AN ABSTRACT OF THE THESIS OF

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Mark D. Needham

Connecting with nature is associated with social, physical, and emotional benefits such as stress relief, improved physical health, and lower crime. Parks and other natural areas offer spaces in which to connect with nature and reap these and other benefits (e.g., family bonding, social events, learning). Despite increasing populations of racial and ethnic minorities in the United States of America, these groups are underrepresented in many outdoor recreation activities and in visitation to many parks and other protected areas. This underrepresentation and other attributes of park visitation can be partially explained through the theoretical lens of constraints to recreation. Constraints are factors that limit participation, affect leisure preferences, and / or reduce enjoyment and satisfaction with recreation experiences. Examples of constraints include inability to afford park fees, fear of crime in parks, and lack of available leisure time. This thesis contains two standalone articles focusing on resident constraints to visiting urban parks and other natural areas in the Portland, Oregon (USA) metropolitan region. These articles examine: (a) the most common constraints to visiting these parks and natural areas, and whether these constraints vary between traditionally well-served (i.e., white majority

residents) and underserved (i.e., ethnic and racial minorities) populations; (b) relationships among constraints, park visitation, and place attachment for both of these groups of residents; and (c) how constraints groups, different types of constraints, and resident characteristics (e.g., minorities) are distributed spatially across this metropolitan region.

Data were obtained from mail and online questionnaires completed by two samples of residents in Clackamas, Multnomah, and Washington counties: (a) a proportionate random sample of residents mostly targeting the following groups: African Americans / Blacks, American Indians, Asians, Hispanics / Latinos, Middle Eastern peoples, and Slavic / Eastern European peoples (i.e., probability sample); and (b) a convenience sample of Opt-In panel members (i.e., nonprobability sample). Questionnaires were completed by a total of 3,328 residents across these samples, and the data were weighted by the most recent Census based on county, age, sex (male, female), and education to be representative of adult residents in this region. Race and other demographics were consistent with the Census after weighting.

Results of the first article showed that the primary constraints to visiting parks and natural areas in this urban region were being too busy to visit, limited knowledge about Metro parks, and lack of access to these places (Metro parks are managed by Metro, which is the main regional government for Clackamas, Multnomah, and Washington counties). There were no differences in these constraints and most other constraints between traditionally underserved and well-served populations. Traditionally underserved residents, however, were significantly more constrained than the well-served residents were by race and cultural issues at parks, as well as lack of facilities and services at Metro parks. Traditionally well-served residents visited all parks and natural areas in the region significantly more often than did the underserved residents, but

there were no differences in visitation to Metro parks or their favorite park. There were also no differences between the two groups in their attachment to their favorite park.

Constraints and visitation explained 15% of the variance in attachment for well-served residents and 38% for underserved residents, and constraints explained 4% of the variance in visitation for well-served residents and 26% for underserved residents. The strongest negative predictor of attachment for well-served residents was Metro parks are not the best places, followed by limited access to these places and disinterest in visiting parks and natural areas. The strongest positive predictor for well-served resident attachment was frequency of visitation, followed by race and cultural issues at Metro parks, and lack of facilities and services in these areas. For underserved residents, the strongest negative predictor of attachment was costs followed by Metro parks are not the best places and limited knowledge about these places. Positive predictors of attachment for these residents included frequency of visitation and lack of facilities and services at Metro parks. The only predictor of visitation to their favorite park for well-served residents was fear of visiting other areas (positive relationship), whereas visitation for underserved residents was negatively associated with limited access to Metro parks and positively associated with costs of visiting other areas.

The second article used a Geographic Information System (GIS) and hot spot analysis of the survey data to determine any spatial patterns in constraints groups, different types of constraints, and resident characteristics (e.g., minorities). Results revealed two major trends: (a) in the northeast area of the region, there is a clustering of minority residents overlapping with the most constrained hot spots and these residents were most affected by constraints associated with health and lack of recreation partners; and (b) residents in the southwest area of the region were most affected by constraints associated with limited knowledge and access to parks.

Specific implications of these results for both management and research are discussed in this thesis. In general, however, these results may inform local agency objectives associated with reaching and engaging various populations, including ethnic and racial minorities. These findings also contribute to the literature by exploring relationships among constraints, park visitation, and attachment between traditionally well-served and underserved populations, and also by applying a GIS analysis of survey data to understand spatial aspects of constraints for each of these populations.

Constraints to urban park visitation: Conceptual connections and spatial attributes for traditionally well-served and underserved residents

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

Jaclyn R. Rushing, Author

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CHAPTER ONE

INTRODUCTION

Visiting parks and other natural areas fosters a connection with nature, which is associated with social, physical, and emotional benefits such as stress relief, improved physical health, and lower crime (Moore & Driver, 2005). Not only do parks offer spaces in which to connect with nature, but they are also places for family bonding, social events, and learning. Despite these benefits of visiting parks and other natural areas, some areas of the United States of America have experienced a downturn in park visitation, especially national parks between 1997 and 2010. Studies have cited the increased role of technology in leisure time and changing childhood socialization (Louv, 2008; Pergrams & Zaradic, 2008; Stevens, More, & Markowski-Lindsay, 2014), but there may be more factors at play influencing this visitation.

In addition to these changes in visitation, populations of racial and ethnic minorities in this country are the largest they have ever been and are continuing to increase (Stodolska, Shinew, Floyd, & Walker, 2014). The 2010 Census found that greater than one-third of the country's population identified as a racial or ethnic minority, and the proportion of non-Hispanic whites had decreased (Humes, Jones, & Ramirez, 2011; Pew Research Center, 2010; Stodolska et al., 2014). Between 2000 and 2010, minorities accounted for almost 92% of the country's population increase, and it is projected that whites will become a minority by 2050 (Passel, Livingston, & Cohn, 2012; Stodolska et al., 2014).

Despite this increasing representation of racial and ethnic minority residents, visitors to some parks and other protected areas do not reflect these demographics. For example, whites have represented 93% of visitors to 32 national parks, Hispanic Americans and Asian Americans

each have represented fewer than 5% of visitors, and African Americans have represented fewer than 3% (Scott, 2014). This discrepancy in demographic representation, however, is not universal across all recreation contexts. Urban proximate local, state, and national parks that are historically and culturally relevant (e.g., Booker T. Washington National Monument, Manzanar National Historic Site) are more frequently visited by racial and ethnic minorities (Scott, 2014). Research examining the concept of constraints attempts to understand obstacles certain groups of people face that reduce their participation and / or keep them from participating in recreation activities such as visiting parks.

All people face barriers that may constrain or prevent them from participating in recreation activities or visiting parks. Constraints are factors that limit participation, affect leisure preferences, and / or reduce enjoyment and satisfaction with recreation experiences (Jackson, 2005; Jun & Kyle, 2011). Some common constraints include ability to afford recreation, residential distance from recreation resources, safety concerns, and time constraints due to work, family, and other obligations. Constraints have typically been separated into three categories: (a) intrapersonal constraints (e.g., fear, depression, perceived ability), (b) interpersonal constraints (e.g., family obligations, partner preferences), and (c) structural constraints (e.g., recreation costs, residential distance from recreation resources, lack time to participate in recreation activities; Crawford & Godbey, 1987). In recreation research, structural constraints have tended to be the most prevalent for park visitation (Crompton & Kim, 2004; Jackson, 1994, 2000; Kerstetter, Zinn, Graefe, & Chen, 2002; Lawton & Weaver, 2008; Mowen, Payne, & Scott, 2005; Scott & Jackson, 1996; Scott & Mowen, 2010; Walker & Virden, 2005; Zanon, Doucouliagos, Hall, & Lockstone-Binney, 2013).

These three categories have been thought to behave in an integrated hierarchical model (e.g., intrapersonal constraints antecedent to interpersonal constraints, which are then related to structural constraints) rather than acting discretely (Crawford, Jackson, & Godbey, 1991). Crawford et al. (1991) suggested that this hierarchical model relies on a "process of negotiating multiple factors, arranged sequentially," but future research should "investigate the entire array of constraints simultaneously" (pp. 317-318). Empirical studies, however, have experienced mixed results confirming this and other related models (Gilbert & Hudson, 2000; Hawkins, Peng, Hsieh, & Ekland, 1999; Jackson Crawford, & Godbey, 2010; McQuarrie & Jackson, 1996; Raymore, Godbey, Crawford, & Von Eye, 1993; Walker, Jackson, & Deng, 2007). This thesis does not adopt the hierarchical model because it sought a more nuanced understanding of various different types of intrapersonal, interpersonal, and structural constraints.

Although the primary constraints on recreation are somewhat similar for most groups of people, some subgroups, such as minorities, women, individuals with disabilities, elderly, and low-income individuals, are more likely to feel constrained by barriers that affect their particular group or situation (Bustam, Thapa, & Buta, 2011; Byrne & Wolch, 2009; Floyd, Shinew, McGuire, & Noe, 1994; Jackson, 2000; Manning, 2011; Shinew & Floyd, 2005; Shores, Scott, & Floyd, 2007; Stodolska & Yi-Kook, 2005; Walker & Virden, 2005; Washburne, 1978). For example, in addition to the most common constraints, racial and ethnic minorities are often more likely to experience fear of discrimination, language barriers, and lack of group facilities (Byrne & Wolch, 2009; Gobster, 2002; Metcalf, Burns, & Graefe, 2013; Stodolska & Yi-Kook, 2005). Walker and Virden (2005) included race and ethnicity as a macro-level (i.e., broader, societal level) constraints factor because race and ethnicity have been connected with low-income, less

access to education, residential location, and other similar factors related to constraints (Byrne & Wolch, 2009; Gobster, 2002; Shores et al., 2007; Stodolska & Jackson, 1998; Stodolska & Yi-Kook, 2005; Washburne, 1978). Given that studies have shown racial and ethnic minorities to be disproportionately predisposed to constraints, this thesis examines potential differences in constraints between racial and ethnic minorities (i.e., "traditionally underserved" individuals) and white majority residents (i.e., "traditionally well-served" individuals).

In many urban contexts, traditionally underserved residents cluster together in neighborhoods and Census blocks, often located in the inner-city and relatively far from many urban parks and green spaces (Byrne & Wolch, 2009; Floyd et al., 1993; Gobster, 2002; Gómez et al., 2015; Heynen, Perkins, & Roy, 2006; Wolch, Wilson, & Fehrenbach, 2005). This residential clustering pattern could result in constraints hot spots clustering around high density minority areas. A spatial analysis of constraints and geographic distributions of minority residents across an urban area would provide park managers with detailed and more nuanced perspectives of who experiences certain constraints and where these are most prevalent. This would facilitate targeting areas in need of outreach. As populations of minorities continue increasing in the United States, it is important that park managers understand the unique constraints faced by these groups to better serve the general public (U.S. Census Bureau, 2010).

Constraints on park visitation may have repercussions beyond a relatively small and somewhat homogenous visitor base. Reduced frequency of visitation is one potential implication of constraints limiting the ability to visit parks, and this could potentially affect the ability to generate feelings of attachment to these places. The concept of place attachment encompasses emotional, functional, and social bonds between humans and places such as parks (Altman &

Low, 1992; Kyle, Mowen, & Tarrant, 2004; Stedman, 2002; Wynveen, Kyle, Absher, & Theodori, 2011). Attachment is believed to develop over repeated visits or interactions with a place, as researchers have found positive statistical associations between place attachment and frequency of visitation (Brooks, Wallace, & Williams, 2007; Hammitt, Backlund, & Bixler, 2004; Hidalgo & Hernandez, 2001; Kyle, Graefe, & Manning, 2005; Kyle, Jun, & Absher, 2013; Tuan, 1974, 1977; Williams & Vaske, 2003). Therefore, constraints limiting or reducing visitation to parks and other protected areas may affect attachment to these places.

In addition to fostering a personal connection to parks, place attachment has other associated benefits, such as increased pro-environmental behaviors toward parks, support of future management actions, volunteerism and civic engagement, adherence to park rules, and visitor satisfaction (Budruk & Lee, 2016; Eder & Arnberger, 2012; Halpenny, 2006; Kyle, Absher, & Graefe, 2003; Kyle et al., 2004b; Payton, Fulton, & Anderson, 2005; Ramkissoon et al., 2014; Manning, 2011; Walker & Chapman, 2003). Understanding attachment can also shed light on perceptions of conflict, crowding, demand, and environmental health associated with recreation sites (Gibbons & Ruddell, 1995; Hailu, Boxall, & McFarlane, 2005; Hawkins & Backman, 1998; Kyle et al., 2004a; Manning, 2011; Sharp, Sharp, & Miller, 2015). Given that place attachment develops and grows stronger with repeated visitation, and is associated with greater support of management action, park managers should be motivated to: (a) understand how constraints and visitation affect park attachment, and (b) take necessary action to increase visitation and attachment to reap the associated benefits (e.g., increased pro-environmental behavior toward parks).

Thesis Purpose and Organization

The concept of constraints to recreation has been examined in a number of different contexts (e.g., remote national parks, community and urban greenspaces). Outdoor recreation research has primarily focused on constraints among traditionally constrained groups such as women, elderly, youth, racial and ethnic minorities, people with disabilities, and low-income individuals (Bustam et al., 2011; Floyd et al., 1993; Shinew & Floyd, 2005; Shinew, Floyd, & Parry, 2004). Research has also examined different activity groups (e.g., skiers, backpackers) and the various constraints associated with these activities. Little research, however, has examined possible theoretical relationships among constraints, frequency of park visitation, and place attachment, or whether spatial patterns of constraints exist. Understanding constraints to recreation both theoretically and spatially may provide managers with a more comprehensive and nuanced understanding of how to engage groups of residents (e.g., traditionally underserved minorities) in recreation participation and park visitation.

This thesis, therefore, contains two standalone articles investigating constraints to visiting parks and other natural areas in the Portland, Oregon metropolitan region. The purpose of this thesis is to: (a) identify the most common constraints to visiting parks and other natural areas in this urban area, and whether these vary between traditionally well-served and underserved residents; (b) examine relationships among constraints, park visitation, and place attachment for both of these groups of residents; and (c) explore spatial distributions of constraints groups, minority residents, and different types of constraints across this region.

The first article investigates constraints to urban park visitation and relationships among constraints, park visitation, and park attachment for both traditionally well-served and

underserved populations in this region. This article explores two research questions. First, do constraints, visitation, and attachment associated with urban parks differ between traditionally underserved and traditionally well-served residents? Second, are there any relationships among constraints, urban park visitation, and attachment, and if so, do these relationships differ between traditionally well-served and underserved residents?

In response to Jackson's (1994) call for integrating geographical and social psychological research in studies of constraints and other concepts in outdoor recreation, the second article explores spatial variation of constraints across this region for both traditionally well-served and underserved residents. This article explores three research questions. First, what are the constraints to urban park visitation in this region and can residents be grouped according to these constraints (e.g., least to most constrained)? Second, are there identifiable spatial or geographic clusters of: (a) these constraints groups, (b) traditionally well-served and underserved residents, and (c) areas dominated or not dominated by different types of constraints? Third, are there locations where the geographic clusters of these characteristics and constraints overlap?

Conclusions drawn from this thesis will increase understanding of constraints on recreation participation for both traditionally well-served and underserved communities in terms of theoretical relationships among constraints, park visitation, and place attachment, and the spatial or geographic distribution of these constraints across an urban area. This research will inform management by identifying the primary constraints faced by these residents, how constraints and visitation are related to attachment, and specific locations where constraints are most prevalent and outreach efforts are needed for relieving these constraints. This thesis will also increase interdisciplinary understanding between the fields of geography and social

psychology, and will serve as a conceptual foundation for integrating constraints and attachment research across multiple disciplines.

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CHAPTER TWO

BARRIERS TO ATTACHMENT? RELATIONSHIPS AMONG CONSTRAINTS, ATTACHMENT, AND VISITATION TO PORTLAND URBAN PARKS

Introduction

National Geographic's headline article in October 2016 was "The power of parks: Unplugging the selfie generation," where (Egan, 2016) discussed the concern that both technology and constraints associated with being a person of color have resulted in a generation less connected to national parks than preceding generations. Jonathan Jarvis, former director of the National Park Service, said "the national parks risk obsolescence in the eyes of an increasingly diverse and distracted demographic'" (Egan, 2016, p. 39). Despite increased visitation to some national parks in the last few years, Egan (2016) highlighted an important nexus between park visitation and two concepts in the field of outdoor recreation: (a) constraints to recreation, and (b) place attachment.

Constraints to outdoor recreation are factors (e.g., costs associated with visitation, lack of free time, inability to travel, personal safety issues in parks) that can affect leisure preferences, limit participation, and reduce enjoyment and satisfaction with recreation experiences (Jackson, 2005; Jun & Kyle, 2011). The second concept, place attachment, involves how humans connect to geographic locations and explores the strength of connections between humans and places (Stedman, 2002; Wynveen, Kyle, Absher, & Theodori, 2011). Place attachment develops over time with repeated encounters with an area (Brooks, Wallace, & Williams, 2007; Green, Bowker, Wang, Cordell, & Johnson, 2009; Hay, 1998; Kyle, Jun, & Absher, 2013; Milligan, 1998; Tuan, 1977), so place accrues richer meaning and attachment with more frequent visits. Given that repeated experiences with a park are associated with fostering place attachment, constraints that

limit visitation should theoretically reduce attachment (Brooks et al., 2007; Kyle et al., 2013; Tuan, 1977). Some groups are more likely to experience constraints to park visitation, including elderly, physically and mentally disabled, low-income individuals, women, and racial and ethnic minorities, and this may result in lower attachment for these constrained populations (Bustam, Thapa, & Buta, 2011; Byrne & Wolch, 2009; Floyd, Gramann, & Saenz, 1993; Green et al., 2009; Shinew & Floyd, 2005; Shinew, Floyd, & Parry, 2004; Stodolska & Yi-Kook, 2005).

One constraint that could impede visitation and attachment to many national parks and other protected areas is their remoteness, which often make these areas difficult and expensive to visit (Walker & Virden, 2005). Urban parks, however, are within or close to population centers. These parks offer a natural refuge in an otherwise built environment and a space in which to unwind, connect with nature, engage in physical activity, hold social events, and participate in education programs. Despite urban parks being closer to diverse population centers, people still face constraints that may influence their ability to visit and become attached to these parks. This article examines relationships among constraints, frequency of visitation, and place attachment associated with urban parks in the Portland, Oregon (USA) metropolitan region. Understanding potential relationships among these concepts can inform theory and management that strive to provide accessibility to a diverse array of visitors.

Conceptual Foundation

Constraints to Outdoor Recreation

Constraints have typically been grouped into three categories: intrapersonal, interpersonal, and structural (Crawford & Godbey, 1987; Crawford, Jackson, & Godbey, 1991). *Intrapersonal constraints* "involve individual psychological states and attributes which interact

with leisure preferences rather than intervening between preferences and participation" (Crawford & Godbey, 1987, p. 122). Intrapersonal constraints include stress, depression, and perceived ability in an activity (Crawford & Godbey, 1987). *Interpersonal constraints* are the result of relationships or interactions, such as differing leisure preferences among spouses or difficulty participating in leisure activities due to family obligations (Crawford & Godbey, 1987). *Structural constraints* are the furthest removed from the individual and have more to do with situational and functional characteristics that constrain recreation (Crawford & Godbey, 1987). The most prevalent constraints related to park visitation are usually structural and include inability to afford visitation costs, lack of time, lack of information, and distance from recreation resources (Crompton & Kim, 2004; Jackson, 1994; Jackson, 2000; Kerstetter et al., 2002; Lawton & Weaver, 2008; Mowen, Payne, & Scott, 2005; Scott & Jackson, 1996; Scott & Mowen, 2010; Walker & Virden, 2005; Zanon et al., 2013).

Although this model by Crawford and Godbey (1987) has been the most widely used (Jackson & Scott, 1999; Jackson, 2005; Shaw & Henderson, 2005), some research has integrated these three categories into a hierarchy where intrapersonal constraints are negotiated first, followed by interpersonal and then structural constraints (Crawford, Jackson, & Godbey, 1991). Other researchers, however, have found a hierarchical approach to be problematic and empirical studies have experienced mixed results confirming this model (Gilbert & Hudson, 2000; Hawkins et al., 2007; McQuarrie & Jackson, 1996). As a result, some have adopted other frameworks for categorizing constraints (Floyd et al., Jackson, 2000, 2005; Nadirova & Jackson, 2000; Shaw & Henderson, 2005; Shinew et al., 2004; Stodolska & Jackson, 1998).

Constraints are not always felt equally by everyone. In the context of park visitation, there is evidence that constraints can be influenced by age, gender, race, income, and education (Jackson, 2000; Shinew & Floyd, 2005; Shores, Scott, & Floyd, 2007; Walker & Virden, 2005; Zanon et al., 2013). Walker and Virden (2005) included race / ethnicity, gender, cultural / national forces, and socioeconomic forces as macro-level (i.e., broader, societal level) factors antecedent to intrapersonal, interpersonal, and structural constraints. Many of these factors act in unison and can have compounding effects on constraints (Shores, Scott, & Floyd, 2007). For example, low-income elderly women of color are often the most constrained, whereas the least constrained are often educated young-adult white males (Jun, Kyle, & Mowen, 2008; Shores et al., 2007).

