found was the inverse, suggesting that people in our sample may be seeking out urban parks when they are feeling down. This result is consistent with other research that has found that people report seeking out green natural spaces for recuperation and recovery from stress. That we also found a negative relationship between physical health and those who reported relaxation and reflection as a preferred park activity further supports the idea that people in our sample seek out natural spaces when they are feeling poorly either emotionally or physically.

Our results and conclusions must be considered in light of study limitations. We relied on self-reporting for physical and psychological health data. Self-reported data can have weaknesses due to faulty respondent memory, response bias, or respondents saying what they think researchers want to hear (Leedy & Ormrod, 2005). Our survey respondents may have been reluctant to report poor physical health, for example. Reporting on emotional issues may have been even more problematic since
psychological challenges may carry a social stigma for many (Guille, Speller, Laff, Neill Epperson, & Sen, 2010). Objective measures of health may have provided a more robust and reliable measure of physical health, but were impractical considering that we were conducting a general population survey.

We also had a modest sample size, which does not permit generalization to the Portland population. Getting people to participate in a survey on a subject they are not interested in is very challenging (Dillman, Etinge, Groves, & Little, 2002). Hence, we had a smaller proportion of respondents who reported not using Portland parks. We conducted a non-response check that revealed a possible bias present in our sample. Park users were more likely to respond than nonusers, which meant that the estimates we found in our models may be biased in favor of park users. The presence of non-response bias must be kept in mind when considering our results as we found weak support only for the relationship between physical health and urban parks. It is possible that a larger proportion of nonuser respondents would have rendered this relationship non-significant.

Though there is reason to suspect that our results may be somewhat biased, they do tend to agree with earlier research that has found a relationship between physical and mental health and park use. We believe that the agreement between our results and earlier research supports our results’ validity. In future studies, it will be helpful to
capture the ideas and attitudes of nonusers since that information would likely be of particular value to managers and planners. By capturing nonuser perceptions, Portland planners could better understand how to make urban nature areas more relevant to nonusers and improve service delivery to all of the Portland metropolitan area’s residents.

More research on the impacts of urban nature areas on city residents is needed. In particular, we suggest using objective measures of health. This would greatly improve researcher ability to assess the impacts urban nature parks have on city dwellers’ well-being. Future studies, for instance, could use an experimental design, in which a small number of subjects are monitored or subjects record objective physical health metrics themselves. We would like to see research used to leverage more funding for urban park programs. Urban nature areas could be included as part of broader municipal programs to support healthy living initiatives, outdoor classroom learning, and as therapeutic settings for those experiencing physical or emotional challenges. More research on what factors affect active city residents’ decisions about using their urban nature areas would also be helpful. Nature parks cannot offer the same opportunities as fully equipped gyms, but they do provide features and amenities not found indoors. If there is indeed an additive effect from both physical and psychological benefits of outdoor activity, then learning more about urban nature areas becomes even more important.
Causality is important to consider, but impossible to substantiate in non-experimental designs. Are urban nature parks making people more active and healthy, or are already active, healthy people using nature parks? If an urban nature park were removed, would users become less active and less healthy? These are important questions to consider, in light of increasing urbanization, diminishing involvement in nature-based recreation, decreasing levels of physical activity in leisure time, and rising rates of obesity in the U.S. Small-scale urban nature parks will not be the only solution to challenges city dwellers will continue to face. But they could be a cost effective and practical contribution to a larger public health strategy to promote physical and psychological well-being for the growing number of urban residents. More research on why city residents may or may not choose to spend time in urban parks will benefit park managers, city planners, and urban residents alike.

Time in natural settings is restorative and salubrious and a necessary component to a healthy lifestyle. A hundred years ago, the population in the U.S. was mostly rural (Platt, 2004). People could walk out their front door and right into the woods, or the prairie, or the wetlands. Today, in major cities, it takes a thirty minute car ride on congested streets or freeways just to get to a tiny parcel of undeveloped land with a few picnic tables. And yet, people make these trips, and use considerable time and resources to travel to distant places like Yosemite and Yellowstone. In fact, travelers from all over the world visit the U.S. to see natural wonders like the Grand Canyon or
Crater Lake. Although small urban nature parks lack the majesty and vastness of a Yosemite or a Yellowstone, they may possess the same essential qualities that promote restoration and health. Some larger urban nature sites offer the potential for more challenging physical activities like mountain biking. Horseback riding is often available. They also provide opportunities for less strenuous pursuits in a pleasant green space, like picnicking or reading a book. The point is, small-scale urban nature parks can provide the restorative and active opportunities that people, especially city dwellers, can benefit from to maintain, or improve, the quality of their lives. Today more than ever, cities are growing more congested and challenging as more people move to them. Small-scale urban nature parks could potentially be a cost effective response to these challenges and directly contribute to urban public health policy.
CHAPTER 3
URBAN NATURE PARKS AND NEIGHBORHOOD HEALTH

Introduction

Living in a complex modern society can be challenging, especially if one lives in a heavily urbanized area (Howley, 2009; Milgram, 1970). Anyone who has ever lived in New York, Los Angeles, Chicago, or any of America’s largest cities would probably agree. It is true that major metropolitan centers offer a host of opportunities for arts, leisure, dining, entertainment, and cultural heterogeneity, but they also routinely challenge residents with noise, pollution, traffic congestion, crime, crowded streets, and social isolation. Jacobs (1961) argued that city planning, unfortunately, often contributed to the challenges of urban living by creating unsightly and unpleasant city neighborhoods that promoted isolation. She suggested that the scale of urban planning during the early to mid-twentieth century was so expansive that small public spaces designed on the human scale were omitted, resulting in the eventual loss of personal connections and interpersonal interactions among city residents. Jacobs and others (e.g., Whyte, 1980; Woolley, 2003) have argued that neighborhood livability and urban quality of life are heavily dependent upon the social interactions residents have with each other in just such small-scale places. The steady loss of these social relationships and interactions that has been occurring for decades is a critical factor in the erosion of the quality of life in the U.S. (Putnam, 1995).
What might be causing the loss of social connection among city dwellers? Jacobs (1961) argued that city scale impedes social interactions leading to reduced social cohesion. Putnam (1995) offered several explanations for the incidence of diminished social connectedness. Putnam suggested that increased mobility is a possible explanation. He argued that people have grown increasingly transient, causing residential stability to weaken because people do not have the time to build roots in their neighborhoods. Another possible explanation Putnam suggested is peoples’ increasing reliance on technology during leisure time. He suggested that the use of technology has “privatized” leisure time. People began watching substantially more television starting around the 1950s for instance, and spent less time casually socializing with neighbors on the street. A third explanation Putnam offered is that demographic transformations may be influential on social connectivity. Increasing divorce rates, families with few or no children, falling real wages, and dual income families may all contribute to eroding social connections among neighbors. Another factor Putnam discussed, which may play a role, is economic scale. He suggested that corner grocery stores in residential neighborhoods are all but extinct in most cities. Local “mom and pop” businesses where neighbors could mingle daily have been replaced by the impersonal check-out lines at the supermarket and, more recently, by the anonymity of shopping on-line. Putnam suggested that these changing patterns of routine, informal interaction and behavior in the neighborhood have resulted in a
gradual unraveling of the social fabric that holds people together and makes communities more pleasant and livable.

Whatever the reasons for this proposed weakening of social cohesion (Putnam, 1995, 2000), it may take on a new degree of importance with changing settlement patterns in the U.S. that are creating highly dense concentrations of people in cities. Since the 1950s, America has been growing increasingly urbanized (Nechyba & Walsh, 2004). An urban area is defined by the U.S. Census Bureau as a densely settled area which generally consists of a cluster of one or more block groups or census blocks of population density of at least 1000 people per square mile, surrounding block groups or census blocks with population density of at least 500 people per square mile, and less densely settled blocks that form enclaves or indentations or are used to connect discontinuous areas (U.S. Census Bureau, 2003). Approximately 40 million acres in the coterminous U.S. were converted from rural to various levels of urbanized uses between 1982 and 2007 (U.S. Department of Agriculture, 2009). In 2009, about 84% of the U.S. population lived in an urban area (Office of Management and Budget, 2009). Alig, Klein, and Lichtenstein (2004) modeled urban development based on National Resources Inventory data from 1982 – 1997 and projected a 79% increase in developed/urbanized area in the U.S. by 2025. These data strongly suggest that patterns of rural residence are vanishing in favor of urban dwelling.
None of the preceding discussion is meant to imply that city living is somehow inherently negative. Indeed, city living has many benefits (Dahly & Adair, 2007). But urban dwellers must also endure the challenges of living in concentrated city populations which can lower overall satisfaction with living conditions and quality of life (Bonnes, Bonaiuto, & Ercolani, 1991; Robin, Matheau-Police, & Couty, 2007). One component of the urban landscape that may help to improve city residents’ quality of life is public open spaces like parks and recreation sites. Local parks and green spaces allow for multiple, impromptu social interactions among neighbors, which creates social cohesion in the neighborhood (Peters, Elands, & Buijs, 2010). By fostering social ties and a sense of neighborhood cohesion, urban parks and green spaces can promote neighborhood health (DeGraaf & Jordan, 2003).

Accepting Putnam’s (2000) and others’ (Coleman, 1988; Forrest & Kearns, 2001; Guest & Wierzbicki, 1999) assertions that social cohesion has been in decline in an increasingly urbanized U.S., our objective was to explore the question of whether small-scale nature parks contribute to a sense of neighborhood health in an urban setting. We propose to examine this research question by testing two hypotheses. Our first hypothesis (H1) is that there will be a positive relationship between the presence of small-scale urban nature parks in neighborhoods and residents’ self-reported sense of neighborhood health. Our second hypothesis (H2) is that park-associated social interaction will significantly contribute to residents’ satisfaction with their
neighborhoods, thereby testing the assertion appearing in earlier research that it is social interactions among neighbors that promote neighborhood health. In the next section of this paper, we will review literature which informed our study, and then discuss the research we conducted in the remaining sections.

**Literature Review**

*Conceptualizing Neighborhood Health*

We will explain neighborhood health using the concept of social capital. Social capital is the ability of individuals to access benefits or resources by virtue of their connection to social networks and structures (Bourdieu, 1986; Portes, 1998). Putnam (2000) defined social capital slightly differently as a collective or communal sense of trust, reciprocity, and civic engagement among community members. Both definitions, in essence, conceive of social capital as the value derived from an individual’s social networks. Just as institutions and individuals use economic and physical capital to produce goods and services, social capital can be mobilized to secure services and benefits. For example, in communities where people know and trust one another, strong connections among neighbors can produce tangible benefits such as help with home projects, or intangible benefits such as emotional support from neighbors during stressful times. Social capital makes resources available (directly or indirectly) to individuals or groups through the social networks they occupy (Carpiano, 2006). In
this paper, we conceive of neighborhood health in terms of social capital. Neighborhood health suggests the presence of social capital, a situation in which residents know who their neighbors are, trust them, and feel empowered to rely upon each other for practical and emotional support. It is in these types of productive and affective social relations among neighbors that neighborhood health is generated and maintained (Wilson, 1997). Social connections among neighbors, in other words, are a primary contributor to healthy neighborhoods.

**Green Space, Social Interaction, and Sense of Community**

Satisfaction with one’s neighborhood directly impacts a person’s quality of life (Hur & Morrow-Jones, 2008). Characteristics that are commonly associated with neighborhood satisfaction include access to parks and recreational spaces and the presence of trees and other green areas (Coley, Kuo, & Sullivan, 1997; Kweon, Ellis, Leiva, & Rogers, 2010). Among the reasons parks and other community green spaces positively impact community satisfaction is that they provide opportunities for social interaction (Peters, Elands, & Buijs, 2010).

Urban green spaces supply many benefits for urban residents. These include ecosystem services (Nowak, Stein, Randler, Greenfield, Comas, Carr, & Alig, 2010), and physical activity opportunities (Kaczynski, Potwarka, Smale, & Havitz, 2009). But the chance for social interaction between neighbors may be among the most
significant for urban quality of life because it creates feelings of neighborliness and a sense of belonging to the community (Kearney, 2006; Whyte, 1980). Repeated social interactions among neighbors build bonds between people which ultimately strengthen a community (Temkin & Rohe, 1998). Social interactions play a role in overall happiness and life satisfaction (Furnham & Cheng, 2000; Kesebir & Deiner, 2008) so it follows that neighborhood satisfaction resulting, in part, from neighborly interaction in urban green spaces, is important because it is a strong predictor of quality of life and life satisfaction for city dwellers (Sirgy & Cornwell, 2002). Informal social encounters among neighbors in city natural areas can therefore be identified as a potential resource for strengthening social ties among residents which will result in healthier neighborhoods (Coley, Kuo, & Sullivan, 1997; Kweon, Sullivan, & Wiley, 1998).

The recognition of the potential benefits from increased neighbor interaction in shared public spaces has led to new trends in urban design and planning, including the creation of a new design philosophy known as New Urbanism (Lund, 2003). New Urbanism incorporates a combination of design elements including compact, walkable neighborhoods, a diverse mix of housing options and activities, and convenient open spaces throughout the neighborhood (Lund, 2003). Among the key ideas embraced in New Urbanism is that developments should be pedestrian friendly, with ample, easy access to amenities like shopping areas and parks to encourage walking behavior.
People who walk in their neighborhoods are more likely to engage in casual social interactions with neighbors, thereby creating relationships or ties among each other (Kim & Kaplan, 2004; Lund, 2003). Developments that incorporate the components of New Urbanism design, including ample public shared natural open space such as greenways and parks, and developed spaces such as tree-lined streets or playgrounds, encourage people to interact with one another, form bonds, and increase their sense of connection and community with one another, improve neighborhood satisfaction and quality of life (Altschuler, Somkin, & Adler, 2004; Bothwell, Gindroz, & Lang, 1998; Harnik, 2006).

Parks and other urban green spaces can contribute to community satisfaction also by bridging gaps between people from diverse backgrounds. They can promote cross-cultural and cross-ethnic interaction, by facilitating interaction among disparate communities (Peters, 2010). Though people primarily interact with family and friends during recreation (Walker, Deng, & Deiser, 2005), parks can bring people from all walks of life together and enhance opportunities for interaction by operating as transitional spaces between the comfortable personal space of home and the completely anonymous spaces in public (Peters, 2010). Neighborhood parks can provide a safe, familiar space for easier interaction among people who might not otherwise come into contact and thereby promote acceptance and understanding (Shinew, Stodolska, Floyd, Hibbler, Allison, Johnson, & Santos, 2006). This
democratizing effect of public parks was one of the principal benefits that Fredrick Law Olmstead imagined for his signature Central Park in New York (Taylor, 2009).

Another type of neighborhood natural open space to consider is the community garden. They have lately become a focus of community health research in recognition of the potential multiple benefits they provide, including bringing community members together. Community gardens, like other urban green spaces, can be effective responses to an increasing sense of isolation among city residents, and produce salubrious contact with natural sites in otherwise highly developed areas (Kingsley & Townsend, 2006). Development and maintenance of community gardens often involve significant cooperation among residents and local officials, and are a good example of how shared urban green spaces help create healthy communities through social interaction (Tieg, Amulya, Bardwell, Buchenau, Marshall, & Litt 2009). Through the development, creation, and maintenance of community gardens, neighbors develop stronger ties to one another, to planners and decision-makers, and to municipal entities (Shinew, Glover, & Parry, 2004; Tieg et al., 2009). Community gardens in urban centers provide individual benefits in the form of physical exercise and access to healthier foods, psychological benefits from contact with nature, and community benefits through stronger networks and improvement of neighborhood aesthetics (Wakefield, Yeudall, Taron, Reynolds, & Skinner, 2007). And they may also foster stronger inter-ethnic communication and understanding through collective
and inclusive behavior (Shinew, Glover, & Parry, 2004). Of particular importance, community gardens can encourage a sense of attachment and involvement in the neighborhood.

Community gardens inspire a sense of involvement or belonging among residents – residents refer to the community gardens as “our” garden (Shinew, Glover, & Parry, 2004, p. 351). Through their feelings of ownership, residents get a sense of feeling connected to their community; they have a sense of belonging to the neighborhood. Community gardens encourage interaction among neighbors, among people from different backgrounds and cultures, provide relief from social isolation for many urban dwellers, and lead to discussions about community issues that transcend the garden (Wakefield et al., 2007). That is, community gardens create opportunities for neighbors to meet and interact, social interactions create more neighborliness, and more neighborliness leads to more livable neighborhoods (Riger & Lavrakas, 1981). These types of benefits are precisely those suggested by social capital theory (Putnam, 2000). Community gardens improve urban residents’ quality of life by increasing their level of physical activity, supporting healthier diets, and improving neighborhood satisfaction.
Neighborhood Green Space and Biophilia

Research results generally support the notion that neighborhood parks and other public areas contribute to neighborhood satisfaction by providing opportunities for social interaction. Neighborhood satisfaction is also dependent upon other qualities such as housing density, views from home, safety, quiet, demographics, and the mere presence of natural areas (Kweon, Ellis, Leiva, & Rogers, 2010; Lovejoy, Handy, & Mokhtarian, 2010). People are attracted to neighborhood green spaces with ample trees (Coley, Kuo, & Sullivan, 1997), and seek out urban open areas that have qualities of nature, space, and quiet (Van Herzele & Wiedemann, 2003). The presence of nearby areas that contain pleasant natural features is especially important to city dwellers for whom the most valued natural areas are often the ones closest to home (Burgess, Harrison, & Limb, 1988; Sugiyama & Ward Thompson, 2008).

