



2014

Reconciling technology and nature : the use of mobile technology in outdoor recreation

Sarah K. Lindell
Western Washington University

Follow this and additional works at: <https://cedar.wwu.edu/wwuet>



Part of the [Geography Commons](#)

Recommended Citation

Lindell, Sarah K., "Reconciling technology and nature : the use of mobile technology in outdoor recreation" (2014). *WWU Graduate School Collection*. 346.
<https://cedar.wwu.edu/wwuet/346>

This Masters Thesis is brought to you for free and open access by the WWU Graduate and Undergraduate Scholarship at Western CEDAR. It has been accepted for inclusion in WWU Graduate School Collection by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.

**Reconciling Technology and Nature:
The Use of Mobile Technology
in Outdoor Recreation**

By

Sarah K. Lindell

Accepted in Partial Completion
of the Requirements for the Degree
Master of Science

Kathleen L. Kitto, Dean of the Graduate School

ADVISORY COMMITTEE

Chair, Dr. Grace A. Wang

Dr. David A. Rossiter

Dr. Olin Eugene Myers Jr.

MASTER'S THESIS

In presenting this thesis in partial fulfillment of the requirements for a master's degree at Western Washington University, I grant to Western Washington University the non-exclusive royalty-free right to archive, reproduce, distribute, and display the thesis in any and all forms, including electronic format, via any digital library mechanisms maintained by WWU.

I represent and warrant this is my original work, and does not infringe or violate any rights of others. I warrant that I have obtained written permissions from the owner of any third party copyrighted material included in these files.

I acknowledge that I retain ownership rights to the copyright of this work, including but not limited to the right to use all or part of this work in future works, such as articles or books.

Library users are granted permission for individual, research and non-commercial reproduction of this work for educational purposes only. Any further digital posting of this document requires specific permission from the author.

Any copying or publication of this thesis for commercial purposes, or for financial gain, is not allowed without my written permission.

Sarah K. Lindell
May 16, 2014

**Reconciling Technology and Nature:
The Use of Mobile Technology
in Outdoor Recreation**

A Thesis
Presented to
The Faculty of
Western Washington University

In Partial Fulfillment
Of the Requirements for the Degree
Master of Science

By
Sarah K. Lindell
May 2014

Abstract

This paper examines the intersection of technology and nature. The advent of mobile technology has created new frontiers for using technology while in nature. Engaging with nature is placed within the context of outdoor recreation, specifically hiking, as hiking provides opportunities for interacting with the environment while simultaneously using mobile technology. Examined is the relationship between the experiences, benefits, and participant characteristics associated with outdoor recreation and mobile technology use among hikers in Mount Pilchuck State Park in Washington State. Surveys were used to collect information on the recreational experiences and behaviors of hikers (n=155).

Results suggest that participant characteristics, outdoor recreation experiences, and outdoor recreation benefits are all related to mobile technology use. Participant characteristics are linked to both type and volume of mobile technology use. The type of mobile technology use may have a stronger relationship with outdoor recreation experiences and benefits than the level of mobile technology use. Generally, several types of mobile technology use are positively associated with outdoor recreation experiences and benefits. The majority of hikers did not significantly use the mobile technology device while hiking but did have the device while in the State Park. Participants took steps to mitigate the intrusion of the device on the outdoor experience and brought the device primarily for picture taking, safety, and because carrying the device is a habit.

Mobile technology can both aid and hinder outdoor recreation. Recognizing the ways mobile technology changes recreation experiences encourages a world where humans can benefit from nature as well as technology.

Acknowledgments

I would first like to express my highest gratitude to my committee chair Dr. Grace Wang for her uplifting conversation, mentorship, and feedback throughout the thesis process. I am also grateful to my committee members Dr. David Rossiter and Dr. Gene Myers for literature suggestions and intellectual insight. Many thanks go to my graduate school friends for the laughs, unquenchable curiosity, and camaraderie I have experienced while at Western Washington University. For unending support and perspective on life, I am indebted to my family. A final thank you to the Washington State Parks and Recreation Commission for the research permit and fee waiver to conduct research in Mt. Pilchuck State Park.

Table of Contents

Abstract	iv
Acknowledgements	v
List of Figures and Tables	viii
Chapter 1: Introduction	1
Statement of the Problem	
Purpose	
Research Goal and Objective	
Research Significance	
Conclusion	
Chapter 2: Literature Review	7
Outdoor Recreation Places	
Technology in Nature	
Benefits of Outdoor Recreation	
Influence of Mobile Technology	
Conclusion	
Chapter 3: Methods	33
Objectives	
Study Area	
Survey Research	
Survey Instrument	
Data Collection	
Statistical Analysis	
Chapter 4: Results	44
Participant Population Characteristics	
Mobile Technology Use and Participant Characteristics	
Mobile Technology Use and Outdoor Recreation Experience	
Mobile Technology Use and Outdoor Recreation Benefits	
Qualitative Responses	
Chapter 5: Discussion and Conclusion	75
Discussion	
Conclusions and Recommendations	
Implications for Management	
Limitations	

Future Research

Bibliography.....88

Appendices.....95

A-Survey Instrument

B-Qualitative Responses

C-Washington State Park Research Permit

D-Human Subjects Research Approval

List of Figures and Tables

Figure 3.1: Map of Mt. Pilchuck State Park in Washington State.....	34
Figure 3.2: Equipment Remains in Mt. Pilchuck State Park in Washington State.....	35
Figure 3.3: Map of Mt. Pilchuck State Park and Urban Area.....	36
Figure 3.4: Map of Mt. Pilchuck State Park and Nation Forests and Parks.....	37
Figure 4.1: Histogram of Participant Population Age.....	45
Figure 4.2: Histogram of Participant Population Education.....	46
Figure 4.3: Histogram of Participant Population Ethnicity.....	47
Figure 4.4: Histogram of Participant Population Income.....	48
Figure 4.5: Histogram of Participant Population Group Size.....	49
Figure 4.6: Histogram of Participant Population Mt. Pilchuck Visits.....	50
Figure 4.7: Histogram of Participant Population Yearly Recreation.....	51
Figure 4.8: Histogram of Participant Population Time at Lookout.....	52
Figure 4.9: Histogram of Participant Population Location of Phone Use.....	53
Figure 4.10: Histogram of Participant Population Mobile Technology Use Relative to Peers.....	54
Figure 4.11: Chart of Reasons for Bringing Mobile Device.....	55
Figure 4.12: Chart of Participant Population Motives to Hike at Mt. Pilchuck State Park.....	56
Figure 4.13: Histogram of Participant Population Purpose of Visit Fulfilled.....	57
Table 4.14: Average Mobile Technology Type and Volume.....	58
Table 4.15: Spearman Rank Correlation Values, Mobile Technology Use Types.....	59
Table 4.16: Spearman Rank Correlation Values, Mobile Technology Use and Self-Report Use Level.....	61
Table 4.17: Mann-Whitney U Values, Gender and Mobile Technology Use.....	62
Table 4.18: Kruskal Wallis Values, Education and Mobile Technology Use.....	63
Table 4.19: Kruskal Wallis Values, Ethnicity and Mobile Technology Use.....	64

Table 4.20: Kruskal Wallis Values, Income and Mobile Technology Use.....	64
Table 4.21: Kruskal Wallis Values, Group Size and Mobile Technology Use.....	65
Table 4.22: Kruskal Wallis Values, Time at Lookout and Mobile Technology Use.....	66
Table 4.23: Kruskal Wallis Values, Outdoor Recreation Experience and Aggregate Mobile Technology Use.....	67
Table 4.24: Spearman Rank Correlation Values, Outdoor Recreation Experience and Mobile Technology Use.....	68
Table 4.25: Kruskal Wallis Values, Outdoor Recreation Benefit and Mobile Technology Use.....	70
Table 4.26: Spearman Rank Correlation Values, Outdoor Recreation Benefit and Mobile Technology Use.....	71

Chapter 1: Introduction

Technology is prevalent in all areas of human life. From managing work responsibilities to facilitating leisure activities, technology permeates the fabric of human existence. Particularly, the advent of mobile phones has embedded mobile technology in outdoor recreation experiences. Both benefits and detriments of the fusion between outdoor recreation and mobile technology exist. Yet do the advantages of mobile technology outweigh the disadvantages, or vice versa? Or is human experience simply changed by mobile technology use and cannot be quantified or reduced from a phenomenological state?

The purpose of this research is to inform one subcategory of the larger technology in human experience framework. Recreation experiences of hikers in Mt. Pilchuck State Park are assessed to determine the possible relationship between mobile technology use and outdoor recreation benefits. The information gained informs State Park manager's use of mobile technology to encourage outdoor recreation on public land. More generally, this research will contribute to the larger discussion of how technology changes human ways of being.

This chapter will outline the necessity of understanding the relationship between technology and outdoor recreation experiences, focus on the specific goals of the research and identify the utility of the research.

Statement of the Problem

Outdoor recreation places have a variety of benefits to both society and the individual. Recreation sites on public lands include wilderness areas, State and National Parks, and designated recreation areas. Benefits from participating in outdoor recreation include opportunities for physical activity, refuge from societal pressures, and interaction with nature (Clayton & Myers, 2009; Stanis Ingrid, & Anderson, 2009). In a study on visitor's motivation to engage in natural settings Kyle, Mowen & Tarrant (2004) found the

following six motives for visiting natural spaces, from most to least important: to learn, engage with nature, autonomy, health, activity, and social interaction. The motive to engage in outdoor recreation has implications for the benefits a visitor will derive from outdoor recreation (Manning, 2011). Moore and Driver (2005) discuss the idea of “recreation experience/benefit preference gestalt” in which the cumulative combination of a particular activity in a specific setting provides the greatest visitor benefit. The concept highlights a central theme throughout outdoor recreation benefit literature, the idea of the whole experience as more valuable than any specific dimension of the total experience (Moore & Driver, 2005). Likewise, specific elements of an experience can alter the perception, tone, and feel in an outdoor recreation place.

A component of outdoor recreation that is prone to controversy is the use of technology in enhancing the visitor experience. Using technology to facilitate an outdoor recreation activity is common among both experienced and beginner outdoorspeople. For example, an individual on a first visit to a national park may appreciate the paved roads that allow easy access to natural areas. Likewise, a mountaineer on a remote peak will appreciate a Global Positioning Device to navigate a safe path. What both of these scenarios have in common is the technology enables the user to receive a benefit from the outdoor recreation activity. While visitors to outdoor recreation places often use technology to enhance the outdoor experience, an opposing cultural phenomena attempts to limit the use of technology in outdoor recreation. The motivation to limit the use of technology is based on the premise that technology use changes the experience of the place in a significantly negative way.

To understand the potential impact of technology use on outdoor recreation experiences, information on the influence of technology in other settings is first necessary. This study is specifically concerned with mobile technology as such devices have significant implications for the human relationship with outdoor recreation places and perceptions. Thus,

mobile technology, such as smart phones and cell phones, is the topic of research.

Mobile technology use has both potentially beneficial and detrimental effects on human experience. The impact of mobile phone use in reducing awareness and increasing distraction is well documented (Hyman, Boss, Wise, McKenzie & Caggiano, 2010; Kass, Cole & Stanny, 2007; Lamberg & Muratori, 2012). Similarly, when technology is used in natural environments, the use may harm the visitor relationship with nature through the loss of experiential quality (Kahn, 2011). Yet mobile technology can also facilitate positive experiences. Mobile phones may encourage environmental exploration by providing a sense of security and easy access to spatial information (Leyshon, DiGiovanna & Holcomb, 2013). In a museum context, handheld devices encouraged people to consider new ideas introduced by the content on the device and to engage with exhibits in new ways (Hsi, 2003). As mobile technology use alters experience in a variety of settings, use in outdoor recreation contexts will also change the visitor experience.

When visitors to outdoor recreation places use mobile technology, the user experience is changed. The ways in which the experience is altered impacts the benefits derived from that outdoor experience. Research shows both positive and negative effects from mobile technology use (Hsi, 2003; Hyman et al., 2010; Kass, Cole & Stanny, 2007; Lamberg & Muratori, 2012; Leyshon, DiGiovanna & Holcomb, 2013). More research is necessary to understand the consequences of mobile technology use in outdoor recreation to ensure that society continues to receive a variety of benefits from outdoor recreation.

Purpose

This thesis examines the change in experience caused by mobile technology use among outdoor recreationists in the Mount Pilchuck State Park. The focus is on the influence of mobile technology in mediating outdoor recreationist's interaction with a natural place.

Research Goal and Objective

The goal of this thesis is to determine if a relationship exists between a visitor's overall experience while recreating and mobile technology use. The first research objective is to determine whether mobile technology use is correlated with participant characteristics. The second research objective is to determine if mobile technology use is correlated with outdoor recreation experience. The final research objective is to determine whether mobile technology use is correlated with outdoor recreation benefits.

Research Significance

The use of the research for this thesis is threefold. First, understanding the relationship between mobile technology use and overall experience in outdoor recreation lends insight into public land management for sites that host outdoor recreation activities. Management and marketing regarding the Washington State Parks Mobile Application can be tailored to visitor preferences based on recreationist's experiences and benefits. The second benefit of the research is as a contribution to geographic literature regarding human interaction and bonding with places. Geography is concerned with the human environment relationship and this research sheds light on one way technology alters human-environment interactions. Finally, fostering a conservation ethic within American society is dependent on individual's relationship with nature. If mobile technology use alters an individual's ability to engage with natural places the individual's conservation beliefs may also take a new form. Consequently, understanding how people engage with natural environments while using technology may affect society's environmental beliefs.

Conclusion

One hundred and fifty five participants returned surveys and as only one hundred and fifty five were given out, the survey had a 100% response rate. A stereotypical participant based on the mode of each demographic question is as follows: Male, between the ages of 25-34, holds a Bachelor's degree, Caucasian, has an income of more than 95,000 a year, was in a party of two, was on his first visit to Mt. Pilchuck State Park, recreates 16 or more times a year and spent between 30 minutes to an hour at the lookout.

The results of the statistical analysis based on the three research objectives provide several insights into the relationship between mobile technology use and outdoor recreation. The findings suggest that mobile technology can interact with both outdoor recreation experience and benefits. The type of mobile technology use may have a stronger relationship with outdoor recreation experiences and benefits than the level of mobile technology use.

Overall mobile technology use is low but picture taking is the most often used type of mobile technology. Picture Taking is positively correlated with the experience variables of Fascination and Paid Attention, and the benefits variable of Positive Affect. Social Network Access and Sending Texts are both correlated with Positive Affect. Email Access is inversely correlated with Burden Free and Paid Attention.

In summary, mobile technology type has a stronger relationship with both outdoor recreation benefits and experience than mobile technology volume of use. Hikers bring the phone on the hike primarily for picture taking, safety, and because having the phone is a habit. Qualitative responses indicate that individuals who deem the phone distracting find ways to mitigate the impact of the phone while recreating. Other individuals use the phone to

enhance the recreation experience and appreciate the photo taking and information access capabilities of the phone. With specific uses, mobile technology can enhance the recreation experience but with certain uses mobile technology can detract from the outdoor experience. Mobile technology and outdoor recreation are not incompatible, but for better and worse, the use of mobile technology does alter the experience and benefits of outdoor recreation.

Chapter 2: Literature Review

Outdoor Recreation Places

Introduction

To fully appreciate the importance of mobile technology's influence on outdoor recreation, an understanding of the historical relationship between technology use and natural places is necessary. As mobile technology becomes more advanced, the ways the devices change human experience is a necessary consideration. The benefits from outdoor recreation are also pertinent to conceptualize the role of technology in facilitating positive outdoor recreation experiences. Each of the preceding concepts are discussed in the following pages with terms defined as each topic is explored.

Abbreviated History of Public Land Preservation

The following section will trace a short history of public land preservation in the United States, beginning in the early nineteenth century through the early twenty first century. Influential figures and cultural influences are discussed. Then, common social constructions of both nature and wilderness, as each pertain to public land, are explored. Finally, the role of technology in shaping the meaning and use types of natural environments is examined.

To understand the relationship between outdoor recreation and technology, a definition of the places Americans recreate in nature is first necessary. Outdoor recreation is often carried out on public land such as National and State Parks, Nature Reserves and National Forests. Such places create, and are created by, American conceptions of both nature and wilderness. Early settlers to the new world feared and strove to dominate the

natural world and not until the Romantic movement did views on nature move beyond purely negative. Romantics, in response to the orderliness and industry of the enlightenment, embraced the wildness and mystery of nature. The transition in nature values laid the foundation for future outdoor enthusiasts (Nash, 1967/2014).

Nationalists quickly co-opted Romantic enthusiasm for nature and wilderness, seeing wild places as a pride worthy resource and the cultural equivalent of Europe's historical landscapes. As American artists and writers increasingly used the wildness of the west as fodder for stories, poems and paintings, the American consciousness was awakened to the beauty and opportunity for adventure found in nature. Thus, Romantics and Nationalists alike facilitated a positive interpretation of nature in the American mind.

A recurring theme in understanding natural environments is the rhetorical dichotomy between civilization and wilderness. Transcendentalism, a belief system that argues for the "existence of a reality higher than the physical," imbues nature with spiritual importance. The philosophy held sway in the midnineteen century and existed alongside increasing industry and civilization. The prominent Romantic writer Henry David Thoreau wrote that the ideal life had both civilization and wilderness but not absolutely one or the other (Thoreau, 1862). Wilderness nourishes and provides an opportunity to exercise "savage instinct" and is optimal when used and partially subdued by civilized life (Nash, 1967/2014). Such thinking planted the seeds for valuing public lands for individual benefit, such as recreation.

One of the foundational supporters of public parks was landscape architect Frederick Law Olmsted. His writings justify the creation and preservation of public lands, particularly

parks. In his *A Consideration of the Justifying Value of a Public Park*, Olmsted argues that parks are a “self-preserving instinct of civilization” as parks guard the human psyche against “vital exhaustion,” loss of faith, and lowness of spirit caused by civilized life. As Americans began to live primarily in civilized towns, a corresponding need to experience the “beauty of natural scenery” was created (Olmsted, 1881). Parks and other natural places were created to meet the need for spaces free of the obvious influence of civilization.

As Americans began to value public lands beyond resource extraction, business interests, particularly railroad companies, saw opportunity in parks as tourist destinations. Beyond the intangible benefits of natural spaces were the very lucrative possibilities from recreation. Yellowstone National Park was the “world’s first instance of large-scale wilderness preservation in the public interest” and legislation to protect the park passed to protect unusual characteristics like hot springs and geysers. Not until several years later did Americans begin to publicly protect the park for cultural or other less tangible values (Rothman, 1998). Similarly, the first state park was created in 1885 by the State of New York as a “Forest Preserve” and creation was strongly motivated by water quality concerns by New York City inhabitants (Nash, 1967/2014). Yet once the precedent for parks and reserves had been set, the value and use of such public lands began to be more focused on appreciation of natural experiences and less on the commercial utility of preserved lands. The shift in thinking was based on a recognition of the psychological and societal benefits from experiencing natural environments.

Nature

The acceptable types of use for public nature areas arises from the meanings

Americans give to natural environments. Consensus on what constitutes nature, and also a wilderness, is hard to come by. While both concepts share strong similarities, each is discussed individually to understand the overarching social construct of natural environments. Clayton and Myers (2009) in the book *Conservation Psychology* argue that concepts of nature include scientific understanding and personal experience, and are informed by both history and culture. The researchers write that humans interact with three types of nature: domestic, managed and wild. Domestic nature is found in the plants one keeps or the pets one dotes on. The next level is managed nature and includes zoos and public parks. The final type of nature, wild nature, is nature without strong human interference and is comparable to wilderness. Each type of nature is differentiated by the level of human involvement in that nature, and so expands the initial definition of nature as more than only a place free from human impact. Thus, depending on context nature may mean a plant, a park, or a rainforest, but is always recognized as earth processes somewhat independent of humans.

Although nature has characteristics grounded in physical reality, the meaning of nature is strongly a societal product. In his examination of Karl Marx's writings on nature, Neal Smith argues that the value of nature is in the opportunities for production found in natural environments and that Marx's understanding of nature is based on the economic needs of his time (Smith, 1994). A more critical review on how nature is constructed is provided by Cindi Katz (1998) in her *Whose Nature, Whose Culture? Private productions of space and the "preservation" of nature*. Katz describes the definition of nature as serving the purposes of corporate interests in the 1970s. When corporations and other capitalists no

longer had unlimited opportunities for resource exploitation and were branded as the enemy of nature, the definition of nature was subverted to fit the needs of capitalism. Companies moved from opposing environmentalism to rebranding in accordance with the environmental movement. Nature was no longer a public good available for investment but as privatized reserves with opportunities for establishing lucrative intellectual property rights (Katz, 1998). The appropriation of 'nature' for private gain highlights the degree of social construction existing in the concept of nature.

The fluidity of the meaning of nature has a long history and was particularly influential in perpetuating colonialism in land preservation. British Columbia, a province of Canada, has extensive forests that are a source of conflict for environmentalists, resource extractors, and First Nations people. The construction of nature within the debate among stakeholders is revealing. Persisting postcolonial ways of thinking and practice discourage First Nations from having a voice in the conversation. Defining nature as a landscape free from social and cultural entities, disallows the legitimacy of First Nations by not recognizing First Nations existence in the forests before colonizers. At the same time, corporations and individuals who benefit from forest resource extraction aim to define nature as a valuable resource that can only be used correctly if entrusted to the specific organizations. Finally, environmentalists construct nature as an entity that can only be correctly represented by the tree huggers themselves as forest preservation goals justify creating nature a certain way. Each group construes the meaning of nature to serve that specific group's purpose. In this case, constructing nature serves to perpetuate colonial ways of thinking and living (Willems-Braun, 1997). The power of creating fundamentally differing definitions of nature from the

same physical matter is epitomized in British Columbia's forest resources.

Wilderness

If nature is ultimately defined as natural processes largely free from human hands what then is wilderness? If human influence and civilization are on one end of a continuum and nature is on the other, wilderness is beyond nature away from human civilization (Nash, 1967/2014). The Wilderness Act of 1964, in defining wilderness, states:

A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value
(National Park Service, 1964).