Washburne (1978) was one of the first to investigate relationships between race and constraints to outdoor recreation, and to suggest that racial and ethnic minorities may perceive different constraints compared to the white majority. Since this seminal article, researchers have examined inter and intra-ethnic group constraints (Bustam et al., 2011; Floyd et al., 1994; Gobster, 2002; Metcalf et al., 2013; Mowen et al., 2005; Shinew et al., 2004; Shores et al., 2007; Stodolska & Yi-Kook, 2005) and immigrant constraints (Berry, 2001; Bustam et al., 2011; Scott, Lee, Ji- Yeon Lee, & Kim, 2006; Shinew & Floyd, 2005; Stodolska, 2000; Stodolska & Yi-Kook, 2005). Common constraints among minorities, however, are often the same as those of the majority population and include lack of time, limited information about parks and activities in these areas, travel costs, proximity to parks, fear of crime, and fear of police force.

Some studies have found that racial and ethnic minorities experience more constraints to recreation compared to non-minorities (Bustam et al., 2011; Gobster, 2002; Metcalf, Burns, &

Graefe, 2013; Shores et al., 2007; Wilhelm Stanis, Schneider, & Russell, 2009), with some of these differences at least partially explained by historic discrimination, economic and other related disadvantages, different cultural values, and personal or institutional forms of discrimination (Blahna & Black, 1993; Floyd et al., 1993; Stodolska & Jackson, 1998; Washburne, 1978; West, 1989). Others, however, have found that different factors, such as available income and free time, may be more influential than race / ethnicity in contributing to constraints (Jackson, 1994, 2005; Scott, 2013). For example, in a national survey of recreation and the environment, Johnson, Bowker, and Cordell (2001) found that African-Americans and those living in urban areas were no more constrained than women and rural dwellers. Conversely, in a study of Chicago parks, Shinew et al. (2004) found that Caucasians perceived more constraints related to transportation, safety, and time than did African-Americans. Despite these mixed findings on the relative importance of demographics, race / ethnicity is commonly associated with some constraining factors such as affordability of recreation costs, residential distance from parks, lack of transportation, and fear of crime (Bustam et al., 2011; Byrne & Wolch, 2009; Fernandez, Shinew, & Stodolska, 2015; Gobster, 2002; Jun et al., 2008; Shinew et al., 2004; Shores et al., 2007; Stodolska, 2015; Stodolska & Yi-Kook, 2005; Zanon et al., 2013).

Place Attachment in Outdoor Recreation

Constraints are thought to often impede, limit, or alter recreation preferences and park visitation. Theory related to place attachment suggests that this non-visitation or limited visitation to a place may influence the ability to become emotionally attached to that place (Brooks et al., 2007; Hidalgo & Hernandez, 2001; Kyle et al., 2013; Tuan, 1977). The concept of *Topophilia*, or love of place, was introduced by Tuan (1974) to describe bonds between

humans and geographical locations. Most outdoor recreation research has examined these human-place relationships as a combination of both place identity and place dependence (Hernandez, Hidalgo, & Ruiz, 2014; Kyle et al., 2013; Manning, 2011; Patterson & Williams, 2005; Ramkissoon, Smith, & Kneebone, 2014; Stedman, 2002; Williams, 2014; Williams & Vaske, 2003; Wynveen et al., 2011). *Place identity* is an emotional connection to a location and it occurs when an area is perceived as an essential part of one's self (Jorgensen & Stedman, 2001; Kyle et al., 2013; Manning, 2011; Williams et al., 1992). Place identity often evolves from familiarity, which is influenced by assigned meanings, childhood memories, and affinity for a particular setting (Fredman & Heberlein, 2005; Hall, Kruger, & Steifel, 2008; Kyle et al., 2004; Manning, 2011; Williams et al., 1992). *Place dependence* is the functional form of attachment that reflects the importance of a place in providing physical and geographic features and conditions that support goals or desired activities (Schreyer, Jacobs, & White, 1981; Williams & Roggenbuck, 1989; Williams & Vaske, 2003).

Place identity and place dependence come together under the umbrella of place attachment and contribute to the understanding of human-place bonds. Tuan (1977) said "what begins as undifferentiated space becomes place as we get to know it better and endow it with value" (p. 6). He also said "it takes time to know a place" (Tuan, 1977, p. 179). Theoretically, therefore, for place attachment to accrue, it is necessary visit a place and develop a relationship with the area (Hay, 1998; Hidalgo & Hernandez, 2001; Kyle et al., 2013; Milligan, 1998). Researchers have empirically tested the relationship between place attachment and frequency of visitation (Brooks et al., 2007). Hammitt et al. (2004), for example, found that accumulated recreation experiences in a park or frequency of visitation in a one-year period can be indicators

of emotional and functional relationships with a place. Other studies have also found positive relationships between measures of place attachment or familiarity and number of prior visits (Moore & Graefe, 1994; Williams et al., 1992; Williams & Vaske, 2003).

Relationships between Constraints and Place Attachment

The concepts of place attachment and constraints have rarely been studied together. Theory suggests that attachment requires repeated interactions with a place (i.e., visitation) and constraints can limit this visitation (Brooks et al., 2007; Burke & Stets, 1999; Jackson, 2005; Jun & Kyle, 2011; Moore & Graefe, 1994; Tuan, 1977; Williams & Vaske, 2003). The few studies that have examined both constraints and place attachment have found that people who have fewer constraints are more likely to visit, and despite constraints, people still remain attached to recreation areas (Fredman & Heberlein, 2005; Jun et al., 2008). In their study of Cleveland Metro parks, for example, Jun et al. (2008) found that the "least constrained" respondents had stronger attachment to these parks compared to those who were "highly constrained." Although their study examined the relationship between constraints and place attachment, they did not examine the role of visitation as part of this relationship. Fredman and Heberlein's (2005) study of backpackers and skiers in the Swedish mountains examined relationships among constraints, place attachment, and visitation. They found that visitors felt less constrained than non-visitors, and discussed place attachment's ability to act as a motivator to visit despite constraints.

Research Questions

This article seeks to expand the present understanding of relationships among constraints, visitation, and attachment to urban parks. This article examines these relationships for both traditionally well-served (i.e., white majority population) and traditionally underserved (i.e.,

racial and ethnic minorities) residents of the Portland metropolitan region. Two research questions are explored. First, do constraints, visitation, and attachment associated with urban parks differ between traditionally underserved and traditionally well-served residents? Second, are there any relationships among constraints, urban park visitation, and attachment, and if so, do these relationships differ between traditionally well-served and underserved residents? Consistent with the literature discussed above, constraints were thought to be antecedent to visitation (i.e., greater constraints, fewer visits) and visitation was thought to be related to attachment (i.e., more visits, greater attachment).

Methods

Study Site and Context

Data were obtained from a mail and internet survey of residents of Clackamas, Multnomah, and Washington counties in the Portland metropolitan region. These counties are the largest by population in Oregon (United States Census Bureau / American FactFinder, 2015). The city of Portland is known for its parks and green spaces, and 17% of its acreage is park lands (Harnik, Martin, & Barnhart, 2015). Many agencies own and manage parks in the Portland metropolitan area, including Metro, Tualatin Hills Park and Recreation District, Oregon Parks and Recreation Department, Portland Parks and Recreation, and the cities of Gresham, Lake Oswego, and Oregon City (Portland Parks & Recreation, 2000). This study focused on parks and natural areas in the Portland region in general, as well as those managed by Metro in particular. As the regional government for Clackamas, Multnomah, and Washington counties, Metro manages approximately 17,000 acres of land. This study examined all 15 protected areas

currently managed by Metro and they include a range of development and naturalness (12 urban parks and natural areas, two boat ramps, one golf course and trail area).

Data Collection

Data were obtained from two samples of residents in these counties: (a) a proportionate random sample of residents (i.e., probability sample), and (b) a convenience sample of Opt-In panel members (i.e., nonprobability sample). Questionnaires for both samples were administered from November 2016 to January 2017. The probability sample received a mixed-mode questionnaire (mail and internet). This sample was drawn randomly as a probability sample using the most current representative address-based system (ABS) databases combined with other databases (e.g., last name algorithms, ethnicity codes, Census block clusters largely consisting of minorities) to mostly target the following groups: African Americans / Blacks, American Indians, Asians, Hispanics / Latinos, Middle Eastern peoples, and Slavic / Eastern European peoples (Dillman, Smyth, & Christian, 2014). These groups were identified based on consultation with Metro. In the analyses, these racial and ethnic minority populations were combined into a single group taken together called traditionally underserved residents. Project scope and funding limited the ability to collect large enough samples of each population to be representative of each on its own. This sample also included traditionally well-served residents (i.e., white majority population).

The nonprobability sample received an internet-only questionnaire. This sample was comprised of members of the Opt-In panel, which is a group of 16,598 people who volunteered to be on the panel because they are interested in regional community and government issues (e.g., economic growth, employment, transportation, park management) and would like to

contribute their opinions through online questionnaires. Although the Opt-In panel contains mostly traditionally well-served residents, it also contains underserved residents.

Both the online and paper versions of the questionnaire were available in English, Latin American Spanish, Russian, Traditional Chinese, and Vietnamese. These are the five most frequently spoken languages in the Portland metropolitan region and were selected in partnership with Metro (US Census Bureau, 2015). The questionnaires for the probability sample were administered using four mailings (Dillman et al., 2014; Vaske, 2008). The first mailing consisted of a cover letter explaining the purpose of the study and an invitation to complete the questionnaire online. Two weeks later, the second mailing consisted of a cover letter, printed questionnaire, and postage paid business reply envelope. One week later, the third mailing consisted of a postcard reminder to complete the paper or online version of the questionnaire. Three weeks later, a fourth mailing consisted of a cover letter, printed questionnaire, and postage paid business reply envelope. The nonprobability sample was administered with an initial email invitation to the entire panel followed by two reminder emails within a two-week period.

Questionnaires were sent to 4,250 residents for the probability sample and all 16,598 members of the Opt-In panel for the nonprobability sample. In total, $n = 620$ completed questionnaires were returned from the probability sample (15% response rate after accounting for undeliverables [moved, vacant]) and $n = 2,708$ were returned from the nonprobability sample (16% response rate from the entire panel and 38% from those who opened at least one of the email contacts). A telephone non-response bias check ($n = 137$) was administered to nonrespondents of the probability sample to determine any potential differences between nonrespondents and respondents. No substantive differences were found between respondents

and nonrespondents (Needham & Rushing, 2017). A nonresponse check was not possible for the nonprobability sample because contact information (e.g., telephone numbers, mailing addresses) was not available for Opt-In panel members.

To test for any possible method effects, all questionnaire responses from the online survey of Opt-In Panel members were statistically compared to those from the mixed-mode (mail, online) survey of the proportionate random sample. Comparisons for every item in the questionnaire were made between each of these surveys for traditionally underserved residents and also between each of these surveys for traditionally well-served residents. There were no substantive differences in responses between these two surveys for each sample across all of these comparisons (i.e., no consistent methods effects), so the data were aggregated across both samples (i.e., surveys), resulting in a total combined sample size of 3,328 residents (traditionally well-served n = 1,981; traditionally underserved n = 557 [n = 790 respondents were excluded from these analyses because they did not answer the race / ethnicity questions]; Needham & Rushing, 2017). The aggregated sample was then weighted by Census data based on county, age, sex (male, female), and education to be representative of the study region. Race and other demographics were consistent with the Census after weighting. Given the substantial number of variables and this large sample size, a significance cut-off level of $p \leq .001$ was adopted based on the Bonferroni correction procedure to reduce the possibility of false discoveries and multiple test bias (i.e., multiple comparison problem, family-wise error; Vaske, 2008).

Analysis Variables

Frequency of visitation was measured with three questions. Two of the three questions pertained to parks managed by Metro and the third question pertained to parks in the Portland

metropolitan region in general. The first Metro park question showed a map of the 15 current Metro parks and asked "the map above shows parks in the region that are managed by Metro. Have you ever visited any of these parks?" The response options were “no” and “yes,” and if the respondent had visited any of these parks, they were then asked "how many times have you visited any of these parks in the last 12 months" (open-ended responses)? The second question asked respondents to select their one favorite Metro park from the list and then answer "how many times have you visited this one favorite Metro park in the last 12 months" (open-ended responses)? The third question was about general park visitation (including, but not exclusively Metro parks) and asked, "about how many times have you visited parks or natural areas in the Portland region in general (not just Metro parks) in the last 12 months?" For this question, responses were on a six-point scale from 1 "never visited in the last 12 months (0 times per year)" to 6 "two or more times a week (81 times per year)."

Thirty-seven constraint items were measured to reflect all three of Crawford and Godbey's (1987) broad constraints dimensions (intrapersonal, interpersonal, structural). Examples of intrapersonal constraints included "I do not feel safe going to parks or natural areas in the Portland region," "I fear crime in parks or natural areas in the Portland region," and "I am afraid of outdoor places such as parks or natural areas in the Portland region." Examples of interpersonal constraints included "I do not have anyone to visit parks or natural areas in the Portland region with," "my partner or family is not interested in visiting parks or natural areas in the Portland region," and "parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group." Examples of structural constraints included "the fees at parks or natural areas in the Portland region are too expensive for me," "I

am too busy or do not have enough time to visit parks or natural areas in the Portland region," and "information (e.g., staff, signs, programs) at parks or natural areas in the Portland region is often only in English, making it difficult for me to visit." These constraint items were consistent with those used in the literature and were adapted to reflect possible constraints unique to the Portland region and Metro parks (Hubbard & Mannell, 2001; Jackson, Crawford, & Godbey, 1993; Metcalf, Burns, & Graefe, 2013; Metcalf et al., 2015; Stodolska & Yi-Kook, 2005). These questions measured constraints to visiting urban parks and natural areas in the Portland region in general (including Metro parks) and also Metro parks in particular. The question regarding Metro parks was: "to what extent do you disagree or agree that each of the following make it difficult for you or your family to visit Metro parks?" The questions regarding parks and natural spaces in general used the same wording, but referred to visiting *any* parks or natural areas in the Portland region (including Metro parks). All of these questions were measured on a 4-point scale from 1 "strongly disagree" to 4 "strongly agree."

The place attachment scales were identical to those in past research. Scales were drawn from Williams and Vaske (2003) who examined well-tested place identity and place dependence items (Jorgensen & Stedman, 2001; Williams & Roggenbuck, 1989; Williams & Vaske, 2003). The attachment items were part of a skip pattern in the questionnaire where respondents only answered questions about attachment if they had visited at least one of the Metro parks that were depicted on the map in the questionnaire (85% of respondents). To reduce questionnaire length and minimize response burden, respondents were asked to identify their one favorite Metro park and then answer six attachment items based on this park (not all six for each of the 15 parks). The three place identity items were: (a) "I feel this park is a part of me," (b) "visiting this park

says a lot about who I am," and (c) "the more often I visit this park, the more I feel emotionally attached to this park." The three place dependence items were: (a) "I would not substitute any other place for what I enjoy doing at this park," (b) "no other park can compare to this park," and (c) "the more often I visit this park, the better it becomes for what I like to do." All six of these items were measured on a 4-point scale from 1 "strongly disagree" to 4 "strongly agree."

The questionnaire also contained demographic questions measuring racial and ethnic identity. Respondents were asked "when asked to identify your racial or ethnic identity, how do you identify?" Response options were: White / Caucasian, Black / African American, Hispanic / Latino / Spanish, Asian / Asian American, American Indian / Alaskan Native, Native Hawaiian / Pacific Islander, and other. Participants were given the option to select all answers that applied. Respondents were then asked: (a) "do you consider yourself to be Slavic (from Russia, Belarus, Ukraine, Poland, Czech Republic, Slovakia, Slovenia, Croatia, Serbia, Bosnia and Herzegovina, Montenegro, Macedonia, or Bulgaria);" and (b) "do you consider yourself to be Middle Eastern (from Egypt, Iran, Turkey, Iraq, Saudi Arabia, Yemen, Syria, United Arab Emirates, Jordan, Palestine, Israel, Lebanon, Oman, Kuwait, Qatar, Bahrain, or Cyprus)?" For each question, participants were given the option to select one response (“yes,” “no”). If participants selected any response other than "White / Caucasian" or they selected "yes" for either of the following two questions, they were considered a "minority" (i.e., traditionally underserved) resident. If participants selected only "White / Caucasian" and responded "no" to the following two questions, they were considered a "white majority" (i.e., traditionally well-served) resident.

Results

A principal axis exploratory factor analysis (EFA) with oblique rotation was performed to reduce the constraints variables into possible dimensions or factors. An EFA was chosen in lieu of a confirmatory factor analysis because the previous literature has predominantly grouped constraints into only three broad categories (i.e., intrapersonal, interpersonal, structural), and this research sought a more nuanced analysis rather than the broad three-category framework. This analysis reduced the 37 constraints variables into 13 factors (Table 1). Factor 1 contained three variables related to health (e.g., "poor health or physical limitations make it difficult to visit parks or natural areas in the Portland region"). Factor 2 contained five variables related to race / cultural issues in all parks in the region in general (e.g., "parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group"). Factor 3 consisted of six items related to Metro parks not being the best places for recreation (e.g., "Metro parks are not the best places for the activities I enjoy doing"). Factor 4 contained five variables associated with fear in parks (e.g., "I do not feel safe going to parks or natural areas in the Portland region"). Factor 5 consisted of three variables regarding limited knowledge about Metro parks (e.g., "before receiving this survey, I did not know where Metro parks were located"). Factor 6 contained three variables related to race / cultural issues specific to just Metro parks in particular (e.g., "Metro parks do not have programs for people in my racial, ethnic, or cultural group"). Factor 7 had two variables about costs of visiting parks (e.g., "the fees at parks or natural areas in the Portland region are too expensive for me"). Factor 8 contained two variables related to lack of interested recreation partners (e.g., "I do not have anyone to visit parks or natural areas in the Portland region with"). Factor 9 included two items associated with limited access to Metro parks (e.g., "visiting Metro parks is hard for me because

they take too long to get to or are too far away"). Factor 10 contained three items related to lack of facilities / services at Metro parks (e.g., "there are not enough facilities such as picnic tables, barbeques, picnic shelters, or restrooms"). The remaining three factors each consisted of single variables, but were retained because they represented important dimensions of constraints: (a) disinterest in visiting parks and natural areas in the Portland region, (b) Metro parks are too unnatural (i.e., too much development now), and (c) being too busy or not having enough time to visit parks or natural areas in the region.

Table 1. Exploratory factor analysis of constraints to visiting both Metro parks and *all* parks and natural areas in the Portland region

	Factor Loadings [a]									
Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
I have a disability that makes it difficult to visit parks or natural areas in the Portland region	.81									
Poor health or physical limitations make it difficult to visit parks or natural areas in the Portland region	.70									
Someone I recreate with is physically unable to visit parks or natural areas in the Portland region	.61									
Based on the experience of someone else, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region		.88								
Based on my own experience, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region		.87								
Parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group		.68								

Table 1. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
Parks or natural areas in the Portland region do not have enough staff representing my racial, ethnic, or cultural group		.65								
Information (e.g., staff, signs, programs) at parks or natural areas in the Portland region is often only in English, making it difficult for me to visit		.58								
Metro parks are not the best places for the activities I enjoy doing.			.72							
The activities that I enjoy doing are not available in Metro parks			.68							
Metro parks do not feel welcoming to me or my family			.65							
Metro parks have too many rules / regulations			.56							
I tend to avoid Metro parks because they are too crowded			.36							
I cannot take pets (e.g., dogs) to Metro parks			.32							

Table 1. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
I do not feel safe going to parks or natural areas in the Portland region				.93						
I fear crime in parks or natural areas in the Portland region				.82						
I am afraid of outdoor places such as parks or natural areas in the Portland region				.77						
I tend to avoid parks or natural areas in the Portland region because I am afraid of injury				.61						
Parks or natural areas in the Portland region do not feel welcoming to me or my family				.46						
Before receiving this survey, I did not know where Metro parks were located					.85					
I do not know where to get information about Metro parks					.71					
I do know enough about what I can do at Metro parks					.60					

Table 1. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
Metro parks do not have enough visitors representing my racial, ethnic, or cultural group						.87				
Metro parks do not have enough staff representing my racial, ethnic, or cultural group						.86				
Metro parks do not have programs for people in my racial, ethnic, or cultural group						.72				
The fees at parks or natural areas in the Portland region are too expensive for me							.92			
It is too expensive for me to travel to parks or natural areas in the Portland region							.69			
My partner or family is not interest in visiting parks or natural areas in the Portland region								.76		
I do not have anyone to visit parks or natural areas in the Portland region with								.59		

Table 1. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
There is no public transportation to the Metro parks I want to visit									.69	
Visiting Metro parks is hard for me because they take too long to get to or are too far away									.58	
There are not enough facilities (e.g., picnic tables, barbeques, picnic shelters, restrooms)										.51
Metro parks do not provide online reservations of picnic areas / shelters										.45
Metro parks are difficult to access for people with disabilities / mobility issues										.36
Eigenvalue	3.57	5.18	3.49	5.46	2.97	4.40	3.67	2.34	1.82	1.48
Percentage (%) of total variance explained	24.27	7.91	6.13	5.44	4.17	2.85	2.77	2.40	1.83	1.54
Cumulative percentage (%) of variance	24.27	32.18	38.31	43.75	47.92	50.77	53.54	55.94	57.77	59.31

[a] Principal axis exploratory factor analysis with oblique rotation. Items coded on a 4-point scale of 1 = *strongly disagree* to 4 = *strongly agree*.