Grinde and Patil (2009) argued that most current and past cultures worldwide demonstrate an affinity for natural features. Archeological evidence from ancient Egypt and Pompeii indicates that people in those ancient civilizations also brought plants into their homes as we do today. Grinde and Patil point out that cities worldwide, both ancient and modern, often contain significant natural features such as trees and natural parks, which evidences a universal human affinity for nature. Ulrich, Simons, Losito, Fiorito, Miles, and Zelson (1991) suggested that part of the reason for peoples’ affinity for natural, non-threatening natural settings that contain trees,
greenery, and water features is because our early human ancestors lived and evolved in such settings. Ulrich et al. suggested that humans have a deeply ingrained, primal response to such sites which we subconsciously positively associate with needed resources and survival. Others have suggested that just as humans have an innate need to be connected to others, to belong to a group (Fiske, 2004), so too do humans have a biologically based need to feel connected to the natural world (Kellert & Wilson, 1993).

Whether for evolutionary or other reasons, people are attracted to green spaces and tend to positively associate local green spaces with neighborhood satisfaction (Kearney, 2006). It seems likely that this is because human beings enjoy benefits from natural settings through a sense of belonging to something larger than ourselves (Mayer, McPherson Frantz, Bruehlman-Senecal, & Dolliver, 2009), from opportunities for physical exercise (Budruk, Virden, & Wasky, 2009), and through psychological revitalization (Ryan, Weinstein, Bernstein, Brown, Mistretta, & Gagné, 2010).

Commercial Benefits of Neighborhood Green Space
Nature views provided by parks and other urban green spaces are associated with neighborhood satisfaction (Kearney, 2006; Velarde, Fry, & Tveit, 2007) but also have more tangible benefits. Urban greenery is not only pleasant to look at for residents, but
also has commercial implications. Urban residents express the positive values they ascribe to urban green spaces through an increased willingness to pay for the many opportunities such areas supply (Crompton, 2001; Tyrväinen & Väänänen, 1998). Research has revealed that there is a connection between attractive green spaces in neighborhoods and property values. Homes that are located immediately adjacent to relatively quiet parks (“passive” parks) can have property values at least 20% higher than otherwise equivalent homes located farther away from a park (Crompton, 2001). There also appears to be a positive association between retail behavior and the presence of urban green space (Wolf, 2005). Consumers have shown a stronger preference for retail areas with more trees and other greenery present, judging the social experience of their retail activities, the quality of the products, and the merchants, more favorably in treed and green shopping areas (Joye, Willems, Brengman, & Wolf, 2010). Consumers reported a greater willingness to patronize shopping areas, and a higher likelihood of traveling to retail areas, that had abundant quantities of trees (Wolf, 2003, 2004). Perhaps most significantly for retailers, consumers demonstrate a higher threshold of price acceptance in retail locations where trees are present, accepting prices as much as 12% higher in treed areas than non-treed areas in large cities, and 9% higher prices in treed areas over non-treed in small cities (Joye et al., 2010, p. 61). Retail sites close to residential areas are sometimes seen as a negative neighborhood feature by residents, but the presence of trees and other
greenery can reduce residential neighbors’ negative evaluation of that retail space (Ellis, Lee, & Kweon, 2006).

\textit{Jacobs’ Warning}

It is important to keep in mind, though, that green spaces like parks and tree-lined streets do not guarantee a sense of community or neighborhood health. In her seminal work on urban design and planning, Jacobs (1961) discussed the values, and misunderstandings concerning urban parks. According to Jacobs, more open space in cities does not necessarily lead to more livable neighborhoods, happier people, or community health. Jacobs discussed examples of parks that became havens for illegal activity and \textit{de facto} residences for the homeless. Jacobs argued that the success or failure of an urban park is a product not only of the existence of an open space, but what is occurring around that space. Indeed, any neighborhood park “is the creature of its surroundings and of the way its surroundings generate mutual support from diverse uses, or fail to generate such support” (p. 98). A park’s success is not only dependent upon its surroundings, but also on what is available \textit{in} the park. A park’s design, its features and attractions, must also be appealing to potential users. Jacobs argues that well-designed, lively, and attractive park features create lively, interested users. Lifeless, monotonous features in a park create no users.
But Jacobs’ main point was that in order for a park to be “successful,” it has to exist within a diverse, mixed-use neighborhood that has various different kinds of users enjoying the park throughout the day and evening. It is unreasonable to develop a park in a blighted neighborhood, and expect it to miraculously improve the community on its own. Parks are a part of the community, such that a healthy, vibrant surrounding community will support a healthy, vibrant park. And, according to Jacobs, the reverse is true. Socially undesirable and criminal elements do not move into a well-used park. They fill the void left after other users have abandoned the park for whatever reason(s). Jacobs argued that “city parks are not abstractions, or automatic repositories of virtue or uplift…they mean nothing divorced from their practical, tangible uses…mean nothing divorced from the tangible effects on them – for good or for ill – of the city districts and uses touching them” (p. 111). Jacobs’ eminently practical conception of parks, arguably applicable to any urban public space, is important to keep in mind in our discussion of parks and neighborhood health. Parks are not a panacea for urban problems, but research does suggest that there is relationship between the presence of urban green space like parks, sense of community, neighborhood health, and ultimately the quality of life for city residents.

**Research Objectives**

As part of a larger study on a relationship between urban parks and individual, and neighborhood well-being, we looked at whether small-scale urban nature parks in
proximity to their homes had any impact on Portland, OR, residents’ perception of their neighborhood’s health. We tested whether the presence of a nature park in the neighborhood (either within a fifteen to twenty minute walk, or a ten minute drive away from home) had a relationship to self-reported neighborhood health (H1). We also tested whether the park-related social interactions Portland residents engage in were contributing to their sense of neighborhood health (H2).

Methods

Survey Distribution
For this study, we targeted residents over the age of 18 living in the Portland, Oregon, metropolitan area. Cities included in the study were Beaverton, Clackamas, Durham, Forest Grove, Gresham, Happy Valley, Hillsboro, King City, McMinnville, Milwaukee, Portland, Tigard, Troutdale, and Wilsonville. We obtained a list of names and mailing addresses from the Oregon Department of Motor Vehicles (OR DMV) for all persons at least 18 years of age in possession of a driver’s license or state identification living in the Portland metropolitan area. We randomly selected a sample of one thousand names from the OR DMV list containing over 700,000 names.

In fall 2010, we distributed a mailback questionnaire to recipients using a modified version of Dillman’s Total Design Method (Dillman, 2007). Our initial mailing
contained a cover letter, the questionnaire, and a self-addressed postage paid return envelope. Three weeks after the first mailing, we mailed a reminder postcard to the entire sample. Several weeks after we mailed the reminder postcard, we sent the third and final mailing consisting of the same cover letter, questionnaire, and return envelope to those who had not responded by the time of the final mailing. An identical version of the questionnaire was also available on-line. We constructed the on-line version of the questionnaire using a web-based service freely available to Oregon State University students and faculty through the business school. The on-line questionnaire contained questions identical to those in the paper version. Instructions on how to access and complete the on-line version were included in the mailed cover letter. A full set of instructions for questionnaire response was also part of the on-line questionnaire. Fifteen out of the 1000 people we attempted to contact by mail had addresses which were not valid. There were 184 usable surveys (169 paper and 15 web-based) returned for a final response rate of 19% (184/985).

Urban Nature Parks Defined

“Open space” can mean many different things and be defined by differing typologies or characteristics (Erickson, 2006). In this paper, we are concerned with open and green space in cities, specifically small-scale nature parks. We defined small-scale urban nature parks as areas whose primary attraction is outdoor recreation in an area dominated by natural landscapes and vegetation, with few or no buildings or other
developed attractions (such as playgrounds or basketball courts). The main features found in these kinds of urban parks are open spaces with abundant vegetation and opportunities for activities like walking or hiking, off-road biking, or just relaxing in a natural setting.

*Neighborhood Health Metric*

We asked respondents six questions to evaluate levels of connection and support among neighbors to build a conceptual variable for neighborhood health. These questions were a subset of questions used in a previous survey to assess neighborhood health (Gueorguiev, 2007). We asked respondents how strongly they agreed or disagreed with statements such as “People in your neighborhood know each other,” and “People in your neighborhood feel connected to one another.” Response categories were on a scale, from “1” (strongly disagree), to “5” (strongly agree). The six items were used to generate an index variable for neighborhood health. Reliability analysis (Table 3.1) reveals that all the items demonstrate internal consistency and warrant retention.
Social Networks Metric

Social network analysis provides powerful tools to measure and model complex interactions among individuals (Wasserman & Faust, 1994). Rather than measure features of respondent’s networks (e.g. density, clustering), we used instead a self-reported measure of the presence of personal networks based on outcomes networks are expected to produce. We used two outcomes of social networks to operationalize the concept: small scale services and companionship/social interaction (Wellman, Carrington, & Hall, 1988). We asked survey participants questions related to small-scale services including whether they could rely on friends and family for help (e.g., watch their kids, give them a ride) and whether they learned about local issues from friends and family. We inquired about companionship/social interaction by asking respondents questions including whether they stopped and talked to neighbors while walking to their local park and whether they talked with neighbors while using a neighborhood park. All responses used a Likert-type scale, from “1” (strongly
disagree) to “5” (strongly agree). Reliability analysis confirmed that all items are appropriate to retain in the index variable (Table 3.2).

Table 3.2
Reliability analysis of social networks index

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
<th>Correlation</th>
<th>Item Total Alpha</th>
<th>Alpha If Item Deleted</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companionship/social interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.73</td>
</tr>
<tr>
<td>Talk with neighbors while at the park</td>
<td>3.32</td>
<td>.884</td>
<td>.49</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk with neighbors on the way to the park</td>
<td>3.33</td>
<td>.971</td>
<td>.51</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk with neighbors about local issues</td>
<td>3.08</td>
<td>1.010</td>
<td>.57</td>
<td>.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family/friends are source for park info</td>
<td>3.04</td>
<td>.979</td>
<td>.36</td>
<td>.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can count on family/friends for help</td>
<td>3.19</td>
<td>1.010</td>
<td>.41</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learn about environmental issues from family/friends</td>
<td>3.06</td>
<td>.894</td>
<td>.48</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Items on five-point scale, from 1 = strongly disagree to 5 = strongly agree.

Psychological Health Metric

Psychological health (as indicated by the absence of, or manageable levels of, stress, anxiety, depression, or other negative emotional states) is associated with life satisfaction and happiness (Argyle, 2001), so we controlled for it in our models, reasoning that emotional/psychological health might have an influence on one’s judgments of their surroundings (Clore & Huntsinger, 2007). We adapted the psychological health reporting questions from the SF-36 survey developed by Ware and Sherbourne (1992) who constructed the survey as a generic measure of general health status. The SF-36 survey questions have their roots in health monitoring instruments in use since the 1970s and 1980s, including the General Psychological
Well-being Inventory and the Health Perceptions Questionnaire (Ware & Sherbourne, 1992). In order to avoid taxing respondents, we used a subset of the SF-36 questions. We constructed two index variables for psychological health. One index variable consisted of three questions concerning mental health and vitality, and the other index contained eight questions about role limitations due to psychological/emotional challenges. The questions on role limitations asked how often in the past month negative emotions or feelings (like sadness or anxiety) had interfered with respondents’ ability to accomplish certain tasks from “1” (very often) to “5” (never) on a Likert-type scale. The mental health and vitality questions asked about things like how often in the past month respondents felt nervous or anxious, full of pep, or had been a happy person. Again, Likert-type scale responses ranged from “1” (very often) to “5” (never). Reliability analysis confirmed that all items contributed to the index and were retained (Table 3.3).
Results

Our sample consisted of more women (56%) than men (44%). More people who reported using Portland area nature parks responded (75%) than those who said they had not used a nature park in the past month (25%). Because our sample was overwhelmingly White (86%), race/ethnicity was not included in our analysis (Table 3.4). Census Bureau figures indicate that in 2010 Portland’s population was 76% White (our sample, 86%), 7% Asian (our sample, 7%), 6% Black (our sample, 2%), 9% Latino/Hispanic (our sample, 2%), 51% female (our sample 56%), and 49% male (our sample, 44%) (U.S. Census Bureau, n.d.).

Table 3.3
Reliability analysis of psychological health index

<table>
<thead>
<tr>
<th>Role limitations</th>
<th>Mean</th>
<th>SD</th>
<th>Correlation</th>
<th>Alpha If Item Deleted</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut down on personal projects</td>
<td>4.04</td>
<td>.999</td>
<td>.70</td>
<td>.88</td>
<td>.90</td>
</tr>
<tr>
<td>Accomplished less than desired</td>
<td>3.96</td>
<td>.944</td>
<td>.74</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>Less careful when performing tasks</td>
<td>4.24</td>
<td>.846</td>
<td>.61</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Mental health &amp; vitality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt full of pep (reverse coded)</td>
<td>2.42</td>
<td>.943</td>
<td>.50</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>Been nervous/anxious</td>
<td>3.51</td>
<td>.852</td>
<td>.59</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Felt down/nothing cheers you up</td>
<td>4.19</td>
<td>.961</td>
<td>.69</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>Felt calm and peaceful (reverse coded)</td>
<td>2.28</td>
<td>.809</td>
<td>.63</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Felt downhearted and blue</td>
<td>3.91</td>
<td>.913</td>
<td>.71</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>Felt worn out</td>
<td>3.18</td>
<td>.890</td>
<td>.60</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Been happy (reverse coded)</td>
<td>1.99</td>
<td>.844</td>
<td>.62</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Felt tired</td>
<td>2.84</td>
<td>.864</td>
<td>.52</td>
<td>.89</td>
<td></td>
</tr>
</tbody>
</table>

*Items on five-point scale, from 1 = very often to 5 = never.*
On average, respondents were college educated, somewhat older with a mean age of nearly 51, and earned between fifty to seventy five thousand dollars annually (Table 3.5). Education and income variables were converted from categorical to quasi-continuous variables to increase degrees of freedom in regression models. Income was originally in ranges (e.g., $24,000 - $35,000), so we used the midpoint of the range to estimate a single dollar value for respondent income. Response categories for education were originally categorical (e.g., less than high school, college graduate etc.), so we converted those categories into years of education. For example, if a respondent reported having a bachelor’s degree, they were assigned a value of 16 years of education.

Table 3.4.
User status and demographics

<table>
<thead>
<tr>
<th>User status</th>
<th>User</th>
<th>Nonuser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>White</td>
<td>Asian</td>
</tr>
<tr>
<td>75%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>56%</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>86%</td>
<td>7%</td>
<td>2%</td>
</tr>
</tbody>
</table>
To measure how respondents felt about their neighborhoods we used an index measuring neighborhood health as the dependent variable in all models. The neighborhood health index variable demonstrated a consistently positive association with park proximity, after accounting for demographic variables and psychological health (Table 3.6). A park within walking distance was positively associated with neighborhood health ($\beta = .181, p = .010$), as was a respondent’s social network ($\beta = .371, p < .001$). Age, income, gender, education, emotional health variables, and park user status (user or nonuser) were not statistically significant in the model.

Table 3.5

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education$^{a,c}$</td>
<td>16.0</td>
<td>16</td>
<td>2.9</td>
</tr>
<tr>
<td>Income$^{b,c}$</td>
<td>72.6</td>
<td>62.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Age</td>
<td>50.7</td>
<td>50</td>
<td>16.2</td>
</tr>
</tbody>
</table>

a. Education in years  
b. Income in 1000s  
c. Education and income are quasi-continuous

Neighborhood Health & Park Proximity

To measure how respondents felt about their neighborhoods we used an index measuring neighborhood health as the dependent variable in all models. The neighborhood health index variable demonstrated a consistently positive association with park proximity, after accounting for demographic variables and psychological health (Table 3.6). A park within walking distance was positively associated with neighborhood health ($\beta = .181, p = .010$), as was a respondent’s social network ($\beta = .371, p < .001$). Age, income, gender, education, emotional health variables, and park user status (user or nonuser) were not statistically significant in the model.
We also tested to see if small-scale nature parks that were close, but not within walking distance (i.e., more than a 15-20 minute walk away), had an effect on perceived neighborhood health. To do this, we asked about parks that were within “driving distance,” which we defined as no more than a ten minute drive from respondents’ homes, and found similar results to parks in within walking distance (Table 3.7). Parks in driving distance were positively related to self-reported neighborhood health ($\beta = .192, p = .006$). Social networks in which people knew their neighbors and had strong connections to family and friends (i.e., “strong” networks) were also positively related to neighborhood health ($\beta = .393, p < .001$). Again, demographic variables were not statistically significant, and neither was the emotional health variable. Park user status was not statistically significant in the model either. The results from our sample tend to support H1. Neighborhood parks are positively associated with neighborhood health.