Of particular importance in interpreting the legal definition of wilderness are two ideas. "An area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain" is significant because two dual worlds are created, one in which humans exist and one in which humans do not. The idea of wilderness as separate from humanity has advantages. Wild areas can be protected from human development and exploitation as the distinction provides boundaries and clearly delineates what land use is and is not acceptable (Ouderkirk, 2003). On the other hand, seeing wilderness as outside the grasp of civilization has practical and philosophical problems. If wilderness is beyond human touch how can wild places and humanity co-exist? If humans cannot be understood as

inhabiting the same world as wilderness then both the environment and human existence may be in jeopardy. Living a high consumption, industrialized life and using wilderness as an escape allows humans to evade responsibility for environmentally detrimental lifestyle choices (Cronon, 1995). Creating a strong separation between actions in wild places and actions in civilization discourages understanding how intertwined and mutually dependent each entity is on the other. Ultimately, ambivalence abounds as dualism between wilderness and other places may facilitate preservation on one front and justify environmentally harmful practices on another.

The second relevant idea is that of wilderness as “retaining its primeval character and influence” and providing “opportunities for solitude or a primitive and unconfined type of recreation.” A tension is created when one use of wilderness is to provide a place to experience solitude and a second use is to allow all Americans access to that experience (Manning, 1999). One possibility is to determine the access given to wilderness areas based on visitor satisfaction, but even determining a criteria and measurement instrument for visitor satisfaction is difficult (Manning, 2003). The quality of a wilderness experience is here drawn into question. Any experience is more than just people or place but also the motive and tools used to create the experience (Moore and Driver, 2005). Determining what elements of an experience create an opportunity for being in wilderness is dependent on the definition of wilderness. Thus, defining the term wilderness has powerful implications for the types and quality of use acceptable in legally protected wilderness areas.

Defining Terms: Wilderness and Nature

While the terms nature and wilderness are not exactly the same they share a similar

meaning: an entity, often a place, mostly devoid of visible human influence and exhibiting earth processes. For the purposes of this thesis, the terms nature and wilderness are understood to be largely alike and only differing along a continuum of visible human impact with wilderness displaying less and nature somewhat more human impact. With such distinction in mind, the terms are used interchangeably, given the degree of similarity between wilderness and nature, for the duration of the thesis.

Nature is a social construct but is grounded in a physical reality. As such, the following section assumes a degree of consensus on the meaning of nature based on the definition given above. For the sake of understanding the relationship between nature and technology within the context of outdoor recreation, nature is construed as a functional component of an outdoor experience.

Technology in Nature

Defining Terms: Technology and Mobile Technology

For the context of this thesis, technology is defined as a tool that assists an individual and does not occur without human effort. Borrowed from Jarvenpaa and Lang (2005) in *Managing the Paradoxes of Mobile Technology*, the definition of mobile technology is “handheld information technology artifacts that encompass hardware (devices), software (interface and applications), and communication (network services).”

Acceptable Role of Technology in Nature

Knowing the meaning given to natural places with the label of either wilderness or nature is essential to determine the role of technology use in such places. If wild places are to have a “primeval character” then perhaps technology use in such places is not appropriate as

technological devices may alter the nature experience. Katz (1998) states that the reason for “technology is to increase human power, control and comfort...Technology ignores the natural world, except as an object to be manipulated, controlled, processed or otherwise used.” Thus, technology use can mediate the experience of nature so that the meaning of a wild place is reconfigured.

Technology may also have a variety of positive impacts. Allowing automobiles into national parks encouraged the creation of a national constituency devoted to preserving and maintaining the parks (Sax, 1980). Synthetic fabrics increase comfort and stronger materials can increase safety in outdoor settings (Ewert and Schultis, 1999). Ultimately, technology alters a nature experience and may not be appropriate in all wild places.

More fundamentally, bringing technology into nature may reintroduce aspects of civilization into places that are foundationally uncivilized. David Strong (1995), in his book *Crazy Mountains* laments that technological devices “impoverish” the experience of mountains and shield people from “the possibility of encountering the depths of the place.” Likewise, Joseph Sax argues that a unique element of nature is the “opportunity for detachment from the submissiveness, conformity, and mass behavior that dog us in our daily lives; it offers a chance to express distinctiveness and to explore our deeper longings” (Sax, 1980). He calls the concept contemplative recreation and argues that opportunities for such a type of recreation are essential for parks and other protected lands. In his discussion of the appropriateness of vehicles in national and state parks, Sax asserts that while cars in some places are necessary to accommodate all types of users:

The purpose of reserving natural areas, however, is not to keep people in their cars, but to lure them out; to encourage a close look at the infinite detail and variety that the natural scene provides; to expose, rather than to insulate, so that the peculiar character of the desert, or the alpine forest, can be distinctively felt; to rid the visitor of his car... (Sax, 1980).

The value of the vehicle as a piece of technology is to facilitate the nature experience but at some point the technology moves from fostering to hindering the experience. To use tools from civilized life to access nature is logical, yet civilization may encroach so far as to devalue the overall experience in a wild place.

An often purported justification for all types of technology use in wild areas is the improved quality of experience. Often driven by outdoor companies selling the latest gear, technology enables the user to feel safer going further into nature and provides the opportunity to choose from an abundance of recreational activities. One example of such technology is the lightweight tent that encourages expanded use by less fit people on longer visits. A second example is the snowmobile, as the machine can lead to recreation type conflicts and an increase in the numbers of people willing to participate in the activity (Ewert and Shultis, 1999). While on the surface outdoor recreation technological development has positive impact to the adventurer, the changed outdoor experience may have unforeseen repercussions (Schultis, 2001). Sarah Krakoff, in her description of the impact of commercialization on Mt. Everest, argues that the consequences are nearly paradoxical. Individuals will spend extensive resources to “engage, interact, and awaken one’s self in the inherently challenging and awe-inspiring context of nature” while avoiding actual self-reliance and without developing a genuine love of the mountain environment (Krakoff, 2003; Simpson, 1997). Krakoff is making a case for determining acceptable technology use based on the perceived degradation of outdoor recreation experience associated with high

technology use.

The line separating harmful technology use from beneficial use is easily blurred. A trend in mountaineering is the use of performance enhancing drugs to provide climbers with capabilities beyond the body's normal threshold. Because of the high altitude and physical stress on the body, climbers commonly use drugs banned by the World Anti-Doping Code. A particularly controversial drug, dexamethasone, commonly known as dex, has recently come to the forefront of the conversation. The drug is endorsed by the Wilderness Medical Society because the substance inhibits cerebral swelling and so reduces edema, a common symptom among climbers. But, if taken in large quantities, the drug can shut down the immune system and individuals may experience mood swings. In 2009, one climber almost died attempting to climb Everest while taking huge quantities of the drug. While the man survived, the scars of his drug use remain in his life (O'Neil, 2013). The story is a visible reminder of the power certain types of technology hold over the psychological and physical well-being of outdoor recreationists.

The use of technology in experiencing wild places has become so ubiquitous that visitors to Denali National Park and Preserve no longer need to leave the tour bus or even look out a window to engage nature. The "Tundra Wilderness Tour" camera bus enables visitors to watch the wildlife and landscape, not directly, but on television screens inside the bus. Technology is used to completely alter the bus tour nature experience (Clary, 2007). However tame the trip may have been previously, the ride very nearly mimics watching nature videos in the living room at home, with pajamas on and a bowl of ice cream at hand. Such technology use raises the question of what is and is not appropriate technology in

nature.

The criteria most often used to determine acceptable types and levels of technology use is the experiential outcome of the nature visitor. Technology in nature areas, often opposed by outdoor enthusiasts, is technology that changes the landscape. In 2006, National Geographic published an article on the increasing appearance of cell phone towers in National Parks. The author, Jennifer Cutraro, highlights a tower built in the vicinity of Old Faithful in Yellowstone National Park as epitomizing the building of towers in National Parks. Other National Parks also have cell phone towers within the park and the development of such visible structures raises questions on when and where unnatural structures are appropriate. For some, the benefit of safety from cell service outweighs any landscape changes. But for other people, the structures violate both the meaning of wilderness and the purpose of the Wilderness Act. Cell phone reception can both facilitate and take away from a park experience but the visible tower is mostly viewed either neutral or negatively (Cutraro, 2006). In a survey of residents and visitors at the Peak District National Park in England, researchers found that “majority of the respondents (82%) thought that masts [towers] had negative impacts (very bad or bad impacts) on the landscape of the National Park” and “masts were also considered to be signs of human influence that did not belong in the National Park by 70% of the respondents.” Nonetheless, 81% of respondents also identified “the ability to use a mobile phone for emergency contact” as the most important reason for cell service with other motives (less isolation, advantage at work etcetera) not garnering more than 33% of the “very important” or “important” identification (Park, Jorgensen, Swanwick and Selman, 2008). The results of this study are reflected anecdotally in the National

Geographic article: cell phone towers on natural landscapes are valuable for safety benefits but degrade the landscape and may not belong in wilderness places.

The proper role of technology in outdoor recreation is extremely difficult to define as devices and tools appropriate in one setting and time may not be suitable in other contexts. In one instance the use of a pill may save a life and in another case destroy a life. Automobiles allow outdoor enthusiasts to access nature but can also insulate visitors from actually engaging with the environment. Televisions on tour busses may thrill tourists but may also take away meaningful elements of being in a specific place. The place of technology in wilderness is ambiguous, yet if the consequences of technology use are not considered, the quality of nature experiences can be compromised.

Technology Changes the Meaning of Nature

Technology use changes the meaning of wilderness. As William T. Borrie (2000) states, using technology “changes the wilderness experience in fundamental ways.” For example, Global Positioning System device use encourages individuals to push the boundaries of what is safe because of an increased sense of safety derived from the communication capabilities of the GPS (Borrie, 2000). One particularly lamentable story epitomizes the problems that may develop from an excessive sense of safety. In 2009, a group of four hikers in Grand Canyon National Park had brought a SPOT device on their trip. The SPOT device, also known as a Satellite GPS Messenger, is able to contact authorities immediately, let friends track your progress through Google Maps, store your movements and “let those back home know that you could use a little assistance but that there's no emergency” (Repanshek, 2009). The four hikers, two fathers and their two teenage sons had

activated the SPOT and pushed the “help” button. Park Rangers responded and found that the group had requested help because they did not have water but has since found a water supply and did not need to be rescued. The evening of the same day, the device was again used but this time the “911” button was pushed. A helicopter crew, using night vision goggles, found that the hikers thought the water they had found taste salty and were concerned about dehydration. The crew left the hikers water but did not evacuate the hikers despite the hikers request for a night evacuation. The next morning the SPOT device was activated a third time. The hikers were evacuated by helicopter and none accepted medical help or assessment. The leader of the hikers was the only adult with any experience in the Grand Canyon, and said that without the SPOT device “We would have never attempted this hike” (Burnett, 2009). While extreme, the story highlights the degree that certain types of technology may interfere with truly seeing wilderness as a force, at least somewhat, beyond the control of civilization.

The idea of nature is based on a physical reality, but when that space is altered, so too will the meaning of that entity be changed (Krakoff, 2003). Recall the development of telephone towers in national parks, the cell tower rising above the natural landscape implies that some types of technology belongs in nature. While the tower itself is not harmful, the structure actually increases safety. Thus, the changed meaning to a natural environment can have profound implications.

Peter Kahn epitomizes the way incremental alternations can change the meaning of nature by something he calls “environmental generational amnesia.” He argues that the state of health a forest is in at the time of a person’s youth is what that person will understand as the natural state of the forest. Over a person’s lifetime the forest may be partially logged or

power lines may be built in the area. The person will recognize the change as the difference occurred during the individual's lifetime. However, the generation of people following the person just described will understand the new state of the forest as natural because such people have no point of reference for a forest without logging or power lines (Kahn, 2011). Several similar concepts also exist. Jared Diamond, in describing the ways inhabitants on Easter Island made the island uninhabitable, introduces the term landscape amnesia. Like Kahn's environmental generational amnesia, landscape amnesia is described as a situation when each subsequent generation cannot see environmental degradation relative to the previous generation because the following generation does not have the same baseline as the preceding generation (Diamond, 2005). Similarly, the addition of visible structures within parks and wilderness can, over time, impact the meaning of nature. Cell towers in national parks, technologies in nature, do have benefits but may also have unintended consequences on outdoor experiences.

Benefits of Outdoor Recreation

Defining Terms: Outdoor Recreation

For the purpose of this paper outdoor recreation is defined as a leisure activity taking place in a natural environment. Thus, the issues raised in the discussion of technology and natural areas are pertinent to outdoor recreation places. The meaning of outdoor recreation encompasses both high impact activities such as skiing and low impact activities like bird watching. The type of outdoor recreation focused on in this research is hiking in a State Park.

Motivation

In a study on visitor's motivation to engage in natural settings Kyle, Mowen &

Tarrant (2004) found the following six motives for visiting natural spaces, from most to least important: to learn, engage with nature, autonomy, health, activity and social interaction. The motive to engage in outdoor recreation has implications for the benefits a visitor will derive from outdoor recreation (Manning, 2011). The goal of the recreation activity identified by the individual will influence the prevalence and type of technology use by the recreationist.

Benefits of Outdoor Recreation

The opportunity for engaging with nature provided by outdoor recreation provides psychological and physiological benefits. Significant phenomenological evidence exists in support of nature as a restorative experience. Recall Joseph Sax's concept of contemplative recreation and Frederick Law Olmsted's justification for parks as refuges from civilization, both men believed in the ability of nature to provide a type of healing from the stresses of urban life. In one study of brain wave patterns among people walking through both a park and an urban setting, the natural environment had psychological benefits. In the study, twelve participants wore a brain wave identifying hat and walked through three different environments: a shopping district, a green space, and a busy commercial district. The brain waves represented frustration, engagement (directed attention), excitement and meditation. On average, participants experienced "reductions in arousal, frustration, and engagement (ie, directed attention), and an increase in meditation" after moving from the shopping district to the green space and then only the directed attention increased as the participants moved to the busy commercial district. The finding suggests the green space provided mental rest from the urban environment (Aspinall, 2013).

The idea of nature as a restorative environment has been formalized by Rachel and

Stephen Kaplan in Attention Restoration Theory. The authors argue that, in general, people prefer natural environments and such environments provide restoration opportunities. The benefit and preference for nature is rooted in the attentional requirements placed on people in urban and daily life versus when in nature. Kaplan and Kaplan describe nature as providing an opportunity for “soft fascination” where the processes and animals in nature capture human attention easily and without effort. Conversely, daily life demands “directed attention.” Here attention requires effort, becomes tiring and is finite. Natural views and experiences capture attention without effort and thereby restore the capacity for attention as directed attention is not necessary (Kaplan and Kaplan 1989, Kaplan 1995). Research supports the theory that contact with nature restores attentional resources. In one study, thirty eight University of Michigan students were first measured on mood and a backwards digit-span task, then sent on a walk either through an urban area or Arboretum, and then retested on mood and the attentional task. The researchers found that when subjects walked through the Arboretum, scores on the attentional task improved after the walk as compared to before the walk more significantly for subjects who walked through the urban setting. Likewise, when subjects walked through the Arboretum mood improved as compared to mood when participants walked in the urban setting (Berman, Jonides, & Kaplan, 2008). The study supports the theory of Attention Restoration as the natural setting walk resulted in higher improvements in mood and success on the attentional task than the mood and attentional task results from the urban walk.

Natural environments can improve mood and subjective well-being. In a study of 150 students at Carleton University researchers found that subjects were more fascinated, relaxed,

reported higher positive affect and lower negative affect after a walk outdoors compared to subjects who walked indoors (Nisbet and Zelenski, 2011).

In a similar study, researchers found that “spending time in nature led to a number of psychological benefits.” Participants walked through either a natural or urban landscape and “those in the nature condition reported significantly more positive emotions than those in the urban condition.” Participants were also asked to reflect on a loose end in the individual’s life to measure the possible influence of a natural setting on the ability to reflect. On the reflection measure the natural landscape was more conducive to reflection than the urban environment (Mayer, Frantz, Bruehlman-Senecal and Dolliver, 2009). The ability to reflect and positive affect both contribute to well-being, and natural settings facilitate reflection and positive mood. Thus, experiencing nature can contribute to well-being.

The opportunity to experience solitude is a benefit of certain types of outdoor recreation. The meaning of solitude varies across individuals and contexts but is generally an opportunity to either spend time alone or with a small group of people separate from the majority of the population. The goal of solitude is commonly found among hikers and backpackers (Manning, 2011). The experience of solitude requires a separation between an individual and the broader group, a separation made difficult by the constant connectivity required by mobile technology. The use of mobile technology in outdoor recreation may undermine the ability to experience solitude and thereby detract from the benefits of solitude, such as increased relaxation.

Influence of Technology on Nature Benefits

Engaging with nature has significant benefits but engaging with nature mediated by

technology may not provide equal benefit. Peter Kahn and fellow researchers explored the possible difference between a technologically mediated experience of nature and experience of nature without significant technology. Participants were placed in an office with a glass window overlooking “a nature scene,” an office without any window or a “technological nature window.” Heart rate, creativity and personal views on judgments and reasoning about windows were all measured. During the exercise participants were recorded by a camera in the room. Kahn et al., while controlling for other factors, found that “there was more rapid heart rate recovery in the glass window condition than in the blank wall condition” and “there was no difference in the heart rate recovery between the technological nature window condition and the blank wall condition.” Such results support the role of nature in recovery from stress as more beneficial than no nature or augmented nature. Creativity was both aided and hindered by nature as elements of the creativity tasks were improved with the glass window rather than the screen or no window, but other creativity elements were lacking among participants with the glass window compared to the screen or no window participants. Most participants felt positively about the glass window but were “less enthusiastic about a technological nature window.” If given a choice for an office with a glass window or a technological nature window only thirteen percent of the participants preferred the screen window. If the choice was between no window and the technological nature window then participants “were more enthusiastic about a technological nature window.” To summarize the results of the technological nature window study:

Even though a technological nature window might look like a window, have a view like a window, and be used by people as a window, it does not confer all of the physiological and psychological benefits of a glass window view of nature (Kahn, 2011).

The study highlights the value of actual nature rather than an experience of nature mediated by technology. The use of any technology while simultaneously interacting with nature will change the cumulative experience. Arguably, technology can so fundamentally alter the nature experience that the essence of the experience no longer conveys the same benefits.

The experience of nature has become a product to be commodified and sold. People are so enthusiastic about engaging with nature that companies and products that sell nature, or the idea, experiences and gear have become extremely lucrative. One such company, The Nature Company, was (or is?) a “multinational retail chain that sells nature.” The company products include “natural objects, simulated nature, and representations of nature, either freestanding or emblazoned on everyday consumer objects.” The irony of selling nature products is the “simultaneous idolization and commodification of nature combined with an aggressive exaltation and effacement of any distinction between real and made natures.” Actual nature is not necessary to benefit from nature at the Nature Company. With over 200 million in sales in 1994, the success of The Nature Company highlights the benefit to urbanites of any type of interaction with nature (Smith, 1984).

Technology has played a key role in the commodification of nature as “most recreationists use technology to visit the backcountry, [but] an increasing number visit the backcountry to use their technology” (Ewert and Schultis, 1999; Schultis, 2001) Technology encourages the use of nature for goals not often associated with outdoor experiences. Individuals may download applications for identifying peaks or use social media to share nature images. When the goal of being in nature is to use a cell phone application or share a photo, the benefit is no longer derived from an interaction with nature but an interaction with

the technology.

A shift in the motivation of recreationists may undermine classic assumptions about the benefits of nature but may also encourage more people to participate in wilderness experiences. On the one hand, “technology can serve as a buffer between the visitor and the realities of the wilderness environment” (Borrie, 2000). If the outdoor experience is mediated by a technological tool the level of engagement with one’s surroundings may decline. On the other hand, the motive for engaging in outdoor recreation may not be as important so long as people continue to receive benefits from time in nature. Thus, technology aids in the commodification of nature and has positive and negative consequences.

Influence of Mobile Technology

The use of technology is inextricably connected to socially constructed ways of being and living. Technology and culture co-create the ways in which people interact with and understand the world. The influence of technology on experience is neither inherently good nor bad (Cuthbertson, Socha and Potter, 2007). The consequences of technology depend largely on the type and the level of technology use. In particular, the ubiquitous use of mobile technology in everyday life shapes the way Americans behave, think and interact. The following section provides an overview of current literature on how mobile technology changes human experience.

The majority of American adults own a cell phone or Smartphone. According to the Pew Research Center’s Internet and American Life Project, 91% of American adults own a cell phone and of that population 56% have a Smartphone. Both ownership of a Smartphone and cell phone have risen over time with an 18% increase overall since 2006 (Duggan, 2013).

Mobile technology use also takes several forms with 81% sending or receiving text messages, 60% access the internet, 49% “get directions, recommendations, or other location based information” and 48% use the device to listen to music. With such widespread use, mobile technology inevitably changes experience.

Mobile Technology Negative Consequences

In a study of mobile technology users in “four highly developed countries with a high penetration of mobile technology devices,” researchers identified an empowerment versus enslavement paradox. Participants appreciated that the mobile device allowed permanent connectivity for interacting with friends, family and work but the same mechanism prevented users from ever escaping the constant connection with others. One respondent stated: “I am in a dilemma that I cannot leave my cell phone at home, but just the fact that I am always connected is stressful” and another said, “Availability all the time! This is not what we humans were made for. And with GPS [global positioning system], it feels like the last piece of privacy has been taken away” (Jarvenpaa & Lang, 2005). Stress associated with constant availability exists but may also be counteracted by the benefits of constant contact. A study of Swedish young adults, ages 20-24, found no association between mobile phone use and social support but associations between mobile phone use and stress, symptoms of depression and sleep disturbances (Thomee, Harenstam and Hagberg, 2011). If outdoor recreation is used as an activity to cope with the stress of life, bringing mobile technology that may increase stress and transport the burdens of everyday life is somewhat counterintuitive.

Mobile technology use increases distraction from the environment one inhabits. Redelmeier and Tibshirani in a study of motor vehicle collisions and cell phone calls found

that “the risk of a collision when using a cellular telephone was four times higher than the risk when a cellular telephone was not being used...and units that allowed the hands to be free offered no safety advantage over hand-held units.” On the positive side almost forty percent of those in a crash called emergency services after the crash so while the phone was a disadvantage before the collision, the device was helpful after the incident.