Reliability analyses of the multi-item dimensions of constraints and place attachment were performed using Cronbach's alpha. An alpha of approximately .60 to .65 or greater indicates that multiple variables are measuring the same factor and justifies combining them into an index (Vaske, 2008). Reliability coefficients indicated internal consistency for most dimensions of constraints: .87 for "health," .92 for "race / cultural issues at all parks in region," .79 for "Metro parks are not the best places," .89 for "fear," .79 for "limited knowledge about Metro parks," .91 for "race / cultural issues at Metro parks," .82 for "costs," .82 for "no interested partners," .54 for "limited access to Metro parks," and .64 for "lack of Metro facilities / services" (Table 2). The coefficient for "limited access to Metro parks" (.54) did not meet the requirement of .60 to .65 or greater, but this factor only included two variables that consistently loaded together and face validity was apparent (e.g., “there is no public transportation to the Metro parks I want to visit,” “visiting Metro parks is hard for me because they take too long to get to or are too far away”). Deletion of any of these variables from their respective factor did not improve reliability. Reliability analyses also indicated internal consistency for each of the place attachment dimensions (.83 for "place identity," .79 for "place dependence") and for the combined index of place attachment (.85; Table 3). [1]

Table 2. Reliability analyses of factors constraining residents from visiting parks and natural areas in the Portland metropolitan region

Constraint factors and items [a]	*M*	*SD*	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Health					.87
I have a disability that makes it difficult to visit parks or natural areas in the Portland region	1.56	.69	.80	.77	
Poor health or physical limitations make it difficult to visit parks or natural areas in the Portland region	1.68	.73	.78	.79	
Someone I recreate with is physically unable to visit parks or natural areas in the Portland region	1.68	.73	.68	.89	
Race / cultural issues at all parks in region					.92
Based on the experience of someone else, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region	1.49	.62	.80	.89	
Based on my own experience, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region	1.49	.62	.79	.90	
Parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group	1.61	.68	.83	.89	
Parks or natural areas in the Portland region do not have enough staff representing my racial, ethnic, or cultural group	1.62	.69	.82	.89	
Information (e.g., staff, signs, programs) at parks or natural areas in the Portland region is often only in English, making it difficult for me to visit	1.52	.61	.68	.92	
Metro parks are not the best places					.79
Metro parks are not the best places for the activities I enjoy doing.	2.20	.73	.59	.73	
The activities that I enjoy doing are not available in Metro parks	2.11	.72	.57	.73	
Metro parks do not feel welcoming to me or my family	1.89	.62	.69	.71	
Metro parks have too many rules / regulations	2.11	.70	.52	.75	
I tend to avoid Metro parks because they are too crowded	2.12	.65	.47	.76	
I cannot take pets (e.g., dogs) to Metro parks	2.36	.92	.40	.79	
Fear					.89
I do not feel safe going to parks or natural areas in the Portland region	1.75	.75	.83	.83	
I fear crime in parks or natural areas in the Portland region	1.99	.85	.73	.86	
I am afraid of outdoor places such as parks or natural areas in the Portland region	1.53	.67	.76	.85	
I tend to avoid parks or natural areas in the Portland region because I am afraid of injury	1.57	.63	.67	.87	
Parks or natural areas in the Portland region do not feel welcoming to me or my family	1.66	.65	.64	.88	

Table 2. Continued

Constraint factors and items[a]	*M*	*SD*	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Limited knowledge about Metro parks					.79
Before receiving this survey, I did not know where Metro parks were located	2.63	.93	.65	.69	
I do not know where to get information about Metro parks	2.38	.83	.65	.69	
I do know enough about what I can do at Metro parks	2.67	.77	.60	.75	
Race / cultural issues at Metro parks					.91
Metro parks do not have enough visitors representing my racial, ethnic, or cultural group	1.82	.63	.85	.85	
Metro parks do not have enough staff representing my racial, ethnic, or cultural group	1.85	.63	.84	.86	
Metro parks do not have programs for people in my racial, ethnic, or cultural group	1.86	.67	.79	.91	
Costs					.82
The fees at parks or natural areas in the Portland region are too expensive for me	2.04	.78	.69	-	
It is too expensive for me to travel to parks or natural areas in the Portland region	1.92	.72	.69	-	
No interested partners					.82
My partner or family is not interest in visiting parks or natural areas in the Portland region	1.83	.78	70	-	
I do not have anyone to visit parks or natural areas in the Portland region with	1.83	.76	.70	-	
Limited access to Metro parks					.54
There is no public transportation to the Metro parks I want to visit	2.43	.79	.37	-	
Visiting Metro parks is hard for me because they take too long to get to or are too far away	2.55	.81	.37	-	
Lack of Metro facilities / services					.64
There are not enough facilities (e.g., picnic tables, barbeques, picnic shelters, restrooms)	2.23	.70	.48	.51	
Metro parks do not provide online reservations of picnic areas / shelters	2.12	.63	.44	.56	
Metro parks are difficult to access for people with disabilities / mobility issues	2.16	.60	.44	.56	

[a] Variables measured on 4-point scales of 1 “strongly disagree” to 4 “strongly agree.”

Table 3. Reliability analyses of place attachment factors

Attachment factors and items [a]	*M*	*SD*	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Place Identity					.83
I feel this park is a part of me	2.70	.72	.70	.76	
Visiting this park says a lot about who I am	2.66	.71	.73	.73	
The more I visit this park, the more I feel emotionally attached I to this park.	2.83	.72	.65	.81	
Place Dependence					.79
I would not substitute any other place for what I enjoy doing at this park	2.19	.72	.66	.68	
No other park can compare to this park	2.08	.69	.68	.65	
The more I visit this park, the better it becomes for what I like to do.	2.55	.66	.55	.79	
Combined place attachment index					.85 [b]

[a] Variables measured on a 4-point scale of 1 “strongly disagree” to 4 “strongly agree.”

[b] Alpha if item deleted for each of the six variables were all less than .85 (.81-.84) and all item total correlations were greater than .40 (.56-.72).

The first research question focused on any differences in attachment, constraints, and visitation between traditionally underserved and well-served residents. Traditionally well-served residents had significantly higher visitation, on average, at all parks and natural areas in the Portland region than did traditionally underserved residents, $t = 3.39$, $p = .001$ (Table 4). The point-biserial correlation (r_{pb}) effect size of .07, however, showed this difference was "small" (Cohen, 1988) or "minimal" (Vaske, 2008). Traditionally underserved residents had slightly higher visitation to Metro parks and their favorite park, but these differences were not significant after adjusting for the Bonferroni correction, $t = 1.91$-2.49, $p = .013$-$.057$. Traditionally well-served and underserved residents did not differ significantly in attachment to their favorite park, $t = 0.21$, $p = .834$, $r_{pb} = .01$. Total mean attachment for traditionally well-served and underserved residents was $M = 2.50$ and $M = 2.51$, respectively.

Table 4. Differences in park and natural area visitation between well-served and underserved residents

Site	Visitation Frequency [a]		Total	*t*-value	*p*-value	Effect size (r_{pb})
	Well-served	Underserved				
All parks and natural areas in the Portland region	3.27	3.03	3.20	3.39	.001	.07
Metro parks	4.49	5.61	4.89	1.91	.057	.06
Favorite Metro park	2.87	4.23	3.34	2.49	.013	.07

[a] Mean visitation frequency in the last 12 months. Means for *all* parks and natural areas in the Portland region are based on a 6-point scale from 1 = *never visited* to 6 = *visit two or more times per week.* Means for Metro parks and favorite Metro park are based on total number of visits in the last 12 months (open-ended responses).

Table 5. Differences in constraints to park and natural area visitation between well-served and underserved residents

Constraints dimensions from EFA	Mean Response [a]		Total	*t*-value	*p*-value	Effect size (r_{pb})
	Well-served	Underserved				
Limited knowledge about Metro parks	2.57	2.60	2.57	0.80	.424	.02
Limited access to Metro parks	2.49	2.43	2.48	1.75	.081	.04
Too busy	2.43	2.47	2.44	1.04	.300	.02
Metro parks are unnatural	2.19	2.13	2.19	2.14	.033	.05
Lack of Metro facilities / services	2.12	2.34	2.18	8.61	< .001	.20
Metro parks are not the best places	2.13	2.12	2.14	0.30	.768	.01
Costs	1.96	2.00	1.99	1.38	.169	.03
Race / cultural issues at Metro parks	1.81	2.01	1.85	5.98	< .001	.15
No interested partners	1.83	1.85	1.84	0.75	.453	.02
Fear	1.70	1.68	1.70	0.79	.429	.02
Health	1.67	1.60	1.65	2.34	.019	.05
Not interested in visiting parks	1.54	1.62	1.56	2.25	.025	.05
Race / cultural issues at all parks	1.50	1.68	1.54	6.15	< .001	.15

[a] Mean degree of constraints that make it difficult to visit urban parks and natural areas on a 4-point scale from 1 = *strongly disagree* to 4 = *strongly agree*.

The three most constraining factors that affect park visitation for both well-served and underserved residents were "limited knowledge about Metro parks," "limited access to Metro parks," and "being too busy to visit parks and natural areas in the Portland region" (Table 5). The least constraining factors were “health,” “not interested in visiting parks and natural areas,” and “race / cultural issues at all parks and natural areas in the Portland region.” Underserved residents were significantly more constrained by the "lack of facilities / services at Metro parks"

and "race / cultural issues" both at Metro parks and all parks and natural areas in the Portland region, t = 5.98-8.61, $p < .001$. The effect sizes (r_{pb} = .15-.20) showed these differences were between “small” and “medium” (Cohen, 1988) or “minimal” and “typical” (Vaske, 2008).

The second research question focused on relationships among constraints, attachment, and visitation. Ordinary least squares (OLS) multiple regression path analyses were performed to understand these relationships and whether any relationships differed between traditionally well-served and underserved residents. Dimensions of constraints served as the exogenous concepts (i.e., predictors), favorite Metro park visitation served as a potential mediator, and the place attachment index for this Metro park served as the endogenous concept (i.e., criterion). [2]

For traditionally well-served residents, 15% of the variance in place attachment was explained by the constraints dimensions and visitation (Figure 1). Dimensions of constraints that were significantly negatively associated with place attachment were "Metro parks are not the best places" (β = -.31), "limited access to Metro parks" (β = -.14), and "disinterest in visiting parks and natural areas" (β = -.11). Dimensions of constraints that were positively related to place attachment for these well-served residents were "race / cultural issues at Metro parks" (β = .14) and "lack of Metro parks facilities / services" (β = .12). "Favorite park visitation frequency" was also positively related to attachment for these residents (β = .17). The constraint dimension most strongly related to attachment for these residents was "Metro parks are not the best places" (β = -.31), whereas the weakest significant predictor was "disinterest in visiting parks and natural areas" (β = -.11). Only four percent of the variance in frequency of favorite park visitation was explained by the constraints dimensions with "fear" (β = .22) the only significant path.

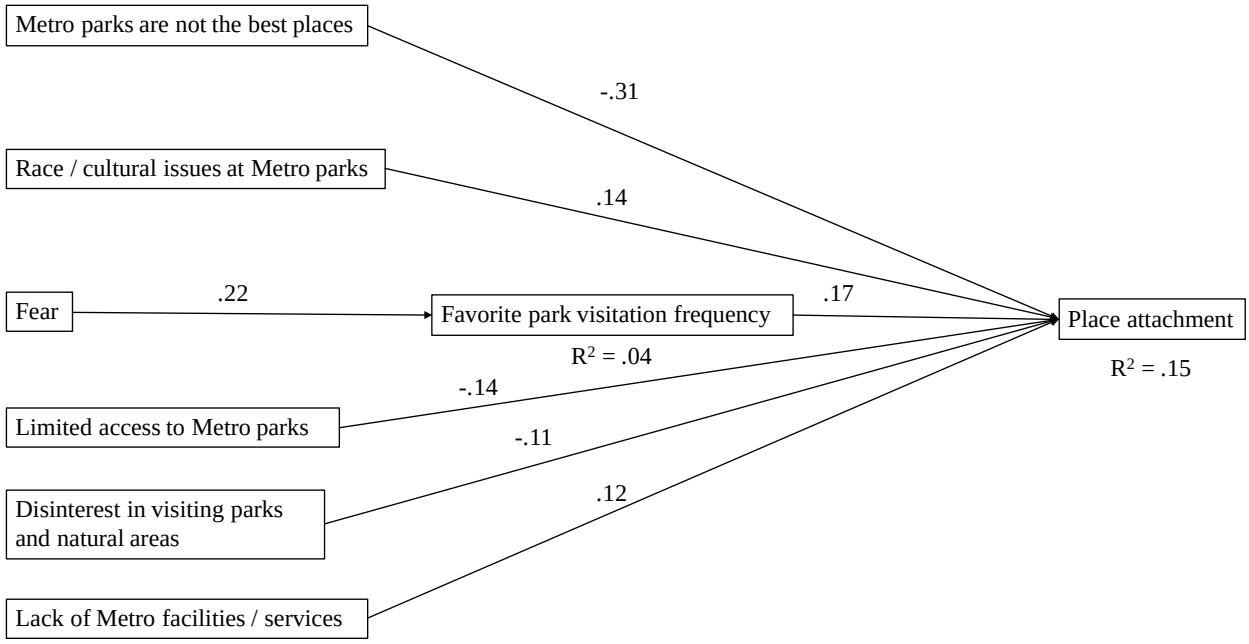

Figure 1. Relationships among constraints, visitation, and place attachment for traditionally well-served residents.[a]
[a] Only significant paths are shown, $p \leq .001$.

For traditionally underserved residents, 38% of the variance in place attachment was explained by the constraints dimensions and visitation (Figure 2). Dimensions of constraints that were significantly negatively associated with place attachment were "costs" (β = -.27), "Metro parks are not the best places" (β = -.25), "limited knowledge about Metro parks" (β = -.25), and "disinterest in visiting parks and natural areas" (β = -.19). Only one dimension of constraints was positively related to place attachment for these underserved residents: "lack of Metro parks facilities / services" (β = .20). "Favorite park visitation frequency" was also positively related to attachment for these residents (β = .27). The constraint dimension most strongly related to attachment for these residents was "costs" (β = -.27), whereas the weakest significant predictor was "disinterest in visiting parks and natural areas" (β = -.19). Twenty-six percent of the variance in "favorite park visitation frequency" was explained by the constraints dimensions for

these residents, with only "limited access to Metro parks" significantly negatively related to visitation (β = -.33) and "costs" significantly positively related to visitation (β = .25; Figure 2).

Frequency of favorite park visitation was examined for both partial and full mediation of relationships between dimensions of constraints and place attachment following analytical guidelines proposed by Baron and Kenny (1986) and Vaske (2008). Frequency of favorite park visitation, however, did not mediate any of the significant relationships between the constraints dimensions and place attachment for both traditionally well-served and underserved residents.

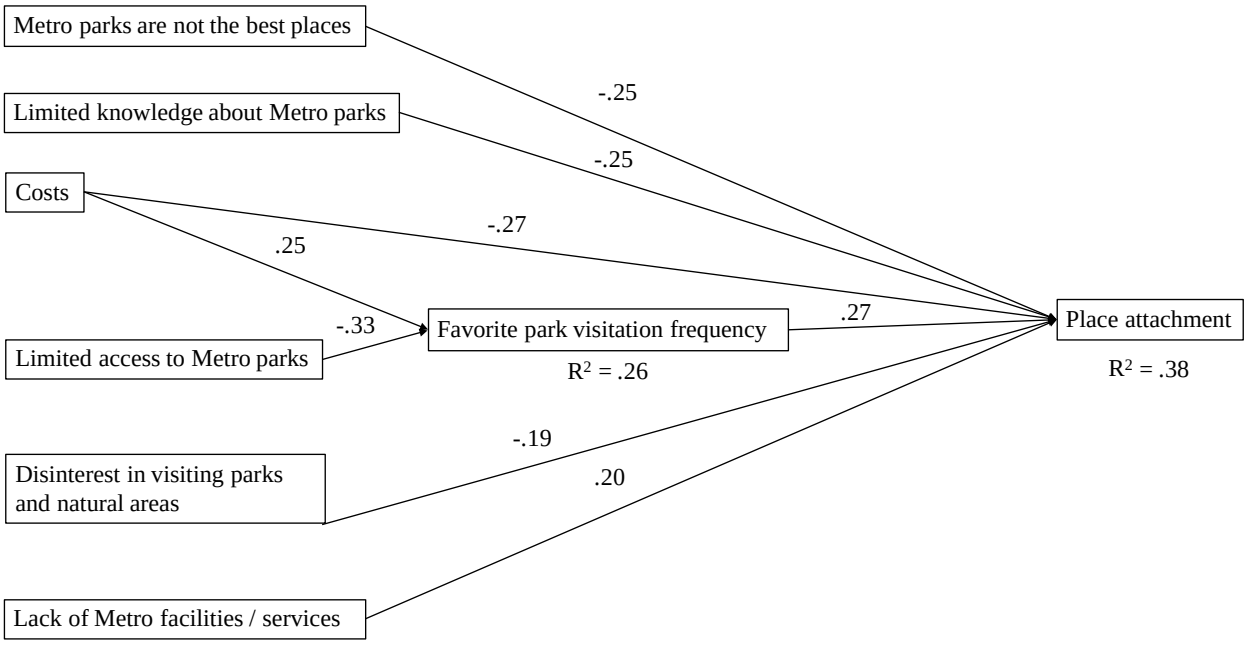

Figure 2. Relationships among constraints, visitation, and place attachment for traditionally underserved residents.[a]
[a] Only significant paths are shown, $p \leq .001$.

Discussion

Management Implications

These results have implications for both research and management. From a management perspective, results showed that traditionally well-served residents in the Portland metropolitan region visited parks and natural areas in general significantly more often than did underserved

residents, but there were no differences between these two groups in visitation to Metro parks or their favorite Metro park in particular. This suggests that Metro may be meeting its objective of reaching a diversity of residents. Despite reaching residents, constraints to visiting these parks and natural areas still exist. The primary constraints for both traditionally well-served and underserved residents were: (a) limited knowledge about Metro parks, (b) limited access to Metro parks, and (c) being too busy to visit parks and natural areas. Park management agencies such as Metro can address knowledge-related constraints by improving awareness and marketing of their parks and natural areas, such as providing more accessible information about locations of spaces they manage and activities that are available. To address constraints associated with accessibility, managers can improve advertising of their parks near public transportation lines and also work with city planners and managers to expand public transportation to these parks.

There were some significant differences in constraints between traditionally well-served and underserved residents. Underserved residents were significantly more constrained by lack of facilities and services at Metro parks. These residents were also more constrained by race and cultural issues (both at Metro parks in particular and at all parks and natural areas in general) even though these constraints were among the lowest (i.e., few agreed they were constrained by race and cultural issues). Although race and cultural issues were relatively low constraints among most respondents, it is still important for managers to create a welcoming environment at their parks for all residents. These constraints could be mitigated by increasing diversity among park staff, creating more programs relevant to racial and ethnic minorities, partnering with relevant community organizations (e.g., church groups, communities of color coalitions), and increasing facilities and services where appropriate (e.g., barbeques, picnic areas).

The path analyses showed that constraints and frequency of visitation collectively explained 15% of the variance in place attachment for traditionally well-served residents and 38% for underserved residents. This suggests that constraints and visitation may be more important factors in place attachment for underserved residents. Place attachment is important for managers in more ways than simply having residents devoted to parks. Attachment, for example, is associated with increased motivation to visit parks, activity involvement, pro-environmental intentions, support of management actions, volunteerism and civic engagement, respect and adherence toward rules, and visitor satisfaction (Halpenny, 2006; Kyle, Absher, & Graefe, 2003; Kyle, Mowen, & Tarrant, 2004; Manning, 2011; Payton, Fulton, & Anderson, 2005; Schreyer et al., 1981; Walker & Chapman, 2003). Therefore, managing agencies can benefit by taking steps to facilitate attachment to their sites.

For example, if managers wish to increase attachment to their parks, it is imperative that they address constraints faced by residents. Results indicated that many of the same constraints were related to place attachment for both traditionally well-served and underserved residents. For both of these populations, "Metro parks are not the best places" and "disinterest in visiting parks and natural areas" were negatively associated with attachment. To address these issues, managers should investigate what would make Metro parks and other parks and natural areas in this region more interesting and better choices for residents. "Lack of Metro parks facilities and services" was positively associated with attachment. Although facilities and services are often rated as more important by underserved communities (Chavez & Olson, 2009; Manning, 2011), this positive association could be explained by: (a) residents of the Portland region preferring less development in parks, and / or (b) these residents being more attached to their favorite Metro park because other parks in the region do not provide enough facilities or services.