Table 3.6

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Zero order correlation</th>
<th>$p$-value</th>
<th>B</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park within walking distance$^b$</td>
<td>.244</td>
<td>.001</td>
<td>.268</td>
<td>.103</td>
<td>.181</td>
<td>.010</td>
</tr>
<tr>
<td>Social networks$^c$</td>
<td>.405</td>
<td>&lt; .001</td>
<td>.421</td>
<td>.079</td>
<td>.371</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

a. $R^2 = .19$, $F(2, 172) = 20.61, p < .001$. Community health index composed of six items: neighbors know each other, socialize together, take care of each others’ pets/home/kids, feel connected, help with problems, watch out for each other. All on a five point scale, 1 = strongly disagree to 5 = strongly agree.
b. Walking distance defined as a 15-20 minute walk from home.
c. Social networks index composed of six items measuring companionship and small-scale services received from neighbors and friends/family.
Table 3.7

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Zero order correlation</th>
<th>p-value</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park within driving distance</td>
<td>.245</td>
<td>.001</td>
<td>.413</td>
<td>.147</td>
<td>.192</td>
<td>.006</td>
</tr>
<tr>
<td>Social networks</td>
<td>.405</td>
<td>&lt; .001</td>
<td>.451</td>
<td>.079</td>
<td>.393</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

a. \( R^2 = .21, F (2, 171) = 22.96, p < .001 \). Community health index composed of six items: neighbors know each other, socialize together, take care of each other’s pets/home/kids, feel connected, help with problems, watch out for each other. All on a five point scale, 1 = strongly disagree to 5 = strongly agree.

b. Without traffic, park is 10 minute or less drive from home.

c. Social networks index composed of six items measuring companionship and small-scale services received from neighbors and friends/family.

Companionship/Social Interaction as a Mediating & Moderating Variable

Social interactions among residents are one of the key contributors to creating healthy, livable neighborhoods (Wilson, 1997). Trust, reciprocity, and investment in the neighborhood result from neighbors getting to know each other (Putnam, 2000). Past research has shown that residents report higher levels of satisfaction with their neighborhoods when neighbors talk with one another in community open spaces (Coley, Kuo, & Sullivan, 1997; Wakefield et al., 2007). To test our second hypothesis, that park-related interaction among neighbors is a significant factor in positive evaluations of neighborhoods, we tested for a mediating and moderating effect of the companionship/social interaction items that constituted a portion of the social networks index. We constructed an index of the three companionship/social interaction variables relating to neighboring activities, which reliability analysis confirmed was appropriate (Table 3.8).
We then tested for mediation by the companionship/social interaction index on the park proximity variables (park within walking and park within driving distance), when they acted as independent variables in models with the neighborhood health index as dependent variable. We used the three-step procedure suggested by Vaske (2008). In step one, we regressed the mediator (companionship/social interaction) on the independent variable (parks proximity) to test their correlation. In step two, we regressed the dependent variable (neighborhood health) on the independent variable(s) (two types of parks proximity). In step three, we regressed the dependent variable on both the potential mediator and the independent variable. If the path coefficient for the independent variable is still significant, but weaker, in the presence of the suspected mediator, this supports a conclusion of partial mediation. If the independent variable path becomes non-significant when the potential mediator is included in the model, this supports a conclusion of full mediation. Our test revealed that the companionship/social interaction index partially mediated the relationship between both park proximity items and neighborhood health (Table 3.9).

Table 3.8

| Table 3.8 |
|-----------------|-----------------|-----------------|-----------------|
| Reliability analysis of social networks-companionship index | Mean | SD | Item Total Correlation | Alpha | If Item Deleted | Cronbach Alpha |
| Companionship/social interaction | | | | | | |
| Talk with neighbors while at the park | 3.32 | .884 | .55 | .40 | |
| Talk with neighbors on the way to the park | 3.34 | .971 | .41 | .61 | |
| Talk with neighbors about local issues | 3.08 | 1.010 | .40 | .60 | |

a. Items on five-point scale, from 1 = strongly disagree to 5 = strongly agree.
A moderating variable is one that affects either the direction or significance, or both, of another independent variable (Vaske, 2008). We also tested for moderation by calculating an interaction term using the park proximity variables multiplied by the companionship/social interaction index variable. If the interaction term is significant and affects the strength or direction, or both, of the independent variable (park proximity), this is evidence of the companionship/social interaction variable having a moderating effect on the relationship between park proximity and neighborhood health.
(Vaske, 2008). After testing, we found that a moderating effect was supported for parks within walking distance (Table 3.10).

<table>
<thead>
<tr>
<th>Table 3.10</th>
<th>Moderation test: Neighborhood health, park within walking distance, social interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent variables</td>
<td>Regression with interaction term</td>
</tr>
<tr>
<td></td>
<td>B</td>
</tr>
</tbody>
</table>
| Park in walking distance
c | -.683 | .416 | -.462 | .102 | .223 | .105 | .151 | .035 |
| Social interaction
d | .183 | .094 | .204 | .054 | .341 | .064 | .380 | < .001 |
| Interaction term
e | 2.85 | 1.26 | .695 | .026 |

a. R² = .22, F (3, 169) = 15.78, p < .001. DV = Neighborhood health index
b. R² = .20, F (2, 170) = 20.65, p < .001. DV = Neighborhood health index
c. Walking distance defined as 15-20 minute walk from home.
d. Social interaction variable, consisting of three items: talk to neighbors at the park, talk to neighbors on the way to park, talk to neighbors about local issues
e. Interaction term = social interaction * park in walking distance

The interaction term was not significant in the model where parks within driving distance was the independent variable (β=.320, p=.394). A moderating effect of social interaction on parks within driving distance, in relation to neighborhood health, was therefore not supported. Overall, our results support H2. Park-related social interaction is a significant contributor to our sample’s sense of neighborhood health.

We conducted a non-response bias check by asking a sample of non-respondents a selection of questions in phone interviews. We compared respondent and non-respondent answers to the selected questions using the chi square and the Wilcoxon rank-sum tests. Non-respondents did not differ from respondents in any of the variables with two exceptions. People who reported being Portland park users were
more likely to respond to the survey than non-users ($\chi^2 = 7.67, p = .006$, Cramer’s $V = .45$). Non-respondents also reported a higher score on a single community health question at the .10 level of significance ($z = 1.718, p = .0858$).

**Discussion**

Our results support the hypothesis (H1) that small-scale nature parks in Portland, OR, contribute to perceived neighborhood health among the urban residents in our sample. These results hold regardless of whether respondents reported being park users or not, and after controlling for socioeconomic variables. Nature parks closer to residents’ homes (identified as parks within a fifteen to twenty minute walk away from home) displayed a slightly weaker relationship to neighborhood health than did parks farther away (identified as parks no more than a ten minute drive away from home), but both levels of park proximity were significantly related to self-reported neighborhood health. The weaker relationship of parks within walking distance could be attributable to lack of availability. Though Portland contains numerous parks that are either nature-themed or contain a natural area (Portland Parks & Recreation Department, n.d.), nature parks are not found on every street corner. Parks within walking distance simply may not be as available as parks within driving distance given the size of the Portland metropolitan area.
Another possible explanation for the weaker relationship of parks within walking distance is that though there may be a park walking distance away from their homes, respondents may prefer using parks farther away because the less proximate parks contain more preferable features than a closer park. A similar situation has been found in prior research on physical activity and parks (Kaczynski & Henderson, 2007). Though researchers may have initially hypothesized that park proximity would be related to increased physical activity, results indicated that people engaged in physical activities in parks farther away because they contained more preferred amenities than parks that were closer to home (Diez Roux, 2007; Kaczynski et al., 2009). Such results demonstrate that park proximity is not always the principal feature users prefer when choosing a park (Gómez & Malega, 2007). Respondents may also choose to drive to a nature park that is within walking distance as a matter of routine, especially if they are bringing along gear for an outing or activity. In any case, parks at both levels of proximity were positively and significantly related to a sense of neighborhood health, and this result is consistent with prior research (Altschuler, Somkin, & Adler, 2004; Maas, van Dillen, Verheij, & Groenewegen, 2009).

We also evaluated the hypothesis that it is the social interactions occurring at parks that makes them valuable for promoting neighborhood health (H2). In our analyses, we included a single social networks variable that captured information on both companionship and small-scale services among neighbors, friends, and family. Social
networks in general demonstrated a positive association with neighborhood health. To test whether informal neighborly interaction and companionship associated with parks predicted sense of neighborhood health, we used a sub-index of the social networks variable, focusing solely on neighbor interactions related to parks (the companionship/social interaction variable). To evaluate whether social interactions associated with parks were significant, we tested for a mediation and moderation effect of the neighborly interactions on the park proximity variables (parks within walking distance and parks within driving distance). We found that the interactions among neighbors partially mediated the relationship between both park proximity variables and neighborhood health. The tests for mediation illustrate that the effect of parks on neighborhood health are partially working through park-related social interactions.

We also tested for a moderating effect of social interactions on park proximity by including an interaction term for park proximity and interactions. An interaction effect between parks within walking distance and social interaction at parks was supported at the .05 level of significance. The presence of this moderation effect provides further evidence that the social interactions among neighbors in nearby parks are a significant contributor to residents’ sense of neighborhood health. The results of our tests for mediation and moderation are consistent with prior research results which suggest that parks improve neighborhood livability and community health through the informal
interactions between residents in neighborhood open spaces (Coley, Kuo, & Sullivan, 1997; Kim & Kaplan, 2004; Wakefield et al., 2007). Regardless of whether parks were located very close (within walking distance) or somewhat farther away (within driving distance) from residences, social interaction among neighbors that was associated with parks had a significant effect on how respondents rated their neighborhood health.

We included a variable for psychological health in the models, reasoning that a person’s mental disposition or state would likely influence their perception of their surroundings (Clore & Huntsinger, 2007). However, the psychological health variable was not significant in the models. One possible explanation for this outcome is that the questions making up the neighborhood health index were positive statements, not normative judgments. We asked, for example, if neighbors help each other, know each other, and other similar questions eliciting responses about what are, rather than what respondents felt ought to be, conditions in their neighborhoods. We did not ask respondents whether they believed it was important or good for neighbors to know each other, but simply whether they did or did not. Because the index questions simply asked about factual conditions, and not about evaluations or judgments of those conditions, they were arguably low arousal items and consequently less likely to trigger strong emotional responses rooted in positive or negative perceptions of conditions (Fox, 2008). In addition to the psychological health variable, we also controlled for demographic variables such as sex, age, level of education, and income.
That none of these variables were significant in the models is not without precedent. In their study on factors that influence neighborhood satisfaction, Hur and Morrow-Jones (2008) found that of all the demographic variables they included, only having children under the age of 18 was significant. Kearney (2006) evaluated factors that influence neighborhood satisfaction and also found that demographic variables were not significant with the exception of number of children present in the household.

Park user status (i.e., user versus nonuser) was controlled for, and found not to be significant, in our models testing the relationship between perceived neighborhood health and the presence of a neighborhood park. The user/nonuser variable’s lack of significance in the model gives some indication that regardless of whether they used them or not, residents associated urban nature parks with a healthy neighborhood. This could be due to residents assigning existence value to neighborhood nature parks. Existence value is the value people place on simply knowing that a resource, like an urban green space, is available, regardless of whether they will actually visit or use it (Harris, 2002). Though we did not directly ask survey recipients if they believed parks improved their neighborhood, our results are consistent with previous research that has found that people need not actively use green space nearby their home to benefit from it (Kaplan, 2001; Kearney, 2006). Results from our sample support the argument that urban residents feel that city green space improves the urban environment and their quality of life (Althschuler, Somkin, & Adler, 2004; Ryan, 2006).
Conclusion

This research sought to examine whether small-scale urban nature parks located in Portland, OR, metropolitan area have an effect on residents’ evaluation of their neighborhood’s health. Results from our sample support previous research which has found that parks in proximity to residences improve a sense of neighborhood health (Largo-Wight, 2011). From our sample, we found that parks within walking and driving distance to respondents’ homes were significantly related to neighborhood health, after controlling for sociodemographic variables, psychological health, and park user status. Interestingly, parks in driving distance (i.e., farther away from home) were slightly more strongly related to neighborhood health than parks within walking distance (i.e., closer to home).

The reasons for this outcome are not immediately clear, but may be a simple consequence of availability. It is plausible that small-scale nature parks happened to be located farther away from residents’ homes but were still considered by respondents to be a part of their neighborhood. Definitions of neighborhood boundaries can vary greatly among people (Coulton, Korbin, Chan, & Su, 2001). For example, for someone without a car, the neighborhood can be quite small and limited only to streets and locations within easy walking distance. For someone who owns a car, the neighborhood boundaries can conceivably be much larger. And though Portland, OR,
is a very “green” city (Houck, 2004), urban nature areas are not found on every city block. In any event, both park proximity variables were significantly and positively associated with neighborhood health.

People who use city green spaces report experiencing physical and psychological benefits (Payne, Orsega-Smith, Roy, & Godbey, 2005; Pretty, Peacock, Sellens, & Griffin, 2005), so we supposed that park users might translate enjoyment of these benefits into stronger positive judgments about their neighborhood. Though it seemed plausible that park user status would be positively related to a sense of neighborhood health, we held no a priori expectations about this relationship. We tested for a relationship between park user status and evaluations of neighborhood health and found no association. Parks and other urban green spaces provide benefits in the form of physical activity, for instance, to people who use them. But urban nature parks also seem to contribute to the general aesthetics of the neighborhood which is a benefit that users and nonusers alike can enjoy. Research has shown, for instance, that the mere presence of green space in a neighborhood has benefits beyond recreation uses, such as aesthetic appeal, and higher property values (Crompton, 2001; Joye et al., 2010). Our results, that park user status was not significant in models testing a relationship between parks and neighborhood health, strengthen the position that regardless of whether people use neighborhood small-scale urban nature parks or not, they still consider them assets that contribute to overall neighborhood health.
We also tested whether social interaction was a substantial contributor to the perceived benefits of urban small-scale nature parks. Results from our sample provide support for this relationship. Previous research suggests that people coming together to enjoy urban natural areas, including parks, improves the quality of life in neighborhoods through the creation of social capital (DeGraaf & Jordan, 2003; Peters, Elands, & Buijs, 2010). That is, neighbors spend time recreating and relaxing together in a comfortable, enjoyable atmosphere where they can interact and get to know each other better. In this way, stronger bonds are created among neighbors that lead to trust, reciprocity, security, a sense of well-being, and belonging (Putnam, 2000). This is the essence of social capital, the presence of which indicates a stronger sense of community and neighborhood health. Our test results for mediation and moderation effects of social interaction on the relationship between park proximity and community health support the idea that social interaction among neighbors is significantly contributing to the beneficial effects of parks on community health.

There are several limitations to this study to keep in mind when considering our results. Our sample size was moderate and, therefore, not representative or generalizable to Portland’s population. Getting people to participate in a survey on a subject they are not interested in is very challenging (Dillman, Eltige, Groves, & Little, 2002). Hence, we had a smaller proportion of people who reported not using Portland parks. Our non-response check revealed a possible bias in our sample. Park
users were more likely to respond than non-users which meant that the regression coefficient estimates in our models may be biased in favor of park users. Modest sample size and potential non-response bias must be kept in mind when considering our results, which are suggestive only. We also did not inquire about all aspects of urban nature parks. For example, this study did not inquire about fear of crime or safety concerns with respect to urban nature parks. Though many urban parks provide valuable recreation resources, opportunities for contact with nature, and valuable social interactions with neighbors, parks may also be associated with crime and other social problems (Jacobs, 1961; Troy & Grove, 2008). Inquiring about crime and perceptions of safety in relation to parks is warranted in future research since crime and a sense of safety are related to perceived neighborhood health (Palmer, Ziersch, Arthurson, & Baum, 2005).

Study limitations aside, our results raise several policy and planning implications to consider. The increasing rate of urbanization in the U.S. is a new challenge for natural resource planners, and city decision-makers. As urban areas continue to rapidly expand, and create greater distances between natural areas at the wildland-urban interface and urban centers (Hammer, Radeloff, Fried, & Stewart, 2007), accessible nature areas within cities will become ever more important to maintain, so city dwellers who lack the resources to visit more distant sites can have opportunities for nature recreation experiences (Gobster, 2002). Not only do urban nature areas provide
respite from the often chaotic pace of urban life, they also provide valuable services that improve the sustainability of cities (Chiesura, 2004). In addition to recreation opportunities, urban green spaces support a host of ecosystem services including improved air and water quality, reduced storm run-off, and lower energy consumption (Nowak et al., 2010).