Strayer and Drews (2007) argue that drivers who carry on a conversation with someone not in the car experience inattentive blindness where attention is diverted to the conversation rather than to elements of the driving landscape. The researchers found that participants talking on a headset phone remembered fewer objects from the driving environment than those who only needed to drive in the simulation. Likewise, participants who carried on a conversation with someone who was also in the car rather than on the phone successfully completed the driving task 88% of the time rather than the 50% success found among the phone conversation drivers. Success was greater among the in car conversation participants because a conversation in the driving environment is able to adjust and accommodate the attentional driving demands on the driver. When a driver is carrying on a conversation on the phone the other person cannot know the attention needs of the driver and so the driver may not give enough attention to the driving task because attention is being given to the phone conversation (Strayer and Drews, 2007).

In a similar study among Western Washington University students, researchers had a person dressed as a clown, ride a unicycle in one section of a busy courtyard and then asked individuals whether or not the person had noticed the clown after passing through the courtyard. When asked the direct question “Did you see the clown?” the results were

divergent, based on the respondents' technology use: only 25% of cell users responded affirmatively. Further, 51% of individuals walking alone, 61% of individuals with a music player and 71% of people walking in a pair responded affirmatively (Hyman et al., 2010). The large difference between cell users and the other three groups on noticing the clown reinforces the idea that cell phone use increases distraction from the surrounding environment. Mobile technology has consequences for the experience of the immediate environment that may have negative implications for receiving the benefits of outdoor recreation experiences.

Ambiguous Consequences of Mobile Technology

Individuals easily become emotionally attached to a mobile device. The use of mobile technology to maintain relationships and store texting conversations, photos and voicemail facilitates a bond between the user and the device. Individuals depend on the device for communication, entertainment and information purposes so much so that the mobile becomes an extension of the identity of the individual. The strong attachment to the phone encourages constant contact with the device and can lead to distress and a sense of bereavement when one is separated from the phone (Vincent, 2006). The degree of attachment an individual has to the piece of mobile technology influences the ways a person will interact with the phone and the perception of acceptable use in a given situation.

The use of mobile technology can encourage exploration and fascination with an environment through increased access to information. The availability of information pertinent to a place can enable a positive experience with the place but may also inhibit individual discovery. Knowing exactly what one will see and experience in a place can

enable visitors but may also eliminate the opportunity for individualized experience. The loss of the unknown may have a greater or less influential impact on visitors to recreation areas based on the motive of the recreationist. The use of mobile technology to improve a place is common in museums where museum guide devices provide information and guidance to the visitor. With museum guides, visitors enjoy the easily accessible range of information but exchange the access for an increase in the engagement with the device rather than the actual museum items. Similarly, mobile technology use in outdoor recreation has significant value in encouraging the exploration of places through easily accessible information like campsite locations, unique features of a place or up to date weather reports. On the other hand, the glut of information can detract from the exploration of the unknown and the opportunity for personalized discovery.

The final consequence of mobile technology use in outdoor recreation pertains to the actual and perceived safety benefit of bringing a mobile device during the recreation activity. Recall the story of the four hikers in Grand Canyon National Park who contacted rescuers two times for trivial issues before being removed from the park on the rescuer's third trip. The hikers would not have not attempted the trip without the safety device but reliance on the device ultimately encouraged the hikers into an unsafe situation. Technology can increase safety in tangible ways but can influence human decision-making so that the increased safety benefit may be negated by poor decisions. Recreationists often bring a mobile device for safety, and a variety of evidence highlights the value of a device for rescue and support but technology is not infallible and can impede as well as facilitate safety.

Conclusion

The meaning of nature is complex but in this thesis is defined as an entity, often a place, mostly devoid of visible human influence and exhibiting earth processes. The appropriate role for technology in natural places where people recreate is created through the perceived impact of the technology on the recreation experience and the purpose of the natural environment. Mobile technology use is ubiquitous among Americans and alters experience by increasing distraction from one's environment, engendering a sense of safety, and facilitating information access. Outdoor recreation benefits are dependent on a specific outdoor experience and mobile technology use can change the outdoor experience. To fully understand the influence of mobile technology on outdoor recreation an examination of both recreation experience and the benefits from the experience is necessary.

Chapter 3: Methods

This thesis is comprised of a mixed methodology; using both qualitative and quantitative data. Mixed method is most useful because quantitative data is most appropriate for understanding larger, general trends within a population, while qualitative data captures the nuances and details within responses. The data is collected through a survey instrument adapted from outdoor recreation literature. The survey participants were day hikers to Mt. Pilchuck State Park. Data gathering took place on the dates of October 5th, 6th and 13th and were conducted at the lookout at the top of Mt. Pilchuck. 155 surveys were administered and returned by participants to a researcher.

Objectives

The goal of this thesis is to determine if a relationship exists between visitor perceptions in an outdoor recreation place and mobile technology use. The first research objective is to determine whether mobile technology use is correlated with situational awareness. In other contexts, such as while driving and walking, increased distraction due to mobile technology use has been noted. The inverse of distraction is awareness so by gauging situational awareness the impacts of distraction can be measured in an outdoor recreation setting. The second research objective is to determine if mobile technology use is correlated with the outdoor recreation benefits of relaxation and reflection. When people constantly carry a phone they can be in constant contact with broader networks, including family and work. If individuals constantly carry a phone, the opportunity and thus benefit of reflecting and relaxing may be lost. The final research objective is to determine whether level of mobile technology use is related to personal characteristics of the hiker.

Study Area

The study area for this thesis is Mount Pilchuck State Park. The area is accessible from Highway 2 and is 57 miles northeast of Seattle. The map below locates Mt. Pilchuck State Park within Washington State.

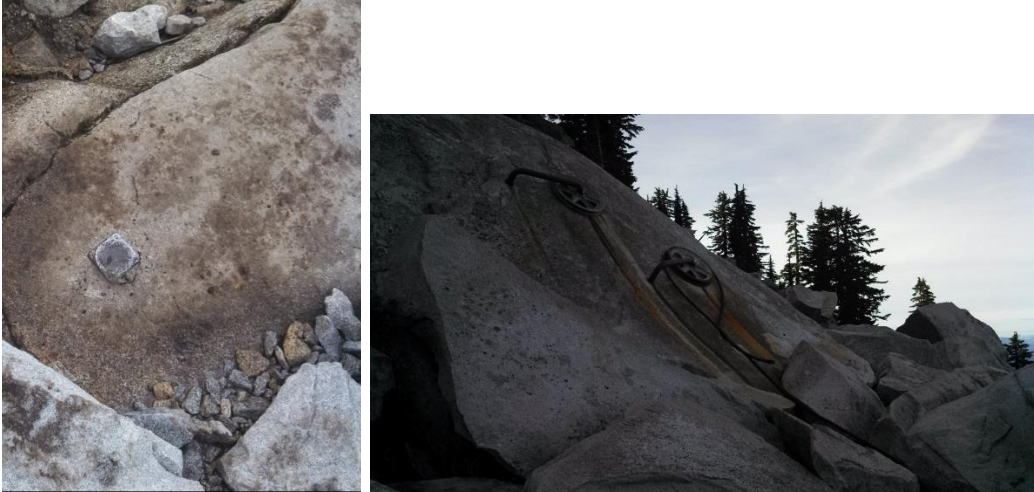
Figure 3.1: Map of Mt. Pilchuck State Park in Washington State



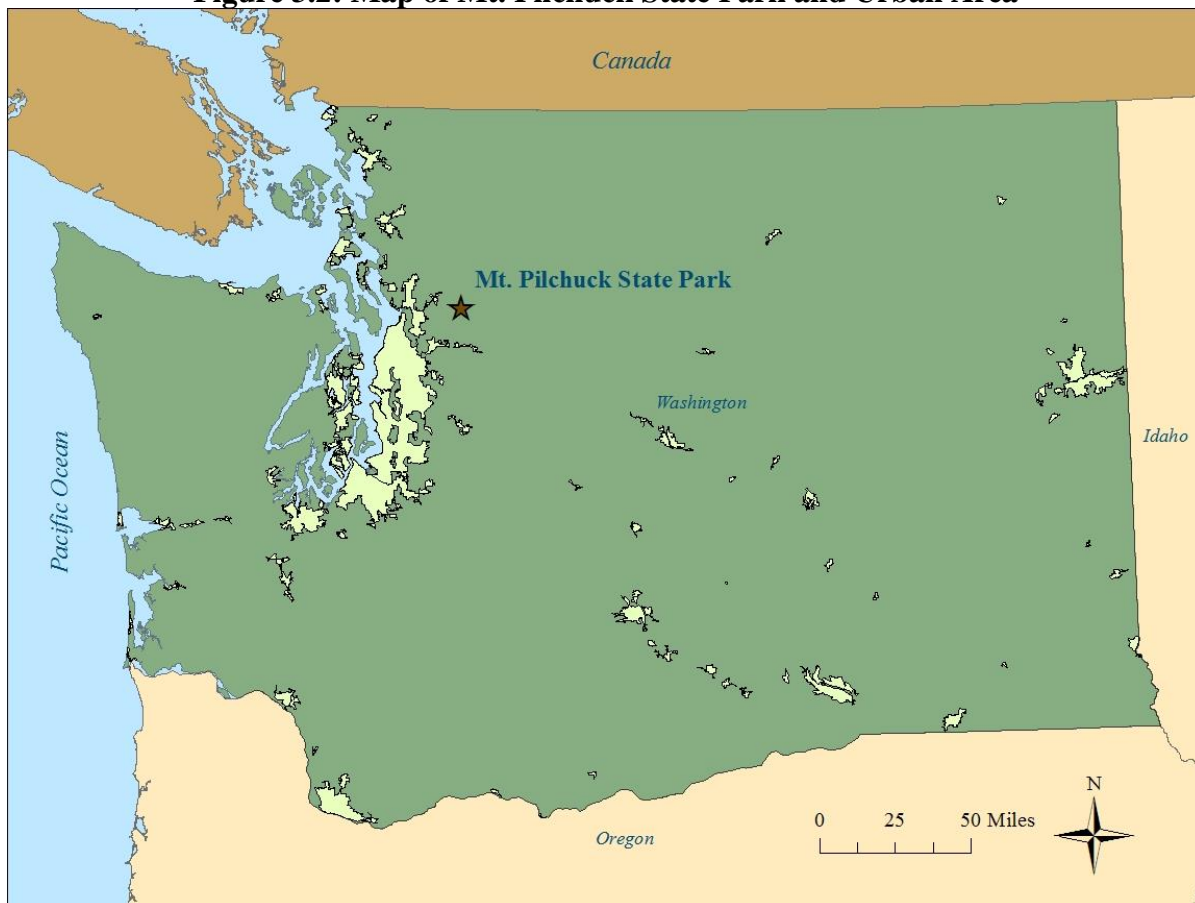
The site was chosen based on five criteria: relative accessibility from the Puget Sound population, call and data coverage at hike destination, moderate hiking difficulty, scenic destination, and high use. The State Park is a day use park managed by both the United States Forest Service and Everett Mountaineers. The hiking trail is two and a half miles to the historic lookout with 2,200 feet of elevation gain (Washington State Parks and Recreation

Commission, 2014). The lookout hosts five interpretative plaques inside and views in all directions outside. The State Park was formerly a ski area and man-made landmarks are still visible on the landscape. Below are examples of the equipment that remains along the trail.

Figure 3.2: Equipment Remains in Mt. Pilchuck State Park in Washington State

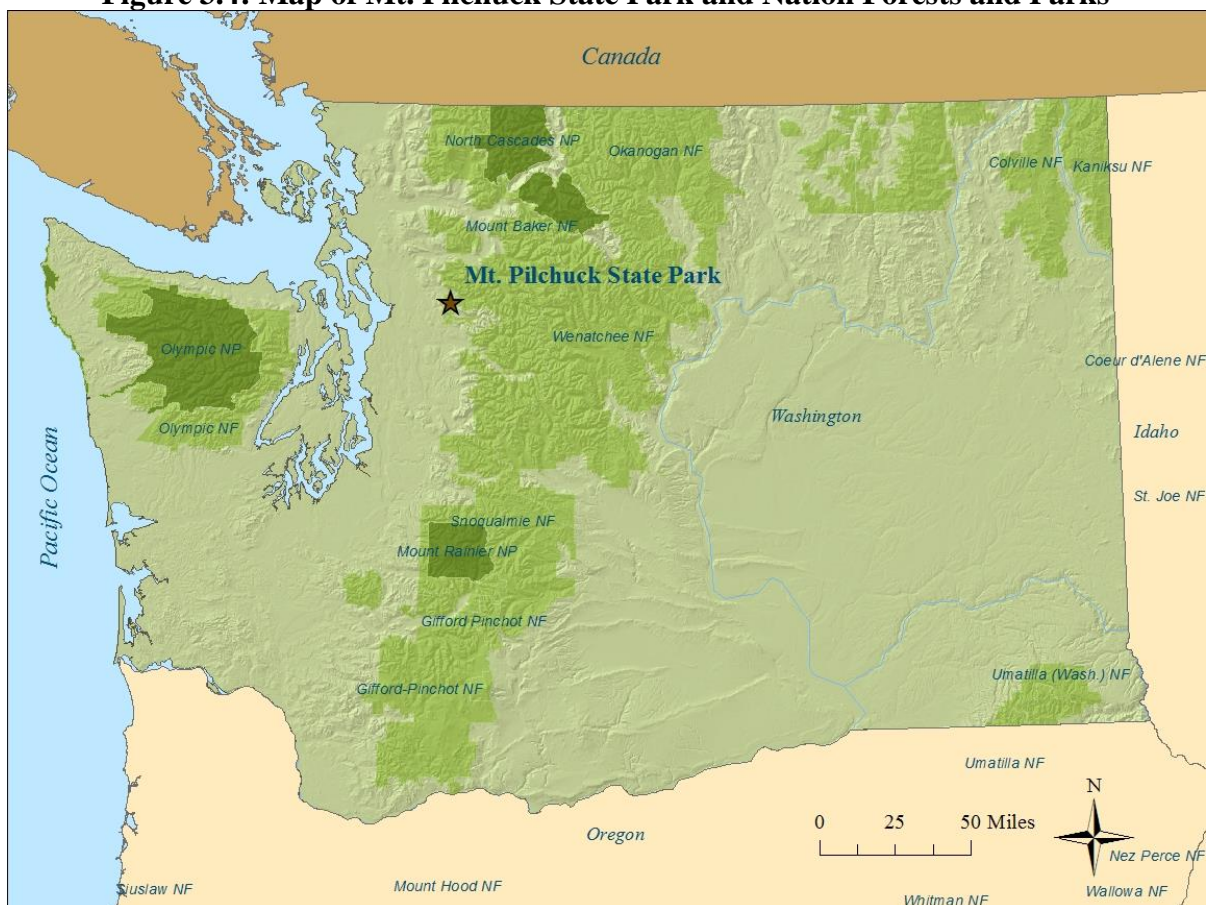


The site receives heavy use during the summer months from Puget Sound area hikers. Below is a map of urban areas in Washington State and the proximity to Mt. Pilchuck State Park. The map highlights the nearness of the State Park to the Seattle urban area.

Figure 3.2: Map of Mt. Pilchuck State Park and Urban Area

Mt. Pilchuck is covered in snow from early fall to late spring as the park is on the western edge of the Cascade Mountain Range. The map below shows the nearness of the Mt. Pilchuck to National Forests and Parks within Washington. From the lookout at the end of the Mt. Pilchuck trail the Cascade Mountains are visible to the east and Puget Sound is discernable to the west.

Figure 3.4: Map of Mt. Pilchuck State Park and Nation Forests and Parks



Survey Research

Surveys are useful for human geography research because data is created through the perceptions of individuals while interacting with a specific landscape. This thesis uses self-administered surveys to gather data pertinent to the question of how mobile technology impacts outdoor experiences. Surveys allow the researcher to access a large, possibly diverse, population while remaining economical and straightforward (requiring limited training to administer) (Dillman, 2000). When individuals respond to a survey the action is understood as part of a social exchange. The three main components of social exchange are rewards, costs, and trust. To maximize participation and responses the researcher must build trust,

minimize costs and maximize rewards (Dillman, 2000). Survey research can provide a rich body of data to statistically analyze and thereby extract information and knowledge.

Statistical research is either experimental or observational. In experimental research the independent variable (IV) is manipulated by the researcher in a relatively controlled environment. Conversely, observational research is conducted by gathering data through the observation of events without IV manipulation by the researcher. The data for this thesis was gathered through the use of a survey and therefore observational research.

Survey Instrument

The sample size is 155 so a choice was made to design several of the questions to provide quantitative data such as age, number of previous visits to Mt. Pilchuck State Park and number of text messages sent while in the State Park. Simultaneously, qualitative data was gathered to provide greater detail and variability than was captured by the quantitative data. An example of a qualitative question is “Have you used a mobile application at any point during your visit to this State Park, if yes for what purpose?” The inclusion of both data types facilitates both an understanding of general trends across the sample population and individual perceptions and motivations.

No previous surveys existed to gather the information necessary for the topic so the survey is an original design. The survey instrument is available in Appendix A. The survey instrument is based on several other similar works. Section one draws on four articles. The first article is Hammitt and Madden’s (1989) *Cognitive dimensions of wilderness privacy: A field test and further explanation*. This article discusses the idea of solitude and the ability of outdoor recreation to remove people from regular routines and duties. The second article that

section one is based on is Watson, Clark and Tellegen's (1988) *Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scale*. This article introduces a scale for measuring positive and negative affect that is subsequently used in outdoor recreation research. The third article section one is derived from is *Underestimating Nearby Nature: Affective Forecasting Errors Obscure the Happy Path to Sustainability* by Nisbet and Zelinski in 2011. This article modified the PANAS to include a measure of relaxation and fascination, two recognized benefits of outdoor recreation. The final article section one references is *Linking Place Preference with Place Meaning: an Examination of the Relationship between Place Motivation and Place Attachment* by Kyle, Mowen and Tarrant in 2004. This final survey instrument within the article is used to understand the motives of visitors to outdoor recreation areas and whether or not the experience of the place satisfied the motive.

Section two is not based on any previous surveys. As the section contains questions of the type and use level of mobile technology, the questions were created based on the personal experience of the researcher. The duration of and type of mobile technology use is important because the outdoor experience may be altered based on the behavioral change through interaction with the mobile technology device. Both the intensity and kind of mobile technology use were measured as volume and function of use may impact the outdoor experience differently. The existing literature on mobile technology use in an outdoor setting is limited and gathering data on mobile technology use and type increases the detail and depth of information available.

Section three measures demographic data so the questions are derived from a survey

on place attachment and individual characteristics. The article that several of the questions are based on is Ramkissoon, Smith and Weiler's *Relationships between Place Attachment, Place Satisfaction and Pro-Environmental Behavior in an Australian National Park*. Further questions were added beyond those included in the article based on the interests of the researchers.

Data Collection

The subject population was identified through the time and location of the survey application. Hikers in Mount Pilchuck State Park were the target population. As such, surveys were administered at the lookout at the end of the trail in Mount Pilchuck State Park. The surveys were administered on October 5th, 6th and 13th, 2013. An attempt was made to survey visitors on fair weather days to ensure a high volume of visitors to the State Park. Key individuals at the Washington States Parks and Recreation Commission were contacted by both phone and email. A Washington State Parks Research permit was applied for July 2nd, 2013 and approved July 18th, 2013. The research permit is attached in appendix C. A research protocol regarding human subjects was submitted to the Human Subjects Review Committee and given exempt status on August 1st, 2013. The human subjects research exemption memorandum is attached in Appendix D.

Survey respondents were recruited at the lookout at the end of the Mount Pilchuck trail. While a hiker spent time at the lookout, a researcher approached the individual and asked if he or she would like to participate in the survey. The survey is a pamphlet of questions asking about hikers experience and mobile technology use. Hikers were compensated with a small snack comprised of fruit snacks, dried fruit, or crackers. The only

other compensation provided was access to the results of the research project. The minimum number of subjects recruited was 100 and no maximum number of subjects was set. The total number of participants was 155. When surveys were administered at the lookout the social exchange with highly visible. From the perspective of a researcher, participant willingness increased significantly when the snack reward with made known. Two components seemed to be at work in encouraging participant willingness. First, people appreciate free food, particularly when hungry after just hiking up a mountain. Second, participants may have experienced guilt that a researcher carried all the snacks up to the lookout just to give to survey participants. The visible investment of a researcher inspired a corresponding willingness to invest in the project by the participant. The lookout is a relatively small (~20 x 20 feet) open room and hikers often interact with one another in the enclosed space. When several hikers are focused on filling out a seemingly important paper, arriving hikers are naturally curious. The inquisitive, or possibly responsible, nature of certain hikers caused the individual to seek out a researcher and stand nearby so as to be visible and thereby asked to participate in the survey. The curious role reversal from actively seeking participants to accepting applicants for participation was both rewarding and amusing to the researchers.

Statistical Analysis

The statistical package SPSS Statistics 21 is used to interpret the quantitative data. Descriptive statistics such as mean and standard deviation were calculated. The normality of variables was assessed, differences between groups were examined for significant differences, and correlation between select variables was calculated.

Determining Significance

In statistics the term significance is used to identify results that are not based on chance (Sprinthall, 2007). To determine if a population parameter is significantly different from a given value a significance level is set before the test is run. The significance level is the probability that the test statistic will reject the null hypothesis when the null hypothesis is actually true. Often the significance level is set at .05 for a two tailed test and .10 for a one tailed test (Triola, 2008).

Error Types

Determining whether to accept or reject the null hypothesis is subject to two types of error. A type I error is when the null hypothesis is rejected despite being true and a type II error is when the null hypothesis is false but is not rejected. The significance level determines the probability of committing a type I error but type II errors are harder to control. The ability of a statistical test to avoid error is based on the interaction of the probability of committing type I and II errors and the sample size. Thus, with a decent sample size and setting the significance level low, the probability of committing a type II error is also reduced (Triola, 2008).

Normality

The Shapiro-Wilk test for normality was performed on all the survey variables. The test is appropriate for relatively small datasets and is equivalent to the Kolmogorov-Smirnov or other methods for determining if parametric or non-parametric statistical tests are necessary. The majority of variables were not normal and so non-parametric statistical tools are used for analysis.