Traditionally well-served residents differed from underserved residents in some other meaningful ways. For example, place attachment for traditionally well-served residents was positively associated with "race / cultural issues at Metro parks," possibly because these residents feel comfortable as the majority or dominant race and culture in the region. In addition, attachment was negatively associated with "limited access to Metro parks" for traditionally well-served residents, and attachment for underserved residents was negatively associated with "limited knowledge about Metro parks" and "costs." To address these constraints, managing agencies should strive to increase resident knowledge of parks, work with city planners and public transportation officials to make parks more accessible, and perhaps consider differential pricing of user fees for some residents (e.g., no fee days, discounted pricing).

Frequency of visitation to their favorite Metro park was the strongest positive predictor of place attachment among traditionally underserved residents, and also one of the strongest for well-served residents. This suggests that frequency of visitation is an important factor in fostering place attachment. There were, however, some differences between traditionally well-served and underserved residents in their constraints that were significantly associated with this visitation. Frequency of visitation to their favorite Metro park among traditionally well-served residents, for example, was positively associated with "fear" of visiting other parks and natural areas, suggesting that they are likely to visit their favorite park more often as they feel safer there than in other places. Visitation for underserved residents was positively associated with "costs" and negatively associated with "limited access to Metro parks." It is possible that constraints associated with costs of visiting other parks and natural areas were positively associated with frequency of visitation to their favorite Metro park because these residents may be more likely to repeatedly visit affordable parks, which may include their favorite Metro park.

To address these fear, access, and cost-related constraints, and perhaps increase visitation, managers should take steps to make parks safer and more accessible (e.g., public transportation, reduce fees, create parks closer to residential areas). In fact, the questionnaire included an open-ended comment section and some of the most common responses focused on perceived safety and security issues such as homeless camping, crime (e.g., theft from vehicles), and drug use in parks and natural areas in this region (Needham & Rushing, 2017). Managers, therefore, should consider increasing visible staff presence, police patrols and enforcement, lighting, and emergency call boxes in parks and natural areas in the Portland metropolitan region.

Research Implications

From a research perspective, these results showed that the most prevalent constraints to visiting parks and natural areas in the Portland region were limited knowledge of these areas, lack of access to these places, and being too busy. These findings are consistent with previous research also showing that constraints related to park visitation are usually structural and include lack of time, information, and access (e.g., Crompton & Kim, 2004; Jackson, 2000; Lawton & Weaver, 2008; Scott & Mowen, 2010; Zanon et al., 2013). The finding that traditionally well-served residents visited parks and natural areas in the Portland region in general more frequently than did underserved residents also aligns with previous research showing that whites often participate more often than communities of color in outdoor recreation (Manning, 2011). Underserved residents are also more likely to experience constraints related to their recreation preferences and racial, ethnic, and cultural identities (Byrne & Wolch, 2009; Fernandez et al., 2015; Floyd et al., 1994; Stodolska, 2015; Stodolska & Yi-Kook, 2005; Washburne, 1978). This previous research is consistent with results here showing that underserved residents were significantly more constrained than well-served residents by "race / cultural issues" at Metro

parks in particular and at all parks and natural areas in the Portland region in general, and by "lack of facilities / services at Metro parks." Previous research has shown that racial and ethnic minorities prefer to recreate in larger groups of similar backgrounds (e.g., families) and in more developed park areas where facilities and services (e.g., barbeques, picnic tables and shelters, restrooms) are important factors in selecting a site (Chavez & Olson, 2009; Floyd et al., 1994; Gobster, 2002; Ho et al., 2005; Krymkowski et al., 2014; Manning, 2011; Washburne, 1978).

Results of the path analyses also confirm the limited previous research showing that constraints and visitation are related to place attachment (Fredman & Heberlein, 2005b; Jun et al., 2008), and expand on this research by: (a) examining the role of visitation between constraints and attachment, and (b) whether these relationships differ between traditionally well-served and underserved residents. Few dimensions of constraints were significantly related to frequency of visitation to their favorite Metro park, and these constraints explained 4% of visitation for well-served residents and 26% for underserved residents. Although speculative, these results indicate that other factors not measured here explain frequency of resident visitation to their favorite parks and suggest that residents are negotiating constraints to ensure they can still visit their favorite parks. Future research should do more to investigate the role of negotiation on constraints and visitation.

Additional relationships among constraints, frequency of visitation, and place attachment were similar for both populations (i.e., traditionally well-served and underserved) in many ways and differed in some meaningful ways as well. Results, for example, were consistent with past studies showing that repeat visitation is important for developing attachment (Brooks et al., 2007; Hammitt et al., 2004; Moore & Graefe, 1994; Williams et al., 1992; Williams & Vaske, 2003), as frequency of visitation to their favorite Metro park was a positive predictor of

attachment for both underserved and well-served residents. In addition, this frequency of visitation to their favorite park was significantly associated with fear-related constraints at other parks and natural areas for well-served residents, and accessibility and cost-related constraints for underserved residents. These results are also consistent with past research because racial and ethnic minorities are disproportionately represented in lower socioeconomic and demographic groups (e.g., income, education, residential location), which are associated with constraints such as affordability of recreation, residential distance from parks, and lack of transportation (Bustam et al., 2011; Byrne & Wolch, 2009; Fernandez et al., 2015; Floyd & Nicholas, 2008; Gobster, 2002; Jun et al., 2008; Shinew et al., 2004; Shores et al., 2007; Stodolska, 2015; Stodolska & Yi-Kook, 2005; Walker & Virden, 2005; Washburne, 1978; Zanon et al., 2013).

Future research can expand on this work in several ways. First, more concepts, such as motivations, should be included in the path models to obtain a broader understanding of conceptual relationships and explain more variance. Motivations, for example, are often considered to be important in understanding constraints and their negotiation (Hubbard & Mannell, 2001; White, 2008). Including motivations, negotiation, and other concepts in the model may help to explain some of the unexplained variance in both visitation and attachment. Second, although previous research has examined constraints in a framework consisting of three broad categories (i.e., interpersonal, intrapersonal, structural; Crawford & Godbey, 1987) that are sometimes arranged in a hierarchy (Crawford, Jackson, & Godbey, 1991), an EFA was performed here to examine more nuanced dimensions of this concept and relationships with other concepts, which have not been thoroughly confirmed in the existing literature. Future research should confirm these findings with confirmatory factor analysis and structural equation modeling. Third, some previous research has found that place attachment separates into

dimensions of place identity and place dependence (Manning, 2011; White, Virden, & Riper, 2008; Williams & Vaske, 2003). This study here and some others (Kyle, Graefe, & Manning, 2005; Wickham & Kerstetter, 2000; Wynveen et al., 2017), however, found that these two dimensions overlap substantially and treated them as a single index of place attachment. Fourth, place attachment research has also included additional related dimensions such as social and place bonding, familiarity, belonging, and rootedness (Manning, 2011). Future research should examine relationships among constraints, visitation, and each of these other dimensions of attachment. Fifth, funding constraints limited this research to only examining racial and ethnic minorities as a single combined group. Given that each race and culture is unique, however, future research should compare subpopulations within the "traditionally underserved" category. Finally, this study is limited to a single geographical area (i.e., Portland metropolitan region) and results may not extend to other regions, so future research should examine relationships among constraints, visitation, and attachment across a number of additional settings.

Notes

1. Exploratory factor analyses (EFA) using: (a) principal components analysis with varimax rotation, and (b) principal axis analysis with oblique rotation both showed that all three items measuring place identity and all three items measuring place dependence loaded together on a single factor. In addition, a Harman single factor test (i.e., single EFA without rotation with the number of factors fixed to one; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) showed the factor explained more than 50% of the variance. These two approaches justify combining all six items into a single mean composite index measuring place attachment.

2. Ancillary analysis of correlations among all of the constraints dimensions, visitation, and attachment did not show any evidence of multicollinearity.

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CHAPTER THREE

SPATIAL ANALYSIS OF CONSTRAINTS TO URBAN PARK VISITATION IN THE PORTLAND METROPOLITAN AREA

Introduction

Urban parks offer a means of connecting with nature in the midst of bustling metropolitan areas. Connecting with nature is associated with social, physical, and emotional benefits such as stress relief, improved physical health, and lower crime (Moore & Driver, 2005). Urban parks offer not only a space in which to unwind and connect with nature, but also a space for family bonding, social events, and learning. Many urban residents, however, may be too constrained to visit these spaces and receive the associated benefits as often as they would like. Constraints are factors that limit participation, affect leisure preferences, and / or reduce the level of enjoyment and satisfaction in recreation experiences (Jackson, 2005; Jun & Kyle, 2011). Examples of constraints include difficulty affording costs of visiting parks, obligations (e.g., work, family), and inability to travel to parks.

Studies have shown that certain groups are more likely to experience constraints to recreation participation and park visitation than other groups (Bustam, Thapa, & Buta, 2011; Byrne & Wolch, 2009; Floyd, Gramann, & Saenz, 1993; Green et al., 2009; Shinew & Floyd, 2005; Shinew, Floyd, & Parry, 2004; Stodolska & Yi-Kook, 2005). Traditionally constrained groups include elderly, physically and mentally disabled, low-income women, and racial and ethnic minorities (Shores, Scott, & Floyd, 2007). In many urban settings, traditionally constrained groups of people, such as low-income and minority residents, often cluster together in neighborhoods and Census blocks. Often, these neighborhoods are located in the inner-city and far from many urban parks and green spaces (Blahna & Black, 1993; Byrne & Wolch, 2009;

Floyd et al., 1993; Gobster, 2002; Gómez, Baur, Hill, & Georgiev, 2015; Heynen, Perkins, & Roy, 2006; Wolch, Wilson, & Fehrenbach, 2005). Therefore, it is possible that constraints to urban park visitation may vary spatially and be related to demographic and residential patterns.

Despite trends of traditionally constrained groups often clustering together in some neighborhoods and Census blocks, limited research has explored connections between spatial attributes and constraints to recreation and park visitation. Jackson (1994) called for integrating geographic and social psychological research in studies of constraints by arguing that "it is necessary not only to analyze spatial variations in constraints on recreation and leisure, but also to compare the relative explanatory power of space and place with other variables that may have a greater or lesser impact on people's leisure choices" (p. 111). This article analyzes data from a social science survey in a Geographic Information System (GIS) to explore spatial variations of constraints associated with visiting urban parks in the Portland, Oregon (USA) metropolitan region. Understanding how groups of residents (e.g., minorities) and their constraints cluster together and vary spatially across an urban setting can provide targeted locations for outreach and engagement designed to attract diverse audiences to parks in these settings.

Conceptual Foundation

Constraints to Outdoor Recreation

Although there are different frameworks for categorizing constraints (Jackson, 2000, 2005; Nadirova & Jackson, 2000; Shaw & Henderson, 2005; Stodolska & Jackson, 1998), Crawford and Godbey's (1987) conceptual model has been the most widely used (Jackson, 2005; Jackson & Scott, 1999; Shaw & Henderson, 2005). Crawford and Godbey (1987) grouped constraints into three categories: intrapersonal constraints, interpersonal constraints, and structural constraints. *Intrapersonal constraints* "involve individual psychological states and

attributes which interact with leisure preferences rather than intervening between preferences and participation" (Crawford & Godbey, 1987, p. 122). Examples of intrapersonal constraints include stress, depression, and perceived ability in an activity (Crawford & Godbey, 1987). *Interpersonal constraints* relate to personal relationships or interactions with others, such as family obligations or differing leisure preferences among spouses that inhibit recreation (Crawford & Godbey, 1987). *Structural constraints* are institutional, situational, and functional characteristics that constrain recreation (Crawford & Godbey, 1987). Structural constraints are often the most prevalent and include cost of recreation, lack of time, lack of information, and distance from recreation resources (Crompton & Kim, 2004; Jackson, 1994, 2000; Kerstetter et al., 2002; Lawton & Weaver, 2008; Mowen, Payne, & Scott, 2005; Scott & Jackson, 1996; Scott & Mowen, 2010; Walker & Virden, 2005; Zanon et al., 2013).

Although this model by Crawford and Godbey (1987) has been the most widely used (Jackson & Scott, 1999; Jackson, 2005; Shaw & Henderson, 2005), some research has integrated these three categories into a hierarchy where intrapersonal constraints are negotiated first, followed by interpersonal and then structural constraints (Crawford, Jackson, & Godbey, 1991). Other researchers, however, have found a hierarchical approach to be problematic and empirical studies have experienced mixed results confirming this model (Gilbert & Hudson, 2000; Hawkins et al., 2007; McQuarrie & Jackson, 1996). As a result, some have adopted other frameworks for categorizing constraints (Floyd et al., 1993; Jackson, 2000, 2005; Nadirova & Jackson, 2000; Shaw & Henderson, 2005; Shinew et al., 2004; Stodolska & Jackson, 1998).

Research suggests that constraints associated with recreation and park visitation are often influenced by characteristics such as age, gender, race, income, and education (Jackson, 2000; Zanon et al., 2013). Walker and Virden (2005) included race / ethnicity, gender, cultural /

national forces, and socioeconomic forces as macro-level (i.e., broader, societal level) factors antecedent to constraints. Many of these macro-level factors act in unison and can have compounding effects on constraints (e.g., low-income elderly women of color are often the most constrained, whereas educated young-adult white males are often the least constrained; Jun, Kyle, & Mowen, 2008; Shores, Scott, & Floyd, 2007). Some studies have found that racial and ethnic minorities experience more constraints to recreation compared to non-minorities (Bustam et al., 2011; Gobster, 2002; Shores et al., 2007; Stanis, Schneider, & Russell, 2009), whereas others have found that different factors, such as available income and free time, contribute more to perceived constraints (Jackson, 1994, 2005; Scott, 2013). Despite mixed results on the relative importance of demographics, it is clear that race / ethnicity is commonly associated with constraints such as affordability of recreation costs, residential distance from parks, lack of transportation to parks, and fear of crime in parks (Bustam et al., 2011; Byrne & Wolch, 2009; Gobster, 2002; Jun et al., 2008; Shinew et al., 2004; Shores et al., 2007; Stodolska & Yi-Kook, 2005; Zanon et al., 2013).

Spatial Analyses of Park and Recreation-Related Concepts

Limited recreation and leisure research has examined the spatial attributes of social psychological concepts, such as constraints, across a landscape (Beeco & Brown, 2013; Jackson, 1994). Recently, however, mapping and spatial analysis of social science data using GIS has started growing in popularity in recreation research. Aswani and Lauer (2006) argued that "spatio-temporal, multidimensional GIS, and remote sensing data can serve to verify, explain, or reveal site-specific or regional patterns of human demographic, political, economic, socio-cultural, and ecological dynamics that may not be obvious to researchers on the ground" (p. 81). For parks and other outdoor recreation areas, spatial analysis of visitor values, conflict, use, and

other behaviors facilitates efficiency in targeting locations for managerial responses to issues such as visitor dissatisfaction, ecological degradation, or other impacts (D'Antonio et al., 2010; D'Antonio & Monz, 2016; Hallo et al., 2012; Kidd et al., 2015; Van Riper & Kyle, 2014; van Riper, Kyle, Sutton, Barnes, & Sherrouse, 2012; Wolf, Brown, & Wohlfart, 2017).

Few studies have examined spatial distributions of constraints across a landscape. Studies that have examined spatial aspects of constraints mainly focused on residential distance from recreation resources as the primary constraint on visitation (Jackson, 1994; Tarrant & Cordell, 1999; Tarrant & Porter, 2005). For all parks, including urban parks, distance from the resource can be a constraining factor inhibiting visitation (Jackson, 2000). Studies have shown, however, that distance from the resource alone is not the most prevalent constraint that visitors face; distance and transportation constraints are often dwarfed by associated costs of visitation (e.g., park fees, travel cost), lack of time, and fear of crime (Byrne & Wolch, 2009; Gobster, 2002; Hultsman, 1995; Jackson, 1994; Tarrant & Cordell, 1999; Tarrant & Porter, 2005).

This article expands on the more conventional approach of using survey research to study constraints by also analyzing these constraints spatially using GIS. This spatial analysis provides a geographic and visual representation of locations where constraints are more or less prevalent. Understanding this geographic distribution of constraints is important because it may enable targeting of areas where park management and outreach efforts are necessary and where they are not, which can improve efficiency of resource allocation.

Research Questions

This article explores three research questions associated with resident constraints to visiting urban parks in the Portland metropolitan region. First, what are the constraints to urban park visitation in this region and can residents be grouped according to these constraints (e.g.,

least to most constrained)? Second, are there identifiable spatial or geographic clusters of: (a) these constraints groups, (b) traditionally well-served (i.e., white majority population) and underserved (i.e., racial and ethnic minorities) residents, and (c) areas dominated or not dominated by different types of constraints? Third, are there locations where the geographic clusters of these characteristics and constraints overlap?

Methods

Study Site and Context

Data were obtained from a mail and internet survey of residents of Clackamas, Multnomah, and Washington counties in the Portland metropolitan region. These counties are the largest by population in Oregon (United States Census Bureau / American FactFinder, 2015). The city of Portland is known for its parks and green spaces, and 17% of its acreage is park lands (Harnik et al., 2015). Many agencies own and manage parks in the Portland metropolitan area, including Metro, Tualatin Hills Park and Recreation District, Oregon Parks and Recreation Department, Portland Parks and Recreation, and the cities of Gresham, Lake Oswego, and Oregon City (Portland Parks & Recreation, 2000). This study focused on parks and natural areas in the Portland region in general, as well as those managed by Metro in particular. As the regional government for Clackamas, Multnomah, and Washington counties, Metro manages approximately 17,000 acres of land. This study examined all 15 protected areas currently managed by Metro and they include a range of development and naturalness (12 urban parks and natural areas, two boat ramps, one golf course and trail area; Figure 3).

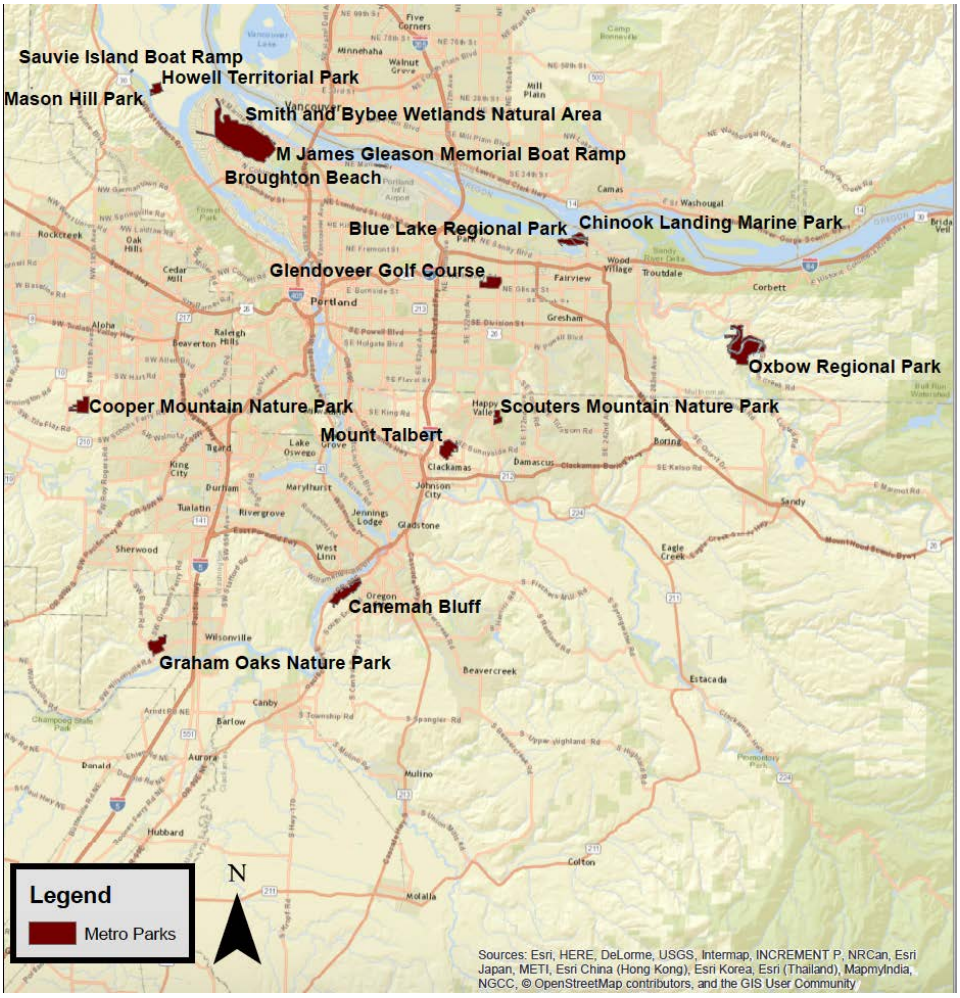

Figure 3. Map of the Metro parks examined. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Data Collection

Data were obtained from two samples of residents in these counties: (a) a proportionate random sample of residents (i.e., probability sample), and (b) a convenience sample of Opt-In panel members (i.e., nonprobability sample). Questionnaires for both samples were administered from November 2016 to January 2017. The probability sample received a mixed-mode questionnaire (mail and internet). This sample was drawn randomly as a probability sample

using the most current representative address-based system (ABS) databases combined with other databases (e.g., last name algorithms, ethnicity codes, Census block clusters largely consisting of minorities) to mostly target the following groups: African Americans / Blacks, American Indians, Asians, Hispanics / Latinos, Middle Eastern peoples, and Slavic / Eastern European peoples (Dillman, Smyth, & Christian, 2014). These groups were identified based on consultation with Metro. In the analyses, these racial and ethnic minority populations were combined into a single group taken together called traditionally underserved residents. Project scope and funding limited the ability to collect large enough samples of each population to be representative of each on its own. This sample also included traditionally well-served residents (i.e., white majority population).