Increasingly concentrated urban centers will also place tremendous development pressure on city open space (Jim, 2004). New housing, commerce, and industrial development are certainly important for a city’s livelihood. However, as results from our sample indicate, urban green space is also important for the quality of life of urban residents. The opportunity to take a walk in a shaded, woody area, or simply to sit and reflect next to a water feature should not be underestimated. A century and a half ago, New York city’s planners recognized the value that open green space has for urban residents and supported Olmstead’s signature Central Park (Taylor, 2009). Today’s city planners and decision-makers would do well to pay attention to the lessons offered by such precedent-setting projects. As Jacobs (1961) suggested, parks themselves are not the singular solution to the many challenges city residents face. But with careful and inclusive planning, small-scale urban nature parks can play a significant role in the development and maintenance of vibrant neighborhoods and sustainable, livable cities in the future.
CHAPTER 4
ATTITUDES ABOUT URBAN NATURE PARKS

Introduction

The character of the American landscape is changing rapidly, especially in the west (Travis, 2007). Two centuries ago, a largely unexplored western frontier drew Americans from eastern cities with the lure of wide open spaces, wild beauty, and seemingly endless quantities of natural resources (Nash, 2001). Today, demographics and settlement patterns have changed, as more Americans are now moving into cities whose expanding boundaries consume surrounding natural lands for housing and other development (Duryea & Vince, 2005).

This accelerating urbanization in the U.S. has been occurring since the 1950s (Nechyba & Walsh, 2004). An “urban” area is defined as a densely settled area which generally consists of a cluster of one or more block groups or census blocks of population density of at least 1000 people per square mile, surrounding block groups or census blocks with population density of at least 500 people per square mile, and less densely settled blocks that form enclaves or indentations or are used to connect discontinuous areas (U.S. Census Bureau, 2003). Approximately 40 million acres in the coterminous U.S. were converted from rural to various levels of urbanized uses between 1982 and 2007 (U.S. Department of Agriculture, 2009). In 2009, about 84% of the U.S. population lived in an urban area (Office of Management and Budget, 2009). Alig, Klein, and Lichtenstein (2004) modeled urban development based on
National Resources Inventory data from 1982 – 1997 and project a 79% increase in developed/urbanized area in the U.S. by 2025. These figures all mark a substantial decline in rural living, and an expansion of cities and their populations. Increasingly urbanized living conditions in America have a host of consequences for its inhabitants. Some of these are favorable (Dahly & Adair, 2007), while others, such as less contact with the natural world, can have deleterious effects (Byrne, Wolch, & Zhang, 2009).

Research suggests that Americans are spending less leisure time engaged in nature-based recreation. A paper published in the Proceedings of the National Academy of Sciences noted that “all major lines of evidence support a pervasive decline in outdoor nature recreation” (Kareiva, 2008, p. 2757). In Oregon, national forests have been experiencing declining visitation since 2004 (Milstein, 2008). Falling numbers of visitors to outdoor recreation destinations may be partly due to increasing use of electronic media (e.g., video games, television, & DVDs) during leisure time (Pergams & Zaradic, 2006, 2008). The consequences of urban residents spending less time recreating in nature may not be trivial. Time spent in natural settings has both psychological (Kaplan, 2001) and physical benefits (Peters, 2010; Rosenberger, Bergerson, & Kline, 2009) that may be especially important for city dwellers who are faced daily with the many challenges and stresses commonly associated with city living (Howley, 2009; Milgram, 1970). Time spent in natural settings has been linked to reduced stress (Chang & Chen, 2005), to improved concentration (Kaplan &
Kaplan, 1989), and to better physical health (Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006). A nature site in the city may be especially valuable because it provides opportunities for urban residents to immerse themselves in a natural setting – an opportunity that many urban dwellers are not experiencing (Byrne, Wolch, & Zhang, 2009; Gobster & Westphal, 2004) and which has demonstrated positive impacts on personal well-being (DeGraaf & Jordan, 2003; Takano, Nakamura, & Watanabe, 2002). Such immersive nature experiences may also strengthen environmental awareness and environmentally responsible behavior since people who regularly recreate outdoors in natural settings are more likely to be aware of environmental problems and supportive of environmental protection (Brennan & Dodd, 2009; Nord, Luloff, & Bridger, 1998; Tarrant & Green, 1999; Ward Thompson, Aspinall, & Montarzino, 2008).

City green spaces have come in different forms, including greenways, river and riparian areas, urban forests, and even derelict land (Gobster & Westphal, 2004). For this research, we chose to focus on urban green space in the form of nature parks. We defined urban nature parks as areas whose primary attraction is outdoor recreation in an area dominated by natural landscapes and vegetation, with few or no buildings or other developed attractions (such as playgrounds or basketball courts). The main features found in these kinds of urban parks are open spaces with abundant vegetation and opportunities for activities like walking or hiking, off-road biking, or just relaxing.
in a natural setting. In order for natural resource planners and decision-makers to effectively manage urban natural parks, improve service delivery to current users, and make them more attractive to potential users, managers need to improve their understanding of the public’s attitudes about these areas.

As part of a larger study looking at how urban nature parks contribute to city resident’s quality of life, we employed a model of attitude formation from social psychology to look more closely at how the components of attitude formation affect Portland residents’ attitudes towards city nature parks. Additionally, we tested whether social networks would act as a moderating variable in the model. We wanted to investigate whether people’s social relationships had a detectable effect on the other components of attitude. Before discussing the research we conducted, we will review research on attitudes, their formation, the tripartite model of attitude formation, and how attitudes are related to natural resource issues.

**Literature Review**

*Background on Attitude Research*

According to Eagly and Chaiken’s seminal work (1993) and others (see, for example, Fishbein & Ajzen, 1975) attitude research has for decades been employed to help explain issues of interest to social psychologists, including voting behavior, consumer
choice and behavior, discrimination, and relationship choices. Because of the comprehensiveness of their text on attitudes, we rely greatly on the work of Eagly and Chaiken (1993), including employing the following definition of attitude that they suggest is generally accepted: *attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor* (p. 1). Attitudes are people’s evaluations of the attributes associated with some *attitude object*, which can be anything from a tangible object to an abstract concept (Eagly & Kulsea, 1997). For example, a person may dislike imported cars because she feels they take jobs away from American auto workers. She therefore holds a negative attitude about foreign cars. In this case, the attitude “object” is an actual object. In other cases, an attitude object may be a behavior, like recycling. Or, an attitude object can be an idea such as, “honesty is the best policy.” A person can have a positive attitude about the idea of being honest.

Since the early decades of the last century, attitude was recognized as a key contributor to behavior research and, indeed, considered by some to be the most important concept to understand in social psychology (Eagly & Chaiken, 1993). This conviction was not universally held, however, because many researchers believed that empirical evidence was not revealing a strong or, in many cases, any connection between attitudes and behavior (Eagly & Chaiken, 1993). Consequently, there has been considerable fluctuation in the primacy afforded attitude research in social
psychology. Some researchers have rejected any attitude effect at all, while others have suggested that attitudes are affected by behavior more so than the reverse (Crano & Prislin, 2008). Closer scrutiny of early attitude research has led contemporary researchers, who noted procedural deficiencies and questionable conclusions made by early critics of attitude research, to repudiate many of the criticisms (Eagly & Chaiken, 1993; Gawronski, 2007). Today, attitude theory remains a foundation of much social psychology research to help understand human behaviors and responses to our surroundings (Crano & Prislin, 2008; Petty, Wegener, & Fabrigar, 1997).

**Attitude Origins**
The attitude construct has been fruitfully applied in research on the use, and management, of natural resources, including work on urban green space (Balram & Dragićević, 2005), attitudinal differences among recreationists of differing ethnicities (Oh & Ditton, 2009), and attitude differences between managers and the public (Broussard, Washington-Ottombre, & Miller, 2008). Despite the occurrence of some disagreements about attitude influence, social psychologists generally believe that attitudes do impact behavior and so they are important to understand (Eagly & Kulsea, 1997). To help understand attitudes, it is useful to briefly consider how they are formed. Olson and Kendrick (2008) offer a succinct discussion of attitude origins, including the notion that there may be a degree of evolutionary origin. For example,
some social psychologists suggest that men and women have different attitudes about ideal mates that are rooted in evolutionary survival imperatives.

Women hold positive and negative evaluations of various male traits that inform their decisions about whether a male is a suitable mate. A woman may judge that a male is a potential mate, for example, by his physical traits that signal dominance, access to resources, and valuable heritable qualities (Salska, Frederick, Pawlowski, Reilly, Laird, & Rudd, 2008). Likewise, a male may hold a positive or negative evaluation of a female as a mate, based on certain physical characteristics that signal fecundity (Clutton-Brock, 2007). A woman or a man’s attitude, that is, about a potential mate, is grounded in signals to which we have evolved to respond.

Olson and Kendrick (2008) also discuss work that supports a hereditary/genetic origin for attitudes. The hereditary explanation would argue, for example, that if a person’s parents were both physically very active and fit, with a predisposition towards good physical condition, then their offspring would be more likely to be strong physical specimens, and hence be likely to have more favorable attitudes towards physically demanding activities. Unfortunately, according to Olson and Kendrick, testing the evolutionary or hereditary/genetic origins of attitudes has proven challenging. Consequently, these theories are not well established. Instead, attitude research has tended to focus largely on the relationship between components or elements of attitude
formation and attitude. This conception is commonly described as the tripartite model of attitude formation (Eagly & Chaiken, 1993; Olson & Kendrick, 2008).

**Tripartite Model of Attitude Formation**

In the tripartite model (Eagly & Chaiken, 1993), three elements create attitude: the cognitive, affective, and behavioral components (Figure 4.1). The cognitive contributor relates to logical, reasoned evaluation of the attributes of an object. This process appears to be explicit, one which is a conscious, purposeful evaluation made by the individual. A person may understand or be aware of the negative effects of climate change, for instance, and judge it to be a harmful, and therefore negative, event. In other words, a person will have a negative attitude about climate change based on knowledge of its damaging consequences.

![Figure 4.1. Tripartite model proposed by Eagly & Chaiken (1993).](image-url)
The affective component relates to feelings about an object, and is typically
considered as more implicit, or unconscious. Though people can certainly be aware of
negative or positive feelings about a particular attitude object, they may not be
immediately aware of how those feelings are affecting their attitude. As an example of
affect impacting attitude, consider that some recreationist’s behaviors are categorized
as non-consumptive or appreciative (Bright & Porter, 2001; Kearney, 2001). These are
things like hiking, bird watching, or just relaxing. These activities do not result in the
deliberate “destruction” or “damaging” of any other entity. Consumptive recreation, in
contrast, involves activities like hunting or fishing, which typically, though not
always, involve killing (Daigle, Hrubes, & Ajzen, 2002). Recreation researchers,
looking at user conflict, have focused on the differences between consumptive and
non-consumptive users (Daigle, Hrubes, & Ajzen, 2002; Vaske, 1995). In the case of
this kind of user conflict, affect would predict attitude if, for example, a non-
consumptive user feels upset by the idea of killing an animal. The negative affective
response to killing precipitates a negative attitude towards hunting and hunters among
some non-consumptive users.

Finally, the behavioral aspect of attitude formation relates to past or related behaviors
to the attitude object. Building on Festinger’s (1954) idea of cognitive dissonance, the
behavior factor is influential in the tripartite model since past or related behaviors
relevant to the object will tend to be consistent with an attitude. Therefore, if one
recalls one’s past behaviors or related behaviors to an object, then that helps one to
determine one’s attitude about that object. For instance, if a person has traditionally
behaved in very pro-environmental ways, then she is likelier to have a positive attitude
about a political candidate that has a pro-environmental record.

Bright and Manfredo (1996) employed the tripartite model of attitude formation to
look at public attitudes towards the controversial environmental issue of wolf
reintroduction. Bright and Manfredo looked at how cognitive factors including
perceptions of the outcomes of wolf reintroduction, affective factors, and behavioral
factors influenced attitudes towards wolves that were to be introduced. Bright and
Manfredo also tested whether issue importance would act as a moderating variable.
That is, the level of personal importance the environmental issue held for survey
respondents was expected to affect the relationship of the other factors with the
attitude toward wolf reintroduction. Among their findings, Bright and Manfredo found
that the affective component of attitude formation was a strong predictor of attitudes
about wolf reintroduction. The personal importance factor was a moderator of the
other variables, and also moderated the ability of attitudes to predict voting behavior
on reintroduction. Interestingly, objective knowledge about wolf reintroduction was
not a strong predictor. Bright and Manfredo suggested that objective, factual
knowledge may be less important in predicting attitudes about natural resource issues
in many cases. They suggest that the meanings and emotions attached to many natural resource issues are more powerful than cognitive elements (p. 17).

Bright, Barro, and Burtz (2002) looked at how cognitive, affective, and behavioral factors contributed to urban residents’ attitudes about ecological restoration in Chicago, a controversial issue given that it often involved intensive management of vegetation (such as tree removal), and issues of access and use of open space. Bright et al. also included issue importance as a moderating variable as Bright and Manfredo (1996) had. Bright et al.’s results supported the hypothesized tripartite model, in which cognition, behavior, and affect were factors that acted as precursors to attitude. Bright et al. also found that the effects of the attitude factors were relative. For instance, for those for whom the issue of ecological restoration was personally important, the cognitive and affective factors were strong predictors of attitude, while for people who indicated the issue was of little importance, the affective factor was a weak predictor. Bright et al. also found that the affective factor had a differing effect between those with a positive and those with a negative attitude towards ecological restoration. Bright et al. concluded their paper by arguing that by capturing information on public attitudes, managers and planners are provided with a more comprehensive picture of the complex intermingling of social and biological issues that are engaged in natural resource management (p. 783). Bright and Manfredo’s and Bright et al.’s results
support the use of the tripartite to help understand attitudes concerning natural resource management.

Theory of Planned Behavior

Though we did not employ Fishbein and Ajzen’s influential theory of planned behavior (formerly the theory of reasoned action) (Ajzen, 2001) in our study, we briefly consider it here, since this seminal theory demonstrates how attitude is central to explaining human behavior (Fishbein & Ajzen, 1975).

According to this theory, human behavior is principally governed by three antecedent beliefs. First, there are beliefs about consequences of the behavior. The combined beliefs about consequences form a favorable or unfavorable attitude about the behavior. Second, a person holds beliefs about normative expectations of what others expect. These normative beliefs, or subjective norms, result in social pressure concerning a behavior. Finally, there are beliefs about conditions that may hinder or support successful engagement in the behavior. These are control beliefs, related to an individual’s perception of how easy or difficult it will be to engage in the behavior (Ajzen & Fishbein, 2000). The combination of attitude about the behavior, subjective norms, and control beliefs results in an intention to engage in the behavior. Fishbein and Ajzen (1975) argue that intention to engage in the behavior acts as an intermediate factor between antecedent beliefs and behavior. That is, a favorable attitude combined
with positive social norms, and a strong sense of being able to engage in the behavior lead to a strong intention to engage in the behavior.

Fishbein and Ajzen’s theory of planned behavior has been influential because of their more nuanced explanation of the relationship between attitude and behavior (Schwarz, 2007). Instead of drawing a direct connection between behavior and attitude, which research has not always supported (Fazio, 2007), Fishbein and Ajzen’s research indicated that attitude is a key contributor, but multiple factors influence one’s intention to engage in a behavior, and finally engagement in the behavior itself. Because of its success at accounting for variations in behavior, their theory has been employed in a variety of studies from those looking at physical behavior (Armitage, 2005), to levels of volunteerism (Greenslade & White, 2005), to the likelihood of getting a mammogram (Tolma, Reinenger, Evans, Ureda, 2006).

Public Attitudes and Natural Resources

Though attitudes may not impact behavior alone, they are a key component underlying people’s behavior and are, therefore, important to understand and account for in natural resource management (Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franěk, 2005). Public support or opposition for controversial natural resource policies, such as wildland fire management, is strongly affected by people’s perceptions and attitudes (Bright, Fishbein, Manfredo, & Bath, 1993). And investigation of attitudes
has proven useful for helping to explain voting behavior related to environmental issues (Vaske & Donnelly, 1999). It is important for managers and planners to understand the role that attitudes play in the public’s support for a policy (Larson, 2009) especially since natural resource management often activates intense attitudes related to personal freedoms, property rights, and governmental regulation (Bright, Barrow, & Burtz, 2002; Bright & Manfredo, 1996; Larson & Santelmann, 2007). Successful planning requires participation by an engaged public, and the degree to which people will become involved with environmental protection and management, and the reasons for this involvement, are in no small measure governed by their attitudes, beliefs, and personal values (Barr, 2007; Hansla, Gamble, Juliusson, & Gärling, 2008; Milfont, Duckett, & Cameron, 2006).

Public attitudes, associated with an awareness of the consequences of human actions on natural systems, can therefore be used to help guide management strategies (Hansla et al., 2008), craft tools for public awareness and outreach (Owens & Driffield, 2008), and modify consumer behaviors to promote more sustainable use of remaining natural resources (Leiserowitz, Kates, & Parris, 2006). Attitude research has been used in connection with natural resource management at a global scale for issues such as climate change (Heath & Gifford, 2006), and at the more localized level to help understand public responses to management actions (Bright & Manfredo, 1996).
There have been different approaches to looking at how attitudes affect environmental behaviors, and public support, or lack thereof, for environmental regulations and legislation. Barr (2007) expanded on the theory of reasoned action to help explain recycling behavior. Barr suggested that environmental values are necessary to account for, in addition to the situational and psychological factors that influence intentions, in order to more fully explain recycling behavior. Fujii (2007) took a slightly different approach when looking at reduced energy use, garbage reduction, and reduction in automobile use. Fujii evaluated environmental concern and attitudes about frugality as predictors of intentions to engage in behaviors that have environmental impacts.