Correlation and Differences Tests

This thesis uses two types of test, correlation and differences between groups or within subjects. Correlation takes two variables and determines how closely matched one is to the other so that as one variable increases so does the other. Correlation can show that as one variable changes so does the other but cannot provide evidence that one variable causes the change in the other, or vice versa. There are two types of difference test, between groups and within subjects. Between groups uses an independent variable (IV) to separate entities into groups and then determine if groups significantly differ from each other on a dependent variable (DV) variable. Within subjects determines if significant differences occur between two DV means. The focus of this thesis is on possible differences between groups so the Mann-Whitney U and Kruskal-Wallis tests are employed. The Mann-Whitney U test is for non-normal ordinal and numerical data and the Kruskal-Wallis is used with multiple groupings of independent variables for non-normal ordinal and numerical data. To determine a possible correlation between two variables the Spearman Rank correlation test is used in this thesis as Spearman's Rank is used when the data is not normally distributed and is either ordinal, interval or ratio (Triola, 2008).

Chapter 4: Results

The following section describes the results of the data gathered from the survey. The complete survey is available in Appendix A. A demographic profile, mobile technology use, and the motive to recreate for the participant population are provided in section one. Section two describes the relationship between mobile technology use and participant characteristics. In the third section, the results pertinent to mobile technology use and outdoor recreation experiences are shown. The fourth section displays the results of the relationship between mobile technology use and outdoor recreation benefits. Finally, in the fifth section, the qualitative responses provided by participants are presented.

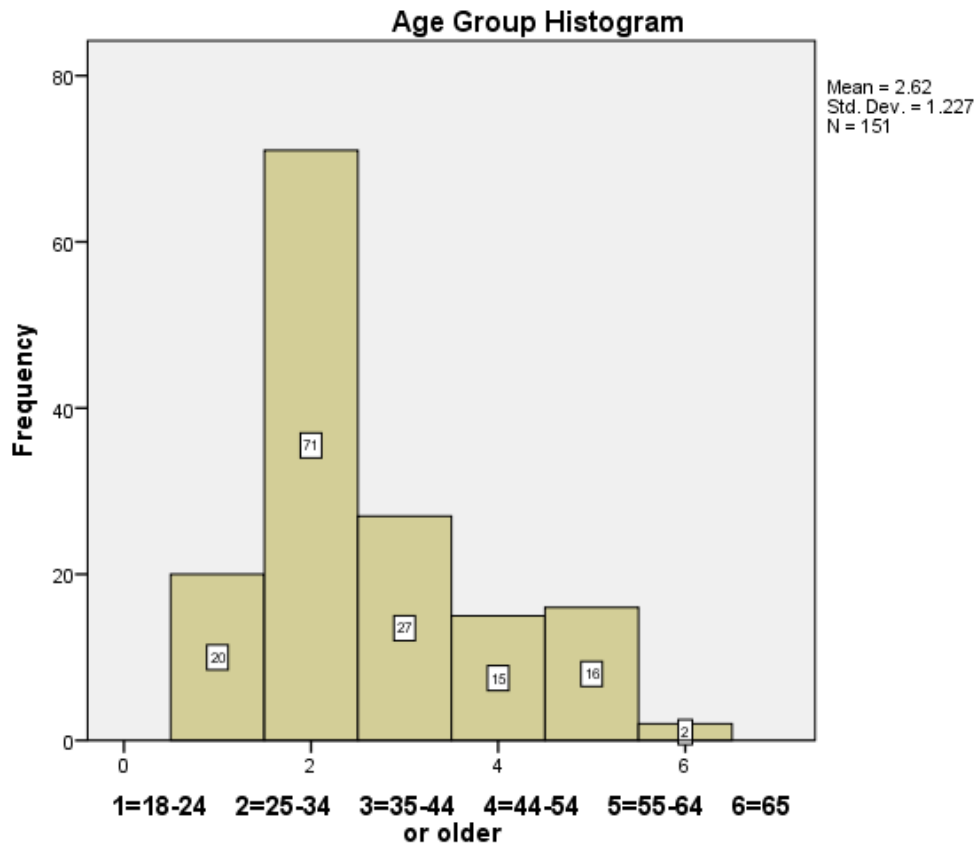
Participant Population Characteristics

Demographics

One hundred and fifty five participants returned surveys and as only one hundred and fifty five were given out, the survey had a 100% response rate. A stereotypical participant based on the mode of each demographic question is as follows: Male, between the ages of 25-34, holds a Bachelor's Degree, Caucasian, has an income of more than 95,000 a year, was in a party of two, was on his first visit to Mt. Pilchuck State Park, recreates 16 or more times a year and spent between 30 minutes to an hour at the lookout.

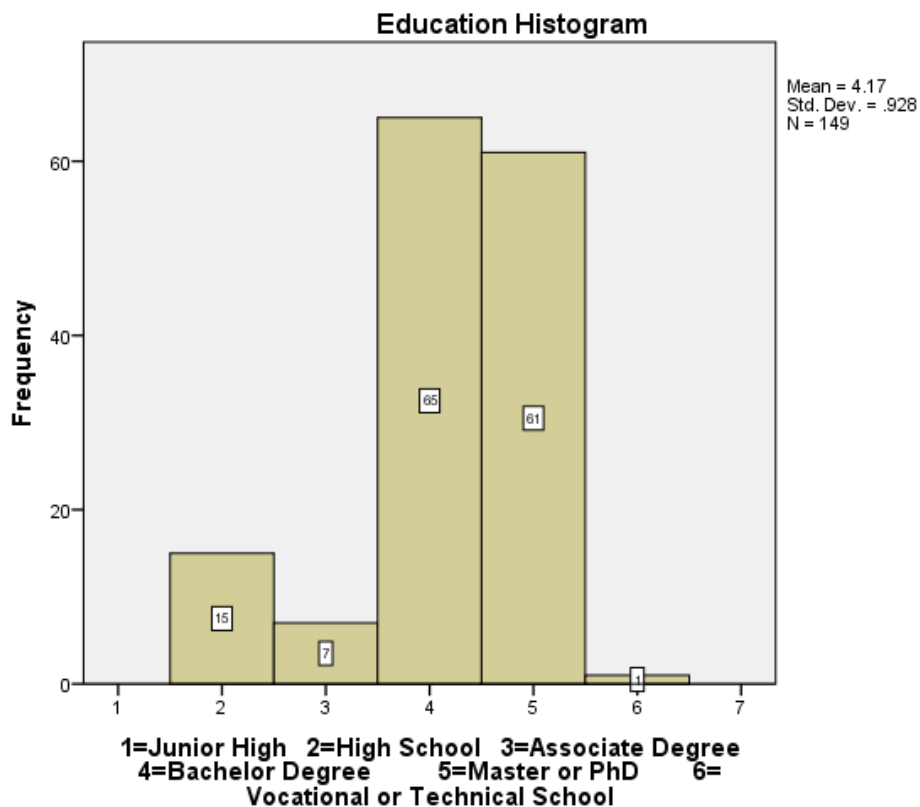
The participant population is almost evenly split between men and women with 75 men, 74 women and six who did not respond to the gender question.

Figure 4.1: Histogram of Participant Population Age

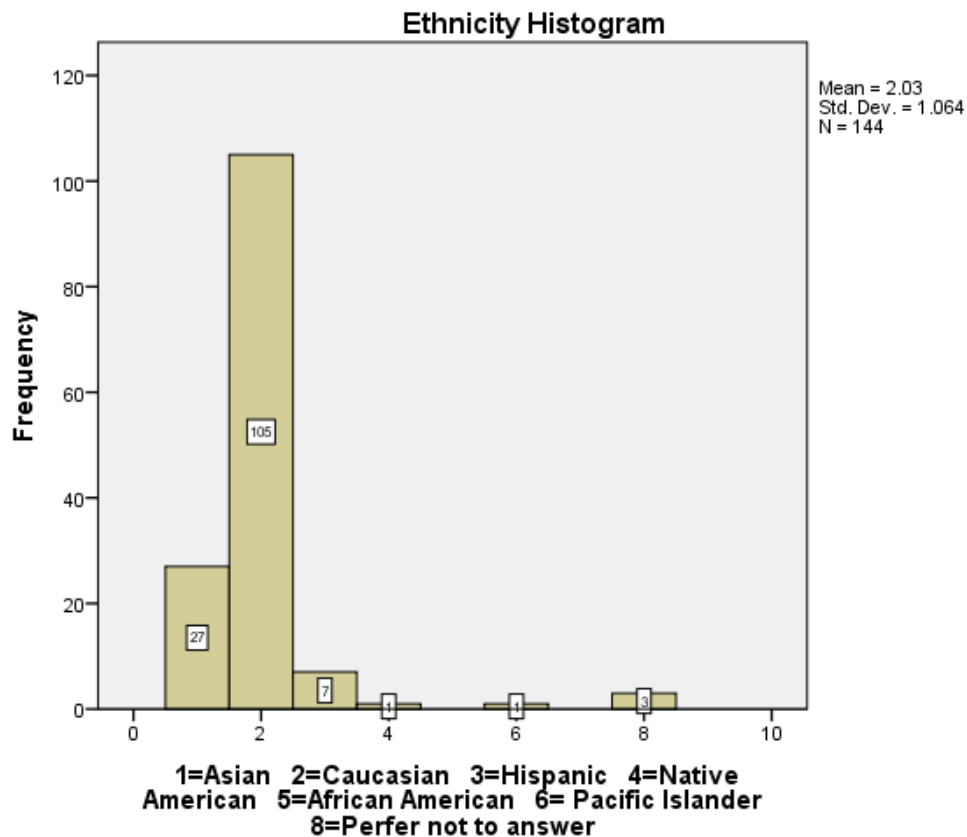


The above histogram describes the age distribution of respondents. The majority of participants were between the ages of 25-34 (71 participants) with a relatively equal distribution across the other age ranges of 18-24, 35-44, 44-54 and 55-64 (20, 27, 15 and 16 participants respectively). As the table shows, only two respondents were 65 years or older.

Figure 4.2: Histogram of Participant Population Education

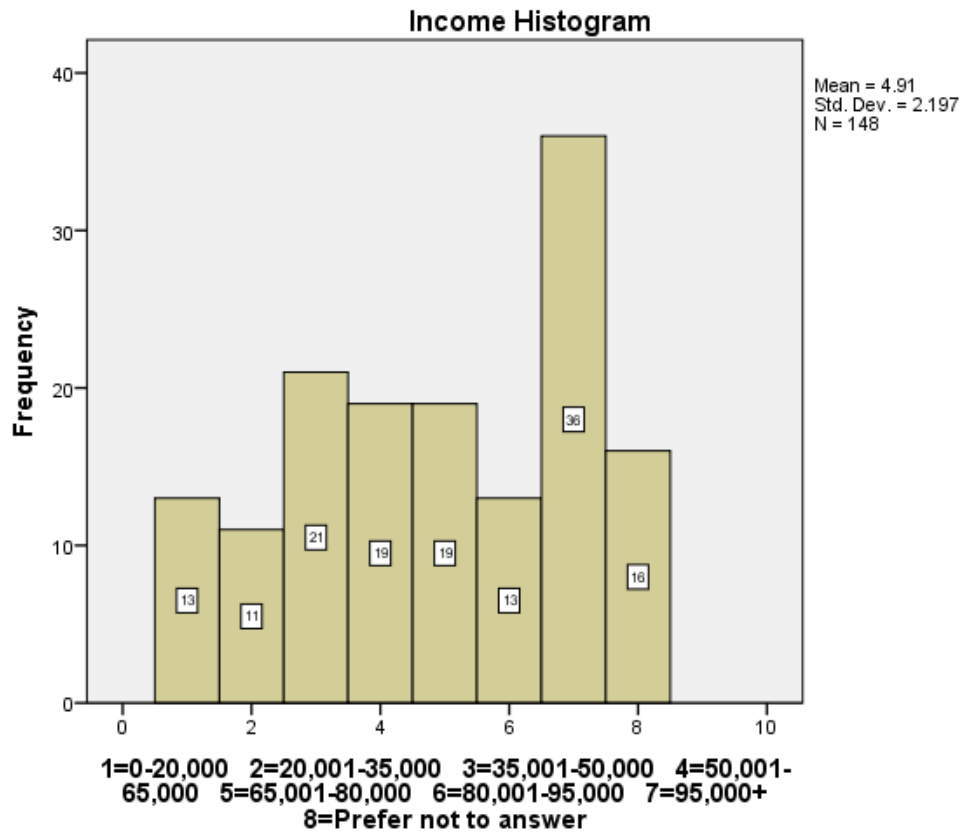


A significant majority of survey participants were highly educated with 65 participants possessing a Bachelor's degree and 61 holding a Masters or Doctoral degree. All participants had completed high school and only one person had attended a vocational or technical school.

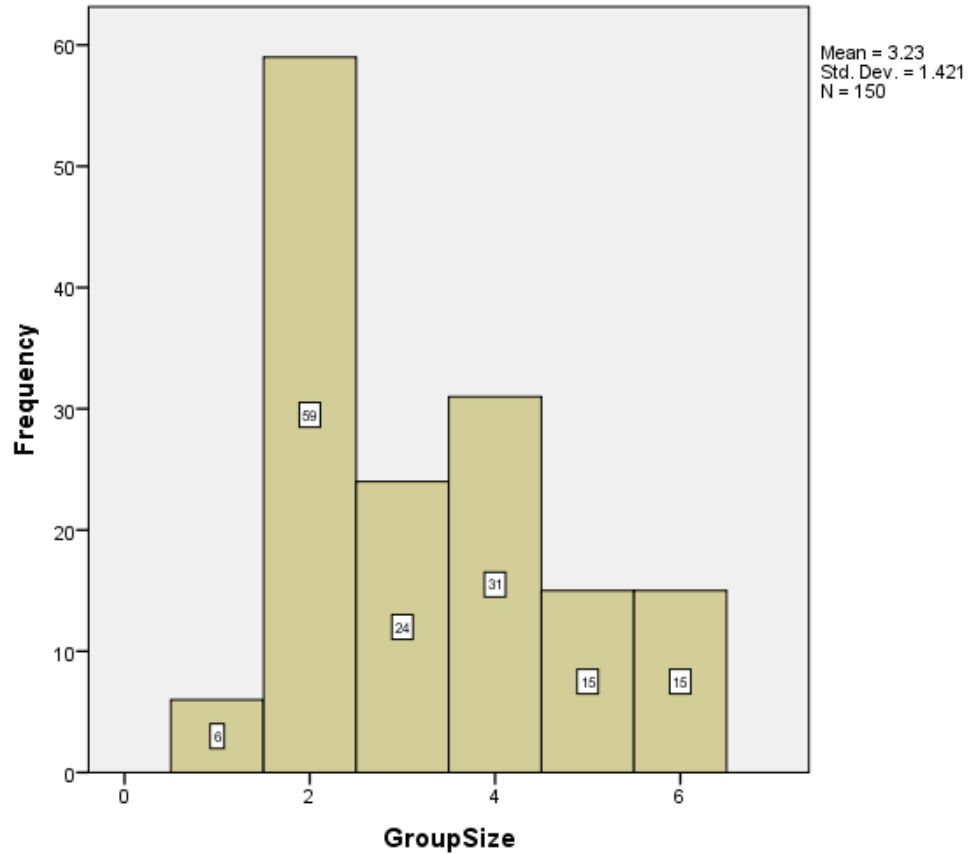
Figure 4.3: Histogram of Participant Population Ethnicity

The participant population was primarily white with a notable minority of 27 Asian and 7 Hispanic. There was one Native American and one Pacific Islander individual with three people responding “prefer not to answer.”

Figure 4.4: Histogram of Participant Population Income

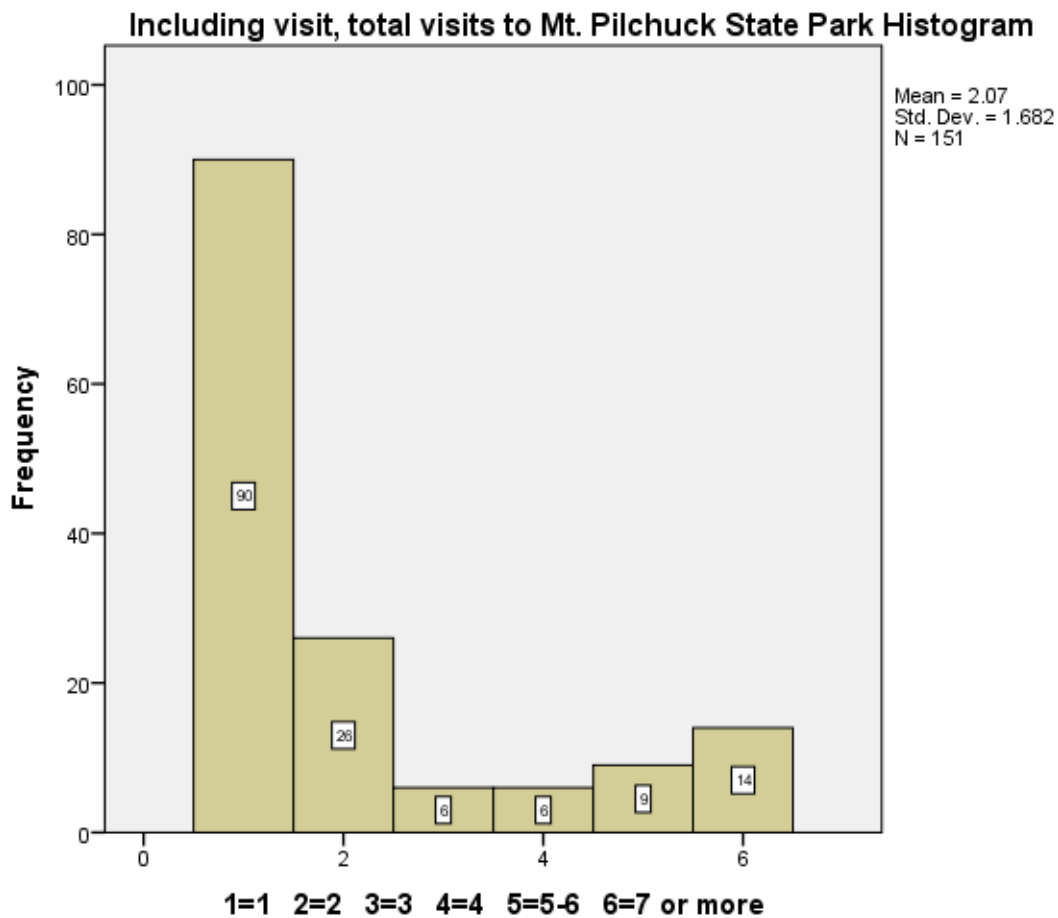


The reported income of the sample population covered a broad range of values. The most common income category was “95,000+” but the income distribution indicates a variety of income levels.

Figure 4.5: Histogram of Participant Population Group Size

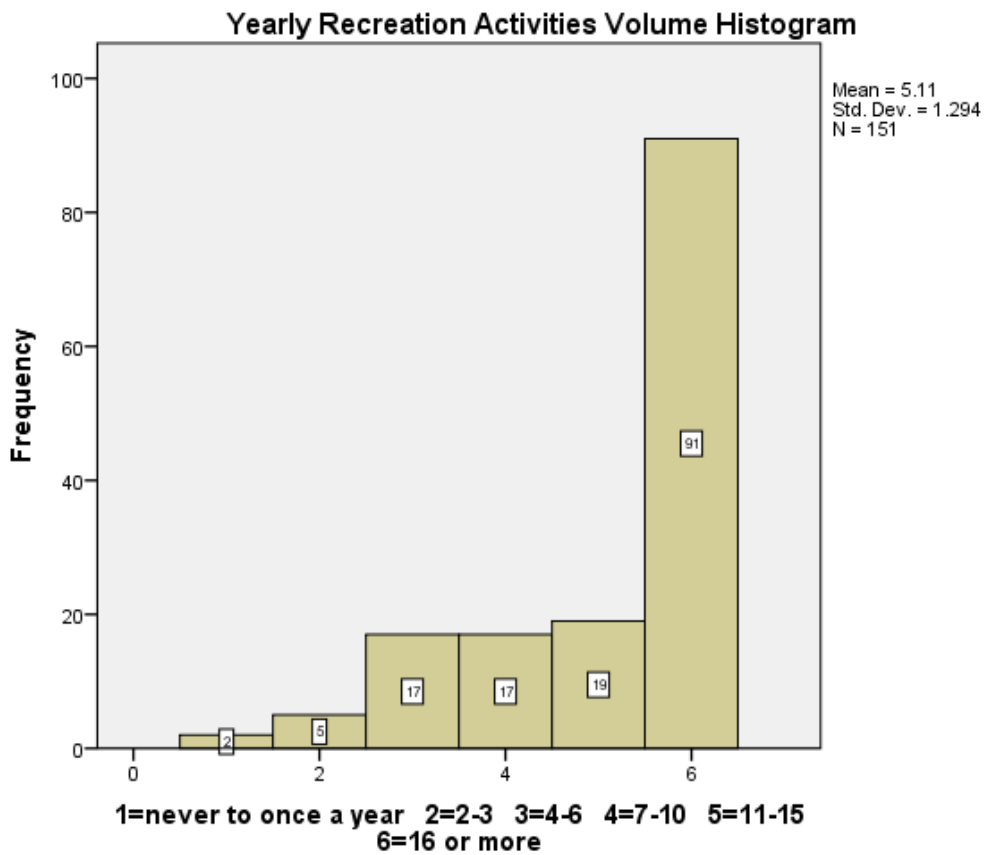
The above histogram indicates that the majority of participants were part of two person parties. Although the relatively high volume of other group sizes indicates that while a group of two was the most common other groups ranging from alone to six people were quite common.