The nonprobability sample received an internet-only questionnaire. This sample was comprised of members of the Opt-In panel, which is a group of 16,598 people who volunteered to be on the panel because they are interested in regional community and government issues (e.g., economic growth, employment, transportation, park management) and would like to contribute their opinions through online questionnaires. Although the Opt-In panel contains mostly traditionally well-served residents, it also contains underserved residents.

Both the online and paper versions of the questionnaire were available in English, Latin American Spanish, Russian, Traditional Chinese, and Vietnamese. These are the five most frequently spoken languages in the Portland metropolitan region and were selected in partnership with Metro (US Census Bureau, 2015). The questionnaires for the probability sample were administered using four mailings (Dillman et al., 2014; Vaske, 2008). The first mailing consisted of a cover letter explaining the purpose of the study and an invitation to complete the questionnaire online. Two weeks later, the second mailing consisted of a cover letter, printed

questionnaire, and postage paid business reply envelope. One week later, the third mailing consisted of a postcard reminder to complete the paper or online version of the questionnaire. Three weeks later, a fourth mailing consisted of a cover letter, printed questionnaire, and postage paid business reply envelope. The nonprobability sample was administered with an initial email invitation to the entire panel followed by two reminder emails within a two-week period.

Questionnaires were sent to 4,250 residents for the probability sample and all 16,598 members of the Opt-In panel for the nonprobability sample. In total, n = 620 completed questionnaires were returned from the probability sample (15% response rate after accounting for undeliverables [moved, vacant]) and n = 2,708 were returned from the nonprobability sample (16% response rate from the entire panel and 38% from those who opened at least one of the email contacts). A telephone non-response bias check (n = 137) was administered to nonrespondents of the probability sample to determine any potential differences between nonrespondents and respondents. No substantive differences were found between respondents and nonrespondents (Needham & Rushing, 2017). A nonresponse check was not possible for the nonprobability sample because contact information (e.g., telephone numbers, mailing addresses) was not available for Opt-In panel members.

To test for any possible method effects, all questionnaire responses from the online survey of Opt-In Panel members were statistically compared to those from the mixed-mode (mail, online) survey of the proportionate random sample. Comparisons for every item in the questionnaire were made between each of these surveys for traditionally underserved residents and also between each of these surveys for traditionally well-served residents. There were no substantive differences in responses between these two surveys for each sample across all of these comparisons (i.e., no consistent methods effects), so the data were aggregated across both

samples (i.e., surveys), resulting in a total combined sample size of 3,328 residents (Needham & Rushing, 2017). The aggregated sample was then weighted by Census data based on county, age, sex (male, female), and education to be representative of the study region. Race and other demographics were consistent with the Census after weighting.

Analysis Variables

The questionnaire contained items measuring constraints to urban park visitation. Thirty-seven constraint items reflected all three of Crawford and Godbey's (1987) broad constraints dimensions (intrapersonal, interpersonal, structural). Examples of intrapersonal constraints included "I do not feel safe going to parks or natural areas in the Portland region," "I fear crime in parks or natural areas in the Portland region," and "I am afraid of outdoor places such as parks or natural areas in the Portland region." Examples of interpersonal constraints included "I do not have anyone to visit parks or natural areas in the Portland region with," "my partner or family is not interested in visiting parks or natural areas in the Portland region," and "parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group." Examples of structural constraints included "the fees at parks or natural areas in the Portland region are too expensive for me," "I am too busy or do not have enough time to visit parks or natural areas in the Portland region," and "information (e.g., staff, signs, programs) at parks or natural areas in the Portland region is often only in English, making it difficult for me to visit." These constraint items were consistent with those used in the literature and were adapted to reflect possible constraints unique to the Portland region and Metro parks (Hubbard & Mannell, 2001; Jackson, Crawford, & Godbey, 1993; Metcalf, Burns, & Graefe, 2013; Metcalf et al., 2015; Stodolska & Yi-Kook, 2005). These questions measured constraints to visiting urban parks and natural areas in the Portland region in general (including Metro parks) and also Metro

parks in particular. The question regarding Metro parks was: "to what extent do you disagree or agree that each of the following make it difficult for you or your family to visit Metro parks?" The questions regarding parks and natural spaces in general used the same wording, but referred to visiting *any* parks or natural areas in the Portland region (including Metro parks). All of these questions were measured on a 4-point scale from 1 "strongly disagree" to 4 "strongly agree."

The questionnaire also contained demographic questions measuring racial and ethnic identity. Respondents were asked "when asked to identify your racial or ethnic identity, how do you identify?" Response options were: White / Caucasian, Black / African American, Hispanic / Latino / Spanish, Asian / Asian American, American Indian / Alaskan Native, Native Hawaiian / Pacific Islander, and other. Participants were given the option to select all answers that applied. Respondents were then asked: (a) "do you consider yourself to be Slavic (from Russia, Belarus, Ukraine, Poland, Czech Republic, Slovakia, Slovenia, Croatia, Serbia, Bosnia and Herzegovina, Montenegro, Macedonia, or Bulgaria);" and (b) "do you consider yourself to be Middle Eastern (from Egypt, Iran, Turkey, Iraq, Saudi Arabia, Yemen, Syria, United Arab Emirates, Jordan, Palestine, Israel, Lebanon, Oman, Kuwait, Qatar, Bahrain, or Cyprus)?" For each question, participants were given the option to select one response (“yes,” “no”). If participants selected any response other than "White / Caucasian" or they selected "yes" for either of the following two questions, they were considered a "minority" (i.e., traditionally underserved) resident. If participants selected only "White / Caucasian" and responded "no" to the following two questions, they were considered a "white majority" (i.e., traditionally well-served) resident.

Residential location was determined using geographic point-location data included as part of the information provided in the probability sample (e.g., each household had a latitude and longitude associated with the address provided in the ABS sample). These X and Y coordinates

provided a spatial tag for residential location that was used in subsequent spatial analyses to determine if demographics and constraints varied geographically across the study area. The nonprobability sample did not contain this latitude and longitude information because it was collected from an existing online panel that does not record this spatial information. As a result, this limited the spatial analysis (i.e., GIS) components of this article to the data collected from only the probability sample (n = 620).

Data Analysis

Social Science Analysis

Social science analyses were performed in IBM SPSS Statistics software. A principal axis exploratory factor analysis (EFA) with oblique rotation was performed to group the 37 constraints items into possible dimensions or factors (hereafter called dimensions of constraints). An EFA was chosen in lieu of a confirmatory factor analysis because the previous literature has predominantly grouped constraints into only three broad categories (i.e., intrapersonal, interpersonal, structural) and this research sought a more nuanced analysis rather than the broad three-category framework. Then, measurement reliability of these multi-item dimensions was assessed using Cronbach's alpha. An alpha of approximately .60 to .65 or greater indicates that multiple variables are measuring the same factor and justifies combining them into an index (Vaske, 2008). A K-means cluster analysis was then used for grouping participants based on their dimensions of constraints (hereafter called constraints groups).

Spatial Analysis

Results of these social science analyses were then examined spatially for the probability sample to determine if there were patterns in racial / ethnic clustering, constraints groups, and dimensions of constraints, and if there were any relationships (i.e., overlap) among these

patterns. The social science results from the probability sample were joined to the residence point locations (i.e., X and Y coordinates for each participant's home address) for spatial analysis in ArcMap 10.5 (ESRI, 2017). A series of maps of the Portland region were created to show the spatial distribution of minority residents, constraints groups, and types (i.e., dimensions) of constraints across the region. A hot spot analysis was performed to examine the spatial patterns of these phenomena. A hot spot analysis identifies statistically significant locations where either high values (hot spots) or low values (cold spots) cluster (i.e., if people in similar locations perceive similar constraints, these results will cluster into hot spots of constraints across the region). Hot spot analysis uses the Getis-Ord Gi* statistic, producing a *z*-score and associated *p*-value, to determine the statistical significance of the point clusters (Getis & Ord, 1992; Mitchell, 2005; Ord & Getis, 1995). Hot spot analysis produces a map of these *z*-scores and bins them into confidence intervals.

The racial / ethnic clustering, constraints groups, and types (i.e., dimensions) of constraints hot spot analyses were interpolated, using a kriging procedure in ArcMap, to predict unknown hot and cold spot significance levels across the study area. Kriging is a geostatistical procedure that generates an estimated surface based on measured data points and spatial autocorrelation (Bourrough, 1986; Oliver, 1990). Spatial autocorrelation is the assumption that phenomena correlate based on location where areas closer to each other will exhibit similar phenomena (Bourrough, 1986). The hot spot and krig interpolations are visualized as a heat map. In these heat maps, statistically significant clusters of racial / ethnic minorities, most constrained residents, and high constraints scores are represented in red. Conversely, significant clusters of white majority residents, least constrained residents, and low constraints scores are represented in blue. Areas that do not have statistically significant clustering appear in yellow.

The kriging interpolations from the hot spot analyses of racial / ethnic clustering, constraints groups, and the health and no interested partners constraints dimensions that were found to vary spatially were converted from raster to polygon data using the "raster to polygon tool" in ArcMap. The "reclassify tool" was used for assigning a code, ranging from 1-9, to the new polygons, where minority residents, higher constraints groups, and higher constraints scores for each of these dimensions were assigned higher values. The four polygon layers were combined with the "intersect tool" to visualize where areas with high and low values overlapped in meaningful ways.

Results

Social Science Results

The EFA reduced the 37 constraints variables into 13 factors (Table 6). Factor 1 contained three variables related to health (e.g., “poor health or physical limitations make it difficult to visit parks or natural areas in the Portland region”). Factor 2 contained five variables related to race / cultural issues in all parks in the region in general (e.g., “parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group”). Factor 3 consisted of six items related to Metro parks not being the best places for recreation (e.g., “Metro parks are not the best places for the activities I enjoy doing”). Factor 4 contained five variables associated with fear in parks (e.g., “I do not feel safe going to parks or natural areas in the Portland region”). Factor 5 consisted of three variables regarding limited knowledge about Metro parks (e.g., “before receiving this survey, I did not know where Metro parks were located”). Factor 6 contained three variables related to race / cultural issues specific to just Metro parks in particular (e.g., “Metro parks do not have programs for people in my racial, ethnic, or cultural group”). Factor 7 had two variables about costs of visiting parks (e.g.,

"the fees at parks or natural areas in the Portland region are too expensive for me"). Factor 8 contained two variables related to lack of interested recreation partners (e.g., "I do not have anyone to visit parks or natural areas in the Portland region with"). Factor 9 included two items associated with limited access to Metro parks (e.g., "visiting Metro parks is hard for me because they take too long to get to or are too far away"). Factor 10 contained three items related to lack of facilities / services at Metro parks (e.g., "there are not enough facilities such as picnic tables, barbeques, picnic shelters, or restrooms"). The remaining three factors each consisted of single variables, but were retained because they represented important dimensions of constraints: (a) disinterest in visiting parks and natural areas in the Portland region, (b) Metro parks are too unnatural (i.e., too much development now), and (c) being too busy or not having enough time to visit parks or natural areas in the Portland region.

Table 6. Exploratory factor analysis of constraints to visiting both Metro parks and *all* parks and natural areas in the Portland region

	Factor Loadings [a]									
Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
I have a disability that makes it difficult to visit parks or natural areas in the Portland region	.81									
Poor health or physical limitations make it difficult to visit parks or natural areas in the Portland region	.70									
Someone I recreate with is physically unable to visit parks or natural areas in the Portland region	.61									
Based on the experience of someone else, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region		.88								
Based on my own experience, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region		.87								
Parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group		.68								

Table 6. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
Parks or natural areas in the Portland region do not have enough staff representing my racial, ethnic, or cultural group		.65								
Information (e.g., staff, signs, programs) at parks or natural areas in the Portland region is often only in English, making it difficult for me to visit		.58								
Metro parks are not the best places for the activities I enjoy doing.			.72							
The activities that I enjoy doing are not available in Metro parks			.68							
Metro parks do not feel welcoming to me or my family			.65							
Metro parks have too many rules / regulations			.56							
I tend to avoid Metro parks because they are too crowded			.36							
I cannot take pets (e.g., dogs) to Metro parks			.32							

Table 6. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
I do not feel safe going to parks or natural areas in the Portland region				.93						
I fear crime in parks or natural areas in the Portland region				.82						
I am afraid of outdoor places such as parks or natural areas in the Portland region				.77						
I tend to avoid parks or natural areas in the Portland region because I am afraid of injury				.61						
Parks or natural areas in the Portland region do not feel welcoming to me or my family				.46						
Before receiving this survey, I did not know where Metro parks were located					.85					
I do not know where to get information about Metro parks					.71					
I do know enough about what I can do at Metro parks					.60					

Table 6. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
Metro parks do not have enough visitors representing my racial, ethnic, or cultural group						.87				
Metro parks do not have enough staff representing my racial, ethnic, or cultural group						.86				
Metro parks do not have programs for people in my racial, ethnic, or cultural group						.72				
The fees at parks or natural areas in the Portland region are too expensive for me							.92			
It is too expensive for me to travel to parks or natural areas in the Portland region							.69			
My partner or family is not interest in visiting parks or natural areas in the Portland region								.76		
I do not have anyone to visit parks or natural areas in the Portland region with								.59		

Table 6. Continued

Constraint Items	Health	General Race and Culture	Metro not the Best	Fear	Limited Knowledge about Metro parks	Metro Race and Culture	Costs	No Interested Partners	Limited Access to Metro parks	Lack of Metro Facilities / Services
There is no public transportation to the Metro parks I want to visit									.69	
Visiting Metro parks is hard for me because they take too long to get to or are too far away									.58	
There are not enough facilities (e.g., picnic tables, barbeques, picnic shelters, restrooms)										.51
Metro parks do not provide online reservations of picnic areas / shelters										.45
Metro parks are difficult to access for people with disabilities / mobility issues										.36
Eigenvalue	3.57	5.18	3.49	5.46	2.97	4.40	3.67	2.34	1.82	1.48
Percentage (%) of total variance explained	24.27	7.91	6.13	5.44	4.17	2.85	2.77	2.40	1.83	1.54
Cumulative percentage (%) of variance	24.27	32.18	38.31	43.75	47.92	50.77	53.54	55.94	57.77	59.31

[a] Principal axis exploratory factor analysis with oblique rotation. Items coded on a 4-point scale of 1 = *strongly disagree* to 4 = *strongly agree*.

Table 7. Reliability analyses of factors constraining residents from visiting parks and natural areas in the Portland metropolitan region

Constraint factors and items [a]	*M*	*SD*	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Health					.87
I have a disability that makes it difficult to visit parks or natural areas in the Portland region	1.56	.69	.80	.77	
Poor health or physical limitations make it difficult to visit parks or natural areas in the Portland region	1.68	.73	.78	.79	
Someone I recreate with is physically unable to visit parks or natural areas in the Portland region	1.68	.73	.68	.89	
Race / cultural issues at all parks in region					.92
Based on the experience of someone else, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region	1.49	.62	.80	.89	
Based on my own experience, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region	1.49	.62	.79	.90	
Parks or natural areas in the Portland region do not have enough visitors representing my racial, ethnic, or cultural group	1.61	.68	.83	.89	
Parks or natural areas in the Portland region do not have enough staff representing my racial, ethnic, or cultural group	1.62	.69	.82	.89	
Information (e.g., staff, signs, programs) at parks or natural areas in the Portland region is often only in English, making it difficult for me to visit	1.52	.61	.68	.92	
Metro parks are not the best places					.79
Metro parks are not the best places for the activities I enjoy doing.	2.20	.73	.59	.73	
The activities that I enjoy doing are not available in Metro parks	2.11	.72	.57	.73	
Metro parks do not feel welcoming to me or my family	1.89	.62	.69	.71	
Metro parks have too many rules / regulations	2.11	.70	.52	.75	
I tend to avoid Metro parks because they are too crowded	2.12	.65	.47	.76	
I cannot take pets (e.g., dogs) to Metro parks	2.36	.92	.40	.79	
Fear					.89
I do not feel safe going to parks or natural areas in the Portland region	1.75	.75	.83	.83	
I fear crime in parks or natural areas in the Portland region	1.99	.85	.73	.86	
I am afraid of outdoor places such as parks or natural areas in the Portland region	1.53	.67	.76	.85	
I tend to avoid parks or natural areas in the Portland region because I am afraid of injury	1.57	.63	.67	.87	
Parks or natural areas in the Portland region do not feel welcoming to me or my family	1.66	.65	.64	.88	
Limited knowledge about Metro parks					.79

Table 7. Continued

Constraint factors and items[a]	*M*	*SD*	Item total correlation	Alpha (α) if deleted	Cronbach alpha (α)
Before receiving this survey, I did not know where Metro parks were located	2.63	.93	.65	.69	
I do not know where to get information about Metro parks	2.38	.83	.65	.69	
I do know enough about what I can do at Metro parks	2.67	.77	.60	.75	
Race / cultural issues at Metro parks					.91
Metro parks do not have enough visitors representing my racial, ethnic, or cultural group	1.82	.63	.85	.85	
Metro parks do not have enough staff representing my racial, ethnic, or cultural group	1.85	.63	.84	.86	
Metro parks do not have programs for people in my racial, ethnic, or cultural group	1.86	.67	.79	.91	
Costs					.82
The fees at parks or natural areas in the Portland region are too expensive for me	2.04	.78	.69	-	
It is too expensive for me to travel to parks or natural areas in the Portland region	1.92	.72	.69	-	
No interested partners					.82
My partner or family is not interest in visiting parks or natural areas in the Portland region	1.83	.78	70	-	
I do not have anyone to visit parks or natural areas in the Portland region with	1.83	.76	.70	-	
Limited access to Metro parks					.54
There is no public transportation to the Metro parks I want to visit	2.43	.79	.37	-	
Visiting Metro parks is hard for me because they take too long to get to or are too far away	2.55	.81	.37	-	
Lack of Metro facilities / services					.64
There are not enough facilities (e.g., picnic tables, barbeques, picnic shelters, restrooms)	2.23	.70	.48	.51	
Metro parks do not provide online reservations of picnic areas / shelters	2.12	.63	.44	.56	
Metro parks are difficult to access for people with disabilities / mobility issues	2.16	.60	.44	.56	

[a] Variables measured on 4-point scales of 1 “strongly disagree” to 4 “strongly agree.”

Cronbach's alpha reliability coefficients indicated internal consistency for most of these dimensions of constraints: .87 for "health," .92 for "race / cultural issues at all parks in region," .79 for "Metro parks are not the best places," .89 for "fear," .79 for "limited knowledge about Metro parks," .91 for "race / cultural issues at Metro parks," .82 for "costs," .82 for "no interested partners," .54 for "limited access to Metro parks," and .64 for "lack of Metro parks facilities /

services" (Table 7). The coefficient for "limited access to Metro parks" (.54) did not meet the requirement of .60 to .65 or greater, but this factor only included two variables that consistently loaded together and face validity was apparent (e.g., “there is no public transportation to the Metro parks I want to visit,” “visiting Metro parks is hard for me because they take too long to get to or are too far away”). Deletion of any of these variables from their respective factor did not improve reliability.

The K-means cluster analysis grouped people based on how constrained they felt across these 13 constraints dimensions from the EFA. From a series of two group to six group cluster analyses, three distinct clusters emerged with this three-group solution providing the best fit. Those who reported the lowest mean scores for all 13 of the constraints dimensions were considered "least constrained." The "most constrained" group had the highest mean scores for all dimensions. Those who fell in between these groups for all dimensions were considered "moderately constrained." The largest proportion of residents was in the moderately constrained group (48%), the second largest was in the least constrained group (33%), and the smallest was in the most constrained group (19%).

Two analyses validated and confirmed the stability of this cluster solution. First, the data were randomly sorted and cluster analyses were conducted after each of four random sorts. These analyses supported the solution identifying the three groups of residents based on their constraints. Second, discriminant function analysis was conducted to determine how well the 37 original individual constraint variables predicted these three cluster groups generated from the 13 factors. All 37 variables significantly predicted the three groups, Wilks’ lambda $U = .548 – .932$, $F = 10.57 – 118.71$, $p < .001$. These variables correctly classified 95% of residents in the least constrained group, 96% in the moderately constrained group, and 91% in the most constrained

group. In total, 95% of residents were correctly classified. Taken together, these results supported the validity and stability of this three-group solution.