Larson, Green, & Castleberry (2011) looked at how children’s attitudes about the environment can be used to develop a measurement tool to capture information on environmental orientation among children of different ethnicities. Larson et al. argued that gaining a better understanding of children’s environmental orientation is becoming increasingly important as more children become less connected to the natural world. Vermeir and Verbake (2006) suggested another model of attitude formation and behavior prediction in the context of consumption of sustainably produced food. Vermeir and Verbake proposed a model in which involvement, level of certainty, and availability predict attitudes towards sustainable foods and intentions to purchase them. Vermeir and Verbake suggested that involvement has to do with values and social norms, level of certainty is predicted by information and knowledge,
and availability is predicted by behavioral control, or the ease with which the consumer can obtain the items. The work of Vermeir and Verbake, Barr (2007), Fujii (2007), and Larson, Green, & Castleberry (2011) all provide additional evidence of the process by which attitudes influence intentions and eventual behavior.

**Social Networks and Attitude Formation**

A social network *consists of a finite set or sets of actors and the relation or relations defining them* (Wasserman & Faust, 1994, p. 20). An individual’s attitudes are acquired, at least in part, through their social interactions. An individual learns to identify acceptable preferences, behaviors, and beliefs by comparison to others within their group (Jackson, 1965). In other words, a person’s beliefs, attitudes, and ultimately their behavior, are influenced by what that person understands to be the boundaries of appropriate behavior and acceptable attitudes as defined in their social context (the process of socialization). These attitudinal and behavioral guidelines are customarily provided by family, friends, neighbors, and to a lesser degree by peripheral actors in the individual’s social environment (Festinger, 1954; Harshaw & Tindall, 2005). Cognitions or beliefs are formed in social networks through the exchanging of ideas, transfer of knowledge, and exertion of influence (Laurber, Decker, & Knuth, 2008).
Information and influence are transmitted through membership in the network or group (Granovetter, 1973), such that similar and consistent individual attitudes not only help to define a collective identity, but individual attitudes are also then reinforced by membership in the collective (Friedkin, 2004; Friedkin & Johnson, 1997). Other people’s behaviors, beliefs, norms, and affective responses that one encounters while interacting with friends, family, neighbors, co-workers, and acquaintances all influence a person’s attitudes and norms (Field & O’Leary, 1973; Friedkin & Johnson, 1997; McPherson, Smith-Lovin, & Cook, 2001; Plickert, Côté, & Wellman, 2007; Borgatti & Cross, 2003). Much of how we evaluate the world around us depends upon comparing our attitudes and behaviors to others with whom we identify (Festinger, 1954). In the process of leisure socialization, for instance, a person internalizes values and beliefs about recreation activities through the prolonged and continuous interaction with other actors and role models in the person’s social landscape (Harshaw & Tindall, 2005; Martin, 2004). In recognition of the often considerable influence social ties have on the individual (Forrest & Kearns, 2001; Petty, Wegener, & Fabrigar, 1997), we wanted to evaluate how a social networks component would perform if added to the traditional tripartite model as a moderating variable (Figure 4.2).
Figure 4.2. Tripartite model, with social networks as suggested moderator added.

**Research Objectives**

In this paper, we employed the tripartite model of attitude formation to examine city dwellers’ attitudes about Portland’s nature parks. We also included a fourth factor in the model, social networks, and tested for its moderating effect on the relationship between the other factors (cognitive, affective, and behavioral) and individuals’ attitude about Portland nature parks.
We used structural equation modeling to look at how the attitude factors of cognition, affect, and behavior acted in relation to Portland residents’ attitudes about small scale urban nature parks. We tested the relationships among factors and park attitude, tested whether social networks would have a significant influence on park-related attitude, and whether social networks would have a moderating effect on the other factors. We also tested for attitude differences between park users and nonusers.

Methods

Sampling
For this study, we targeted residents over the age of 18 living in the Portland, Oregon, metropolitan area. Cities included in the study were Beaverton, Clackamas, Durham, Forest Grove, Gresham, Happy Valley, Hillsboro, King City, McMinnville, Milwaukee, Portland, Tigard, Troutdale, and Wilsonville. We obtained a list of names and mailing addresses from the Oregon Department of Motor Vehicles (OR DMV) for all persons at least 18 years of age in possession of a driver’s license or state identification living in the Portland metro area. We randomly selected a sample of 1000 names from the OR DMV list containing over 700,000 names.
Survey Distribution

We distributed a mailback questionnaire to recipients using a modified version of Dillman’s Total Design Method (Dillman, 2007). We did not have the resources to conduct a survey process that meets all of Dillman’s suggestions. We modified the procedure by mailing an initial full version of the survey package which contained a cover letter, the questionnaire, and a self-addressed postage-paid return envelope. Three weeks after the first mailing, we mailed a reminder postcard to the entire sample. Several weeks after we mailed the reminder postcard, we sent the final mailing which included another full survey package to those who had not responded by the final mailing. Survey mailing took place in September and October of 2010. An identical version of the questionnaire was also available on-line.

We constructed the on-line version of the questionnaire using a web-based service freely available to Oregon State University students and faculty. The on-line questionnaire contained the identical questions found in the paper version, and also required the respondent to input the unique identifying number we placed on each paper version of the questionnaire. Instructions on how to find and complete the on-line questionnaire were included in the mailed cover letter. A full set of instructions for questionnaire response was also part of the on-line questionnaire. Of the 1000 surveys distributed, 15 mailings were returned as undeliverable. One hundred and
eighty four usable surveys (169 paper versions and 15 web versions) were returned for a final response rate of 19% (184/985).

Following receipt of completed surveys mailed randomly to Portland residents, we collected responses into a single database, and followed the customary procedure for structural equation modeling (SEM) analysis (Brown, 2006; Byrne, 2012; Kaplan, 2009; Kline, 2005). First, we conducted reliability analysis on all the scale variables and retained only those questionnaire items that contributed to each index variable. Next, we carried out an exploratory factor analysis, followed by confirmatory factor analysis. After retrieving an acceptable measurement model in the confirmatory factor analysis, we finally assembled a proposed structural equation model.

**Results**

*Attitude Model Metrics*

To operationalize the tripartite attitude model, we created a series of questions to capture information on the cognitive, affective, and behavioral factors, as well as questions related to residents’ attitudes about Portland’s urban nature parks (Table 4.1). Our questions were influenced by Bright and colleagues’ work on attitudes related to natural resource issues (Bright, Barro, & Burtz, 2002; Bright & Manfredo, 1996).
Table 4.1

Reliability analysis for attitude model factor items (excludes related behavior)

<table>
<thead>
<tr>
<th>Park Attitude</th>
<th>Mean</th>
<th>SD</th>
<th>Item Total Correlation</th>
<th>Alpha If Item Deleted</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green space in cities is important</td>
<td>4.67</td>
<td>.613</td>
<td>.64</td>
<td>.61</td>
<td>.76</td>
</tr>
<tr>
<td>Nature parks improve QoL</td>
<td>4.66</td>
<td>.633</td>
<td>.60</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>Tax dollars shouldn't be spent on nature parks (reverse coded)</td>
<td>1.86</td>
<td>.972</td>
<td>.52</td>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>Perceived Outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.91</td>
</tr>
<tr>
<td>Contact with nature is important for well-being</td>
<td>4.47</td>
<td>.732</td>
<td>.86</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Important to have convenient nature parks in Portland</td>
<td>4.31</td>
<td>.807</td>
<td>.78</td>
<td>.91</td>
<td></td>
</tr>
<tr>
<td>City nature parks provide valuable contact with nature</td>
<td>4.40</td>
<td>.783</td>
<td>.83</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>Affective Component</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.83</td>
</tr>
<tr>
<td>Time in an urban nature park relaxes you</td>
<td>4.45</td>
<td>.789</td>
<td>.68</td>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>Expect to feel refreshed after visiting a nature park</td>
<td>4.29</td>
<td>.763</td>
<td>.65</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Nature parks are boring (reverse)</td>
<td>1.40</td>
<td>.622</td>
<td>.61</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td>Contact with nature has no effect on QoL (reverse)</td>
<td>1.47</td>
<td>.760</td>
<td>.59</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.77</td>
</tr>
<tr>
<td>Humans meant to rule over nature</td>
<td>2.22</td>
<td>1.150</td>
<td>.63</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>Plants/animals have as much right to exist as humans (reverse)</td>
<td>4.23</td>
<td>.881</td>
<td>.52</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Humans have right to modify nature to suit our needs</td>
<td>2.47</td>
<td>1.048</td>
<td>.65</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td>Networks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.73</td>
</tr>
<tr>
<td>Stop and talk to neighbors while walking to local nature park</td>
<td>3.33</td>
<td>.971</td>
<td>.57</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>Enjoy talking with neighbors at local nature park</td>
<td>3.32</td>
<td>.884</td>
<td>.54</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>Talk to neighbors about local issues</td>
<td>3.08</td>
<td>1.008</td>
<td>.63</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td>Can count on family and friends for help</td>
<td>3.19</td>
<td>1.008</td>
<td>.32</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>Learn a lot about local environmental issues from friends/family</td>
<td>3.06</td>
<td>.894</td>
<td>.39</td>
<td>.72</td>
<td></td>
</tr>
</tbody>
</table>

a. All items use Likert-type scale from 1 = Strongly disagree to 5 = Strongly agree
To construct the cognitive factor, we asked a series of questions concerning residents’ thoughts about perceived outcomes of park use and the existence of parks, and questions concerning respondents’ general ecological values (along the anthropocentric-biocentric continuum). For example, to assess perceived outcomes of park use and the presence of parks, we asked for respondents level of agreement (on a five-point scale from “1” (Strongly disagree) to “5” (Strongly agree) about whether contact with nature was important for human well-being and whether they believed it was important for Portland residents to have convenient nature parks in the city.

For the values factor, we adapted questions from Dunlap, Van Liere, Mertig, & Jones’ (2000) NEP scale along the anthropocentric-biocentric continuum since basic values patterns have demonstrated reliable prediction of attitudes in prior research (Bright, Manfredo, & Fulton, 2000; Tindall, 2003; McFarlane & Boxall, 1999; Whittaker, Manfredo, Fix, Sinnott, Miller, & Vaske, 2001). We asked respondents questions that included whether they agreed that humans were meant to rule over nature and whether they agreed that animals and plants had as much right to exist as humans. Again, we used a five point scale to assess level of agreement, ranging from “1” (Strongly disagree) to “5” (Strongly agree). We also included a variable to express objective knowledge about Portland urban nature parks, which was constructed based upon general information readily available from the Portland parks website. Four true/false
questions were presented, from which a single score of correct responses was calculated, with a possible maximum of four, and minimum of zero.

The affective factor indicator questions were based upon basic emotions differentials (Eckman, 1992). Feldman Barrett and Russell (1998) hypothesized a semantic structure of affect/emotion in which poles (in a Cartesian coordinate arrangement on an x-y axis) represent extremes of emotion, from activation to deactivation, and unpleasant to pleasant emotional states (p. 970). We employed these concepts of basic emotional responses to construct our affective component. We asked respondents, for instance, for their level of agreement on the same five point scale previously described, with statements about whether they found Portland’s nature parks boring (unpleasant deactivation) and whether time spent in parks made respondents feel better (pleasant activation).

We assessed the behavioral component by asking respondents about behaviors that we expected would be consistent with visiting a local nature park or outdoor recreation in general. We asked people whether they agreed with statements about enjoying looking at other types of urban green elements like people’s gardens, and whether people agreed that watching urban wildlife like birds and squirrels was enjoyable. We also asked people about whether they belonged to any organizations that supported environmental protections, whether they participated in other outdoor activities like
camping or hunting, and to report on the number of hours they spent doing some kind of physical activity in a nature park, but these items did not perform well enough to retain in the scale. Consequently, the related behaviors factor has only two items, and no Cronbach’s alpha was calculated. The correlation was .75.

For park attitude indicators, we asked respondents to evaluate the contribution that Portland’s urban nature parks make to their quality of life. For example, we asked respondents about their level of agreement with statements such as “Portland’s nature parks improve the quality of life in the city,” and about their level of agreement that green space is important in cities. These statements were evaluated on a five point scale, from “1” (Strongly disagree) to “5” (Strongly agree).

To operationalize the social networks variable, we relied on individuals’ self-reporting of the outcomes that networks can be expected to produce. We used two types of outcomes from social networks to operationalize the concept: small scale services and companionship/social interaction (Wellman, Carrington, & Hall, 1988). We asked survey participants questions related to small-scale services including whether they could rely on friends and family to help them (watch their kids or give them a ride), and whether they learned about environmental issues from friends and family. We inquired about companionship/social interaction by asking respondents whether they stopped and talked to neighbors while walking to their local park, and whether they
talked with neighbors while at a neighborhood park. All responses used a scale from “1” (Strongly disagree) to “5” (Strongly agree). Reliability analysis confirms that all social network items performed well enough to retain in the index variable. Although the removal of one item (Can rely on family and friends for help) did appear to improve the Cronbach’s alpha, and this item and one other (Learn a lot about environmental issues from friends/family) had item correlations slightly below the customary threshold of .40 (Vaske, 2008), we elected to retain them because the alpha value did not improve substantially by removing the one item, and retaining both items added additional elements to the final attitude model to facilitate a permissible model outcome (Brown, 2006).

Exploratory Factor Analysis

Following reliability analysis of the attitude model indicator items, we conducted an exploratory factor analysis (EFA) in Mplus, version 6, to ascertain whether our observed indicator variables were expressing the proposed underlying constructs adequately (Table 4.2). EFA results ($\chi^2 = 492.3, p$-value < .001, df = 371, CFI = .954, TLI = .926, RMSEA = .047, SRMR = .032) revealed seven factors that were consistent with our initial reliability analysis. One EFA outcome that did not entirely meet our expectations was that the items capturing information on social networks did not load onto one factor. The companionship and small scale services items loaded independently onto their own separate factors, which might have been expected given
our initial reliability analysis results (Table 4.1). Despite their appearance as separate factors, we combined the companionship and the small-scale services items as a single social networks factor in the attitude model based upon their theoretical relationship (Wellman, Carrington, & Hall, 1988). Additionally, the objective knowledge variable did not load significantly on any factor, and was omitted from further analysis. Our results are consistent with Bright and Manfredo (1996), who also found that objective knowledge was not a significant contributor to their model of attitude formation.
Table 4.2

Exploratory factor analysis for items in attitude model factors (n = 184)

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1: Affect</th>
<th>Factor 2: Park Att</th>
<th>Factor 3: Outcomes</th>
<th>Factor 4: Behavior</th>
<th>Factor 5: Companion-ship</th>
<th>Factor 6: Values</th>
<th>Factor 7: Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in an urban nature park relaxes you (X7)</td>
<td>.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expect to feel refreshed after visiting a nature park (X8)</td>
<td>.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nature parks are boring (reverse) (X9)</td>
<td></td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact with nature has no effect on QoL (reverse) (X10)</td>
<td></td>
<td></td>
<td>.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green space in cities is important (Y1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.46</td>
<td></td>
</tr>
<tr>
<td>Nature parks improve QoL (Y2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.49</td>
<td></td>
</tr>
<tr>
<td>Tax dollars shouldn't be spent on nature parks (reverse coded) (Y3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.53</td>
<td></td>
</tr>
<tr>
<td>Contact with nature is important for well-being (X1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td>Important to have convenient nature parks in Portland (X2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>City nature parks provide valuable contact with nature (X3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>Like to look at gardens, flowers in city (X11)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>Enjoy looking at urban wildlife (X12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>Stop and talk to neighbors while walking to local nature park (X13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>Enjoy talking with neighbors at local nature park (X14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>Talk to neighbors about local issues (X15)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.70</td>
<td></td>
</tr>
<tr>
<td>Humans meant to rule over nature (X4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>Plants/animals have as much right to exist as humans (reverse) (X5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>Humans have right to modify nature to suit our needs (X6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>Can count on family and friends for help (X16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.38</td>
<td></td>
</tr>
<tr>
<td>Learn a lot about local environmental issues from friends/family (X17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.41</td>
<td></td>
</tr>
</tbody>
</table>

Eigenvalue | 12.46 | 2.48 | 1.93 | 1.59 | 1.48 | 1.29 | 1.10 |
Percent (%) of total variance explained | 35.60% | 7.10% | 5.50% | 4.50% | 4.23% | 3.70% | 3.10% |
Cumulative percent (%) of variance | 35.60% | 42.70% | 48.20% | 52.70% | 56.93% | 60.63% | 63.73% |

a. Oblique factor rotation using geomin rotation. Only factors with eigenvalues greater than one and items with factor loadings greater than .30 are retained in the final factor structure (Brown, 2006).
b. Variable names in parentheses correspond to Figures 4.3 and 4.4.
Confirmatory Factor Analysis

After completing the exploratory factor analysis, we ran the initial confirmatory factor analysis to examine the relationships among the factors ($\chi^2 = 215.6$, $p$-value = .002, df = 158, CFI = .956, TLI = .947, RMSEA = .047, SRMR = .064, n = 163) (Figure 4.3).
Due to space constraints, we could not label indicator variables in the CFA figures.