Figure 4.6: Histogram of Participant Population Mt. Pilchuck Visits



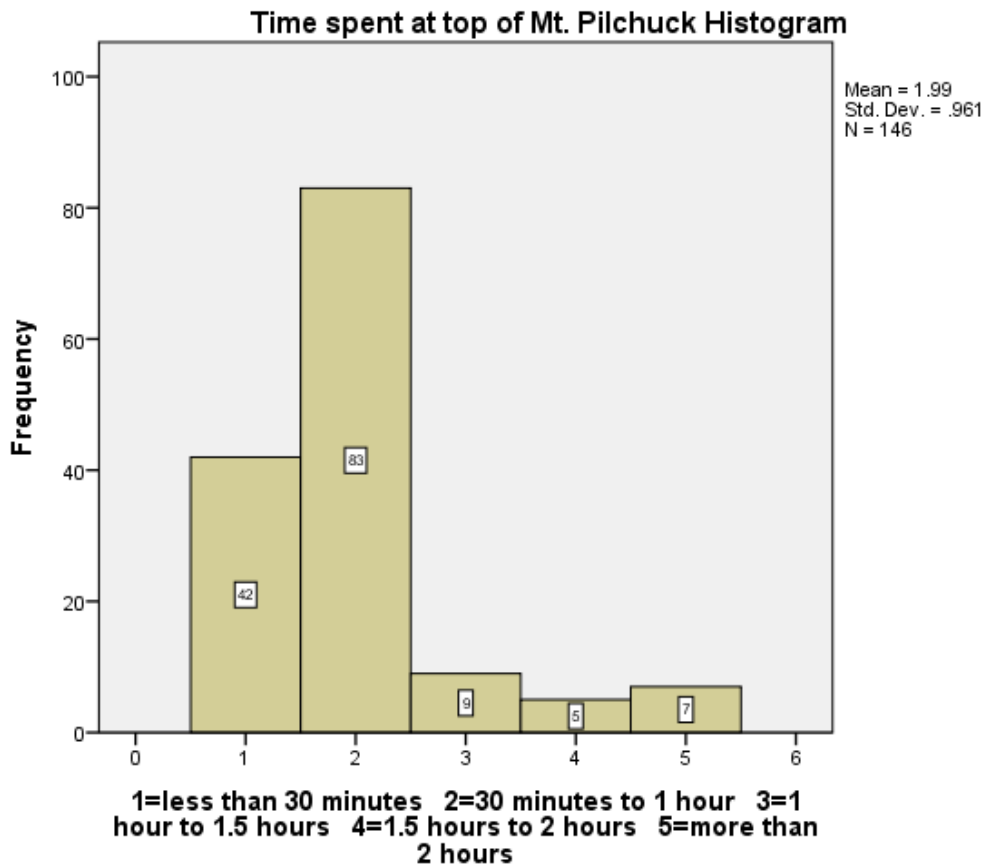
For a significant majority of participants (90 individuals), the trip that included responding to the survey was the individual's first visit to Mt. Pilchuck. Only 26 people were on a second trip to Mt. Pilchuck State Park with six people each for the three and four visit categories. A notable trend is the increase in frequency of responses as number of visits increased, as in the six visits and seven or more categories.

Figure 4.7: Histogram of Participant Population Yearly Recreation



Overwhelmingly, survey participants were avid outdoorspeople. 91 individuals indicated yearly outdoor recreation experiences as “16 or more” and only two people responded with “never to once a year” for recreation activities.

Figure 4.8: Histogram of Participant Population Time at Lookout



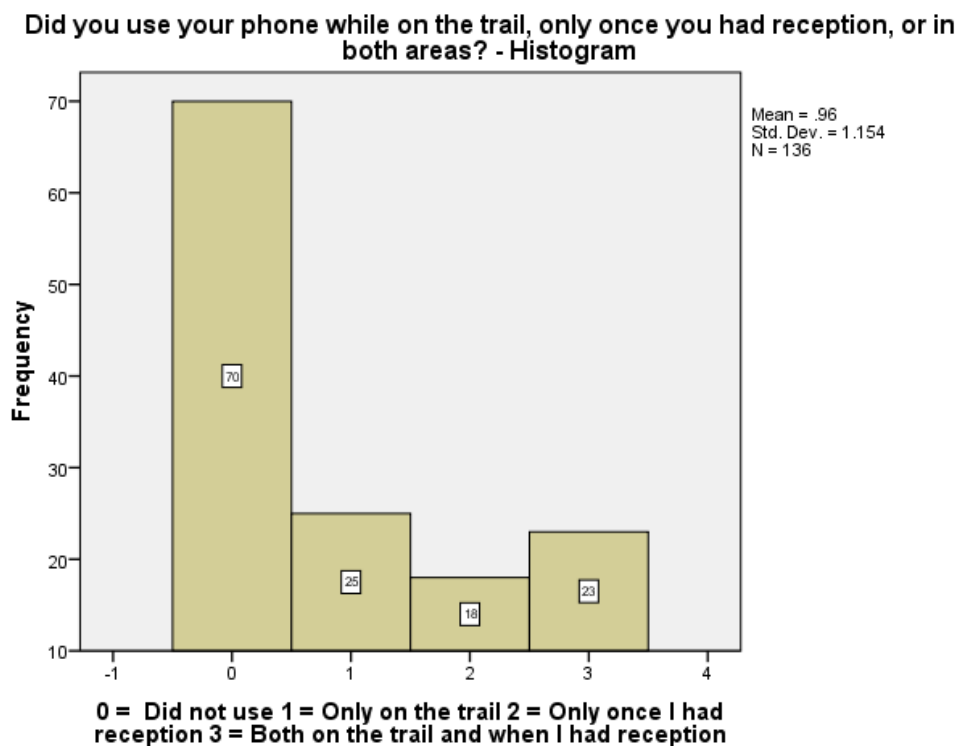
The majority of participants (83 individuals) spent “30 minutes to 1 hour” at the lookout, at the time of survey administration. The second most common response was “less than thirty minutes” with 42 responses. The relatively low amount of time spent at the lookout by respondents when the survey was filled out may be due to the way the survey was administered. Because the lookout is small, new visitors to the lookout were easy for a researcher to identify as possible participants. Secondly, visitors quickly realized something was happening at the lookout, became curious and talked with participants or a researcher.

Thus, the amount of time spent at the lookout by participants may have been lower than the amount of time spent if the survey had not been conducted that day.

Mobile Technology Use and Type

Most participants brought a phone on the hike to the Mt. Pichuck lookout. 136 respondents brought a phone whereas only 16 did not bring a phone. Three people did not respond to the question.

Figure 4.9: Histogram of Participant Population Location of Phone Use

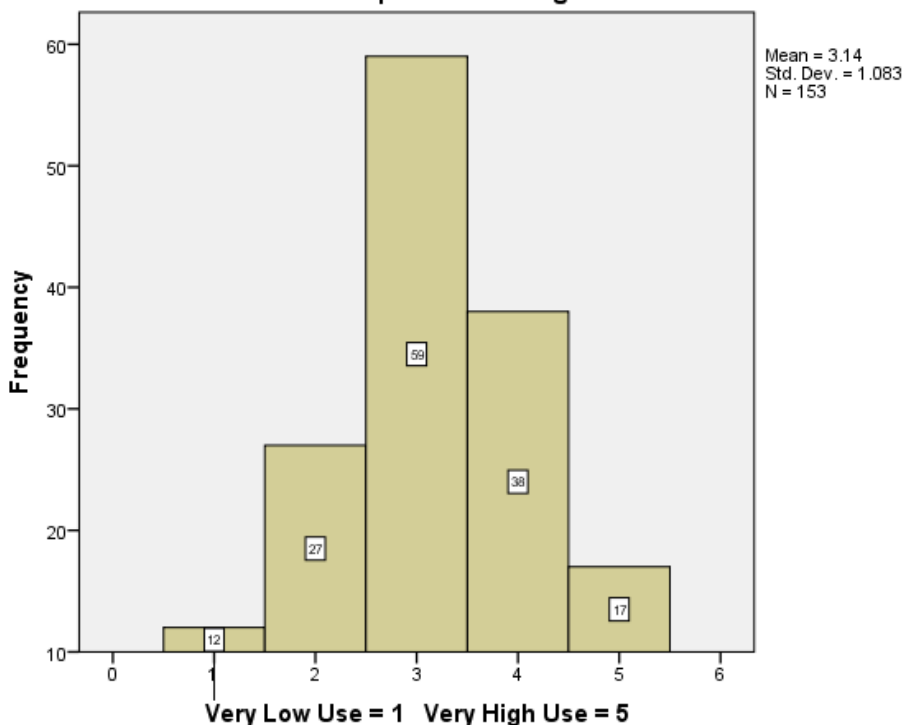


While most people did bring a phone on the trip, the majority of participants did not use the phone while in the State Park. 70 respondents had not used the phone at all while 25 had used

the phone only on the trail, 18 used the phone only once the individual had reception, and only 25 people used the phone both on the trail and once reception was available.

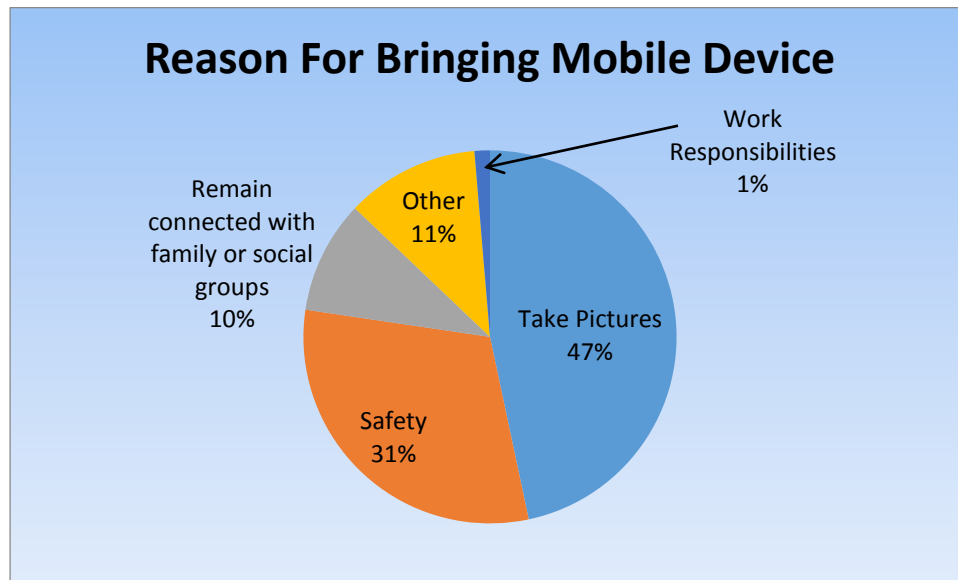
Figure 4.10: Histogram of Participant Population Mobile Technology Use Relative to Peers

How would you classify your level of mobile technology use as compared to your peers? - Histogram



The self-measured level of personal mobile technology use relative to one's peers shows that while most people believe their mobile technology use is average, more people indicated higher levels of use than those with low reported levels of use.

Figure 4.11: Chart of Reasons for Bringing Mobile Device



As described in the table above, 47% of participants brought a phone to take pictures. Safety was the second most common reason for bringing the phone. Respondents could indicate more than one reason for bringing the phone although most chose only one response. Twenty respondents did not provide any response to this question but sixteen of such people were not asked to respond as they had not brought a phone, thereby making the question not applicable. In Appendix B is a list of the reasons for bringing the phone written in by the participants. The majority of qualitative responses were similar to the reasons described in the chart above but provide a greater degree of detail into the thought process of the

individual. For example rather than just the ‘safety’ response one person said “In case I get lost!” The qualitative responses also revealed reasons to have the phone not captured by the quantitative question. For example, several respondents brought the phone because “I always have it” or “because I never am away from it.” Such responses may indicate that taking the phone is not a conscious decision as much as a behavior based on habit.

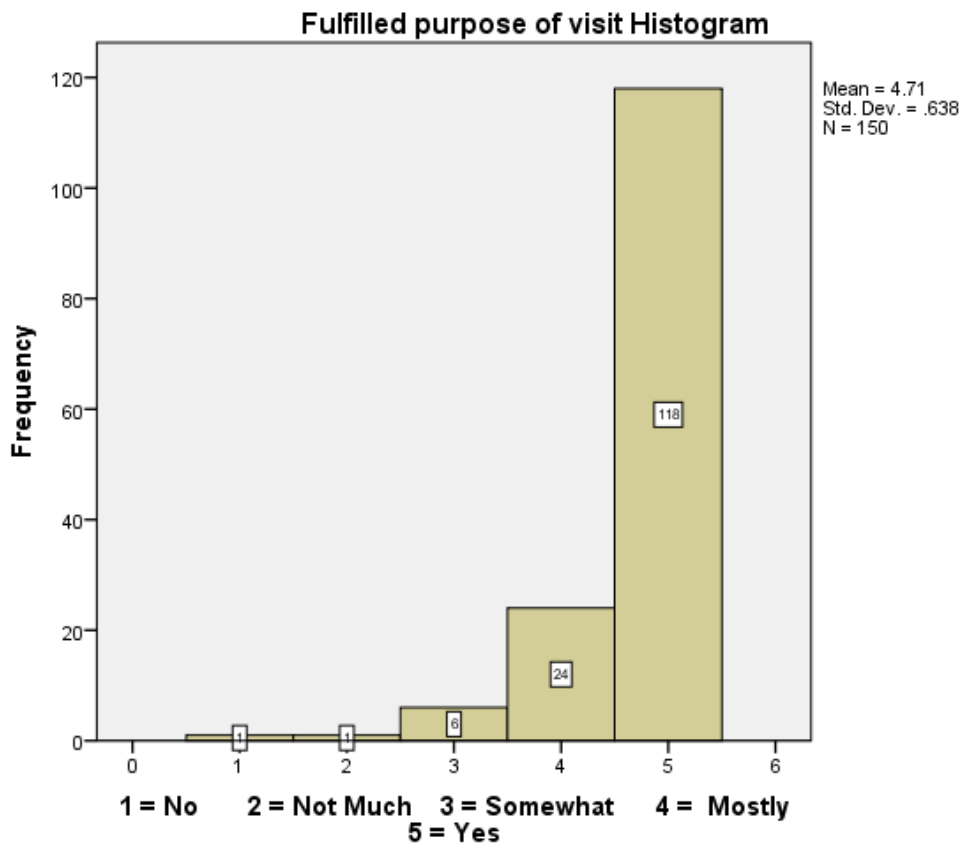
Figure 4.12: Chart of Participant Population Motives to Hike at Mt. Pilchuck State Park



The motive to visit question had several interpretation difficulties for participants. The question is available within the survey in Appendix A. Two common problems occurred, either a respondent did not rank his or her responses and only checked off categories or participants used a rank value more than once. When both of the described response types were removed from the dataset 103 responses remained. The above graph was created using the responses that were correctly answered. The categories that were ranked as the top three

recreation motives for each individual were totaled and are presented in the above graph. The graph shows that the aggregate highest priority among participants was ‘exercise/fitness’, followed by ‘environment/atmosphere’ and ‘socializing/meeting’ with friends, respectively. Seeming less motivating for the participant population was ‘appreciation, watch or study of plants, birds or animals’ and ‘solitude and reflection.’ Mt. Pilchuck is a very popular, convenient hike and so the two qualities may be significant factors in deciding where to hike. People hiking for personal fitness and socially may find the attributes of Mt. Pilchuck more enticing than hikers who prioritize the natural environment in a secluded setting.

Figure 4.13: Histogram of Participant Population Purpose of Visit Fulfilled



When asked if the purpose of the visit was fulfilled, 118 responded ‘yes,’ 24 indicated ‘mostly’ and only 8 identified ‘somewhat’ or a lesser answer.

Mobile Technology Use

The participant population average mobile technology type and volume is provided in the table below.

Table 4.14: Average Mobile Technology Type and Volume

	Responses	Minimum	Maximum	Mean	Std. Deviation
Calls	136	0	1	.03	.17
Text	136	0	10	.42	1.35
Pictures	135	0	250	11.98	28.35
Social Network Access	127	0	3	.13	.44
Email	127	0	2	.06	.26
Relevant Information Access	127	0	5	.40	.91
Aggregate MT Use	154	0	250	11.38	26.90

The means of the mobile technology use variables indicates that overall mobile technology use is low. The most common type of use was picture taking, with all other types of use less than .5 times per person. The table also shows that the vast majority of aggregate mobile technology use accounted for by picture taking. Thus, when aggregate mobile technology use is discussed, the majority of that use is picture taking. The aggregate mobile technology use variable is strongly correlated with picture taking ($r=.980$), as is shown in the table below. Several picture responses were “tons” or “many.” When these responses were given they were coded as ten photos.

Table 4.15: Spearman Rank Correlation Values, Mobile Technology Use Types

		Calls	Texts	Pictures	Social Network Access	Email Access	Relevant Information Access
Calls	Test Statistic (R) Significance (two-tailed)						
Texts	Test Statistic (R) Significance (two-tailed)	0.165 0.055					
Pictures	Test Statistic (R) Significance (two-tailed)	-0.068 0.432	0.073 0.399				
Social Network Access	Test Statistic (R) Significance (two-tailed)	.296** 0.001	.236** 0.007	.204* 0.022			
Email Access	Test Statistic (R) Significance (two-tailed)	-0.035 0.699	-0.004 0.965	-0.046 0.608	0.174 0.051		
Relevant Information Access	Test Statistic (R) Significance (two-tailed)	0.024 0.790	0.230 0.800	0.131 0.143	.335** 0.000	0.037 0.683	
Aggregate MT Use	Test Statistic (R) Significance (two-tailed)	0.008 0.928	.179* 0.037	.980** 0.000	.295** 0.001	0.002 0.979	.243** 0.006

*Correlation is significant at the 0.05 level
(two tailed)

**Correlation is significant at the 0.01 level
(two tailed)

The table of correlations between mobile technology use types shows that social network access is significantly correlated with all other use types except email access.

Likewise, the aggregate mobile technology use variable is significantly correlated with all use variables except email access and calls.

The self-reported use level question should have a positive correlation with the number of calls, texts, pictures, social network access, email access, aggregate mobile technology use, and trip information access variables. The correlation table below shows that self-report use level is only significantly correlated with pictures taken, social network access, and aggregate mobile technology use. Therefore, people who report high mobile technology use relative to peers only actually have corresponding high use with picture taking, social network access and aggregate mobile technology use.

Table 4.16: Spearman Rank Correlation Values, Mobile Technology Use and Self-Report Use Level

		Self-Report Use Level
Calls	Test Statistic (R)	-0.079
	Significance (two-tailed)	0.369
Texts	Test Statistic (R)	-0.021
	Significance (two-tailed)	0.806
Pictures	Test Statistic (R)	.201*
	Significance (two-tailed)	0.020
Social Network Access	Test Statistic (R)	.223*
	Significance (two-tailed)	0.012
Email Access	Test Statistic (R)	0.103
	Significance (two-tailed)	0.249
Relevant Information Access	Test Statistic (R)	0.065
	Significance (two-tailed)	0.473
Aggregate MT Use	Test Statistic (R)	.229**
	Significance (two-tailed)	0.005

*Correlation is significant at the 0.05 level (two tailed)

**Correlation is significant at the 0.01 level (two tailed)

Mobile Technology Use and Participant Characteristics

To determine if mobile technology use is related to outdoor experience, between group differences tests are necessary. First, mobile technology type and level are compared to individual's characteristics. To perform this Mann-Whitney U test a specific demographic characteristic is set as the independent variable and the use level and type of mobile technology is the dependent variable. Level of mobile technology use is determined by the

self-reported use level and the reported volume of calls, texts, pictures, social network access, email access and information access.

Gender

Table 4.17: Mann-Whitney U Values, Gender and Mobile Technology Use

MT Type	Test Statistic (U)	Significance (two-tailed)
Calls	2178	1
Texts	2097	0.562
Pictures	1652.5	0.022*
Social Network Access	1868	0.612
Email Access	1854	0.375
Trip Information	1899	0.889
Self-Reported Use Level	2000.5	0.003*

*Correlation is significant at the 0.05 level (two tailed)

The above test result shows that the only two variables in which gender had significantly different response types is the self-reported mobile technology use level and the number of pictures taken by the participant. Because the Mann-Whitney U test result is less than .05 for self-reported use level, the test indicates that the likelihood of the different results between men and women being from random chance is .03% for the self-reported use level variable and 1.1% for the pictures variable. Because the significance level for the differences between groups tests has been set at 5% or less as indicating not random, both the pictures and self-reported use level variables are significantly different when grouped by gender. Examining the histogram of self-reported use level responses grouped by gender indicates that men were more likely than women to report higher than average mobile technology use levels as compared to their peers.

Similarly, the histogram of volume of pictures taken split by gender shows that men reported taking more photos than women. Both histograms, taken with the Mann-Whitney U test results indicate that as a group men took significantly more pictures and self-reported higher mobile technology use levels than women.

Age

A Kruskal Wallis test for age mobile technology use indicates that there is no significant differences between age groups on the calls, texts, pictures, social networks access, email access, trip information access and self-reported use level variables.

Education

Table 4.18: Kruskal Wallis Values, Education and Mobile Technology Use

MT Type	Test Statistic (H)	Significance (two-tailed)
Calls	4.455	0.348
Texts	7.568	0.109
Pictures	13.252	0.01*
Social Network Access	0.9	0.925
Email Access	1.144	0.887
Trip Information	0.945	0.918
Self Reported Use Level	4.289	0.368

*Correlation is significant at the 0.05 level (two tailed)

The above test statistic indicates that education level has a significant impact on the volume of pictures taken and is almost significant for the number of texts sent, but is not significant on any other mobile technology use or type indicator. A review of the pictures histogram divided by education group shows that people who have a bachelor's degree, master's or doctorate have a significantly higher volume of pictures taken than those with education levels of high school, associate's degree or vocational or technical school.

Ethnicity

Table 4.19: Kruskal Wallis Values, Ethnicity and Mobile Technology Use

MT Type	Test Statistic (H)	Significance (two-tailed)
Calls	0.431	0.994
Texts	2.907	0.714
Pictures	5.127	0.401
Social Network Access	1.416	0.923
Email Access	2.938	0.71
Trip Information	2.153	0.828
Self Reported Use Level	16.104	0.007**

**Correlation is significant at the 0.01 level (two tailed)

The above test result shows that ethnicity has a statistically significant relationship with only self-reported use level and no other mobile technology use level or type variable. A review of the self-reported use level histogram split by ethnicity indicates that respondents who indicated Asian ethnicity reported significantly higher self-reported use levels.

Income

Table 4.20: Kruskal Wallis Values, Income and Mobile Technology Use

MT Type	Test Statistic (H)	Significance (two-tailed)
Calls	2.896	0.822
Texts	4.269	0.64
Pictures	3.15	0.79
Social Network Access	7.165	0.306
Email Access	5.897	0.435
Trip Information	10.114	0.12
Self Reported Use Level	14.771	0.022*

*Correlation is significant at the 0.05 level (two tailed)

The above test statistic shows that self-reported use level is significantly related to income among the participant population. The test did not use responses from people who

indicated ‘prefer not to answer’ for income, a total of 16 responses. A review of the self-reported use level histogram split by income group shows an increase in self-reported use level as income increases.