Spatial Results

A hot spot analysis followed by a krig interpolation was performed to determine if there was any spatial clustering of minority (i.e., traditionally underserved) residential locations. This produced a heat map showing the distribution of minority residents in the sample across the Portland metropolitan region (Figure 4). In this case, minority residents (n = 235) were given a value of 1 and white majority (i.e., traditionally well-served) residents (n = 316) were given a value of 0. Figure 4 shows that minorities in the sample tended to cluster in the northeast of the Portland metropolitan region, whereas white majority respondents were clustered more in the southern area of the region. Similarly, a hot spot analysis of the three constraints groups (least, moderately, most constrained) revealed that the most constrained respondents also clustered significantly more in the northeast region (i.e., northwest of Gresham), whereas the least constrained respondents clustered significantly more in the southwest (near Sherwood; Figure 5). Areas with concentrations of higher values appear red (clusters of minority or most constrained residents), whereas areas with concentrations of lower values appear blue (clusters of white majority or least constrained residents).

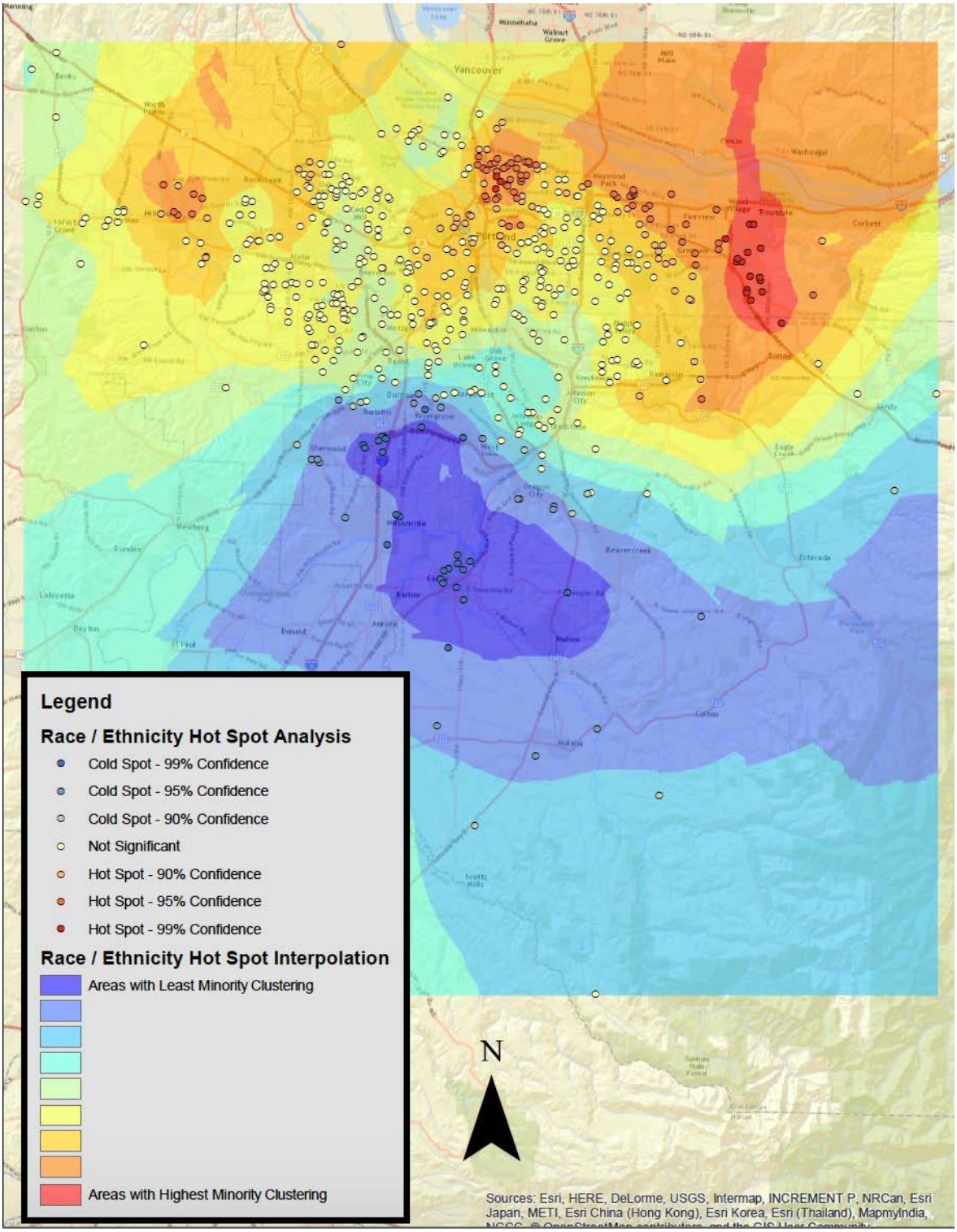

Figure 4. Hot spot analysis and krig of minority residential location. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

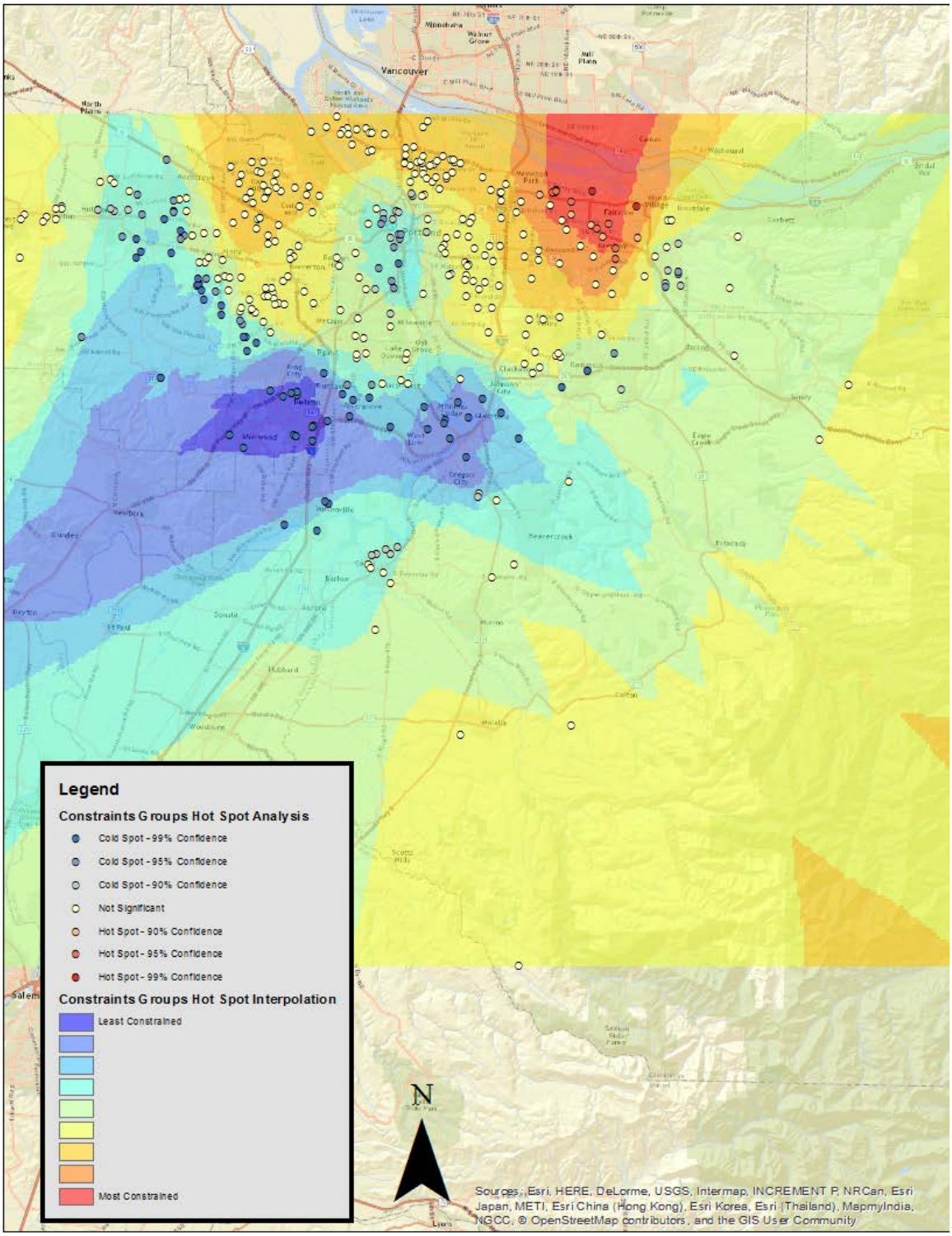

Figure 5. Hot spot analysis and krig of most, moderately, and least constrained groups' residential location. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

A hot spot analysis was then run for each of the 13 constraints dimensions to determine if there were any spatial patterns. Five of the 13 dimensions had clear evidence of spatial clustering (physical health, lack of partners, limited of knowledge about Metro parks, limited access to Metro parks, Metro parks are too unnatural), whereas the remaining eight dimensions did not. Respondents living in the northeast of the Portland region were significantly more constrained by health and lack of partners, whereas those living in the northwest were significantly less constrained by these factors (Figures 6 and 7). A hot spot for the lack of partners dimension appears in the south-central area of the region, but that appears to be centered around a single resident, so may not accurately represent regional trends (Figure 7). Respondents in the western part of the region were significantly more constrained by both limited knowledge about Metro parks and limited access to these parks, whereas those in the east were significantly less constrained by these dimensions (Figures 8 and 9).

Results from the intersect analysis confirmed that some of the findings for constraints groups and dimensions overlapped with areas of high racial / ethnic minority clustering. The northeast area of the region has significantly higher clustering of racial / ethnic minorities, most constrained residents, and residents constrained by health and no interested partners (Figure 10).

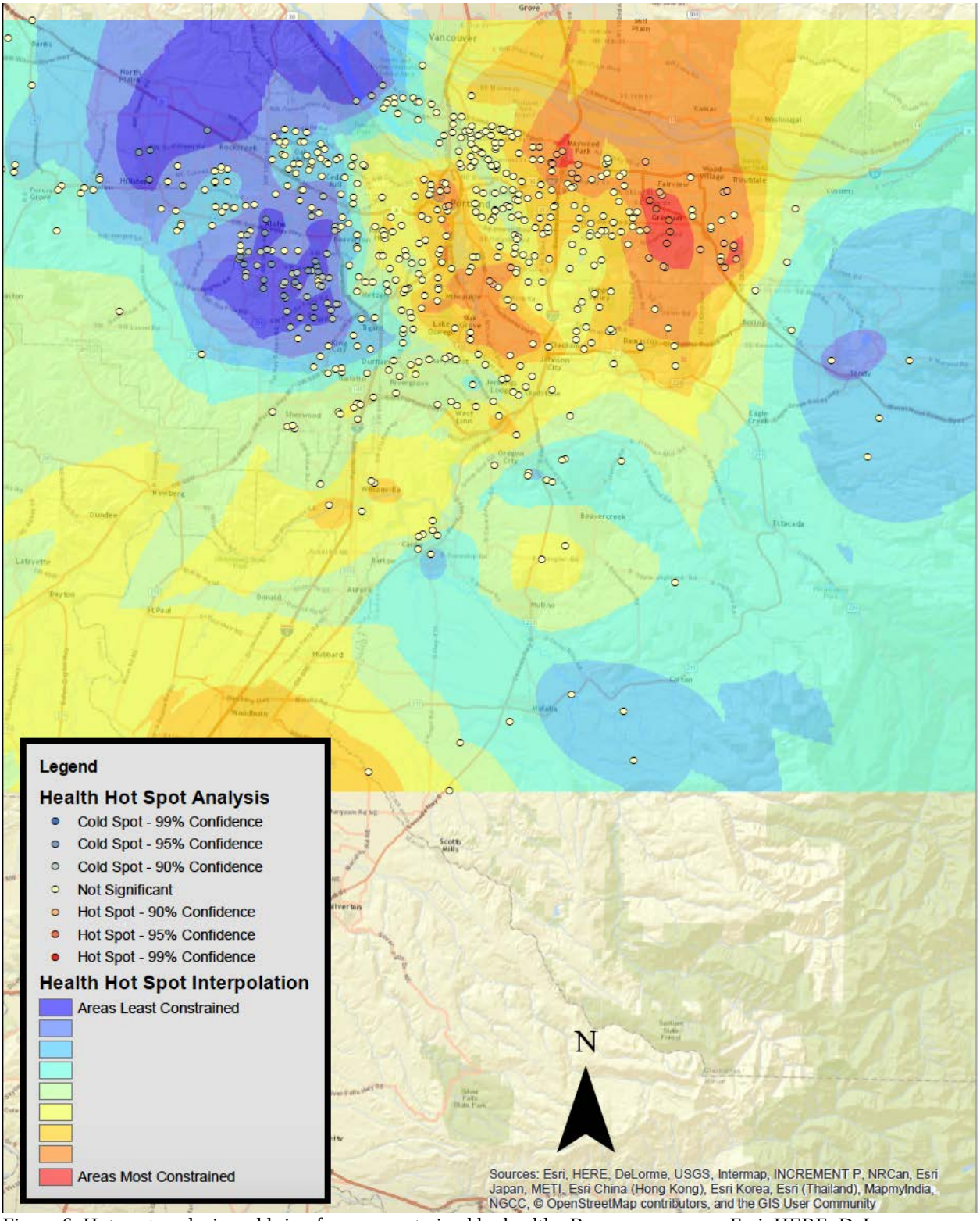

Figure 6. Hot spot analysis and krig of areas constrained by health. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

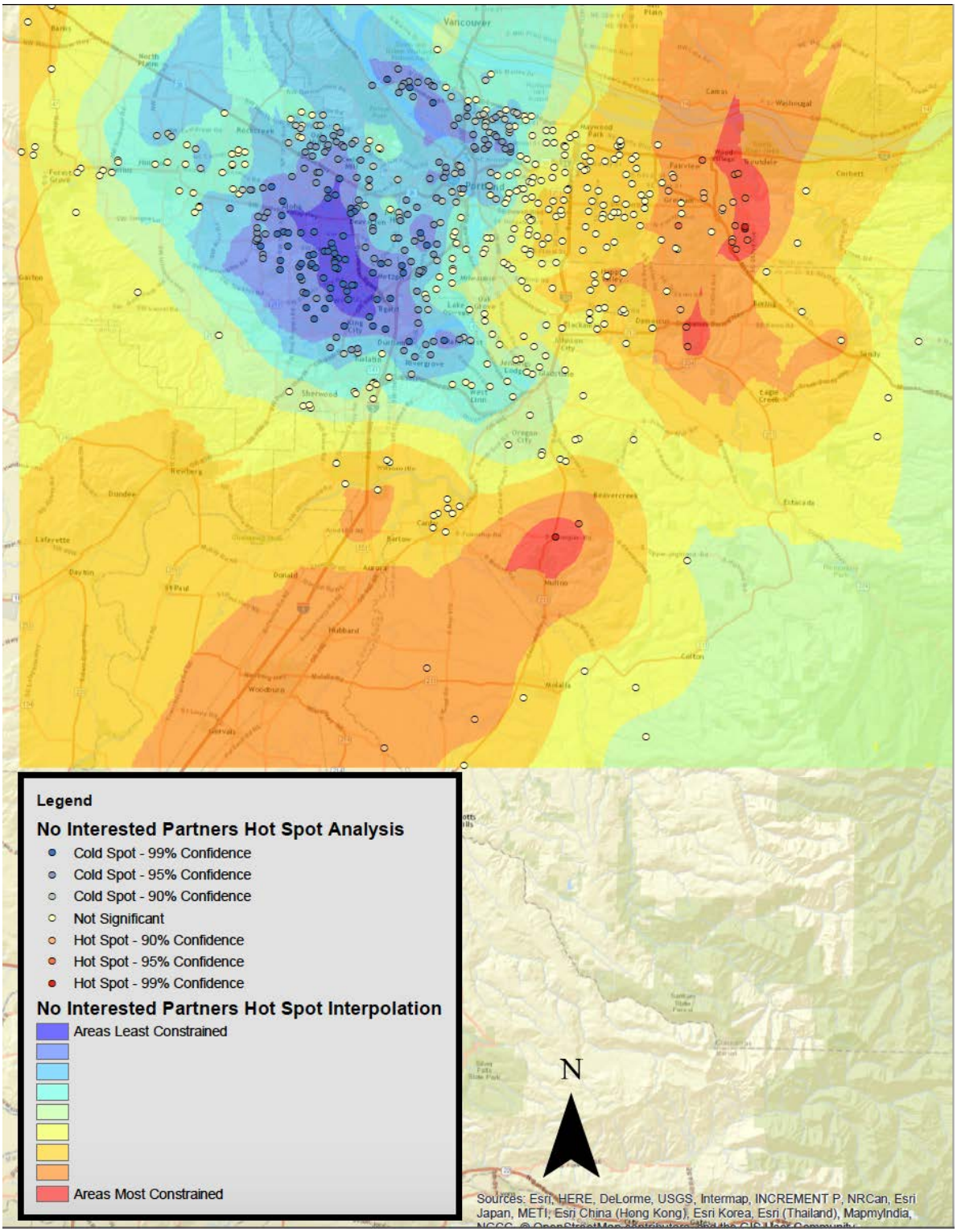

Figure 7. Hot spot analysis and krig of areas constrained by lack of partners. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

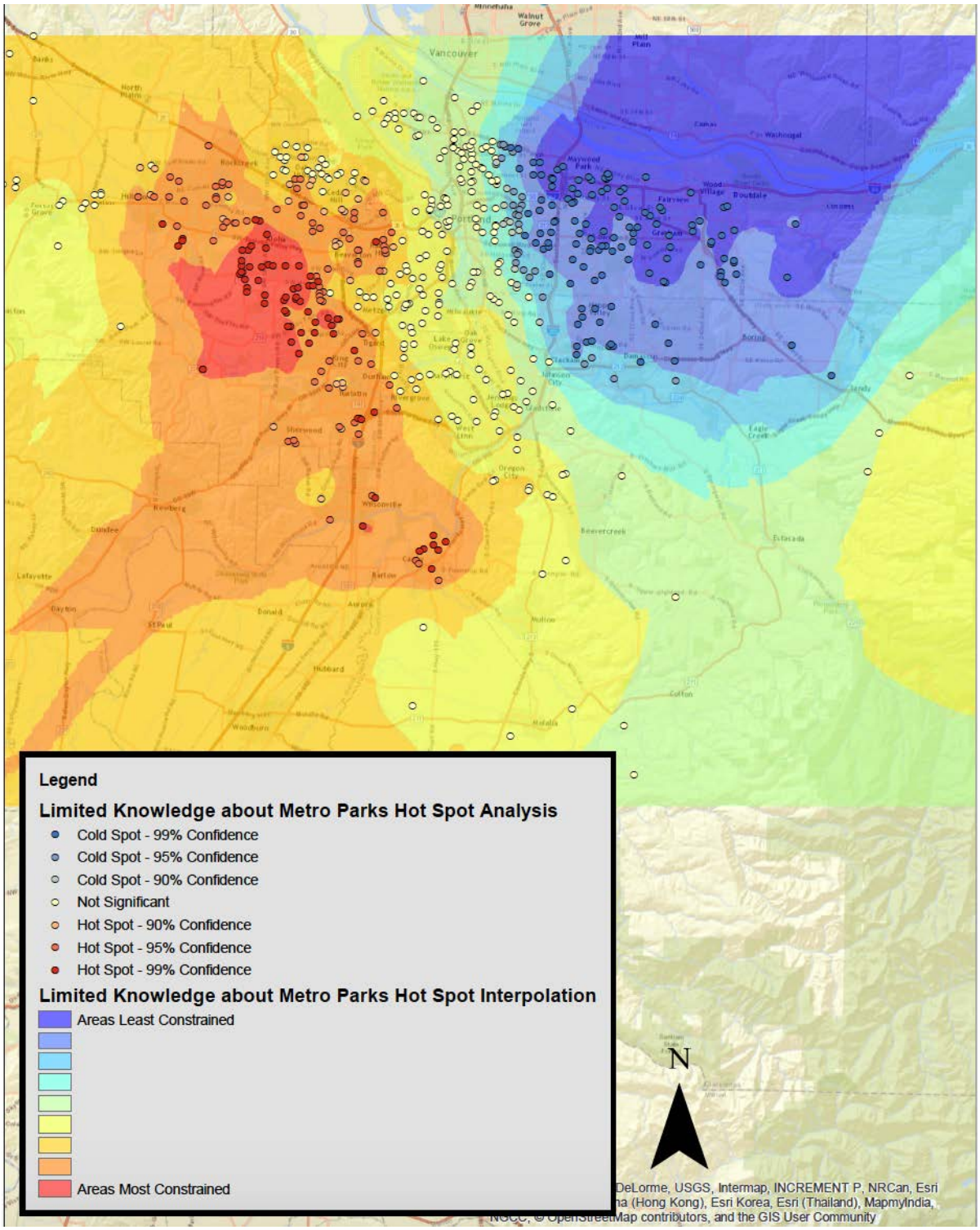

Figure 8. Hot spot analysis and krig of areas constrained by limited knowledge about Metro parks. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