The indicator variables are as follows:

Table 4.3
Variable names for Figures 4.3 and 4.4

<table>
<thead>
<tr>
<th>Park Attitude</th>
<th>Values</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1-Green space in cities is important</td>
<td>X4-Humans meant to rule over nature</td>
<td>X11-Like to look at gardens, flowers in city</td>
</tr>
<tr>
<td>Y2-Nature parks improve QoL</td>
<td>X5-Plants/animals have as much right to exist as humans (reverse coded)</td>
<td>X12-Enjoy looking at urban wildlife</td>
</tr>
<tr>
<td>Y3-Taxdollars shouldn’t be spent on nature parks (reverse coded)</td>
<td>X6-Humans have right to modify nature to suit our needs</td>
<td></td>
</tr>
<tr>
<td>Perceived Outcomes</td>
<td>Affect</td>
<td>Network</td>
</tr>
<tr>
<td>X1-Contact with nature is important for well-being</td>
<td>X7-Time in an urban nature park relaxes you</td>
<td>X13-Stop and talk to neighbors while walking to local nature park</td>
</tr>
<tr>
<td>X2-Important to have convenient nature parks in Portland</td>
<td>X8-Expect to feel refreshed after visiting a nature park</td>
<td>X14-Enjoy talking with neighbors at local nature park</td>
</tr>
<tr>
<td>X3-City nature parks provide valuable contact with nature</td>
<td>X9-Nature parks are boring (reverse coded)</td>
<td>X15-Talk to neighbors about local issues</td>
</tr>
<tr>
<td></td>
<td>X10-Contact with nature has no effect on QoL (reverse coded)</td>
<td>X16-Can count on family and friends for help</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X17-Learn a lot about local environmental issues from friends/family</td>
</tr>
</tbody>
</table>

Following the initial confirmatory factor analysis, we examined modification indices, expected parameter change (EPC) values, and residuals to assess areas where model improvement would be realized. These assessments indicated that correlating the error of several factor indicator variables would improve model fit. Brown (2006) suggests that correlated error terms for indicators are reasonable in response to situations including introduced measurement error, which we believed was a sensible interpretation in this case. We correlated indicator error terms in the affective factor (X7 & X9 with X8), in the values factor (X5 with X6), and for two indicators related...
to neighborhood-based behavior (X12 and X13) in response to the modification indices and EPC values. After making adjustments, we again conducted a CFA with results indicating a permissible outcome ($\chi^2 = 164.9, p$-value = .26, df = 154, CFI = .992, TLI = .990, RMSEA = .021, SRMR = .057, n = 163) (Figure 4.4).

![Final CFA model](image_url)

Figure 4.4. Final CFA model.
*Attitude Model*

Finally, after running the additional CFA, we tested the SEM model (Figure 4.5). Our results yielded a permissible outcome with acceptable model fit ($\chi^2 = 164.9$, $p$-value = .26, df = 154, CFI = .992, TLI = .990, RMSEA = .021, SRMR = .057, n = 163).

![Image of Final SEM model](image)

Figure 4.5. Final SEM model. ns = not significant.

The correlation between the cognitive factor and the affective and behavioral components was somewhat high, but still below the acceptable threshold to support discriminant validity among the factors (Brown, 2006). The SEM solution for the entire sample revealed that all the proposed antecedents to attitude were significant.
with the exception of the behavioral factor which was not significantly related to the entire sample’s attitudes about Portland’s nature parks. The social networks factor was negatively associated with attitude about Portland’s urban nature parks.

MIMIC Model

Because we elicited responses from both users of urban nature parks and those we categorized as nonusers, we also conducted a test of difference in attitudes between the two groups. Brown (2006) suggests two approaches to group comparisons using SEM. One, multiple group comparison, allows the researcher to perform more tests of model equivalence, but requires a larger sample size than we had. Brown suggests using a second approach, called a MIMIC (multiple indicators, multiple cases) model, to compare groups under small or modest sample size conditions since it uses a single measurement model and input matrix versus the multiple group comparisons that assesses numerous models simultaneously. We used the MIMIC technique given our modest sample size. MIMIC assumes that factor loadings, error variances/covariances and factor variances/covariances are identical across groups, so it estimates fewer parameters and therefore can accommodate smaller samples. Also known as CFA with covariates, MIMIC uses a single observed variable to identify group membership. In our case, the single observed variable was group membership (urban nature park users or nonusers). The latent factors and their indicators are regressed onto the observed covariate to determine if any of their loadings are significant. Significant loadings of
any of the factors on the covariate indicate a group difference (i.e. different factor means). The MIMIC approach also allows testing of measurement instrument invariance between groups (i.e. different intercepts). That is, one can test whether the measurement instrument itself is responsible for group differences, or whether substantive group differences are supported. Measurement invariance would suggest that differences between groups are due to substantive differences, not differential performance on the survey instrument. Because of sample size issues, we were required to simplify the model somewhat for the MIMIC comparison. A permissible model could not be retrieved using the second order model design (Figures 4.3 & 4.4). In order for the MIMIC comparison to work, we removed the second order factor “Cognitive Component” and instead used its two first order factors, Perceived Outcomes, and Values in the model. By following this procedure, we are using a different model and relationships among factors, but the theoretical relationship between the factors and their indicators remains similar to the second order model. Though this strategy changes the factor relationships somewhat, it was the only means to retrieving an admissible model outcome with model fit indices comparable to the second order model. MIMIC results for the simplified model support a substantive difference in attitude between users and nonusers. All factor-covariate loadings were significant at the .05 level or below (Table 4.4).
Testing for measurement invariance indicated that users and nonusers interpreted survey instrument questions in the same way.

**User and Nonuser Model Comparison**

Since there was a difference in attitudes concerning parks, we wanted to compare users and nonusers on their respective models. An effective and robust approach for comparing groups is multiple group comparison, as discussed above. However, again, our sample size was not large enough to accommodate a multiple group comparison. Consequently, we instead assessed the attitude model independently for each group. We again used a simplified model with first order factors only, since sample size would not permit use of the second order model. The side-by-side comparison, using unstandardized coefficients (Kline, 2005), is suggestive of similarities and differences in users and nonusers (Table 4.5). The affective component is significant in both groups, but has a stronger relationship with park attitude among users than nonusers.

### Table 4.4

**MIMIC results for attitude factors regressed onto user/nonuser covariate**

<table>
<thead>
<tr>
<th>Attitude Factor</th>
<th>( \beta )</th>
<th>SE</th>
<th>p -value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park attitude</td>
<td>.351</td>
<td>.090</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Perceived outcomes factor</td>
<td>.362</td>
<td>.085</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Affective factor</td>
<td>.506</td>
<td>.074</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Behavioral factor</td>
<td>.320</td>
<td>.082</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Values factor</td>
<td>-.195</td>
<td>.092</td>
<td>.034</td>
</tr>
</tbody>
</table>

\( a \) Model results \( \chi^2 = 113.9, p\text{-value} = .05, df = 90, CFI = .977, TLI = .969, RMSEA = .040, SRMR = .051 \)
Neither group demonstrated a significant relationship between their perceived outcomes associated with use, or the presence of, urban parks. The groups differed in three areas. For users, related behaviors and social networks are not significantly associated with park attitudes, but for nonusers, both are significant. The significance of anthropocentric – biocentric values also differed between groups in their attitudes.

### Table 4.5

**Side-by-side comparison of simple user and nonuser models (DV=park attitude)**

<table>
<thead>
<tr>
<th>Factor</th>
<th>B</th>
<th>SE</th>
<th>p-value</th>
<th>Factor</th>
<th>B</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived outcomes</td>
<td>.064</td>
<td>.042</td>
<td>.125</td>
<td>Perceived outcomes</td>
<td>.073</td>
<td>.253</td>
<td>.774</td>
</tr>
<tr>
<td>Values</td>
<td>-.095</td>
<td>.045</td>
<td>.038</td>
<td>Values</td>
<td>-.020</td>
<td>.073</td>
<td>.783</td>
</tr>
<tr>
<td>Affective</td>
<td>.612</td>
<td>.163</td>
<td>&lt;.001</td>
<td>Affective</td>
<td>.363</td>
<td>.075</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Related behaviors</td>
<td>-.096</td>
<td>.074</td>
<td>.197</td>
<td>Related Behaviors</td>
<td>.624</td>
<td>.251</td>
<td>.013</td>
</tr>
<tr>
<td>Social networks</td>
<td>-.011</td>
<td>.053</td>
<td>.840</td>
<td>Social Networks</td>
<td>-.359</td>
<td>.078</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

a. All values are unstandardized to permit comparison
b. User group model. n = 124, χ² = 210.3, p-value = .002, df = 155, CFI = .928, TLI = .912, RMSEA = .054, SRMR = .073
c. Nonuser group model, n = 39, χ² = 223.4, p-value <.001, df = 155, CFI = .878, TLI = .851, RMSEA = .106, SRMR = .097

**Social Networks Moderation Test**

The final test we conducted involved looking at a moderating effect of social networks on the antecedent factors of park attitudes in our sample. To test for moderating effects of social networks on the other attitude factors, we followed a procedure suggested by Dabholkar and Bagozzi (2002) that has been used successfully by others (Im, Kim, & Han, 2008). This method, based on the work of Jöreskog and Sörbom (1993), divides the dataset into two groups with the statistical results from one model used to constrain the results of comparative models. This method tests significant difference in
changes in $\chi^2$ associated with changes in degrees of freedom ($\Delta \chi^2 / \Delta \text{df}$). The procedure constructs four models;

Model A – all factor loadings constrained across groups, and error variances of the indicators for the endogenous variable(s) constrained to equality.

Model B – all factor loadings free, error variances of endogenous indicator items constrained

Model C – all factor loadings, and endogenous factor indicator items error variances free.

Model D – all factor loadings constrained, error variances are free to vary across groups.

If models A and D (or models B and C) are different, this suggests that error variances account for model differences, and does not support moderation. If models C and D (or A and B) are different, this is evidence of moderation since it will be caused by different factor loadings and path coefficients. This ability to parse out differences due to error variances or differences in factor loadings is the chief advantage of this procedure. Because of the size of our data set, and potential issues of non-normality, all tests were conducted using an MLM estimator to correct for potential distribution issues. A consequence of using this estimator though is that chi-square difference tests must be calculated slightly differently using a Satorra-Bentler scaling correction factor supplied by Mplus (Satorra, 2000). We constructed the grouping variable by splitting social networks into two groups according to responses on the scale from one
(Strongly disagree) to five (Strongly agree) where three is neither agree nor disagree.

Those with responses to the networks questions that fell at three or below were grouped together and those whose responses at four or above were grouped together.

We constructed the models, and calculated the changes in $\Delta \chi^2$ according to Satorra (2000), and compared model results (Table 4.6).

Table 4.6

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>CFI</th>
<th>TLI</th>
<th>RMSEA</th>
<th>SRMR</th>
<th>$\Delta \chi^2/\Delta df$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>295.9</td>
<td>183</td>
<td>.902</td>
<td>.888</td>
<td>.086</td>
<td>.092</td>
<td>2.36&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>B</td>
<td>280.3</td>
<td>173</td>
<td>.907</td>
<td>.887</td>
<td>.086</td>
<td>.078</td>
<td>1.56&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>C</td>
<td>268.7</td>
<td>170</td>
<td>.915</td>
<td>.895</td>
<td>.083</td>
<td>.075</td>
<td>2.60&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>D</td>
<td>284.5</td>
<td>180</td>
<td>.910</td>
<td>.895</td>
<td>.083</td>
<td>.084</td>
<td>1.58&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Difference test between models A and D, $p$-value = .124
<sup>b</sup> Difference test between models A and B, $p$-value = .212
<sup>c</sup> Difference test between models B and C, $p$-value = .107
<sup>d</sup> Difference test between models C and D, $p$-value = .209

The results of our tests for differences in path coefficients as evidence of moderation revealed that, for our entire sample, there were no statistically significant differences between the models. There was not a statistically significant difference between models A and B, or C and D. Consequently, there is no evidence in the data from our sample to suggest that social networks act as a moderating variable on the antecedent factors proposed in the tripartite model of attitude formation. The social networks
factor was significant, though, in the final SEM model (Figure 4.5) and negatively associated with attitudes about Portland parks in the entire sample.

**Discussion**

To help understand Portland residents’ attitudes about their urban nature parks, we used a tripartite model of attitude formation (Eagly & Chaiken, 1993). The tripartite model has demonstrated its effectiveness in describing and analyzing attitudes about environmental issues (Bright, Barrow, & Burtz, 2002; Bright & Manfredo, 1996; Vaske & Donnelly, 1999), and proved equally instructive in our study.

Our results for the entire sample confirmed that both the cognitive factor and the affective factor have a significant association with attitude formation. Though the tripartite model generally treats antecedent factors as roughly similar in their effect on attitude formation (Olson & Kendrick, 2008), there is disagreement over the primacy of cognition or affect in influencing attitudes. In some conceptions, such as the expectancy-value theory (Fishbein and Ajzen, 1975), the cognitive component of attitude formation plays a stronger role than affect, because it is theorized that reason-based assessments of attitude objects underlie positive or negative evaluations of the object (Malhotra, 2005). Others have suggested that affect is the stronger influence on attitude formation (Zajonc, 1980). In this case, affect and mood not only directly influence attitude (Eagly & Chaiken, 1993), but also influence the manner in which
information about an attitude object is processed (Meloy, 2000). More recent research has looked at how cognition and affect influence attitude differentially in response to other influences, including prior exposure to the attitude object (Homburg, Koshate, & Hoyer, 2006), and how attitudes respond when a person is artificially induced under experimental conditions to react more affectively or more through cognition (van den Berg, Manstead, van der Pligt, & Wigboldus, 2006). The natural disposition of the individual, their innate tendencies towards more thinking or more feeling, may also play a role in which factor is more influential in attitude formation (Malhotra, 2005).

The model for the entire sample (both users and nonusers combined) revealed that the cognitive component was strongly influential (Wright, Cullum, & Schwab, 2008) on people’s attitudes towards urban parks. When we looked at a different, simplified model (a first order model) for each group separately, several trends appear that warrant attention. When we parsed out the different people into their respective groups, the elements of the cognitive component (perceived outcomes and values) do not appear nearly as influential as the affective factor. Research has revealed that affect can be a very powerful influence on attitude (Allen, Machleit, Schultz Klein, & Sahni Notani, 2005), and further, that there is an identifiable interaction effect between emotions/affect and cognition (Agarwal & Malhotra, 2005; Barnard, Duke, Byrne, & Davidson, 2007). As such, our results may point to such an interactive effect. In the models separated by group, affect is still a significant predictor in both groups, yet the
components of the cognitive factor lose predictive power. Though for park users, values are still significant and perceived outcomes approach significance. In the combined sample, second order model the cognitive factor has a large, statistically significant path coefficient, and the affective component demonstrates a weaker relationship to park attitude than in the individual group models. That there is a relatively high interfactor correlation between cognition and affect also suggests that affect may be boosting the explanatory power of the cognitive component in the second order model (Figure 4.5). However, the differences in results could also be due to the models themselves. The second order model for the combined sample was a better fit, accounted for more variance in park attitudes than either of the individual group models, and more faithfully represented the theoretical relationship among the factors proposed in the tripartite model. Further, when comparing the first order side-by-side attitude models for each group, it should be noted that model fit indices for the nonuser group in the comparison were poor because of sample size. Therefore, any discussion of the meanings of these model outcomes must be considered with caution and be regarded as speculative. With that noted, perceived outcomes (a part of the cognitive component in the second order model in Figures 4.3 & 4.4) were not significant for either group. The values metric (the second piece of the cognitive component), based on the anthropocentric-biocentric dichotomy, was not a significant predictor of attitude for park nonusers, but was a significant predictor of attitude for park users, who leaned more biocentric.
The results from the entire sample reveal that the antecedents to attitude proposed in the model performed as hypothesized, with the exception of related/past behavior. Related/past behavior may not have performed as anticipated in part because of our operationalization of the concept. Past research has included related behavior in the model and found a significant contribution (Bright, Barro, & Burtz, 2002; Bright and Manfredo, 1996). The non-significant result from our sample may be due to the indicators we selected. The most obvious indicator of park-related behavior is park use, about which we did naturally inquire separately in the model. Park user status did have a significant relationship to attitudes about urban nature parks in the MIMIC model. In order to avoid collinearity problems in cross group comparisons, we chose to include other types of behaviors that we expected to be consistent with participation in outdoor nature recreation in parks, including appreciation of plants and urban wildlife (Daigle, Hrubes, & Ajzen, 2002), to replace park user status which was the grouping variable in cross group comparisons. When we separated the sample into those we defined as users or nonusers (Table 4.5), we found that users’ related behaviors were not significant predictors of park attitude, but such behaviors were significant for nonusers.

We found that there was a significant difference in the attitude measure between users and nonusers. Our MIMIC CFA confirmed that users and nonusers differ, with users more strongly agreeing that urban nature parks are a positive contribution to life in
Portland. The MIMIC model further permitted a check on whether the survey instrument performed differently for each group. There is no evidence in our results that each group interpreted the questionnaire differently, so the attitude difference is not the result of a method effect from the questionnaire, but the result of a substantive difference between groups.