Group Size

Table 4.21: Kruskal Wallis Values, Group Size and Mobile Technology Use

MT Type	Test Statistic (H)	Significance (two-tailed)
Calls	6.094	0.297
Texts	16.398	0.006**
Pictures	3.775	0.582
Social Network Access	6.011	0.305
Email Access	3.689	0.595
Trip Information	6.997	0.221
Self Reported Use Level	3.011	0.698

**Correlation is significant at the 0.01 level (two tailed)

The above test result shows that the number of texts send while at the State Park is significantly related to the size of each participant’s group. A review of the texts sent histogram split by group size does not indicate a clear relationship between texts send and group size. A Spearman Rank correlation test of texts sent and group size indicates that while not a significant correlation, as group size increased the number text messages send decreases.

Previous Mt. Pilchuck Visits

A Kruskal Wallis test of previous visits to Mt. Pilchuck State Park and mobile technology use variables indicates number of previous visits to Mt. Pilchuck State Park has no significant relationship to volume or type of mobile technology use.

Yearly Outdoor Recreation

A Kruskal Wallis test for yearly outdoor recreation and mobile technology use variables indicates there was no significant relationship between yearly outdoor recreation activities and mobile technology use or type. The first two categories of this question, ‘never to once a year’ and ‘2-3’ were not included in the analysis because of the low volume of responses for each category.

Time Spent at Mt. Pilchuck Lookout

Table 4.22: Kruskal Wallis Values, Time at Lookout and Mobile Technology Use

MT Type	Test Statistic (H)	Significance (two-tailed)
Calls	2.716	0.606
Texts	10.634	0.031*
Pictures	4.055	0.399
Social Network Access	7.554	0.109
Email Access	2.004	0.735
Trip Information	0.849	0.932
Self Reported Use Level	0.544	0.969

*Correlation is significant at the 0.05 level (two tailed)

The above test result shows that the amount of time a respondent spent at the Mt. Pilchuck lookout is significantly related to only the amount of texts sent while on the trip. A Spearman Rank Correlation test was done with the Texts and Time Spent at Lookout variables. The correlation result indicates a significant positive correlation exists between Time Spent at Lookout and Texts Sent with a correlation value of .229 and a significance value of .009. Thus, the longer a person was at the lookout the more texts that person sent and vice versa.

Mobile Technology Use and Outdoor Recreation Experience

To know if a relationship exists between mobile technology use and outdoor recreation experience the nonparametric Kruskal Wallis H test and the Spearman Rank correlation are used. Level of mobile technology use is determined the individual mobile technology use variables of Calls, Texts, Pictures Taken, Social Network Access, Email Access, Trip Information, and Aggregate Mobile Technology Use. The dependent experience variables are Paid Attention, Relics, Water Features, Vegetation and Fascination.

There were no significant relationships between people who did or did not bring a phone and the responses to “While hiking here I paid close attention to my surroundings and the scenery,” the Relics, Water Features and the Vegetation variables. Thus, there is no difference between the group who brought a phone and those who did not for the responses to situational awareness variables. There is also no significant difference between phone and no phone groups for responses to the Fascination variable.

The below Kruskal Wallis test result shows that the only outdoor recreation experience variable significantly related to aggregate mobile technology use is Fascination. Aggregate mobile technology was binned into six groups to perform the test.

Table 4.23: Kruskal Wallis Values, Outdoor Recreation Experience and Aggregate Mobile Technology Use

Experience Type	Test Statistic (H)	Significance (two-tailed)
Fascination	16.231	0.006**
Paid Attention	4.115	0.533
Relics	4.445	0.487
Water Features	8.169	0.147
Vegetation	8.155	0.148

**Correlation is significant at the 0.01 level (two tailed)

The Kruskal Wallis test confirmed that a significant relationship exists between outdoor recreation experience and mobile technology use. To more fully understand the relationship between mobile technology use and outdoor recreation experience for participants a Spearman rank correlation test was conducted.

Table 4.24: Spearman Rank Correlation Values, Outdoor Recreation Experience and Mobile Technology Use

		Vegetation	Fascination	Paid Attention
Calls	Test Statistic (R)	-.255**	-0.035	-0.026
	Significance (two-tailed)	0.009	0.702	0.761
Pictures	Test Statistic (R)	0.094	.346**	.176*
	Significance (two-tailed)	0.342	0.000	0.041
Email	Test Statistic (R)	-0.022	-0.019	-.193*
	Significance (two-tailed)	0.830	0.844	0.030
Aggregate MT Use	Test Statistic (R)	0.082	.320**	0.075
	Significance (two-tailed)	0.375	0.000	0.355

*Correlation is significant at the 0.05 level (two tailed)

**Correlation is significant at the 0.01 level (two tailed)

Neither the relics or water features variable is included in the table above as neither variable had a significant relationship with mobile technology use. Likewise, texts, social network access and trip information access are not included as the variables don't have a significant relationship with outdoor recreation experience. The test shows both the mobile technology aggregate and the pictures taken variable are significantly correlated at the .01 level with Fascination at correlations of .320 and .346, respectively. While the aggregate mobile technology variable is not significantly correlated with the Paid Attention variable, the Pictures taken variable is significantly correlated at the .05 level with a correlation of

.176. The Paid Attention variable is significantly inversely correlated with the email access variable at the .05 level with a correlation of $-.193$. Calls made and Vegetation are also inversely correlated at the 0.01 significance level and a correlation $-.255$.

To summarize the relationship between mobile technology use and outdoor recreation experience, bringing a phone or not has no relationship with situational awareness or fascination but certain types of mobile technology use do interact with situational awareness and fascination. The majority of mobile technology use comes from picture taking and the Pictures variable is positively correlated with both Fascination and Paid Attention. So as participants took more pictures the scores of Fascination and Paid Attention also rose. Conversely, Email Access is inversely correlated with Paid Attention and Calls is inversely correlated with Vegetation. Both inverse correlations mean that as the specific type of mobile technology use rose a specific type of situational awareness decreased.

Mobile Technology Use and Outdoor Recreation Benefit

The final possible significant relationship is between mobile technology use and outdoor recreation benefits. Once again, level of mobile technology use is the independent variable and determined by Calls, Texts, Pictures Taken, Social Network Access, Email Access, Trip Information, and Aggregate Mobile Technology Use. The dependent variables are Relaxation, Positive Affect, Burden Free, Solitude, and Reflection.

The first analysis test necessary is the Mann-Whitney U to determine if there is a significant difference between those who brought phones and those who did not in the dependent variables of Burden Free, Solitude, Reflection, Relaxation and Positive Affect. A Mann Whitney U test indicates there are not two different populations based on phone or no

phone. Once again, the aggregate of all the mobile technology use variables is binned into six groups and then used for a Kruskal Wallis H test to determine if a relationship exists between mobile technology use and outdoor recreation benefits.

Table 4.25: Kruskal Wallis Values, Outdoor Recreation Benefit and Aggregate Mobile Technology Use

Benefit Type	Test Statistic (H)	Significance (two-tailed)
Reflection	9.06	0.107
Solitude	9.027	0.108
Relaxation	2.724	0.742
Positive Affect	19.205	.002**
Burden Free	3.914	0.562

**Correlation is significant at the 0.01 level (two tailed)

The above test results show that on the positive affect variable the aggregate mobile technology use groups have significantly different results. A Spearman Rank correlation test of the mobile technology use variables and the outdoor recreation benefit variables shows several significant correlations. Because Solitude, Reflection and Relaxation don't have a significant relationship with mobile technology use variables, the variables are not included in the table. Similarly, calls and trip information access are also not included as neither variable has a significant relationship with any outdoor recreation benefits. There is an inverse correlation of $-.176$ between Email Access and the Burden Free variable that is significant at the 0.05 level. Positive Affect is correlated with Texts Sent at the 0.05 significance level with a correlation of $.214$. Positive Affect is also significantly, positively correlated at the 0.01 level with Pictures Taken, Social Network Access, and Aggregate Mobile Technology Use with correlations of $.265$, $.254$ and $.284$ respectively.

Table 4.26: Spearman Rank Correlation Values, Outdoor Recreation Benefit and Mobile Technology Use

		Burden Free	Positive Affect
Texts	Test Statistic (R)	0.043	.214*
	Significance (two-tailed)	0.620	0.020
Pictures	Test Statistic (R)	0.126	.265**
	Significance (two-tailed)	0.147	0.004
Social Network Access	Test Statistic (R)	0.146	.254**
	Significance (two-tailed)	0.101	0.007
Email Access	Test Statistic (R)	-.176*	-0.034
	Significance (two-tailed)	0.048	0.720
Aggregate MT Use	Test Statistic (R)	0.080	.284**
	Significance (two-tailed)	0.326	0.001

*Correlation is significant at the 0.05 level (two tailed)

**Correlation is significant at the 0.01 level (two tailed)

In review, having a phone on the trip is not related to outdoor recreation benefits but specific mobile technology uses do have a relationship with the benefit variables of Positive Affect and Burden Free.

Qualitative Responses

Outdoor Recreation Experience

Individuals were asked what type of ski area relics were seen, what type of water features were noticed, and the different types of wildflowers, plants, and trees noticed on the trip. The responses are available in appendix B. The responses show that most people noticed a large range of elements for each question but that there was a core of elements that were common throughout the dataset. Many people saw steel pins on the trail and a concrete block as relics of the former ski area on the site.

The water features question had a broad range of responses. Although the actual question is “How many waterfalls, streams or lakes did you notice while hiking on the trail? ___” followed by “Which types of water features did you notice?” Respondents often wrote in elements visible at the lookout such as ‘lakes’ or ‘Puget sound.’ The idea behind the question was only to describe elements seen while hiking but most responses included water features from the lookout view.

The vegetation question was also difficult to gather any meaning from as many respondents did not know the types of vegetation seen. Nonetheless, the qualitative responses for the situational awareness variables provide insight into the breadth and detail of elements noticed on the hiking trail.

Bring Device or Not Reasoning

For the responses to the question of why a person did or did not bring a phone on the trip please see Appendix B. The responses offer insight into the relationship participants have with the mobile technology device. A theme that emerged from the responses is the idea that a participant brought the phone simply out of habit and the person always has the phone within reach. A second theme also confirms the motive to bring the phone for many people was to take photos. The third theme to emerge is the use of the phone as a tool for emergencies. Those who did not bring the device often described the phone as distracting or incompatible with an enjoyable experience of the outdoors. For example one respondent said, “Nature is for viewing and experience not texting.”

Smartphone Use Purpose and Mobile Application Use

The responses to the smartphone use purpose and mobile application use questions are available in Appendix B. The response to the other Smartphone use question has a few surprises such as “Check Seahawks score” and “check the time.” Individuals seem to rely on the phone for functions that other tools previously were used for, such as using the phone to tell time rather than wearing a watch. The types of applications people used are also novel. For example, an application that one participant showed a researcher is a peak finding application. The application allows an individual to hold a phone up to the skyline and the phone screen adds a filter to the image that identifies the mountain peaks in the frame. The peak finding application highlights the capability of mobile technology to increase enjoyment of the environment while simultaneously buffering the person from directly engaging the environment.

Fulfilled Purpose of Visit

Most of the fulfilled purpose of visit responses mirror the recreation motive ranking question. The responses are available in Appendix B. A somewhat unexpected theme was the crowding complaint as the hike is known to be social. One consequence of people filling out a survey at the lookout is that the lookout was more crowded than usual. So the survey collection may have played a role in increasing the number of crowding complaints. The responses increase detail and provide insight beyond the recreation motive and fulfilled purpose of visit questions. For example, “Had a great day with my daughter!! ☺” and “so many people it is hard to commune” reveal a greater degree of information than was captured by the fulfilled purpose of visit question.

Final Information

The final question asks “Is there anything else you would like to let us know?” and the full list of responses is available in Appendix B. The responses range from random, to grumpy, to friendly, to a line of original poetry. Responses were generally positive and helpful.

Chapter 5: Discussion and Conclusion

The aim of this thesis is to examine the role of mobile technology in outdoor recreation. This chapter will discuss the results of the survey research described in chapter 4, provide conclusions and recommendations, examine implications for management, address limitations of the research and identify directions for future research.

Discussion

Demographics

The demographic profile of the participant population is consistent with much literature on outdoor recreation populations. Outdoor recreationists tend to be Caucasian and relatively affluent. The fact that the largest group per income category was the \$95,000+ category is somewhat surprising. The high income of the population may be partially explained by the proximity of the hike to Seattle as the city has many opportunities for high earning. The high incomes may also be associated with the high education level of the participant population. People who have a Bachelor's degree or higher may be more willing than other individuals to fill out a survey and consequently the participants were more highly educated than general hiking populations.

A caveat to the place of residence question is the ambiguity in the term "greater Puget Sound area." A significant number of participants wrote in a place of residence that can be within a definition of the greater Puget Sound area. Because the greater Puget Sound area boundary is subjective, the groups defined by the question may overlap or participants omitted from one category and incorrectly represented in another. While no significant results were found pertaining to the place of residence question, wording the question

differently may have led to different results.

Recreation Motive

While many participants had trouble responding to the recreation motive question, the question still provides valuable insights. Exercise was the most commonly chosen highest recreation motive and with environment and appreciation as second and third respectively. Appreciation and environment are quite similar motives and, when taken together, reveal a participant population highly motivated by engaging the natural environment. Such a recreation motive is then reflected in the type of mobile technology use most common, that of picture taking, and in the high fascination scores of picture taking participants.

The relatively low prioritization of solitude and contemplation is commensurate with the reputation of Mt. Pilchuck as a social hike. The more a hike is known for crowds and high use the fewer people who recreate for solitude and contemplation will go on that hike. Similarly, the moderate prioritization of socializing is somewhat surprising as the motive is not a stronger motive for participants. The result may be due to the design of the question. Each recreation motive has to be prioritized relative to the other possible motives. Thus, the socializing motive may be high relative to hiker motives in general but not appear high within the Mt. Pilchuck dataset.

Demographics and Mobile Technology Use

A surprising result exists between the age groupings and the mobile technology use variables, namely that there is no significant influence by age on mobile technology use. Age often plays a role in phone use and so the fact that age did not play a role in the Mt. Pilchuck context was unexpected. Other demographic factors that did play a role in mobile technology

use may have had a stronger influence such as education or gender. The hiking context may have also limited the range of age groups represented so that the influence of age was negligible.

Mobile Technology Use and Outdoor Recreation Experience

For this thesis the definition of experience is based on the variables Paid Attention, Fascination, Relics, Water Features, and Vegetation. While not encompassing of the range of human momentary experience, the definition includes measurable components of experience that are relevant to mobile technology use. No significant group differences were found between those who brought a phone and those who did not regarding experience, but significant correlations do exist between outdoor recreation experience and mobile technology use.

Fascination is significantly correlated with Picture Taking with a correlation of .346 and Aggregate Mobile Technology Use with a correlation of .320. The result challenges the notion that mobile technology use detracts from engaging with the environment, and instead shows that as mobile technology use increases, so does fascination with the environment. The Aggregate Mobile Technology Use variable is deceiving as the majority of all mobile technology use was picture taking. So while Aggregate Mobile Technology Use is correlated with Fascination, the result may be due to the influence of the Picture Taking variable on the Aggregate Mobile Technology Use variable. None of the other mobile technology use variables have a significant relationship with Fascination and this finding corresponds to the idea that general mobile technology use is less relevant to Fascination than Picture Taking. Whether people who are more naturally fascinated by the environment choose to then take

more pictures of nature or if taking photos encourages fascination is not known.

A similar relationship exists between Paid Attention and Picture Taking with a significant correlation of .176. The Paid Attention variable is a direct self-report question whereas Fascination is a more indirect measure of environmental awareness. The correlation between Paid Attention and Picture Taking reinforces the idea that taking photos has a positive relationship with situational awareness.

The inverse correlation between Paid Attention and Email Access implies that all mobile technology use is not equal. The picture taking component of mobile technology use rises as Paid Attention does but when email access rises, Paid Attention falls. Thus, experiencing the environment may be related more to type of mobile technology use rather than level of use. Sending an email on the device can also require more time and attentional resources than picture taking and thereby may detract more from situational awareness.

The experience variable of Vegetation, that is the volume of vegetation seen by a participant, had an inverse correlation with the Calls Made variable. Theoretically, Vegetation would not have been the only experience variable to have a significant correlation as Relics and Water Features are very similar variables. Vegetation had a greater range of responses than the other two variables and so perhaps differences in the dataset were more easily identified in the correlation test. The inverse correlation affirms the concept of mobile technology engagement at odds with environmental engagement.

Mobile Technology Use and Outdoor Recreation Benefits

The outdoor recreation benefit variable with the greatest relationship with mobile technology use is Positive Affect. Positive Affect is a measure of the momentary positive

emotions of the individual. The variable is significantly correlated with Texts, Pictures Taken, Social Network Access and Aggregate Mobile Technology Use. The results indicate a general trend of a positive correlation between mobile technology use and good mood. The Texts variable is also correlated with Time Spent at the Lookout and so the relationship between Texts and Positive Affect may have a confounding variable in Time Spent at Lookout. Also, as previously discussed, Pictures Taken accounts for the majority of Aggregate Mobile Technology Use so when Pictures Taken has a significant correlation Aggregate Mobile Technology Use may also exhibit the same relationship. Nonetheless, the inclusion of Social Network Access indicates that mobile technology use beyond picture taking can have a positive relationship with positive emotion.

A second benefit variable with a significant relationship to mobile technology use is Burden Free. Email Access is inversely correlated with Burden Free at a correlation of $-.176$. The result highlights the importance of mobile technology type. Email access is an avenue for everyday problems to be given attention despite an individual being removed from the daily situation. Email access is not necessarily negative but is generally reserved for more formal communications than with close friends and family. The other types of mobile technology use may not have a negative relationship with Burden Free because such mobile technology use is generally more carefree and casual. Email Access may also bring work responsibilities to the attention of the individual and work brings burdens. An individual may also know of responsibilities that must be addressed through email and so that person was more likely to access email while on the hike. As Email Access rose Burden Free responses fell, thus those who accessed email while hiking were less likely to report feeling free of

daily burdens, a common benefit of outdoor recreation.

Most notably, no significant relationships exist between the outdoor recreation benefit variables of Relaxation, Reflection, and Solitude, and mobile technology use variables. This finding suggests that mobile technology use does not have an impact on most outdoor recreation benefits. One explanation is that at the lookout of Mt. Pilchuck participants do not experience relaxation, reflection and solitude. Because the mountain is a social hike, reflection and solitude are not recreation motives so hikers don't experience the two benefits. Likewise, accessing the lookout is difficult as boulders must be clambered over and a ladder is the final access point. Anecdotally, several people expressed feelings of tension and stress because of the height and strain of climbing into the lookout. In such a setting, a measure of relaxation may not have been an appropriate recreation benefit. If the survey had been administered at the end of the hike individuals may have experienced more relaxation, but at the lookout relaxation was mingled with stress for many participants.

Taken together, the relationship between mobile technology use and outdoor recreation benefits mirrors the pattern found with outdoor recreation experience. The type of mobile technology use plays a larger role in interacting with outdoor recreation benefits than the volume of use.

Implications for the Social Construction of Nature

Given that only 16 of 155 participants did not have a phone while hiking in Mt. Pilchuck State Park, the majority of hikers may construe nature as compatible with mobile technology use. Participants fall along a continuum for determining the acceptable role of technology in nature based on differing worldviews and values. Survey participants exhibit a

range of definitions for nature and epitomize the social construction of nature. Several qualitative responses indicate that bringing the phone is justified by the safety benefit but the device is recognized as a possible distraction from engaging with the environment. Leaving the phone in one's backpack or switching to airplane mode minimizes the intrusion of the device and indicates an understanding of nature as largely without mobile technology. Conversely, a group of participants saw the mobile device as engendering increased engagement with the environment through mobile applications such as a peak naming application. Experience of nature for the latter group may be less important than using the technology device and engaging nature only a secondary consequence to the goal of recreating with the technology. In summation, the degree of mobile technology use by a visitor is determined by, and has implications for, the meaning given to nature for each individual.

Conclusions and Recommendations

The results of the statistical analysis based on the three research objectives provide several insights into the relationship between mobile technology use and outdoor recreation. The findings suggest that mobile technology can interact with both outdoor recreation experience and benefits. The type of mobile technology use may have a stronger relationship with outdoor recreation experiences and benefits than the level of mobile technology use.

As picture taking is both the most common reason to bring a mobile technology device hiking and the most often used type of mobile technology, the State Parks mobile application may benefit from an emphasis on photo taking functions. Picture taking is also positively correlated with the experience variables of Fascination and Paid Attention, and the

benefits variable of Positive Affect. Thus, if recreation managers encourage picture taking visitors may also benefit from heightened experiential awareness and positive mood.

Similarly, Social Network Access and Sending Texts can be encouraged as both variables are correlated with Positive Affect. A mobile application may not be able to alter the volume of text messages sent but can encourage connecting with social networks.

If possible, email access and making calls can be discouraged while recreating outdoors as both variables are associated with a less positive outdoor recreation experience as measured by the Burden Free variable and the Paid Attention variable. Discouraging visitors from using a phone in a particular way may be impossible. Recreation managers may be limited to simply not encouraging such behaviors.

In summary, mobile technology type has a stronger relationship with both outdoor recreation benefits and experience than mobile technology volume of use. Hikers bring the phone on the hike primarily for picture taking, safety, and because having the phone is a habit. Qualitative responses indicate that individuals who deem the phone distracting find ways to mitigate the impact of the phone while recreating. Other individuals use the phone to enhance the recreation experience and appreciate the photo taking and information access capabilities of the phone. With specific uses, mobile technology can enhance the recreation experience but with certain uses mobile technology can detract from the outdoor experience. Mobile technology and outdoor recreation are not incompatible, but for better and worse, the use of mobile technology does alter the experience and benefits of outdoor recreation.

Implications for Management

Outdoor recreation area managers can use the information provided in this thesis to

encourage positive recreation experiences while capitalizing on the opportunities provided by mobile technology. First, the overall volume of mobile technology use is low with picture taking as the highest use type. Encouraging people to take pictures and upload the photos onto social media can facilitate positive emotions and engagement with the environment while recreating. Second, discouraging email access encourages the idea of outdoor recreation as an opportunity to experience freedom from daily burdens. Third, allowing the use of mobile technology is supported by the fact that people primarily bring the phone for safety and taking pictures, and individuals who are annoyed by the phone find ways to mitigate the impact of the phone. In summation, the benefits of mobile technology use among visitors in Mt. Pilchuck State Park outweigh any negative consequences.