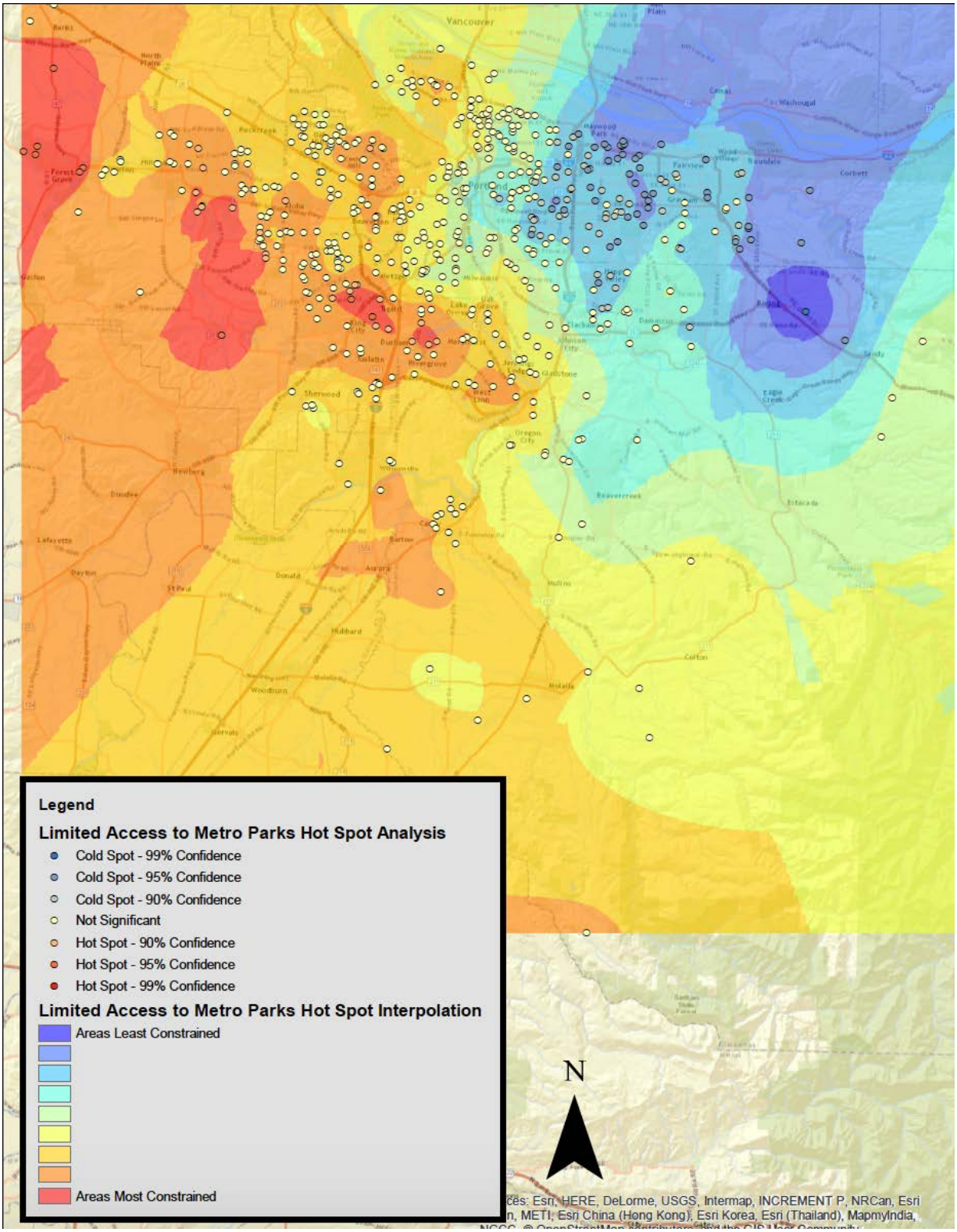

Figure 9. Hot spot analysis and krig of areas constrained by limited access. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

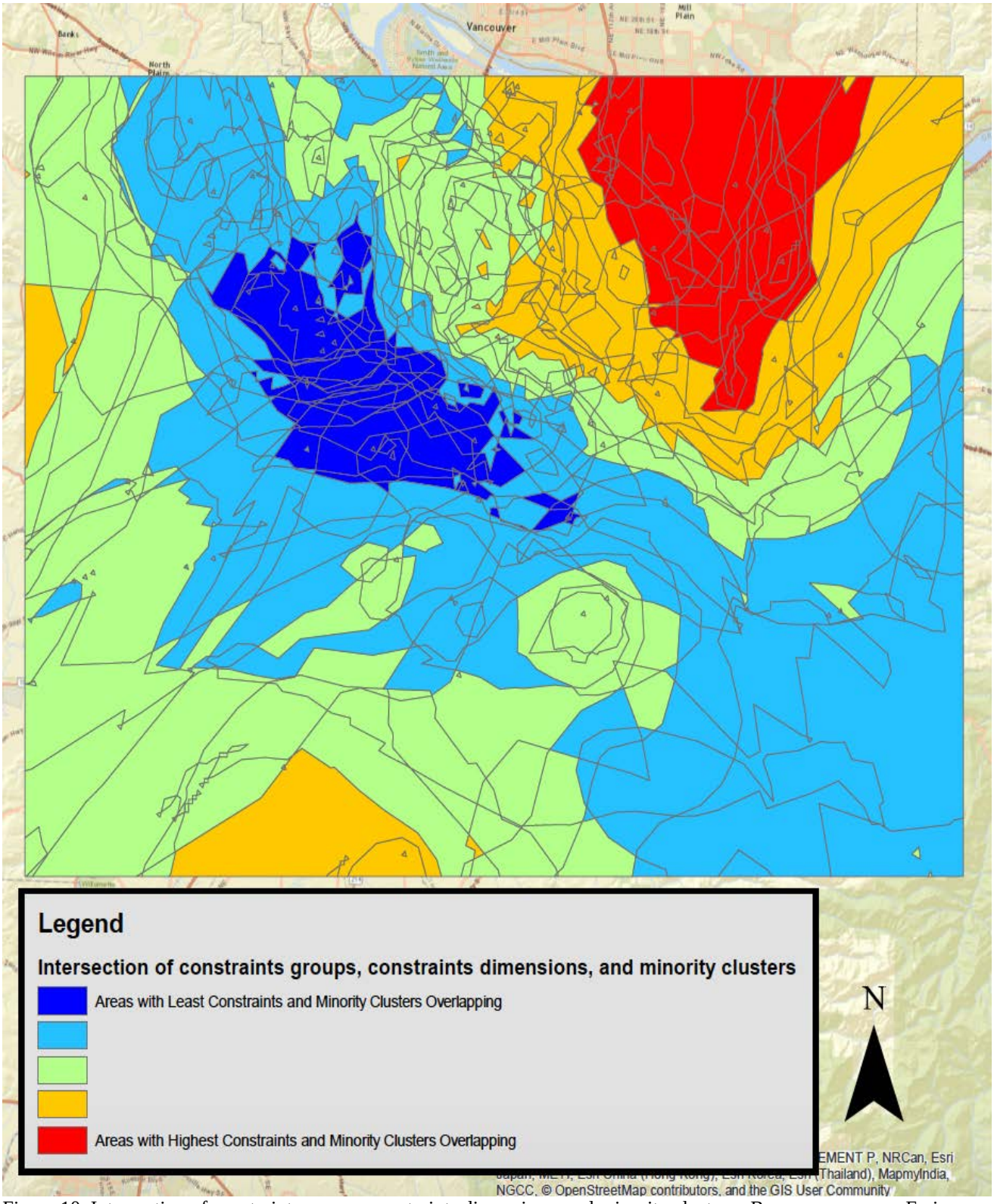

Figure 10. Intersection of constraints groups, constraints dimensions, and minority clusters. Base map sources: Esri, HERE, DeLorm, USGS, Intermap, INCREMENT P, NR Can, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Discussion

This study was conducted partly in response to Jackson's (1994) call to integrate the fields of constraints and geography given the limited research exploring spatial attributes of constraints to recreation. This research is methodologically novel in that it analyzes social science survey data spatially to examine the distribution of constraints across an urban area. Results revealed two major trends in the Portland metropolitan region: (a) there is a clustering of minority residents overlapping with the most constrained hot spots in the northeast area of the region, with residents most affected by constraints associated with health and lack of recreation partners; and (b) residents in the southwest area of the region are most affected by constraints associated with limited knowledge and access to parks. This methodology is replicable and these results have clear implications for both research and management.

Implications for Management

From a management perspective, the interpolated maps generated from the hot spot analyses provide visual representations of estimated residential distributions (e.g., race / ethnicity) and constrained communities in the Portland region. These findings can allow managers to understand where high densities of certain populations (e.g., racial / ethnic minorities) reside, what areas are most impacted by constraints, and whether communities in these locations face specific types (i.e., dimensions) of constraints. With these visualizations, managers can follow a more directed and efficient approach to community outreach, marketing, and efforts to relieve constraints.

Results also showed that many minority residents clustered in the northeast area of the region. Managers with goals to include more racial and ethnic minorities in outdoor recreation participation may consider directing outreach to minority-dense areas such as this northeast part

of the region. Outreach to minorities may include contacting community leaders and hubs (e.g., markets, pre-existing community groups and organizations, churches) that should be culturally relevant and appropriate (Stodolska & Yi-Kook, 2005). Once this effort has been built or expanded, then managers can learn how to make parks feel more welcoming for minority groups. In addition to reaching minority communities, it is imperative that managers address the specific constraints that these residents face to best serve the population. Residents in the northeast part of this region are not only significantly more constrained by health and lack of partners, but are also the most constrained population in the entire region. Managers should direct efforts to understand how to help relieve constraints for this community, such as possibly providing more ADA accessibility and benches for people with physical health constraints, and more group oriented programming for visitors to meet recreation partners.

Hot spots of residents constrained by lack of knowledge about Metro parks and lack of access to these parks appeared in the western and southwestern areas of the region. These results were consistent with the open-ended responses at the end of the questionnaire, where many respondents complained about lack of parks in this part of the region (Needham & Rushing, 2017). There are fewer Metro parks in the west and southwest areas of this region than in the north and northeast, so it would be expected that residents in these areas would know less about these parks and would feel more constrained by distance and access. A notable finding is that Cooper Mountain Nature Park is located in the center of the hot spot for limited knowledge about Metro parks, which suggests that managers should improve marketing of parks in this community given that some of its residents are currently unaware there is a Metro park in their neighborhood. To address constraints associated with limited knowledge and access to parks in the southwest part of the region, managers also need to increase broader marketing and outreach

in this area of the region. If managers wish to attract more people living in this area to their parks, they may also need to work with city planners to expand public transportation bringing residents in the southwest to park destinations in other areas of the region, such as the northeast. In addition, if managers are in a position to acquire more land for parks and protected areas, they may want to consider focusing land acquisitions on the southwest area of the region. These results can provide managers with a representative and specified starting point for directing constraints relief and inclusion efforts across the region they serve.

Implications for Research

Implications of this work also contribute to both theory and methodology. These findings confirm past research showing that areas with higher minority resident clustering overlap with areas that have clustering of the most constrained residents. For example, research has shown that demographic factors, such as race and ethnicity, predict constraints and can work in unison with these constraints, resulting in compounding effects (Shores et al., 2007; Walker & Virden, 2005). Despite mixed findings in the literature, race and ethnicity are also sometimes associated with health-related constraints (Centers for Disease Control and Prevention, 2004; Lowry, Kann, Collins, & Kolbe, 1996; Taylor, Floyd, Whitt-Glover, & Brooks, 2007). Past research has also shown that racial and ethnic minorities generally prefer to recreate with partners and other familiar people, often in large groups such as with families (Floyd et al., 1994; Gobster, 2002; Johnson & Monroe, 2008; Payne, Mowen, & Orsega-Smith, 2002; Schelhas, 2002; Shinew et al., 2004). The overlapping of areas with higher minority clustering and residents who are significantly more constrained by health issues and a lack of recreation partners are predictable in light of this previous research.

A goal of this exploratory research was to respond to Jackson's (1994) call for integrating geographical and social psychological research on constraints, and determine if constraints to recreation could be analyzed spatially. Analyses of this kind provide researchers and managers alike with a novel way for understanding constraints as they vary spatially across a geographical area. Since Jackson's (1994) call, however, there has been limited research on how constraints relate to spatial attributes. Research that does exist has largely focused on residential distance from recreation sites; spatial analysis of additional constraints and the extent that they are related to other resident characteristics (e.g., race and ethnicity) have received little attention (Jackson, 1994; Tarrant & Cordell, 1999; Tarrant & Porter, 2005). Results from this study show that spatial hot spot analyses of multiple constraints can reveal clear trends across an urban area. The resulting visualizations from these analyses allow researchers to see spatial patterns in constraints and can serve as tools for efficiently directing further research and funding efforts to relieve relevant constraints for specific communities.

Results presented here examined dimensions of constraints with notable and significant spatial patterns ("health," "no interested partners," "limited knowledge about Metro parks," "limited access to Metro parks"); there were other dimensions of constraints that did not show significant spatial clustering of hot and cold spots (e.g., "disinterest in visiting parks and natural areas," "fear," "costs"). This study, however, is limited to a single geographical area (i.e., Portland metropolitan region) and results may not extend to other regions. Future research, therefore, should investigate all 13 dimensions of constraints in other locations to explore whether the clustering patterns found and not found here hold true in other locations, or if significant spatial patterns are site-specific. This research was also limited to examining racial

and ethnic minorities as a single combined group. Given that each race and culture is unique, future research should compare subpopulations within the "traditionally underserved" category.

This exploratory study found that hot spot analysis of constraints, distribution of traditionally underserved and well-served residents, and constraints groups is a novel way of understanding spatial attributes of these constraints. Other spatial analysis techniques, such as cluster and outlier analysis, grouping analysis, and optimized hot spot analysis, could have been used, but hot spot analysis was chosen because it tends to be more robust in dealing with potential outliers (Caldas de Castro & Singer, 2006). Future research should expand on these findings using hot spot analysis and other spatial analysis techniques, examine more concepts that have not been traditionally analyzed spatially (e.g., norms, motivations, attachment), and continue responding to Jackson's (1994) call for integrating classical social science research with more contemporary geographic approaches. One advantage of the methodological and analytical approaches used here is that they can be applied to results of any sample or survey that contains geographic point location information (e.g., residential latitude and longitude). Using this information to conduct spatial analyses of constraints and other concepts will contribute to a greater understanding of these concepts and how they relate to geographical spaces. This will also provide managers with important, accessible material for efficiently addressing constraints and other issues faced by their clientele, thereby creating a more inclusive environment in spaces they manage.

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CHAPTER FOUR

CONCLUSION

This thesis investigated constraints to urban park visitation among traditionally well-served and underserved residents of the Portland, Oregon metropolitan region. For the purpose of this research, the general underrepresentation of racial and ethnic minorities in outdoor recreation (Manning, 2011) justified classifying them as "traditionally underserved," whereas the white majority's overrepresentation justified classifying them as "traditionally well-served." In two standalone articles, this thesis examined: (a) comparisons of constraints between traditionally well-served and underserved populations, (b) relationships among constraints and both place attachment and park visitation for both of these populations, and (c) how constraints groups, different types of constraints, and resident characteristics (e.g., minorities) are distributed spatially across this region. This thesis contributes to the field and literature on constraints by introducing novel understanding of theoretical relationships among constraints, visitation, and attachment, and applications of GIS analysis of survey data to understand spatial variations in constraints and how these are related to geographical distributions of traditionally underserved populations.

Some findings in this thesis confirmed past research. Results in chapter two, for example, showed that the most prevalent constraints to visiting parks and natural areas in the Portland region were limited knowledge about Metro parks, lack of access to these places, and being too busy to visit. These findings are consistent with previous research showing that constraints related to park visitation are usually structural and include lack of time, information, and access (e.g., Crompton & Kim, 2004; Jackson, 2000; Lawton & Weaver, 2008; Scott & Mowen, 2010; Zanon et al., 2013). The finding that traditionally well-served residents visited all

parks and natural areas in the Portland region (including Metro parks) more frequently than did underserved residents also aligns with previous research showing that whites often participate more often than minorities in outdoor recreation (Manning, 2011). Underserved residents are also more likely to experience constraints related to their recreation preferences and their racial, ethnic, and cultural identities (Byrne & Wolch, 2009; Fernandez et al., 2015; Floyd et al., 1994; Stodolska, 2015; Stodolska & Yi-Kook, 2005; Washburne, 1978). Previous research, for example, has shown that racial and ethnic minorities prefer recreating in larger groups with people of similar backgrounds (e.g., families) and in more developed areas where facilities and services (e.g., barbeques, picnic tables, shelters, restrooms) are important (Chavez & Olson, 2009; Floyd et al., 1994; Gobster, 2002; Ho et al., 2005; Krymkowski et al., 2014; Manning, 2011; Washburne, 1978). Results in this thesis are consistent with these previous findings, as they showed that underserved residents were significantly more constrained than well-served residents by lack of facilities / services at Metro parks and by race and cultural issues at Metro parks in particular and at all parks and natural areas in the Portland region in general.

Little previous research has examined relationships among constraints, visitation, and place attachment. Research on place attachment suggests that repeat visitation is an important contributor related to attachment (Brooks et al., 2007; Hammitt et al., 2004; Moore & Graefe, 1994; Williams et al., 1992; Williams & Vaske, 2003). Constraints are often thought to impede, limit, or alter recreation park visitation, so therefore may be directly or indirectly related to attachment to a park. This research, therefore, explored relationships among these concepts. Findings aligned with the limited previous research in that visitation frequency and some constraints were related to resident attachment to their favorite Metro park. For both traditionally well-served and underserved residents, frequency of visitation was positively

associated with place attachment. Constraints and frequency of visitation together explained 15% of the variance in place attachment for traditionally well-served residents and 38% for underserved residents, suggesting that constraints and visitation may be more important factors in attachment for underserved residents. Constraints explained only 4% of the variance in visitation for well-served residents and 26% for underserved residents. For both traditionally well-served and underserved residents, there were relatively few dimensions of constraints that were significantly related to visitation, suggesting that both groups negotiated these constraints and visited their favorite Metro park despite the constraints they face.

Results in chapter two also have management implications. Findings suggested that to increase visitation and attachment to parks, especially among traditionally underserved residents, constraints are important for managers to address. Managers cannot easily resolve issues related to lack of time, but disinterest, access, knowledge, costs, fear, lack of facilities / services, and feeling that some parks are not the best places for recreation can be addressed by managing agencies. For example, managers could explore expanding public transportation to include areas near their parks, improve marketing by making information about their parks more relevant and accessible, implement differential pricing (e.g., no fee days, discount pricing), increase safety and security measures (e.g., enforcement, patrols, lighting, emergency call boxes), improve and add more facilities where applicable (e.g., picnic areas, barbeques), and engage with local residents and community organizations (e.g., churches, communities of color coalitions) to determine what would make parks more attractive and accessible for residents.

Just as there has been limited research exploring relationships among constraints, visitation, and place attachment, there has been even fewer studies exploring spatial attributes of constraints. Studies that have examined spatial aspects of constraints have focused primarily on

residential distance from recreation resources (Jackson, 1994; Tarrant & Cordell, 1999; Tarrant & Porter, 2005). For all parks, including urban parks, distance from the resource can be a constraining factor inhibiting visitation (Jackson, 2000). Research has shown, however, that distance alone is often not the most prevalent constraint that visitors face, especially when compared to costs of visitation (e.g., park fees, travel cost), lack of time, and fear of crime (Byrne & Wolch, 2009; Gobster, 2002; Hultsman, 1995; Jackson, 1994; Tarrant & Cordell, 1999; Tarrant & Porter, 2005). Given the paucity of studies on spatial aspects of constraints, Jackson (1994) called for integrating geographical and social psychological research by stating that "it is necessary not only to analyze spatial variations in constraints on recreation and leisure, but also to compare the relative explanatory power of space and place with other variables that may have a greater or lesser impact on people's leisure choices" (p. 111).

Chapter three responded to this gap in the literature by investigating spatial distributions of constraints groups, dimensions or types of constraints, and residential location of traditionally underserved residents. Results revealed two major trends in the Portland metropolitan region: (a) there is a clustering of minority residents overlapping with the most constrained hot spots in the northeast area of the region, with these residents most affected by constraints associated with health and lack of recreation partners; and (b) residents in the southwest area of the region are most affected by constraints associated with limited knowledge and access to parks. Five of the constraints dimensions showed significant spatial clustering, whereas the other dimensions did not. Taken together with the findings from chapter two, however, it is clear that the other dimensions of constraints (e.g., being too busy) are important, but they are likely to be more widespread across the study area and not spatially bound to specific locations. In addition, chapter two showed that lack of facilities and services at Metro parks, and racial and cultural

issues at Metro parks and other parks and natural areas in the region were significantly more constraining for traditionally underserved residents. These constraints, however, did not exhibit any clear spatial relationships with the residential hot spot locations for these traditionally underserved residents. This could be for two reasons: (a) many residents who felt constrained by these issues may have been in the nonprobability sample and were therefore not analyzed spatially, or more likely (b) residents who felt most constrained by these issues may have lived throughout the Portland metropolitan region, so results were possibly more evenly distributed and would not present geographic hot spots.