Finally, we tested whether social networks would act as a moderator on the other attitude antecedents since socialization and social ties are theorized to have a strong effect on attitude formation (Eagly & Chaiken, 1993; Olson & Kendrick, 2008) often by influencing the nature and content of information people receive (Granovetter, 1973). A person’s responses to external stimuli in his/her surrounding environment are influenced to a degree by others with whom a person is in contact (Borgotti & Cross, 2003; Plickert, Côté, & Wellman, 2007). We suspected then that the cognitive component, affective component, and likely related behavior component, would be influenced by a respondent’s social ties. Our results, however, did not support this hypothesis for the model evaluating the entire sample. There was no evidence of a moderating effect by social networks for the entire sample. Though negative and weaker than the other factors, social networks did have a significant relationship with park attitudes for the entire sample.
We held no firm a priori ideas about the direction of the association, but we suspected
that the relationship would likely be positive, since several of the social networks
variables related to park-associated interaction with neighbors. Interaction with
neighbors in public open spaces like parks has been shown to yield positive results
including improved community health and quality of life (Sirgy & Cornwell, 2002;
Tieg, Amulya, Bardwell, Buchenau, Marshall, Litt, 2009; Wakefield, Yeudall, Taron,
Reynolds, & Skinner, 2007) which suggested to us that the social networks factor
might well be positively associated with park attitudes. A positive association between
park attitude and social networks might also be anticipated because friends, family,
and neighbors typically share much in common, including information, values, beliefs,
and attitudes (Granovetter, 1973; McPherson et al., 2001). In order to better
understand how networks influenced attitudes, we will consider each individual
group’s results separately, again acknowledging that our sample size was small for
nonusers, and moderate for users.

Social networks were not a significant predictor of park attitudes for park users (Table
4.5). This result is somewhat unexpected since interaction with others is recognized as
being influential on attitude formation (Olson & Kendrick, 2008). For park users, we
anticipated that their park-related interaction with neighbors would be positively
associated with their attitudes about parks. However, attitudes about parks among
users in our sample were not impacted by their social interactions. We can speculate that the absence of a relationship may be due, in part at least, to ambivalence.

Ambivalence refers to an individual simultaneously holding multiple and conflicting attitudes about an object (Baek, 2010). One attitude may take precedence in some situations, while the opposing or contradictory attitude may be primary in another situation (van Vuuren & Cooren, 2010). These multiple and seemingly incompatible attitudes, considered by some to be a central aspect of human psychology, interact to cause people to behave in seemingly inconsistent ways under varying conditions (Harrist, 2006). For example, in their study of mobile communication technology, Jarvenpaa, Lang, and Tuunainen (2005) found that people in their sample held a series of simultaneous, yet paradoxical attitudes about mobile technology, including empowerment and enslavement, independence and dependence, and competence and incompetence.

We suggest that perhaps park users in our sample were exhibiting a level of ambivalence about social interaction associated with parks. We asked the sample about meeting and talking with neighbors at their local park, as part of their social network (companionship). It is possible that though people in our sample may appreciate that these kinds of activities improve their sense of community health (Coley, Kuo, & Sullivan, 1997; Kweon, Sullivan, & Wiley, 1998; Peters, Elands, &
Buijs, 2010), it may also be that people simultaneously prefer to be more solitary during nature-based activities (Gobster, 2002; Walker, Deng, & Dieser, 2005). So while park users may perceive benefits, like stronger neighborly bonds, from meeting neighbors at the park (which would be expected to be associated with a positive attitude about social interaction), the same park users may visit a nature park for a solitary walk, and not wish to be in direct contact with anyone during this leisure time, including a neighbor (corresponding to a more negative attitude about social interaction). This proposed ambivalent attitude about interacting with neighbors, being both appreciative of the benefits to the neighborhood but at the same time wanting to be left alone while recreating, could explain why social networks were not a significant predictor of park users’ attitudes about parks.

For nonusers, the significant negative relationship between park attitudes and social networks could be due to the reinforcing messages nonusers receive through their social ties. People tend to associate with those they perceive most like themselves (Carley, 1991; McPherson et al., 2001). It is conceivable that the social ties nonusers have with others, who may hold a negative attitude about nature parks, are reinforcing a less positive attitude. It should be noted, however, that the average level of agreement about the positive contribution urban nature parks make to Portland was relatively high (4.17 on 5-point scale, where 1 = strongly disagree and 5 = strongly agree) among nonusers. So though their networks may be negatively related to their
park attitudes, nonusers were still more positive about urban nature parks than not. We could not perform a moderation test for park user status on park attitudes, since sample size was insufficient.

Our results are suggestive of issues that might prove useful for urban planners and natural resource professionals. Regardless of park user status, the sample held a favorable attitude towards urban nature parks. This is a positive outcome for those interested in developing urban green space in Portland, and perhaps in other American cities. We also found that social networks had a significant, but negative, relationship to nonusers’ attitudes. This may signal that urban park managers need to carry out public information campaigns targeted at opinion leaders among groups not using the parks to infuse positive messages about the contribution urban nature parks make. By connecting with opinion leaders, and using information pathways within their social networks, urban park managers might be successful in generating interest among current nonusers (Rogers, 1995). For both groups, the affective/emotional component was strongly related to attitudes, so here too, public relations campaigns might be more effective by appealing to emotional stimuli, rather than relying on more fact-based strategies targeting cognitive processes.
Study Limitations

There are limitations in this study to keep in mind. Most significantly, we had a modest overall sample size, and a small subsample of park nonusers. Small samples prohibit generalizable statements to the population of Portland so our results and discussion are suggestive only. In the future, it would be helpful to gain a better understanding of nonusers specifically, since this population represents potential demand. That is, there may be a segment of the Portland population that would be amenable to using small-scale urban nature parks, but may be unaware of what they have to offer, or this group may be receiving information from friends or family that impedes their usage (Crawford, Jackson, & Godbey, 1991; Searle & Jackson, 1985). Another limitation is that we did not inquire about other important issues associated with urban green space, such as transportation challenges or crime. It may be that more people would be happy to visit a nature area in Portland, but they lack personal transportation or a convenient public alternative. Recreation research has revealed that transportation and access can be significantly related to park usage (Godbey, Caldwell, Floyd, & Payne, 2009; Skowron, Stodolska, & Shinew, 2008). Further, we did not inquire extensively about safety issues. We did ask one question about crime, which was not a significant contributor to the model. We did not explore the concept of crime and fear of crime in relation to urban green space, which would be a useful issue to explore in greater detail in future research on urban green space (Alfonzo, 2005; Yokohari, Amemiya, Amati, 2006).
Conclusion

Our results point to several management implications worth considering. First, on the whole, users and nonusers in our sample held positive attitudes about Portland’s nature parks. In another paper (Baur & Tynon, forthcoming), we looked at perceptions of community health in relation to park proximity and found that regardless of user status, people in our sample felt that having a nature park in their neighborhood improved neighborhood well-being. This result is consistent with other research that reveals that people appreciate green space in their city and neighborhoods (Crompton, 2001; Ellis, Lee, & Kweon, 2006; Ward Thompson, 2011). Portland city planners and decision-makers are supplying a valued service by continuing to provide ample green space in the city, which people have shown concern over preserving in the face of mounting development pressures in cities (Bengston, Fletcher, & Nelson, 2004; Greenberg & Lewis, 2000). Results from this study and others (Gobster & Westphal, 2004; Matsuoka & Kaplan, 2008; Tyrväinen, Mäkinen, & Schipperijn, 2007), suggest that city planners and managers not just in Portland, but across the U.S., by increasing the quantity of urban green space, are providing a publicly valued service that improves the quality of life for city dwellers.

Another important management implication to consider is what factors are more or less influential in users’ and nonusers’ attitude about parks. This kind of information can help inform targeted campaigns designed to promote more support and
engagement by the public (Chib, Chiew, Kumar, Choon, & Ale, 2009; Cordano, Ellis, & Scherer, 2003; Pooley & O'Connor, 2000). Park users in our sample held positive attitudes about urban nature parks, which were strongly influenced by their values and feelings. Therefore, park managers might benefit from communication programs directed at park users that incorporate messaging which appeals to users’ biocentric values and engages affective/emotional themes that emphasize the restorative, rejuvenating qualities of urban nature parks.

For nonusers, social networks were a significant predictor of park attitude, so park planners and managers may benefit by strengthening ties to community leaders and organizations that can, in turn, disseminate persuasive information about the benefits of parks to those not currently enjoying them. For instance, managers, park employees, and volunteers could organize outreach campaigns directed at community leaders who could carry a welcoming message back to their constituents. At specially hosted events, park managers could educate local business leaders about the positive influence parks and green spaces have on local economies (Ellis, Lee, & Kweon, 2006; Wolf, 2005). Urban nature area managers and staff could hold events at nature parks and personally invite neighbors (via telephone, or door-to-door contact, for example) in order to develop stronger ties to the surrounding community. Or nature area managers, staff, and volunteers could participate in other publicly sponsored events unrelated to parks, to get out the word about their parks to members of the
public who may simply not know about the opportunities the parks offer. And as with the users group, appeals that engage emotions and feelings may be a powerful way to reach nonusers too. Nonusers in this sample generally agreed that green space was a good thing to have in the city, so public relations campaigns could harness that positive image in outreach targeting positive feelings associated with, and resulting from, use of parks. Nonusers’ related behaviors (appreciation of urban plants, gardens, and flowers, and urban wildlife viewing) were significant predictors of their park attitude. Park management and staff might benefit from tapping into these interests by communicating to nonusers how these activities can be facilitated by visiting a neighborhood nature park. Though again, it is important to keep in mind that results from the group models may be somewhat suspect due to modest sample size.

Social psychology research posits that the nature and operation of attitudes, and the effect they have on behavior, are important to understand if we are to understand how humans behave, and how they interact with each other and with their surroundings (Eagly & Chaiken, 1993; Olson & Kendrick, 2008). Researchers in various fields have successfully employed the concept of attitudes to help explain social phenomena, from consumer behavior and economic beliefs (Arvanitidis, Lalenis, Petrakos, & Psychar is, 2009; Kim & Choi, 2005), to children’s environmental orientation (Larson, Green, & Castleberry, 2011). As more and more Americans move to cities (Alig et al., 2004),
the need for increasing public input in developing and planning livable urban communities becomes ever more important.

Urban green spaces, like city nature parks, can fulfill an important role in ensuring quality of life by providing places for physical exercise (Maas et al., 2006), rest and relaxation (Hartig, Kaiser, & Strumse, 2007), and improving community livability (DeGraaf & Jordan, 2003). Social science research focusing on public attitudes will help resource managers and decision-makers to better respond to the public with a more nuanced understanding of how the public feels and what they believe about urban nature areas. Understanding and responding to public attitudes about these parks is a powerful means to ensuring responsive and inclusive planning. Attitudes are not the only influence on people’s behaviors or intentions, but they are a very important contribution to behaviors, and therefore important to understand and account for in any decision concerning natural resource management in an urban setting.
CHAPTER 5
DISSERTATION CONCLUSION

Parks and other urban open spaces have a long history of contributing to the quality of life for people living in concentrated settlements (Taylor, 2009). The first Puritan settlers in America were strongly influenced by the traditions of the English village so even the earliest American settlements contained public greens (Glaab & Brown, 1976). These commons however, were not what we would think of as parks in the modern sense. Early American public commons or greens were areas used for grazing, public meetings, executions, prisons, and workhouses for the poor (Bass Warner, 1972). Many of these areas, places like Boston Common, would eventually be transformed into green spaces used for recreation and respite from the challenges of urban living (Taylor, 2009).

The design and features of urban parks are historically grounded in public cemeteries, whose comparatively large open and verdant spaces, tree lined and pastoral, represented one of the few places in the city, or at the city’s border that city dwellers could seek refuge from the heat, pollution, and crowding of the city center (Taylor, 2009). Throughout their history, urban parks and green spaces have been expected to meet multiple demands, which through much of their history included “civilizing” the poor and working classes (Cranz, 1982; Taylor, 2009), helping to prevent the spread of epidemic diseases like cholera (Teaford, 1993), and provide physical outlets to help
prevent riots and unrest (Bass Warner, 1972). Today, parks have the additional responsibility of helping to create sustainable cities (Cranz & Boland, 2004) by providing ecosystem services such as reduced energy consumption and storm runoff mitigation (Nowak et al., 2010). Throughout their history in the U.S., parks have consistently remained, if not always a priority, at least a concern of city officials, landscape planners, and advocates for social equality (Cranz & Boland, 2004; Taylor, 2009).

This dissertation focused on the association between individual and community health and urban nature parks in Portland, Oregon. Researchers in multiple fields including recreation, landscape and urban planning, climate change, and ecosystem services have argued that urban parks can make contributions to the quality of life for urban populations (Kearney, 2006; Kweon, Sullivan, & Wiley, 1998; Nowak et al., 2010; Tyrväinen, Mäkinen, & Schipperijn, 2007). Today’s rural populations are shrinking, while people migrate to urban metroplexes (Fairfield, 2010; Travis, 2007). The trend of increasing urbanization in this country for the foreseeable future (Alig, Klein, & Lichenstein, 2004) has led many natural resource professionals to pay greater attention to urban green spaces (Wolf & Kruger, 2010). Of course there are distinct advantages to concentrated living conditions, both for people and for the environment (Dahly & Adair, 2007; Fairfield, 2010), but there can also be substantial costs to individuals living in highly urbanized locations (Howley, 2009). The research presented in this
dissertation contributes to prior studies that suggest that urban green space can play a role in strategies to alleviate many of these challenges. Open space in cities is coming under increasing pressure for developed uses such as commerce, retail space and new housing (Bengston, Fletcher, & Nelson, 2004), and wild lands at the urban fringe are being lost to urban sprawl (Hammer, Radeloff, Fried & Stewart, 2007; Pincetl et al., 2008). It is becoming increasingly important that natural resource researchers and managers continue to improve our understanding of the human and biophysical dimensions of green spaces in, and adjacent to, expanding urban areas to ensure sustainable management of remaining natural resources while simultaneously providing livable space for people.

The research presented herein provides support for the hypotheses that time spent in natural settings is associated with better physical (Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006) and psychological health (Kaplan, 2001; Korpela, Ylén, Tyrväinen, & Silvennoinen, 2010), and that community green spaces contribute to feelings of attachment and satisfaction with one’s community (Kearney, 2006; Kweon, Sullivan, & Wiley, 1998). Though sample size was insufficient to make generalizable statements about Portland’s population, our results are suggestive and consistent with prior research. We found a weak association between self-reported physical health and park use, and some evidence that psychological well-being is related to park use. The data showed a stronger relationship between parks and
community health. The sample revealed a positive relationship between park proximity and community satisfaction, regardless of whether people in the sample reported being regular park users or not. Previous research (Bothwell, Gindroz, & Lang, 1998) has suggested that parks have this community cohesiveness effect because of the social interactions among neighbors that occur while visiting a local green space or park. The results from our statistical analysis demonstrate that the social interaction associated with park usage had a significant relationship to a sense of neighborhood health among respondents, regardless of whether parks were closer to home (i.e., a ten to fifteen minute walk from home) or farther away (i.e., a ten minute drive from home). Our results align with arguments made by Putnam (2000) and others (Kim & Kaplan, 2004; Lund, 2003; Schneider, 1979) that levels of social cohesion precipitated by the many, informal interactions neighbors have with each other in neighborhood common areas foster neighborhood well-being and health. Neighbors’ feelings of cohesion, their sense of belonging to, and being responsible for, the neighborhood lead to better living conditions through practical and emotional support, and safety (Altschuler, Somkin, & Adler, 2004; Bothwell, Gindroz, & Lang, 1998; Kweon, Sullivan, & Wiley, 1998; Lund, 2003).

As a means to helping gain a better understanding of Portland residents’ relationships to urban nature parks, we also used a model from social psychology that has been applied to other natural resource issues, to examine city residents’ attitudes about their
urban nature parks. We found that attitudes about parks differed between users and nonusers, yet both groups valued them as benefits in the urban environment. Furthermore, different components of attitude formation seem to be differentially influential in users or nonusers. For instance, park users’ attitudes were more strongly affected by their environmental values (i.e., biocentric versus anthropocentric) than nonusers were affected by their environmental values. And though social networks were not found to moderate park attitudes as initially hypothesized, they did differentially affect users, for whom networks were not significantly related to attitude, and nonusers, for whom social networks significantly affected attitude. The affective component of attitudes had a significant relationship with park attitude for both users and nonusers. However, further research is needed on nonusers to more fully understand their attitudes and behaviors concerning urban nature areas.