Mt. Pilchuck State Park is similar to numerous other recreation areas with high use, partial cell phone reception, access to most hikers and relatively close to an urban center. To the degree that Mt. Pilchuck is representative of outdoor recreation places, the conclusions of this thesis are applicable to Washington State Parks and other recreation places nationally.

Limitations

Survey Research

A fundamental research limitation is that the data was gathered using a survey. A necessary question in any survey research is if a variable is accurately addressing the phenomena the question was designed to address. For example, the solitude variable is limited in the meaning data can convey as the definition of solitude will not be the same for all people, and the solitude data is based on the question “I am satisfied with the level of solitude I experienced on this hike.” The question may not be addressing the same

phenomena that the question is designed to ask based on the subjective interpretation of the individual. All survey data has an element of subjectivity and ambiguity in knowing if a question accurately addresses the concept it is designed to address.

A second limitation of survey research is that the statistical analysis can determine if a correlation exists between two variables but cannot conclusively determine causation. For example, Positive Affect is positively correlated with Social Network Access but stating that accessing a social network causes positive emotions is not accurate, neither is stating that positive emotions cause one to access social networks. The analysis only determines that as correlated variables, when Positive Affect rises so does Social Network Access. So for all variables with a significant relationship, determining why is not possible, only that a specific relationship works a certain way.

Another issue is that of confounding variables. There is a possibility that multiple variables can also be involved in the relationship between two variables. The data gathered on a specific phenomenon may not be the only information pertinent to the situation or behavior. Ultimately, a relationship between two variables may not be describing the whole of the relationship as other factors may exist but are not addressed.

Thesis Specific

A limiting factor in determining the role of mobile technology in outdoor recreation is the small number of participants who did not bring a phone. Because so few people did not bring a phone statistical analysis, between those who brought a phone and those who did not, was difficult. Analysis was primarily done based on the level and type of mobile technology use rather than between the participant groups of phone and no phone.

A second consideration for this thesis is the length of time participants spent at the lookout before filling out the survey. New visitors to the lookout quickly understood that something was going on and the necessity of identifying new faces at the lookout for a researcher led to the majority of participants spending only thirty minutes to an hour at the lookout at the time of survey administration. Ideally, a hiker would have been asked to participate in the survey at the end of the individual's time at the lookout to maximize the possible mobile technology use by the individual. Because so little time had been spent at the lookout when a participant filled out the survey, the mobile technology use reported may be less than the actual mobile technology use by an individual by the end of the time spent at the lookout.

This study only addressed the relationship an individual has with a phone in the outdoors but does not consider the impact a hiker using a phone may have on another recreationist. Complaints about phone use in the outdoors often revolve around the impact one individual using a phone has on the experience of another person. Such an experiential alteration is not accounted for in the data gathered by this thesis.

Finally, the mobile technology use questions measure phone use initiated but not necessarily received. For example, participants were asked how many text messages were sent while at Mt. Pilchuck hiking but not how many text messages were received. The received messages may have still constituted an engagement of the phone by the participant. Consequently, the mobile technology use data may have fewer responses than the actual amount of overall mobile technology use.

Future Research

To more fully explore the relationship between mobile technology use and outdoor recreation several options exist. First, a study could be designed to control for extraneous variables and focus on only mobile technology use in outdoor recreation. The current survey is observational and can only indicate possible relationships between a variety of variables. An experiment designed to measure the differences among participants caused by mobile technology use can eliminate confounding variables and build a stronger link between mobile technology use and the experience and benefits of outdoor recreation.

A study area with a greater focus on solitude and reflection would allow a greater emphasis to be placed on the recreation benefits of solitude and reflection. The Mt. Pilchuck hike is a social mountain and so does not encourage the recreation motives of solitude and reflection. The mobile technology literature indicates that solitude and reflection may be interrupted or impaired by mobile technology use. Consequently, a focus on the recreation benefits of solitude and reflection would behoove the technology in outdoor recreation literature.

Another question for future research is whether or not mobile technology use while recreating outdoors has any relationship with environmental values or the meaning one gives to nature. Individuals who value nature often have a positive relationship with natural places and mobile technology use may alter that relationship, thereby possibly altering the corresponding environmental ethic. Simply knowing if mobile technology use is related to environmental values is a valuable piece of information in understanding the relationship between beliefs, values and behavior in an environmental context.

This thesis did not address the impact mobile technology use while hiking by one person may have on a different person. Outdoor recreation, particularly hiking, is often social and interacting with other recreationists is common. The mobile technology use of one individual may alter the experience of another person and knowing such information would contribute to a richer understanding of the outdoor recreation experience while using mobile technology.

Finally, research that is less subjective in measuring experience would more accurately gauge the impact of mobile technology use on recreation experience. The variables used for experience in the current study are extremely subjective. Reducing the subjectivity of outdoor recreation experience will lead to a greater understanding of the relationship between mobile technology use and outdoor recreation.

Bibliography

- Aspinall, P., Mavros, P., Coyne, R.c & Roe, J. (2013). The urban brain: analysing outdoor physical activity with mobile EEG. *British Journal of Sports Medicine*.
- Berman, M. G., Jonides, J., & Kaplan, S. (2008). The Cognitive Benefits of Interacting With Nature. *Psychological Science (Wiley-Blackwell)*, 19(12), 1207-1212.
doi:10.1111/j.1467-9280.2008.02225.x
- Borrie, W. T. (1998). The Impacts of Technology on the Meaning of Wilderness. In Watson, A. W., Aplet, G. H. and Hendee, J. C., (Editors), Proceeding of Sixth World Wilderness Congress Symposium on Research, Management, and Allocation, Volume II, Bangalore, India, October 24-29, 1998. Proc. RMRS-P-14. (pp. 87-88). Fort Collins, CO: USDA Forest Service.
- Burnett, J. (2009, October 21). This Third Time Was Anything But Charming- SPOT Misuse At Grand Canyon National Park. *National Parks Traveler*. Retrieved from:
<http://www.nationalparkstraveler.com/2009/10/third-time-was-anything-charming-%E2%80%93-spot-misuse-grand-canyon-national-park4790>
- Clary, A. (2007). TechnoNature: Wilderness and Simulation on the "Last Frontier." *Interdisciplinary Humanities*, 24(1), 51-64.
- Clayton, S. & Myers G. (2009). Conservation Psychology. Chichester, UK: Wiley-Blackwell.
- Cronon, W. (1995). The Trouble with Wilderness; or, Getting Back to the Wrong Nature. In Cronon W. (Ed.), *Uncommon Ground: Rethinking the Human Place in Nature* (pp.69-90). New York: W. W. Norton & Company.

- Cuthbertson B., Socha T.L. & Potter, T.G. (2004) The double-edged sword: Critical reflections on traditional and modern technology in outdoor education. *Journal of Adventure Education & Outdoor Learning*, 4(2), 133-144. doi: 10.1080/14729670485200491
- Cutraro, J. (2006, May 31). Cell Phone Towers in U.S. Parks Dial Up Debate. *National Geographic News*. Retrieved from: http://news.nationalgeographic.com/news/2006/05/060531-cell-phones_2.html
- Diamond, J. (2005). *Collapse*. New York, NY: Viking.
- Duggan, M. (2013). *Cell Phone Activities 2013*. Retrieved from Pew Research Center: <http://pewinternet.org/Reports/2013/Cell-Activities.aspx>
- Ewert, A. & Shultis, J. (1999). Technology and Backcountry Recreation: Boon to Recreation or Bust for Management? *Journal of Physical Education, Recreation & Dance*, 70(8), 23-28. doi: 10.1080/07303084.1999.10605701
- Hammitt, W. E., & Madden, M. A. (1989). Cognitive dimensions of wilderness privacy: A field test and further explanation. *Leisure Sciences*, 11(4), 293-301. doi:10.1080/01490408909512228
- Hsi, S. S. (2003). A study of user experiences mediated by nomadic web content in a museum. *Journal Of Computer Assisted Learning*, 19(3), 308-319. doi:10.1046/j.0266-4909.2003.jca_023.x
- Hyman, I. R., Boss, S., Wise, B. M., McKenzie, K. E., & Caggiano, J. M. (2010). Did you see the unicycling clown? Inattentional blindness while walking and talking on a cell phone. *Applied Cognitive Psychology*, 24(5), 597-607. doi:10.1002/acp.1638

- Jarvenpaa, S. R. & Lang K. R. (2005). Managing the Paradoxes of Mobile Technology. *Information Systems Management*, 22(4), 7-23.
- Kahn, P. (2011). *Technological nature*. Cambridge, MA: MIT Press.
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal Of Environmental Psychology*, 15(3), 169-182. doi:10.1016/0272-4944(95)90001-2
- Kaplan R. & Kaplan S. (1989). *The Experience of Nature: A Psychological Perspective*. New York, NY: Cambridge University Press.
- Kass, S. J., Cole, K. S., & Stanny, C. J. (2007). Effects of distraction and experience on situation awareness and simulated driving. *Transportation Research: Part F*, 10(4), 321-329. doi:10.1016/j.trf.2006.12.002
- Katz, C. (1998). Whose Nature, Whose Culture? Private productions of space and the “preservation” of nature. In Braun B. (Ed.) *Remaking Reality: Nature at the Millennium* (pp.46-63). New York, NY: Routledge.
- Krakoff, S. (2003). Mountains without Handrails... Wilderness without Cellphones. *Harvard Environmental Law Review*, 27(2), 417.
- Kyle, G. T., Mowen, A. J., & Tarrant, M. (2004). Linking place preferences with place meaning: An examination of the relationship between place motivation and place attachment. *Journal Of Environmental Psychology*, 24(4), 439-454.
- Lamberg, E. M., & Muratori, L. M. (2012). Cell phones change the way we walk. *Gait & Posture*, 35(4), 688-690. doi:10.1016/j.gaitpost.2011.12.005
- Leyshon, M., DiGiovanna, S., & Holcomb, B. (2013). Mobile Technologies and Youthful

- Exploration: Stimulus or Inhibitor?. *Urban Studies*, 50(3), 587-605.
- Manning, R. (1999). *Studies in Outdoor Recreation*. Corvallis, OR: Oregon State University Press.
- Manning, R. E. (2003). What to Do About Crowding and Solitude in Parks and Wilderness? A Reply to Stewart and Cole. *Journal Of Leisure Research*, 35(1), 107.
- Manning, R. E. (2011). *Studies in Outdoor Recreation: Search and Research of Satisfaction*. Corvallis, OR: Oregon State University Press.
- Mayer, F., Frantz, C., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial?: The role of connectedness to nature. *Environment And Behavior*, 41(5), 607-643. doi:10.1177/0013916508319745
- Moore, R. & Driver, B. L. (2005). *Introduction to Outdoor Recreation: Providing and Managing Natural resource Based Opportunities*. State College, PA: Venture Publishing.
- Nash, R. F. (2014). *Wilderness and the American Mind*. New Haven: Yale University Press. (Original work published in 1967).
- National Park Service. (1964). The Wilderness Act. Retrieved from <http://wilderness.nps.gov/document/WildernessAct.pdf>
- Nisbet, E. K., & Zelenski, J. M. (2011). Underestimating Nearby Nature: Affective Forecasting Errors Obscure the Happy Path to Sustainability. *Psychological Science (Sage Publications Inc.)*, 22(9), 1101-1106. doi:10.1177/0956797611418527
- Olmsted, F.L. (1881). *A Consideration of the Justifying Value of a Public Park*. Harvard University. Retrieved from <https://archive.org/details/aconsiderationj00olmsgoog>

- O'Neil, D. (2013, March 14). Climbing's Little Helper. *Outside*. Retrieved from:
<http://www.outsideonline.com/fitness/Climbings-Little-Helper.html?page=6>
- Ouderkirk, W. (2003). On wilderness and people: a view from Mount Marcy 1. *Philosophy & Geography*, 6(1), 15-32. doi: 10.1080/1090377032000063298
- Park, J.J, Jorgensen, A., Swanwick, C. & Selman, P. (2008). Perceived landscape impacts of mobile telecommunications development in the Peak District National Park, England. *Journal of Environmental Planning and Management*, 51(5), 679-699.
 doi:10.1080/09640560802218529
- Ramkissoon, H., Smith, L., & Weiler, B. (2013). Relationships between place attachment, place satisfaction and pro-environmental behaviour in an Australian national park. *Journal Of Sustainable Tourism*, 21(3), 434-457. doi:10.1080/09669582.2012.708042
- Redelmeier, D., & Tibshirani, R. (1997). Association between cellular-telephone calls and motor vehicle collisions. *The New England Journal Of Medicine*, 336(7), 453-458.
- Repanshek, K. (2009, August 8). Traveler's Gear Box: SPOT, The Next Generation. *National Parks Traveler*. Retrieved from:
<http://www.nationalparkstraveler.com/2009/08/travelers-gear-box-spot-next-generation>
- Rothman, H. (1998). Devil's Bargains: Tourism in the Twentieth-Century American West. Lawrence, KS: University Press of Kansas.
- Sax J. (1980). Mountains Without Handrails. Ann Arbor, MI: University of Michigan Press.
- Shultis, J. (2001). Consuming nature: The uneasy relationship between technology, outdoor recreation and protected areas. In *The George Wright Forum* 18(1), 56-66.

- Simpson, J. (1997) *Dark Shadows Falling*. Seattle, WA: Mountaineers.
- Smith, N. (1984). *Uneven Development: Nature, Capital and the Production of Space*. New York, NY: Blackwell.
- Sprinthall R. (2007). *Basic Statistical Analysis*. Boston, MA: Pearson Education, Inc.
- Stanis, S., Ingrid E., S., & Dorothy H., A. (2009). State Park Visitors' Leisure Time Physical Activity, Constraints, and Negotiation Strategies. *Journal Of Park & Recreation Administration*, 27(3), 21-41.
- Strayer, D. L., & Drews, F. A. (2007). Cell-phone-induced driver distraction. *Current Directions In Psychological Science*, 16(3), 128-131. doi:10.1111/j.1467-8721.2007.00489.x
- Strong, D. (1995). *Crazy Mountains*. Albany, NY: State University of New York Press.
- Thomé, S., Härenstam, A., & Hagberg, M. (2011). Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults - a prospective cohort study. *BMC Public Health*, 11(1), 66-76. doi:10.1186/1471-2458-11-66
- Thoreau, H. D. (1862). In *The Thoreau Reader*. Retrieved from <http://thoreau.eserver.org/default.html>
- Triola M. F. (2008). *Elementary Statistics*. Boston, MA: Pearson Education, Inc.
- Vincent, J. (2006). Emotional Attachment and Mobile Phones. *Knowledge, Technology & Policy*, 19(1), 39-44.
- Washington State Parks and Recreation Commission. (2014, May 6). Retrieved from <http://www.parks.wa.gov/548/Mount-Pilchuck>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief

measures of positive and negative affect: The PANAS scales. *Journal Of Personality And Social Psychology*, 54(6), 1063-1070. doi:10.1037/0022-3514.54.6.1063

Willems-Braun, B. (1997). Buried epistemologies: The politics of nature in (post)colonial British Columbia. *Annals of The Association Of American Geographers*, 87(1), 3.

Appendix A

Mount Pilchuck State Park Visitor Survey



Sarah Lindell
Under advisement of Dr. Grace Wang
Western Washington University
Permit #130703

Informed Consent

Mount Pilchuck State Park Visitor Survey – Researcher Copy

Each participant will receive a copy of the informed consent form.

The study involves research on the subject of mobile technology use in outdoor recreation. The purpose of the research is to identify type and use level of mobile technology and visitor experience in an outdoor recreation area.

Each participant will complete a ten minute survey at the Mount Pilchuck State Park lookout. After returning the survey participants will be compensated with a small food snack. The researcher will analyze the feedback to identify type and use level of mobile technology and visitor experience at the Mount Pilchuck State Park.

Risks should not exceed those experienced in everyday life.

Benefits of the research are: greater understanding of the type and use level of mobile technology, information on the experience and benefits to visitors, and the researcher will gain experience in conducting original research at Mount Pilchuck.

Participant questions about the procedure should be sent to lindels2@students.wvu.edu or the researcher can be contacted directly at 509-860-7410. Questions about subject's rights as a research subject should be addressed to: the WWU Human Protections Administrator (HPA), (360) 650-3220. If a subject suffers any research related injuries or adverse effects as a result of participation in the study the researcher or Research Compliance Officer should be contacted. The Research Compliance Officer can be reached by phone at (360) 650-3082 or email at Janai.Symons@wwu.edu.

Participation is voluntary and participants are free to withdraw consent and discontinue participation at any time without penalty or loss of benefits to which the participant is otherwise entitled.

Confidentiality of participants will be maintained as much as possible by the researcher. Personal information will not be matched with participant feedback. Informed consents will be stored separately from the responses. Only the researcher will have access to individual responses. The responses will be presented in aggregate form and no individual answers will be provided with the research results.

By signing I acknowledge that I have read the Informed Consent Form, am at least 18 years of age, and freely give my consent to be a participant for this study.

Printed Name of Research Participant

Signature

Date Signed

Section 1

This first section will ask you about your experience at Mount Pilchuck State Park.

Please rate to what extent you agree or disagree with the following statements by circling one number with 5 equal to “strongly agree” and 1 equal to “strongly disagree.”

“I experienced freedom from my daily burdens such as work or family obligations on this trip”	1	2	3	4	5
“I am satisfied with the level of solitude I experienced on this hike”	1	2	3	4	5
“Hiking here encouraged personal reflection”	1	2	3	4	5
“While hiking here I paid close attention to my surroundings and the scenery”	1	2	3	4	5

Mount Pilchuck was once a ski area. How many relics of the ski area, such as timber, steel pins, or cement blocks, are visible from the hiking trail? _____

-Which types of ski area relics did you see?

How many waterfalls, streams or lakes did you notice while hiking on the trail? _____

-Which types of water features did you notice?

How many different types of wildflowers, plants and trees did you notice on this hiking trip? _____

What types of wildflowers, plants and trees have you seen?

This portion consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment.

Use the following scale to record your answers.

1-very slightly or not at all 2-a little 3-moderately 4-quite a bit
5-extremely

___interested	___distressed	___excited
___upset	___curious	___strong
___guilty	___scared	___hostile
___fascinated	___proud	___irritable
___alert	___ashamed	___active
___inspired	___afraid	
___nervous	___jittery	
___attentive	___determined	
___enthusiastic	___relaxed	

Section 2

This section will ask you about your mobile technology use at Mount Pilchuck State Park.

Did you bring a mobile technology device such as a Smartphone or cell phone on your trip to this State Park?

Yes No

Please explain why you checked yes or no in the box above:

How would you classify your level of mobile technology use as compared to your peers?

Very high use Above average use Average use
 Below average use Very low use

*If you did not bring a phone on your trip to the lake you can now skip to section 3.

Did you use your phone while on the trail, only once you had reception, or in both areas?

I did not use my phone Only once I had reception
 Only on the trail Both on the trail and once I had reception

IF you did bring a phone on your trip to this recreation area, why did you bring it?

Work Responsibilities
 Remain connected with family or social groups
 Safety
 Take Pictures
 Other, please explain _____

How many calls have you made while at this State Park? _____

How many text messages have you sent while at this State Park? _____

How many pictures have you taken while at this State Park? _____

*If your phone is not a Smartphone you can now skip to section 3.

IF your phone is a Smartphone:

Have you used your Smartphone to connect with social networks while at Mt. Pilchuck?

No Yes, if yes how many times? _____

Have you used your Smartphone to access your email while at Mt. Pilchuck?

No Yes, if yes how many times? _____

Have you used your Smartphone to access information relevant to your trip to the Mt. Pilchuck State Park?

No Yes, if yes how many times? _____

Have you used your Smartphone for any other purpose while at Mt. Pilchuck State Park?

No Yes, if yes for what purpose?

Have you used a mobile application at any point during your visit to this State Park?

No Yes, if yes for what purpose?

Section 3

Please rank the purpose of your visit to this recreation area with one being your most influential purpose and eight being the least influential purpose.

___ Get away from daily pressures such as work or family obligations

___ Socializing/meeting with friends and family

___ Solitude and contemplation

___ Relaxing/resting

___ Exercise/fitness

___ Appreciation, watch, or study of plants, birds or animals

___ Environment/atmosphere

___ Other (please specify) _____

Has this hiking experience allowed you to fulfill the purpose of your visit?

Yes Mostly Somewhat Not Much No

Please explain your answer:

Your Gender

- Male Female

Which age group do you belong to?

- 18-24 25-34 35-44 45-54 55-64 65 or older

Where is your usual place of residence?

- Marysville Seattle Greater Puget Sound Area
 Other, please specify: _____

What is the highest level of education you completed?

- Junior High High School Associate Degree Bachelor Degree Master or PhD
 Vocational or Technical School

Please identify your ethnicity:

- Asian Caucasian Hispanic Native American
 African American Pacific Islander _____
 Prefer not to answer

Please indicate your income category:

- 0-20,000 20,001-35,000 35,001-50,000 50,001-65,000
 65,001-80,000 80,001-95,000 95,000+ Prefer not to answer

What is the size of your group?

- By yourself 2 3 4 5 6 or more

How many times have you visited Mount Pilchuck State Park, including this visit?

- First visit 2 3 4 5-6 7 or more

On average how often do you engage in outdoor recreation activities each year such as hiking, biking or fishing?

- Never to once a year 2-3 4-6 7-10 11-15 16 or more

Did your level of technology use (or lack of technology use) enhance your recreation experience?

- Yes Mostly Somewhat Not Much No

Please explain your answer:

Roughly how much time have you spent at the top of Mount Pilchuck?

- Less than 30 minutes 30 minutes to 1 hour 1 hour to 1 ½ hours
 1 ½ hours to 2 hours More than 2 hours

Is there anything else you would like to let us know?

Thank you for participating. If you wish to know the results of this research project you can contact the researcher at lindels2@students.wvu.edu.

Appendix B

Did you bring a mobile technology device such as a Smartphone or cell phone on your trip to this State Park?