Beyond localized spatial variation in constraints, these results also indicated that spatial hot spot analyses of multiple constraints revealed clear trends across an urban area. The resulting visualizations from these analyses can allow researchers and managers to see spatial patterns in constraints that can serve as tools for efficiently targeting future research and management efforts to help relieve relevant constraints for specific communities.

Taken together, this thesis explored original research questions that contribute to management, theory, and research methodology and analysis. Future research can build on this work in many ways. First, this study was limited to a single geographic area (i.e., Portland metropolitan region) and results may not extend to other regions, so future studies should examine spatial attributes of constraints and theoretical relationships among constraints, visitation, and attachment across additional settings to determine if results found here generalize to other locations. Second, this research was limited to examining racial and ethnic minorities as a single combined group. Given that each race and culture is unique, future research should compare subpopulations within traditionally underserved residents. Third, although previous research has examined constraints in a framework consisting of three broad categories (i.e.,

interpersonal, intrapersonal, structural; Crawford & Godbey, 1987), analyses performed in this thesis examined more nuanced dimensions of this concept and relationships with other concepts, which have not been thoroughly confirmed in the existing literature. Future research should confirm these findings with confirmatory factor analysis and structural equation modeling. Fourth, some previous studies have found that place attachment separates into dimensions of place identity and place dependence (Manning, 2011; White, Virden, & Riper, 2008; Williams & Vaske, 2003). This study here and others (Kyle, Graefe, & Manning, 2005; Wickham & Kerstetter, 2000; Wynveen et al., 2017), however, found that these two dimensions overlap and have treated them as a single index of attachment. Place attachment research has also included additional related dimensions such as social and place bonding, familiarity, belonging, and rootedness (Manning, 2011). Research should examine relationships among constraints, visitation, and these other dimensions of attachment. Finally, research should expand on the findings in this thesis by continuing to respond to Jackson's (1994) call for integrating classical social science research on constraints with more contemporary geographic approaches. Analysis of constraints spatially will improve understanding of this concept and provide managers with important geographically targeted information for efficiently addressing constraints that their clientele face and creating a more inclusive environment in spaces they manage.

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APPENDIX

Your opinions about Metro parks and natural areas

Important questions for Portland-area residents

Please complete this survey and return it in the envelope as soon as possible

Participation is voluntary and responses are confidential

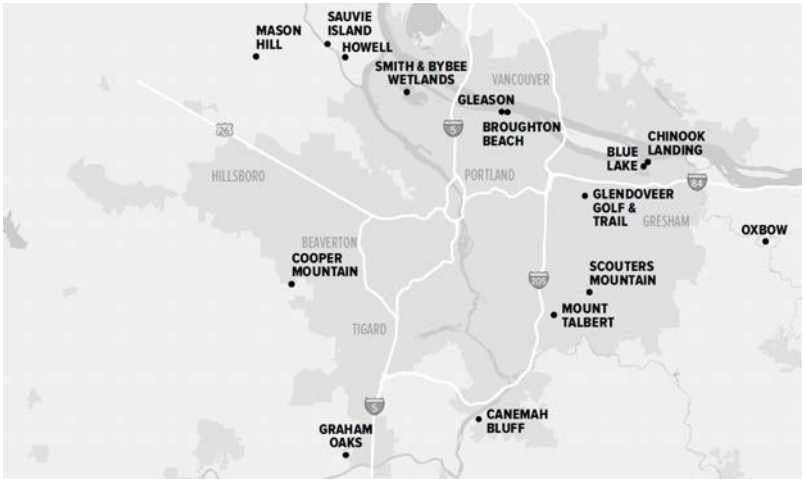
Thank you for your participation!

A study conducted by:

OSU Oregon State University

Metro

We are conducting this survey to learn about your opinions regarding parks and natural areas in the Portland region. Your input is important and will assist managers. ***Please complete this survey and return it in the addressed and postage-paid envelope.***



1. The map above shows parks in the region that are managed by Metro. These are referred to as "***Metro parks***" in this survey. Have you ever visited ***any*** of these parks? **(check *ONE*)**

   ☐ No → if no, please skip to question 7 on the next page

   ☐ Yes → if yes, about how many times have you visited any of these parks ***in the last 12 months***? **(write number)** _____ time(s)

2. Which of these Metro parks have you visited (shown on the map above)? **(check *ALL THAT APPLY*)**

☐ ***A.*** Oxbow Regional Park	☐ ***F.*** Smith & Bybee Wetlands Natural Area	☐ ***K.*** Graham Oaks Nature Park
☐ ***B.*** Blue Lake Regional Park	☐ ***G.*** Sauvie Island Boat Ramp	☐ ***L.*** Canemah Bluff Nature Park
☐ ***C.*** Chinook Landing Marine Park	☐ ***H.*** Howell Territorial Park	☐ ***M.*** Mount Talbert Nature Park
☐ ***D.*** Broughton Beach	☐ ***I.*** Mason Hill Park	☐ ***N.*** Scouters Mountain Nature Park
☐ ***E.*** James Gleason Boat Ramp	☐ ***J.*** Cooper Mountain Nature Park	☐ ***O.*** Glendoveer Golf Course & Fitness Trail

3. From Question 2 above, what is your ***ONE*** favorite Metro park (shown on the map above)? **(write *ONE* letter)**

   Letter for your favorite Metro park _____

4. About how many times have you visited this one favorite Metro park (from Question 3 above) ***in the last 12 months***? _____ time(s)

5. What can Metro do to make this one favorite Metro park (from Question 3 above) even better? **(write response) _____**

   _____

6. Thinking about this one favorite Metro park (from Question 3 above), to what extent do you disagree or agree with each of the following statements? **(circle one number for *EACH*)**

	Strongly Disagree	Disagree	Agree	Strongly Agree
When visiting this park, I usually feel a connection with nature.	1	2	3	4
I feel this park is a part of me.	1	2	3	4
Visiting this park says a lot about who I am.	1	2	3	4
The more often I visit this park, the more I feel emotionally attached to this park.	1	2	3	4
I would not substitute any other place for what I enjoy doing at this park.	1	2	3	4
No other park can compare to this park.	1	2	3	4
The more often I visit this park, the better it becomes for what I like to do.	1	2	3	4
Time spent at this park allows me to bond with my family or friends.	1	2	3	4
Visiting this park allows me to spend time with people who are close to me.	1	2	3	4
The more often I visit this park, the more I associate it with special people in my life.	1	2	3	4

7. If you could visit any of the Metro parks, what ***day(s) of the week*** would be most convenient to visit? **(check *ALL THAT APPLY*)**

☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday

8. If you could visit any of the Metro parks, what ***time(s) of the day*** would be most convenient to visit? **(check *ALL THAT APPLY*)**

☐ Early Morning ☐ Late Morning ☐ Early Afternoon ☐ Late Afternoon ☐ Evening

9. To what extent do you disagree or agree that each of the following make it difficult for you or your family to visit Metro parks? **(circle one number for *EACH*)**

	Strongly Disagree	Disagree	Agree	Strongly Agree
A. I do not know enough about what I can do at Metro parks.	1	2	3	4
B. Before receiving this survey, I did not know where Metro parks were located.	1	2	3	4
C. I do not know where to get information about Metro parks.	1	2	3	4
D. The activities I enjoy doing are not available in Metro parks.	1	2	3	4
E. Visiting Metro parks is hard for me because they take too long to get to or are too far away.	1	2	3	4
F. There is no public transportation (e.g., buses) to the Metro parks I want to visit.	1	2	3	4
G. I do not feel emotionally attached to any Metro parks.	1	2	3	4
H. Metro parks are not the best places for the activities I enjoy doing.	1	2	3	4
I. I cannot take pets (e.g., dogs) to Metro parks.	1	2	3	4
J. I tend to avoid Metro parks because they are too crowded.	1	2	3	4
K. There are not enough developed facilities / services at Metro parks (e.g., picnic tables, barbeques, picnic shelters, restrooms).	1	2	3	4
L. Metro parks do not provide online reservations of picnic areas / shelters.	1	2	3	4
M. Facilities at Metro parks are difficult to access for people with disabilities / mobility issues.	1	2	3	4
N. Metro parks are not natural enough (in other words, there is too much development now).	1	2	3	4
O. Metro parks have too many rules / regulations.	1	2	3	4
P. Metro parks do not feel welcoming to me or my family.	1	2	3	4
Q. Metro parks do not have enough *staff* representing my racial, ethnic, or cultural group.	1	2	3	4
R. Metro parks do not have enough *visitors* representing my racial, ethnic, or cultural group.	1	2	3	4
S. Metro parks do not have *programs* for people in my racial, ethnic, or cultural group.	1	2	3	4
T. Other (write response) _____	1	2	3	4

10. From the list in Question 9 (above), please choose up to ***three*** that are the most important for park managers to address in order to make it easier for you or your family to visit Metro parks in the future. **(write up to *three letters* from the question above)**

Letter(s) _____ _____ _____

11. Do you think Metro should provide information in parks (e.g., signs, staff, programs) in languages other than English? **(check *ONE*)**

☐ No

☐ Yes → if yes, what other languages should be used for information? **(write up to three)** _____ _____ _____

12. If Metro required only credit cards to pay park fees (e.g., parking, reservations), how would it change your visitation? **(check *ONE*)**

☐ I would visit less ☐ I would visit the same as now ☐ I would visit more ☐ I don't visit Metro parks, so it doesn't matter

13. Now, we would like to ask about ***all parks or natural areas in the Portland region in general (not just Metro parks)***.
About how many times have you visited parks or natural areas in the Portland region ***in the last 12 months***? **(check *ONE*)**

☐ Never visited in the last 12 months (0 times per year)
☐ Less than once a month (1 to 11 times per year)
☐ About once a month (12 to 18 times per year)
☐ About two or three times a month (19 to 45 times per year)
☐ About once a week (46 to 80 times per year)
☐ Two or more times a week (81 or more times per year)

14. To what extent do you disagree or agree that each of the following make it difficult for you or your family to visit parks or natural areas in the Portland region? **(circle one number for *EACH*)**

	Strongly Disagree	Disagree	Agree	Strongly Agree
A. I am not interested in visiting parks or natural areas in the Portland region.	1	2	3	4
B. The *fees* at parks or natural areas in the Portland region are too expensive for me.	1	2	3	4
C. It is too expensive for me to *travel to* parks or natural areas in the Portland region.	1	2	3	4
D. I am too busy or do not have enough free time to visit parks or natural areas in the Portland region.	1	2	3	4
E. Poor health or physical limitations make it difficult for me to visit parks or natural areas in the Portland region.	1	2	3	4
F. I have a disability that makes it difficult for me to visit parks or natural areas in the Portland region.	1	2	3	4
G. I do not have anyone to visit parks or natural areas in the Portland region with.	1	2	3	4
H. My partner or family is not interested in visiting parks or natural areas in the Portland region.	1	2	3	4
I. Someone I recreate with is physically unable to visit parks or natural areas in the Portland region.	1	2	3	4

15. From the list in Question 14 (above), please choose up to ***three*** that are the most important for park managers to address in order to make it easier for you or your family to visit parks or natural areas in the Portland region in the future. **(write up to *three letters*)**

Letter(s) _____ _____ _____

16. To what extent do you disagree or agree that each of the following make it difficult for you or your family to visit parks or natural areas in the Portland region? **(circle one number for *EACH*)**

	Strongly Disagree	Disagree	Agree	Strongly Agree
A. Parks or natural areas in the Portland region do not feel welcoming to me or my family.	1	2	3	4
B. I am afraid of outdoor places such as parks or natural areas in the Portland region.	1	2	3	4
C. I do not feel safe going to parks or natural areas in the Portland region.	1	2	3	4
D. I fear crime in parks or natural areas in the Portland region.	1	2	3	4
E. I tend to avoid parks or natural areas in the Portland region because I am afraid of injury.	1	2	3	4
F. Information (e.g., staff, signs, programs) at parks or natural areas in the Portland region is often only in English, making it difficult for me to visit.	1	2	3	4
G. Parks or natural areas in the Portland region do not have enough *staff* representing my racial, ethnic, or cultural group.	1	2	3	4
H. Parks or natural areas in the Portland region do not have enough *visitors* representing my racial, ethnic, or cultural group.	1	2	3	4
I. Based on my *own personal experience*, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region.	1	2	3	4
J. Based on *experiences of someone close to me*, I fear prejudice from staff or other visitors at parks or natural areas in the Portland region.	1	2	3	4

17. From the list in Question 16 (above), please choose up to ***three*** that are the most important for park managers to address in order to make it easier for you or your family to visit parks or natural areas in the Portland region in the future. **(write up to *three letters*)**

Letter(s) _____ _____ _____

18. What would make parks or natural areas in the Portland region feel more welcoming to you? **(write response) _____**

_____

19. When visiting parks or natural areas in the Portland region, how interested are you in ***experiencing*** each of the following?
(circle one number for *EACH*)

	Not Interested	Slightly Interested	Moderately Interested	Very Interested
Guided walks in natural areas (e.g., seeing birds, wildlife, wildflowers).	1	2	3	4
Wetland canoe or kayaking tours.	1	2	3	4
Practicing art in nature (e.g., drawing, painting, writing, photography).	1	2	3	4
Storytelling in nature (e.g., sharing stories, songs, performances).	1	2	3	4
Harvesting seeds or planting native plants.	1	2	3	4
Collecting data about nature or wildlife to help scientific research.	1	2	3	4
Cleaning up / caring for trails.	1	2	3	4
Stargazing (observing stars / planets).	1	2	3	4
Searching for mushrooms.	1	2	3	4
Other (write response) _____	1	2	3	4

20. When visiting parks or natural areas in the Portland region, how interested are you in the following ***sources of information***?
(circle one number for *EACH*)

	Not Interested	Slightly Interested	Moderately Interested	Very Interested
Speaking with park staff / personnel.	1	2	3	4
Signs with directions for how to get to parks or move around inside parks.	1	2	3	4
Educational / interpretive signs in parks.	1	2	3	4
Maps of parks.	1	2	3	4
Printed brochures or guides that you can carry with you.	1	2	3	4
Information accessed with a smartphone using apps, codes, or websites.	1	2	3	4
Organized educational programs (e.g., tours, interpretive talks).	1	2	3	4
Displays in visitor centers.	1	2	3	4
Other (write response) _____	1	2	3	4

21. When visiting parks or natural areas in the Portland region, how interested are you in learning about the following ***topics***?
(circle one number for *EACH*)

	Not Interested	Slightly Interested	Moderately Interested	Very Interested
How humans used the land in the past (includes agriculture and forest management).	1	2	3	4
Significance of the land to Native American communities.	1	2	3	4
The role of nature in healthy or livable communities.	1	2	3	4
Climate change.	1	2	3	4
Plants, animals, or birds of the region.	1	2	3	4
Soils or how soils are formed.	1	2	3	4
Natural processes (e.g., floods, fires).	1	2	3	4
Water quality in the region's streams / rivers.	1	2	3	4
How agencies such as Metro manage / care for their land.	1	2	3	4
What activities or events you can do at nearby parks or natural areas.	1	2	3	4
Other (write response) _____	1	2	3	4

22. When visiting parks or natural areas in the Portland region, how interested are you in learning about the following ***skills***? **(circle one number for *EACH*)**

	Not Interested	Slightly Interested	Moderately Interested	Very Interested
How to use a map with a compass (basic orienteering).	1	2	3	4
Outdoor survival skills (e.g., shelter, water, fire, flood).	1	2	3	4
How to identify plants or trees (e.g., for fun, food, healing).	1	2	3	4
How to identify animal tracks or signs of wildlife.	1	2	3	4
How you or your family can hike safely.	1	2	3	4
How to camp overnight safely.	1	2	3	4
How to lead or teach groups outdoors.	1	2	3	4
Natural gardening skills for home.	1	2	3	4
How or where to fish.	1	2	3	4
Archery basics.	1	2	3	4
Other (write response) _____	1	2	3	4

23. How often do you participate in each of the following activities when visiting parks or natural areas in the Portland region? **(circle one number for *EACH*)**

	Never	Once or Twice	Sometimes	Often
A. Hiking or walking for pleasure.	1	2	3	4
B. Jogging, running, or walking for exercise.	1	2	3	4
C. Picnicking, barbecuing, or family gatherings.	1	2	3	4
D. Relaxing, hanging out, or escaping the weather / heat.	1	2	3	4
E. Bicycling (road bike or mountain bike).	1	2	3	4
F. Horseback riding.	1	2	3	4
G. Camping (e.g., tents, cabins, recreational vehicles).	1	2	3	4
H. Fishing for fun or for food.	1	2	3	4
I. Swimming or wading.	1	2	3	4
J. Motorized boating.	1	2	3	4
K. Non-motorized boating (e.g., canoe, kayak, row, paddle, raft).	1	2	3	4
L. Field sports or games (e.g., soccer, baseball, softball, football).	1	2	3	4
M. Disc golf.	1	2	3	4
N. Wildlife watching, birding, or nature study.	1	2	3	4
O. Photography, painting, or drawing.	1	2	3	4
P. Participating in nature education programs (e.g., talks, tours).	1	2	3	4
Q. Visiting nature centers, historic sites, or related facilities.	1	2	3	4
R. Enjoying playgrounds or other facilities often used by children.	1	2	3	4
S. Other (write response) _____	1	2	3	4

24. From the list in Question 23 (above), please choose the ***ONE*** activity that you do most often when visiting parks or natural areas in the Portland region. **(write letter)**

Letter for most common activity _____

25. When looking for a place in a park to picnic and gather, which of the following two options would you prefer the most? **(check *ONE*)**

☐ First-come-first-served (non-reservable) picnic areas / shelters ☐ Reservable (in advance) picnic areas / shelters

26. In general, how interested are you in each of the following? **(circle one number for *EACH*)**

	Not Interested	Slightly Interested	Moderately Interested	Very Interested
Paid jobs or internships in parks and nature for *adults*.	1	2	3	4
Paid jobs or internships in parks and nature for *youth*.	1	2	3	4
Learning about careers in the parks and nature field.	1	2	3	4
Learning about how to work as a contractor / consultant for parks and nature agencies.	1	2	3	4
Volunteer (unpaid) opportunities in parks and nature for *adults*.	1	2	3	4
Volunteer (unpaid) opportunities in parks and nature for *youth*.	1	2	3	4

27. What words or short phrases would you associate with the word "nature?" **(write up to three responses on the lines below)**

_____ _____ _____

28. What makes you feel personally connected to nature? **(write response)** _____

29. How do you describe yourself? ☐ Male ☐ Female ☐ Transgender ☐ I do not identify as male, female, or transgender

30. What is your age? **(write age)** _____ years old

31. How many children under the age of 18 live in your household? **(write number, or 0 if you have none)** _____ child(ren)

32. Do you live with a physical, mental, or emotional disability? **(check *ONE*)** ☐ No ☐ Yes

33. When asked to identify your racial or ethnic identity, how do you identify? **(check *ALL THAT APPLY*)**

☐ White / Caucasian ☐ Hispanic / Latino / Spanish ☐ American Indian / Alaskan Native ☐ Other (write response)
☐ Black / African American ☐ Asian / Asian American ☐ Native Hawaiian / Pacific Islander _____

34. Do you consider yourself to be Slavic (from Russia, Belarus, Ukraine, Poland, Czech Republic, Slovakia, Slovenia, Croatia, Serbia, Bosnia and Herzegovina, Montenegro, Macedonia, or Bulgaria)? **(check *ONE*)**

☐ No
☐ Yes

35. Do you consider yourself to be Middle Eastern (from Egypt, Iran, Turkey, Iraq, Saudi Arabia, Yemen, Syria, United Arab Emirates, Jordan, Palestine, Israel, Lebanon, Oman, Kuwait, Qatar, Bahrain, or Cyprus)? **(check *ONE*)**

☐ No
☐ Yes

36. What is the language spoken most in your home? **(check *ONE*)**

☐ English ☐ Vietnamese ☐ Japanese ☐ Arabic
☐ Spanish ☐ Cantonese ☐ Korean ☐ African language(s) (e.g., Somali, Swahili, Hausa, Zulu)
☐ Russian ☐ Mandarin ☐ French ☐ Other (write response) _____

37. What is your highest level of educational experience? **(check *ONE*)**

☐ Less than high school ☐ Bachelor's degree
☐ Some high school ☐ Some postgraduate work
☐ High school diploma or GED ☐ Post-graduate degree (e.g., masters, PhD, law, medical doctor)
☐ Some college or an Associates or 2-year technical degree ☐ Other (write response) _____

38. Which of the following broad categories best describes your annual household income before taxes? **(check *ONE*)**

☐ Less than $10,000 ☐ $50,000 to $74,999
☐ $10,000 to $19,999 ☐ $75,000 to $99,999
☐ $20,000 to $29,999 ☐ $100,000 to $149,999
☐ $30,000 to $49,999 ☐ $150,000 or more

39. What county do you live in? ☐ Multnomah ☐ Washington ☐ Clackamas ☐ Other (write response) _____

40. What is your zip code? **(write response)** _____

Do you have any other comments about Metro parks or how Metro can help connect you with nature and the outdoors?
If so, please write your comments in the space below.

THANK YOU! PLEASE RETURN THIS SURVEY AS SOON AS POSSIBLE IN THE ENVELOPE PROVIDED!