An element of urban nature parks and other metropolitan green spaces (e.g., greenways, riparian areas, urban forests, and community gardens) that was not included in this dissertation, but which is of growing importance in the face of climate uncertainty, is the contribution that urban green spaces make to sustainable cities (Gill, Handley, Ennos, & Pauleit, 2007). Cranz (1982) has described four urban park eras in America, starting with the Pleasure Ground (1850-1900) era to the current type, the Open Space System that started to appear around 1965. In the Open Space era, parks primarily provide open space to cities through a system of smaller sites. Cranz and
Boland (2004) propose that a new urban park era is emerging where parks function as integral elements of a sustainable city. Cranz and Boland suggest that features of this new model of city parks include such things as use of native plants, restoration of streams and other riparian habitats, wildlife habitat, recycling, and sustainable construction and maintenance (p. 104). Parks and other urban green areas have arguably always fulfilled some or all of these ecologically oriented functions but, today, urban planners and managers are increasingly focusing on the central role that parks, urban forests, and other urban and urban-adjacent green spaces play in providing ecosystem services which benefit humans and biophysical systems (which benefit humans indirectly). Urban green spaces should be managed not only for recreation, but also to ensure that these multiple ecological services be protected and encouraged (Tzoulas, Korpela, Venn, Yli-Pelkonnen, Kaźmierczak, Niemela, & James, 2007), especially given the uncertainties associated with climate change (Gill et al., 2007).

The biophysical system benefits that urban green spaces like nature parks provide should, of course, be a significant management component. However, managers and planners should not ignore the many social, cultural, and spiritual benefits that city green space provides for people. Until about sixty years ago, cities in the U.S. were centers of democratic activity that engaged the population in politics, the economy, social equality, and other social matters (Schneider, 1979). According to Fairfield
(2010), “popular engagement with issues of planning generated an ‘urban conversation,’ a recent historian of city planning argued, which served to ‘justify public action in a society that is deeply individualistic’” (p. 277). City open spaces such as plazas, parks, and greenways afford city populations at least the opportunity to interact with their neighbors which can help promote stronger ties among residents who have, over the decades, grown increasingly isolated from one another in part because their communities have fragmented as cities have expanded (Teaford, 1993). An innovative example of incorporating green space in the city comes from New York, where abandoned elevated train tracks are being converted to verdant pedestrian walkways thirty feet above the streets (High Line, 2011). This unconventional use of existing resources in New York is an imaginative way to help people from different neighborhoods and different walks of life enjoy time in a green setting and get to know one another better. The High Line is providing those very same opportunities that Olmstead envisioned for Central Park (Rybczynski, 1999). If neighbors develop connections to each other while visiting urban nature parks and other public green spaces, like the High Line in New York, such social ties could help alleviate feelings of isolation and improve individual and community well-being in neighborhoods by building social capital in urban populations.

To summarize, urban nature parks are a potential source of a host of benefits. By offering opportunities for a quiet walk in a natural landscape, urban nature parks can
improve psychological well-being through contact with nature (Korpela et al., 2010), and can supply the chance for physical exercise with its associated benefits (Rosenberger, Bergerson, & Kline, 2009). Homes nearby green spaces in cities tend to have higher property values (Crompton, 2001), and urban greenery seems to encourage retail behavior and more spending by consumers (Wolf, 2005). Urban nature parks can also be a source for valuable ecosystem services (Neimelä et al., 2010). And they are linked to healthier more livable communities (Coley, Kuo, & Sullivan, 1997). We should be cautious, though, about the expectations we have for urban green spaces. In response to what she saw as poorly planned and ultimately harmful urban renewal projects (Teaford, 1993), Jacobs (1961) admonished us that simply putting a park in a crumbling neighborhood would not save the neighborhood. Jacobs argued that neighborhoods need a mix of components, including urban green spaces, to remain vibrant and livable. Today’s planners and decision-makers should be mindful of both the successes and mistakes of the past, be attentive to current multiple needs of urban populations, and consider the expected future climate conditions, when making decisions about how to manage urban natural resources. Parks have the potential to be valuable assets, but can be disappointing failures if planned and managed using poor information, and ignoring public input. To enable comprehensive management of the multiple benefits urban green areas supply, public and private organizations should continue to support research like that appearing in this dissertation and the exemplary work that precedes it. The research community needs
this support if it is to contribute to livable, sustainable urban communities that will face considerable challenges from a rapidly changing climate, and increasing population pressures on natural resources. New and existing parks will thrive and help produce healthy people and vibrant communities if managers are imaginative and careful, rely on current research, are attentive to the public, and understand the complexity of ecosystems upon which all biophysical systems depend.
BIBLIOGRAPHY


APPENDICES
Appendix A

Portland Urban Parks Questionnaire
Portland's Nature Parks

Benefit or Useless?
What do you think?

Department of Forest Ecosystems & Society - Oregon State University
A Survey of Portland Residents and their Use of City Nature Parks
Department of Forest Ecosystems and Society—Oregon State University

INSTRUCTIONS
This survey is being conducted as a research project by the Department of Forest Ecosystems and Society at Oregon State University in Corvallis, Oregon. The purpose of the study is to better understand public
attitudes, perceptions, motivations, and personal issues related to the use of nature parks in Portland. The information that you provide will be confidential (it cannot be traced back to you). Your participation in this
study is voluntary, at any time you may choose not to participate, and you may choose not to answer any
questions. Please refer to the cover letter for discussion of any risks and benefits to you. Please take your time
answering the questions even if you don’t use Portland nature parks. The questionnaire should take
approximately 30 minutes to complete.

SECTION I – Your Opinion about Parks: People feel differently about nature parks
and nature in general. In this section, we’d like to learn about your opinion on Portland’s
nature parks, nature in the city, and the relationship people have with the natural
environment.

Directions: Please indicate the extent to which you feel the statement reflects your opinion on
the following topics by placing a “X” or “O” in the box along the scale from 1-5, with 1 being strongly
disagree and 5 being strongly agree.

1. Portland nature parks provide you with opportunities to interact with
your neighbors/friends from your community  
2. Portland’s nature parks improve the 
quality of life in the city  
3. Urban nature parks are a good thing to have in
Portland  
4. There are too many nature parks
in Portland  
5. You don’t think tax dollars should be spent
on Portland’s nature parks  
6. You worry about crimes (like theft or assault)
occurring in a city nature park  
7. Nature parks and green spaces provide
opportunities for healthy physical activities  
8. It’s important that cities have areas
with natural landscapes and green space

Please continue on to the next page.

SECTION IV – General Information: In this section, we’d like to learn a little bit more
about you. This information will be kept in the strictest confidence and used for statistical
purposes only.

Are you? ☐ Male (44%) ☐ Female (56%)

What is your age? ________

Which statement best describes your total 2009 annual household income? (Check only one)
☐ Less than $24,000 (16%) ☐ $24,001 - $35,000 (10%)
☐ $35,001 - $50,000 (14%) ☐ $50,001 - $75,000 (17%)
☐ $75,001 - $100,000 (15%) ☐ $100,001 - $125,000 (13%)
☐ $125,001 - $150,000 (2%) ☐ $150,001 (1%)

How many people does your income support (including you) ________?

Please indicate the highest level of education you have obtained? (Check only one)
☐ Less than High School Graduate (9%) ☐ Some College (11%) ☐ Some Graduate School (8%)
☐ High School Graduate (10%) ☐ College Degree (23%) ☐ Advanced Degree (24%)
☐ Technical School (4%)

Which of the following best describes your race or ethnic origin? (Check only one)
☐ Caucasian/White (56%) ☐ Black/African American (2%) ☐ Native Hawaiian/Pacific Islander (9%)
☐ Asian (7%) ☐ Hispanic/Latino (5%) ☐ American Indian/Alaskan Native (9%)
☐ Multi-ethnic/Mixed (2%) ☐ Other ________ (0.5%)

That completes our survey. Thank you very much for your assistance!

IF YOU NEED MORE INFORMATION, PLEASE CONTACT:

Dr. Josepho Young & Jordan Group, Department of Forest Ecosystems and Society, College of Forestry, Oregon State University, 232 Richardson Hall, Corvallis, OR 97331, Phone (541) 737-9999, email: jyoung@oregonstate.edu, or jordan.group@oregonstate.edu

Or if you have questions about your rights as a participant in this study, contact the Oregon State University
Institutional Review Board (IRB) Human Protection Administrator at 541.737.8008 or by email at
IRB@oregonstate.edu

This is the final page of your survey.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>You learn a lot about local environmental issues from friends and neighbors.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You rely on official sources (city employees, government websites, agency brochures) for information about Portland's outdoor recreation activities and opportunities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Neighborhood Connections:** The following questions ask you to think about your neighborhood. Please indicate your level of agreement with the following statements.

**People in your neighborhood:**

<table>
<thead>
<tr>
<th>Interaction</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. know each other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. socialize with each other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. take care of each other's pets, houses, kids etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. feel connected to one another</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. help each other out with problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. watch out for each other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. in general, feel there is a strong sense of community in the neighborhood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. You expect to feel refreshed and energized after spending time in a city nature park.
10. Having a connected nature park makes you tense and nervous.
11. All nature areas in a city should be developed for things like housing and commerce.
12. Spending time in natural surroundings like an urban nature park relaxes you.
13. Nature parks are boring.
14. Contact with nature has no effect on the quality of life for city dwellers.
15. Any urban nature park is valuable because it provides space for plants and animals to live.
16. Spending time in a city nature park helps you in a good social.
17. Nature parks in cities take money away from other more important public services.
18. Portland nature parks deserve more attention from city officials.
19. It's important to you to have convenient nature parks available in Portland.
20. Contact with nature is important for human well-being.
21. City nature parks provide valuable opportunities for contact with nature.
22. It's important to you to be informed about Portland nature park issues.
23. You don't care about whether nature parks are available in Portland.
24. You are a member of one or more environmental organizations.
25. Even if you don't participate, it's nice to walk, bike, or drive past a nature park in Portland.
26. You participate in outdoor activities like camping, hunting, fishing etc.
### SECTION III: Personal and Neighborhood Connections: Family, friends, and neighbors can be important parts of our daily activities, including recreation activities. In this section, we'd like to learn more about your interactions with family, friends, and neighbors and how these interactions affect you.

**Personal Connections:** Please indicate the extent to which you feel the statement reflects your opinion on the following topics by placing a "✓" or "✗" in the box along the scale from 1-5, with 1 being strongly disagree and 5 being strongly agree.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. You prefer to spend leisure time with a close friend or family member</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>b. You like being by yourself during your leisure time</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>c. You most often recreate with a regular group of people (i.e. hiking association, sports club, or community group)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>d. You enjoy seeing and talking with people from your neighborhood at the local nature park</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>e. You often stop and talk with your neighbors while walking to a local park or public area</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>f. Close friends and family members are your most common source of information about Portland's outdoor recreation activities</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>g. You talk to your neighbors often about local activities and issues</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>h. If you want to take a quick walk, bike, or hike ride, you know you can count on family or friends to help (match the kids, give you a ride)</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Park Knowledge: Please answer the following four questions about nature parks in Portland. These are true/false questions designed to evaluate your basic knowledge about parks in the city. Please do not look up information to answer the questions. We are interested in your general knowledge about parks. Please indicate whether you believe the statement is true or false by placing a "✓" or "✗" in the appropriate box.

<table>
<thead>
<tr>
<th>Park Knowledge</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There are over 10,000 acres of parks and natural areas in Portland</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>2. Alcoholic beverages are not allowed on park property unless you have applied for and received a permit</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>3. All of Portland's nature parks are accessible for people with disabilities</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>4. Portland residents and non-residents pay the same user fee for fee-based activities in Portland parks</td>
<td>✓</td>
<td>✗</td>
</tr>
</tbody>
</table>
Emotional Health: Your health is not only related to your physical condition, but also to your emotions and feelings. To help get a better idea of your overall health, we would like to know how your emotions and feelings have been affecting you lately.

1. Please describe how often during the past month negative emotions or feelings (like sadness, anger, or feeling anxious) have affected you in the following ways by placing a "√" or "X" in the appropriate box:

<table>
<thead>
<tr>
<th>Very Often</th>
<th>Often</th>
<th>Sometimes</th>
<th>Almost Never</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

   a. Crying
   b. Tired
   c. Sadness
   d. Anxious
   e. Feel down
   f. Feel gritty
   g. Confused
   h. Feel happy
   i. Feel tired

2. We would like to know a little more about how your emotions or feelings have affected you. By placing a "√" or "X" in the appropriate box, please tell us how often in the past month you have:

<table>
<thead>
<tr>
<th>Very Often</th>
<th>Often</th>
<th>Sometimes</th>
<th>Almost Never</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

   a. Felt full of pep and energy
   b. Felt nervous and anxious
   c. Felt down, nothing seems to cheer you up
   d. Felt calm and peaceful
   e. Felt down
   f. Felt happy
   g. Been a happy person
   h. Felt tired

Park Proximity: Here is a list of statements about how close the nearest nature park is to your home. Please indicate whether you agree or disagree with statements by placing a "√" or "X" in the appropriate box, and write in the number of minutes for statement 3.

1. Without traffic, you can drive to a nature park from your home in 10 minutes or less
2. There is a nature park within walking distance (10-20 minute walk) from your home
3. You can get to the nearest nature park in ___ minutes by bike from your home

SECTION II: Activities and Health: City nature parks supply different opportunities. Some people like to exercise in them, others to relax. Others choose to walk or ride at places other than parks. In this section, we'd like you to tell us a little more about how nature parks contribute to your activities. Since activity and health are related, we'd also like to know a bit more about how your overall health has been lately.

1. In the last month, how many hours per week did you spend doing some kind of physical activity in a local nature park in Portland? ___ hours.
2. In the last month, how many hours per week did you spend exercising or working out at a gym, spa, or other exercise facility (including non-activities)? ___ hours.
3. In a typical week, most of your physical activity comes from (check all that apply):
   - [ ] Homework
   - [ ] Gyms
   - [ ] My job
   - [ ] Working out at the gym or at home
   - [ ] Exercise in a local nature park
   - [ ] Biking on neighborhood streets
   - [ ] Walking/jogging on the street
   - [ ] Off road biking in a local nature park
   - [ ] Other (please describe)
4. Here is a list of reasons people might typically visit their local nature parks. Thinking back over the past month, please indicate the reasons you visited your local nature park (check all that apply):

- Go running
- Walk your dog(s)
- Take your kids to the park
- Play Frisbee (Ultimate, tossing it around)
- View wildlife (birds, squirrels, etc.)
- Ride your bike
- Celebrate (birthday party, wedding)
- Picnic/BBQ with friends or family
- Rollerblade, roller skate, skateboard
- Relaxation and quiet reflection
- Practice yoga, tai chi or martial arts
- Meet a friend to talk
- Read a book
- Take a walk
- Other:

5. You did not visit a Fortland nature park in the past month.

Physical Health: Physical health is often related to one's lifestyle and activities. The following questions are about how much exercise intensity you get and about your physical health:

<table>
<thead>
<tr>
<th>Poor</th>
<th>Fair</th>
<th>Moderate</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. In general, your physical health is:  
   [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5

2. How many hours during a typical week do you spend doing moderate physical activities (e.g., related walking, cleaning the house, gardening)? ___ hours.

3. How many hours during a typical week do you spend doing vigorous physical activities (e.g., jogging, running, playing basketball, mountain biking)? ___ hours.

4. Here is a list of statements about general health. Please indicate how strongly you agree with each statement:

- You seem to get sick more than other people
- You are as healthy as anyone you know
- You expect your health to get worse
- You are in excellent health

5. By placing a "V" or "X" in the appropriate box, please describe how often during the past month physical health problems have:

   [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5

   a. Cut down on the amount of time you spent on work or other daily activities
   b. Caused you to accomplish less than you wanted to on a project or activity
   c. Limited the kind of things you wanted to do at work or in daily life
   d. Limited your ability to do vigorous activities (running, fast hiking, sports)
   e. Reduced the amount of time you spent doing moderate activities (raking, cleaning the house, gardening)
   f. Interfered with your ability to climb several flights of stairs
   g. Made it hard to walk several blocks
Appendix B

Endogeneity Check
Because physical and emotional health metrics were used as both dependent and independent variables since research reveals that physical health affects mental health, and vice versa (Paluska, & Schwenk, 2000; Wagner, Wolfe, Rotnitsky, Proctor, & Erickson, 2000) we potentially violated the assumption of an uncorrelated error term in the models (Berry, 1993). To test for this possible correlation, or endogeneity, we used the Hausman specification error test (Gujarati, 2003). The Hausman test isolates the error term, inputs it as a new variable into a regression, and assesses its significance. A non-significant coefficient for the error term indicates the assumption of uncorrelated error has not been violated. We performed the Hausman test on all the regression models, and found no evidence of endogeneity (Table B1).
We tested for endogeneity in all the models, regardless of whether statistically significant relationships among key variables were found, to ensure that endogeneity was not problematic in any way. First we tested for endogeneity for the first emotional health metric (role limitations) with the general physical health metric, and got a non-significant outcome for the error term coefficient ($\beta = -.261$, $p = .504$). We also tested whether the general physical health metric was endogenous to the role limitations emotional health index and again found a non-significant result ($\beta = .184$, $p = .382$). We then tested the second emotional health metric (mental health and vitality) for
endogeneity with general physical health, and again found no significance ($\beta = .264$, $p = .571$). Finally, we tested the general physical health metric for endogeneity with the mental health and vitality index, and found no significance ($\beta = .085$, $p = .605$). Hausman tests on all the models show that we did not violate the assumption of uncorrelated error in our regressions.