Yes No

Please explain why you checked yes or no in the box above:

Responses:

don't leave home without it
 pictures
 take pictures of scenery, check email
 I brought my smartphone
 picture taking
 because I brought a cell phone
 photos, safety, emergency, snapchat, instagram
 photos, emergency, contact/progress
 in case of emergency
 for safety and to take pictures
 I always have my phone
 photo use
 camera
 to have a camera
 for pictures mostly, to listen to a speaker tape.
 family called and pictures
 safety, pictures
 navigation, pictures
 has a map, time, emergency, camera, communicating
 didn't need one
 windows phone-take photos and send to family
 take pictures of scenery, check email
 Brought a smartphone, for a camera
 trail map and GPS app
 cell phone, GPS
 brought phone for use on road and to check calls and put in my pack to avoid chance of theft
 out of car.
 In case of emergency and for camera feature
 I brought a cell phone
 Used for tracking
 iphone

picture
 cell phone (Smartphone)
 I use the phone to take pictures
 map
 911
 forgot it
 brought phone for instagram
 no reason
 cellphone
 nice to have in case of emergency
 photo ops
 I used in for GPS directions to the State Park
 just for emergency
 I always bring it with me. Left phone in car
 used smartphones camera
 contact with kids at home, endomondo app
 for the camera
 always have it/camera/emergencies
 to take photos
 for the camera purpose, safety
 check time/seahawks score/ pictures
 wanted to check sports cores
 Just happened to be in my pocket when I came here
 don't leave my house
 photos
 BF brought his. I'm not expecting any calls
 I left it in the car
 emergencies
 have smartphone
 my husband has his and I don't like to carry lots of things on hikes
 only to use as a camera-activated airplane mode
 its my camera
 Out of habit-Its in my backpack
 windows phone 8, nokia 920, takes nice pictures, data is off
 It is my camera too and I brought it to take photos and also thought it might be helpful in
 case of emergency
 phone, maps
 brought a cellphone
 I always have it with me and use it for a camera
 music
 music/ to capture the beauty of nature by photography/ for timekeeping
 safety, pictures
 call emergency, pictures
 consolidity away from technology I guess

I always bring it with me. Left phone in car
 always carry- for emergencies
 pictures
 in case of an emergency
 photo; son in hospital
 Left it in the car; didn't need one because my wife had one
 pictures
 Phone/camera/emergency
 nature is for viewing and experience not texting
 I want my teenager to reach me if she needs me-she is home riding today.
 emergencies, check email, photos
 in case of emergency
 didn't want to leave it in car; in case of emergency
 emergency
 phone
 emergency
 cell phone for emergency use, pictures
 used google maps to get here, take pictures with it
 In case of emergencies
 Camera on my phone
 Brought it just for emergency
 Because I have it with me as backup camera
 Because I don't want to leave it in my car. It is Off I don't use it for photos
 For camera
 useful in emergency/ take pictures
 pictures and music
 GPS feature
 didn't want to be bothered
 emergency use only
 just in case
 used for directions here and photographs
 always have it on me
 don't want to leave in car-theft. No use on mountain
 It was in my pocket as always
 Always hike with a cell phone for emergency
 brought smartphone and GPS
 personal safety
 A sense of connection back to the world
 just in case, pictures
 In case I get lost!
 left in the car since didn't think I would have reception
 didn't see how it would be useful
 Because I brought my phone
 I brought my phone. I bring it everywhere.

I always have it
 camera
 cell phone
 Smartphone
 for pictures mostly, to listen to a speaker tape.
 smartphone along for camera
 photo
 photos
 because I never am away from it
 communication, emergencies, pictures
 because I always bring my phone
 smartphone
 cell phone with camera
 tracfone left in car
 in the car; not on hike. Want to get away from technology
 photos
 just in case, take photos
 geocaching
 facebook
 I have a phone
 habit. Photo.
 emergency
 safety
 yes for safety-on airplane mode
 GPS
 didn't need it
 for the camera function
 It is off but needed for emergency
 left at home

IF you did bring a phone on your trip to this recreation area, why did you bring it?

- Work Responsibilities**
- Remain connected with family or social groups**
- Safety**
- Take Pictures**
- Other, please explain** _____

Responses:

for use off trail too, in parking lot
 time my climb, track GPS
 didn't want to leave in car
 Music
 navigation

mao/gps, time
 messaging pictures
 Map and gps app
 track location
 sports scores
 out of habit
 maps
 music
 emergency use
 If emergency
 Don't like to leave it in car
 GPS location
 directions
 use on way home
 data (GPS)
 I always have it
 use all trail apps
 car-emergency use only
 photos
 geocaching!

Have you used your Smartphone for any other purpose while at Mt. Pilchuck State Park?

No Yes, if yes for what purpose?

Responses:

pictures
 pictures and to tell time
 pictures
 time, GPS tracking
 track my GPS location
 check the time
 messaging pictures to family
 GPS
 location tracking
 WTA trip report
 pics
 check seahawks score
 check sports scores
 I don't have a smartphone
 camera only

to take photos
 send video of 360 degree view
 music
 pictures
 to check on proper permitting
 respond to text messages
 clock-keep track of speed
 pictures
 camera only
 photos
 text
 camera
 Photos

Have you used a mobile application at any point during your visit to this State Park?

No Yes, if yes for what purpose?

Responses:

pictures
 GPS
 family called to check in
 GPS and maps
 location tracking
 peak finding, photos
 taking a picture
 endomondo app tracks mileage and calories
 same as above
 Only the camera app
 upload photos
 In the parking lot I used pandora briefly
 google maps
 Instagram (social)
 directions, peaks
 forest pass website, google maps, WTA site
 maps
 GPS data
 text
 (can't read writing) trails for trail
 music
 directions
 but I thought about it

geocaching app

Please rank the purpose of your visit to this recreation area with one being your most influential purpose and eight being the least influential purpose.

- ___ **Get away from daily pressures such as work or family obligations**
- ___ **Socializing/meeting with friends and family**
- ___ **Solitude and contemplation**
- ___ **Relaxing/resting**
- ___ **Exercise/fitness**
- ___ **Appreciation, watch, or study of plants, birds or animals**
- ___ **Environment/atmosphere**
- ___ **Other (please specify)_____**

Responses:

enjoy the weather
 fresh air and mountains
 the view
 spend time with daughter
 :)
 lil time with my wife
 to be adventurous
 take my son on a trip
 appreciation of views
 Amazing weather!
 WW III
 beautiful landscape
 to say I hiked here

Has this hiking experience allowed you to fulfill the purpose of your visit?

- Yes** **Mostly** **Somewhat** **Not Much** **No**

Please explain your answer:

Responses:

beautiful weather and views
 I was able to get some exercise and socialize at the same time
 Probably the most challenging hike I have been on, proud of myself
 Set my best ascent time
 Purpose was to have fun, but it was more difficult than expected
 Good exercise with a fulfilling climax at the top

beautiful views and scenery, great (can't read writing) and good work out
 Hiking with friends
 wanted to see the view at the top and enjoy exercise with my friends.
 I enjoyed the beautiful outdoors and great company
 first time here, great hike
 gorgeous day
 the views are amazing
 wish it was more solitary
 work out and (can't read writing)
 Would have liked mor solitude, but expected what was here and loved hike anyway-beautiful
 sunshine, views, gorgeous rocks, red huckleberries etc.
 beautiful view
 Had to fill out survey
 show amazing scenery to my family visiting from out of town
 came with a group of friends from school; very fun!
 exercise, friends, scenery
 Beautiful views and great sunny day
 Very busy at lookout
 it was awesome
 the goal was to get to the top with my kids
 beautiful day, beautiful view, great exercise
 got exercise and saw beautiful scenery
 I came mainly to enjoy the forest and mountain view, and I did both
 A little crowded. Slowed me down.
 sunny (can't read writing) in october
 it was a beautiful day, the hike was hicc and we were able to find a place with some solitude
 Gotten amazing news-perfect weather
 One of my favorite parts of this hike is the exhibit in the lookout tower. Unfortunately it
 wasn't possible to view this time with all the people sitting filling out their surveys
 too many people but still great
 wish there was more solitude but wasn't expecting it as this hike
 just wanted to get away for awhile
 experience the great outdoors and the exercise
 we made it to the top
 got to top, saw views
 I've never hiked up a mountain, it felt great to see the nature and embrace it all
 the view is magnificent
 looking forward to lunch
 I wanted to reach the lookout on this beautiful sunny day- great views
 exercise, outdoors, time with wife
 Get out of the city routine
 there are quite a few people on the trail, it is a Sunday though
 I have a beautiful relaxing time enjoying nature with my husband and my friend!
 mindfulness, exercise, good company, views

The afternoon and company was perfect.
 I wanted exercise and time to think. I got both.
 Had a great day with my daughter !!:)
 great sightseeing
 plan (can't read writing) hike/climb
 too clouded
 too crowded
 not too steep but beautiful view
 so many people it is hard to commune
 I wish it was less cloudy
 did not see Mt. Baker due to clouds-nice hike though
 I got to the top! And got a lot of exercise
 It was a bit busy
 exercise in nature with friends
 everything perfect except for clouds
 see family, enjoy nature and weather
 A little crowded. Slowed me down.
 too many people
 too many people
 Enjoy being outside; enjoy being with friends-the survey unexpected, but I like being helpful
 with my people
 came up with 8 people to visit

Where is your usual place of residence?

- Marysville** **Seattle** **Greater Puget Sound Area**
 Other, please specify: _____

Responses:

Gold Bar
 Monroe
 Kirkland
 camino Island
 Kirkland
 Kirkland
 Queen Creek, AZ
 arizona
 Everett/Toronto
 Sammish
 denver
 kirkland
 Everett/Toronto
 Canada, Toronto
 San Diego, CA

Arlington
 auburn, fed way
 mount Vernon
 Bellevue, WA
 Arlington
 Shoreline
 Kenmore, WA
 Arlington, WA
 Lake Stevens
 San Jose, Costa Rica
 Costa Rica
 Costa Rica
 Washington, DC
 Arligton
 Everett
 Canada
 Forks
 Wash, DC
 Skagit county
 kirkland
 Mill Creek
 MT. Vernon
 Fife
 Bellingham
 Skagit valley
 PDX
 PDX
 Everett

Please identify your ethnicity:

- Asian Caucasian Hispanic Native American
 African American Pacific Islander _____
 Prefer not to answer

Responses:

Russian
 Pakistani

Did your level of technology use (or lack of technology use) enhance you recreation experience?

- Yes Mostly Somewhat Not Much No

Please explain your answer:

Responses:

Use phone just for pictures

lake pictures

I was not able to use technology because I had no cellular service

I would have liked to have more reception so I could use snapshot

I was able to track my progress

I got here with the phone's GPS

I didn't use it, just for safety

for pictures

didn't have to take pictures

photo memories

It's good to unplug and be outside

just want pictures to remember but it did not enhance while hiking

I'm glad that I have not used my phone like I normally would-calls/email-because the it feels like a break but I love being able to get good news from home (daughter got first in 400 I'm (can't read writing)! :)!)

I was glad to be able to capture the view to share with the family

safety, pictures, tracking distance

navigation

downloaded map of hike (but did not use it while hiking), navigation for driving

great pictures and video to share and for memories

I just take pictures and first hand experience is what counts

I try to avoid technology when I'm outside

Maps, weather, trip report

It is nice to be away from email, facebook, etc.

location tracking, mapping, emergency communication

tracking the hike with app for distance and time

peak finding, route finding, tracking

Picture taking is key with the outdoor activity

I was able to get here

no use/no obvious effect

camera for pictures

didn't use really

CTPS, walki talkis

I use the camera and maps. Makes in easier to pack without carry paper maps

would have done better with my camera

I have a cell phone to use if I need help or need to help someone else.

The camera was handy

Never does. I never carry any

disconnect

helped focus on the beauty with pictures

nice to not have to be constantly checking my phone
 Don't like being beholden to cell phone, email
 great for pictures.
 makes it easier to navigate here (GPS) camera, texting (keeping in touch)
 didn't use my phone once at the trailhead
 glad I can take photos
 I like being able to share the views, experience with family
 music
 spent less time on my phone
 did not use
 recorded the experience
 pictures for memories
 only piece of (can't read writing)
 helped use find the road to Mt. p. parking lot
 I don't use technology much
 emergency phone if needed, check email
 I didn't look at my phone at all. It was great!
 felt safe, connected but did not need to use
 I love the outdoors with or without technology
 photos
 GIS service (google maps), smartphone=camera, thermometer, etc.
 Brought my GPS and cell phone. Usually do not bring cell but knew I would have reception
 here. GPS for fun and safety
 Binocular, digital camera
 Aside from the ability to record the trip via pictures, no enhancement derived.
 Take pictures, use peak app
 Wasn't necessary for me, except for my DSLR
 Try to get away from it
 Could find all the info I needed while riding in the car instead of sitting on my laptop at
 home
 I never use it while out!
 I hike to disconnect
 safety
 Some apps make the parks experience easier (even educational) plus picture taking
 I didn't feel like I needed a cell phone. I didn't want to have to look at it.
 I didn't bring much for technology. I did bring my camera though
 pics
 I would be bummed if I couldn't take pics to show my accomplishment getting to the top.
 no signal
 pictures for memories
 Appreciate opportunity to record the experience
 for pictures
 taking photos helps me remember and share with family
 easy to take pics

document the journey
 pictures for memories
 just camera
 get away from phone
 at least I wasn't following someone talking on the phone
 only for geocaching
 I didn't use it
 It is mostly irrelevant due to poor reception!
 I try not to use technology while hiking
 Appreciate tech for safety and option to take pictures
 no phone
 enjoyed not using it
 no worries

Is there anything else you would like to let us know?

Responses:

nope
 Everything is good
 Thank you for the snack. Good luck with your survey.
 It's scary!
 love hiking! :)
 I find this area incredibly beautiful and I cant wait to come again!
 Love the fact that cell phones work along the hike. So I can send pictures realtime.
 Washington is awesome!
 Im s/w dev. (software developer)
 Now that I am thinking about my phone, I kind of want to check my email, facebook, etc.
 Good luck in your research. I love (heart symbol) Glissaging (sic!)
 no
 cement does not equal concrete
 Amazing Vistas!
 You picked a fabulous office!
 beautiful hike-amazing hike the entire hike
 I'm always surprised when cell phones work in the parks. I almost wish they would
 automatically turn off! Or at least not receive texts or calls. Like airplane mode there should
 be "nature mode" where phone can only keep time and take pictures!!
 hakuna matata
 NA
 Roses are red, snow is white, Dana has a cuban heart, I am happy as a clam. Good luck with
 the study! :)
 We love it here! (it is a bit annoying to be doing this survey
 Love this place. It has special meaning. Was here 4 years ago.
 thank for the survey. Good luck with your project. :)

Having cell phone access is more a safety issue rather than social

no---Good Luck!

Listen to your advisor! (most times)

Surveys rock!

nop

too crowded

This was a very smart idea ;)

Cool survey! Good Luck!

I love backpacking/hiking because its an excuse to turn off the phone/email and be bound to it

Lots of people therefore less solitude. Environment-great people of like mind nice

Appendix C

Don Black
DirectorSTATE OF WASHINGTON
WASHINGTON STATE PARKS AND RECREATION COMMISSION1111 Israel Road SW - P.O. Box 42650 - Olympia, Washington 98501-9650
(360) 902-8500 - Washington Telecommunications Relay Service at (800) 833-6368
www.parks.wa.gov

SCIENTIFIC RESEARCH PERMIT

130703

Mount Pilchuck State Park

This scientific research permit is made and entered into, by and between the Washington State Parks and Recreation Commission, hereinafter referred to as the "COMMISSION", and Sarah Lindell and Grace Wang, hereinafter referred to as the "PERMITTEE".

WHEREAS, the PERMITTEE requests a permit for scientific research to assess changes in recreational experiences caused by mobile technology use as per the original scientific research permit application dated July 2, 2013;

WHEREAS, PERMITTEE is a representative of Western Washington University and;

WHEREAS, the COMMISSION has waived the fee because the requested action will be of benefit to the general public, and;

WHEREAS, the requested data collection is exempt from SEPA by WAC 197-11-800 (17), and;

WHEREAS, PERMITTEE will obtain all necessary state and federal permits, if any, for this study;

NOW THEREFORE, COMMISSION hereby grants PERMITTEE a permit and right of entry to Mount Pilchuck State Park beginning on July 20, 2013 and terminating on September 1, 2013 upon the following terms and conditions:

1. COMMISSION hereby grants to PERMITTEE a revocable right to enter the above-mentioned park at such times as are mutually agreeable to PERMITTEE and PARK MANAGER to perform the following tasks as described in the original letter of request dated July 2, 2013:

Survey hikers to Mount Pilchuck State Park lookout about mobile technology use.

2. PERMITTEE shall notify and coordinate visits and research site locations in advance with park manager at the following park:

Wallace Falls State Park, Shawn Tobin, Area Manager
14503 Wallace Lake Road
Gold Bar, WA 98251-9384
Phone: (360) 793-0420
Email: shawn.tobin@parks.wa.gov

Permit #: 130703
Category: Mobile Technology

3. Any materials approved under this permit for removal from COMMISSION owned properties will become the property of the PERMITTEE unless otherwise stipulated.
4. All tools, equipment, and other property owned by PERMITTEE shall remain the property of PERMITTEE and are to be removed from the park by PERMITTEE prior to the expiration of this permit, or within 30 days following revocation.
5. PERMITTEE will be responsible for damages arising from any activities of PERMITTEE, its officers, agents, employees or representatives on said land, in the exercise of rights under this permit and hereby agrees to indemnify and hold COMMISSION harmless from any such damages.
6. COMMISSION shall not be responsible in any manner for the tools, equipment or other property owned by PERMITTEE.
7. PERMITTEE shall keep a copy of this permit on his or her person at all times research is being conducted on park land. PERMITTEE shall exhibit the permit if requested to do so by COMMISSION staff or other law enforcement personnel.
8. PERMITTEE shall provide a report to COMMISSION, in electronic form, detailing work completed under this permit within 60 days of permit expiration. And no later than six months after research is completed, PERMITTEE shall provide COMMISSION a report detailing the findings and conclusions of the research conducted. PERMITTEE will also provide a complimentary copy to COMMISSION of any scientific publications resulting from this study.
9. Stipulations:
 - a. PERMITTEE must contact park staff prior to entering the park to conduct research as outlined in this permit.
 - b. PERMITTEE shall explain research activities to the public if asked.
 - c. In the event archaeological resources are found or unearthed during the work allowed by this permit, PERMITTEE shall cease work immediately and contact State Parks Archaeologist, Daniel Meatte at (360) 902-8637. If cultural resources are discovered, the PERMITTEE shall comply with provisions of Chapter 27.44 RCW, Chapter 27.53 RCW and the rules and regulations of the Department of Archaeology and Historic Preservation, including compliance with all archaeological excavation permit requirements.
 - d. PERMITTEE shall not harm flora or fauna while conducting research at Mount Pilchuck State Park except as necessary for research activities regulated by this permit.
 - e. PERMITTEE shall leave research sites as undisturbed as possible to protect the natural wildlife.

Permit #: 130703
Category: Mobile Technology

10. This permit shall expire September 1, 2013 unless otherwise mutually agreed by both parties--except that PARKS may revoke said permit for any cause. Any request for extension of this permit must be made in writing as an addendum.

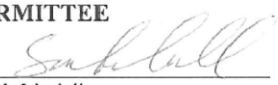
DATED: 22 July 2013

DATED: 7/22/13

COMMISSION

By 
Rob Fimbel
Stewardship Program

PERMITTEE

By 
Sarah Lindell

APPROVED AS TO FORM ONLY:
Jessica Fogel, AAG 5/12/10
Office of the Attorney General

Don Hoch
Director



STATE OF WASHINGTON

WASHINGTON STATE PARKS AND RECREATION COMMISSION

1111 Israel Road SW • P.O. Box 42650 • Olympia, Washington 98504-2650
(360) 902-8500 • Washington Telecommunications Relay Service at (800) 833-6388
www.parks.wa.gov
August 12, 2013

Sarah K. Lindell
Western Washington University
516 High Street
Bellingham, WA 98225

RE: Amended Scientific Research Permit – Mount Pilchuck State Park – SRP #130703

Dear Ms. Lindell

Your request for renewal of your original permit (#130703) issued to Sarah Lindell and Grace Wang is extended through November 01, 2013, effective immediately.

Please note the condition that you or your designees contact Park staff in advance of beginning research activities to assure good communication and field staff availability. The amended permit also requires a copy of the permit be carried by the researchers to protect them should their activities be challenged by any party.

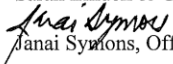
Please note the Scientific Research Permit Fee Notice has been waived.

I know you will find our staff appreciative of your working with them to minimize any impact your research may have on the park and the park patrons. Should you have any questions or need additional information, please contact Nata Hurst in Olympia at (360) 902-8638.

Sincerely,

Rob Fimbel
Stewardship Program

Appendix D**WESTERN WASHINGTON UNIVERSITY
Office of Research and Sponsored Programs****MEMORANDUM**

TO: Sarah Lindell & Grace Wang, Environmental Studies
FROM:  Janai Symons, Office of Research and Sponsored Programs
DATE: 8/1/2013
SUBJECT: Human Subjects Review – Exemption Research Approval

Thank you for submitting a research protocol regarding your human subject research EX14-002 "Mobile Technology Use and Experience at Mt. Pilchuck State Park", for review by the Human Subjects Review Committee (HSRC).

Approval: The HSRC has reviewed the materials you submitted and found the project described falls into Category #2: research involving survey or interview procedures. Although the research qualifies for exempt status, the investigators still have a responsibility to protect the rights and welfare of their subjects, and are expected to conduct their research in accordance with the ethical principles of Justice, Beneficence, and Respect for Persons, as described in the Belmont Report, as well as with state and local institutional policy. All students and investigators collecting or analyzing data must be qualified and appropriately trained in research methods and responsible conduct of research.

Determination Period: An exempt determination is valid for five years from the date of the determination, as long as the nature of the research activity remains the same. If the involvement of human subjects changes over the course of the study in a way that would increase risks, please submit a revised protocol.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems that may increase the risk to the human subjects and change the category of review, notify the Research Compliance Officer promptly. Any complaints from subjects pertaining to the risk and benefits of the research must be reported to the Research Compliance Officer.

If you have any questions, feel free to email me at janai.symons@wwu.edu.

Cc: Michael Medler