UNDERSTANDING VISITOR CONNECTIONS TO TECHNOLOGY IN REMOTE AND URBAN-PROXIMATE FORESTS

By

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ABSTRACT

Reconnecting with nature, escaping the stress of everyday life, and unplugging from technology are some of the reasons people take part in outdoor recreation. However, increasingly people are bringing their electronic devices along with them. Concerns associated with the growth of forest technology include an increase in risky behaviors (e.g., bear selfies), visitors becoming more reliant on technology instead of their skill and experience, and a change in a visitor's emotional attachment to nature. The objective of this thesis is to determine forest visitors' attitudes towards technology in the forest setting, intended technology behaviors, support for potential technology management actions across forest and camping contexts, and visitor demographics (e.g., age, race, gender, education). This thesis also looks to determine whether forest technology attitudes predicts intended technology behaviors and, support for potential technology management actions across forest contexts.

From June to August 2017, 444 visitors in the Chequamegon- Nicolet National Forest (CNNF-a remote forest, 182 respondents) and the Forest Preserves of Cook County (FPCC-an urban-proximate forest, 262 respondents) completed an on-site questionnaire. The questionnaire focused on personal electronic technology such as cellular phones, tablets, E-readers, Fitbits, and similar devices. The average response rate of all sites surveyed was 80.2%.

This study found that negative forest technology attitudes were universal across forest contexts. In general, urban campers differed in their pro-technology

and anxiety/dependence attitudes, while remote campers in both sub contexts were similar. Demographically, visitors were more alike than different. Trends in everyday technology use based on demographics did not transfer over into technology use in the forest setting. Across demographics and forest contexts there were differences in support for integrating technology into management, while there was similar support for banning technology or using technology as a replacement. Lastly, results indicate that forest technology attitudes are not reliable predictors of support for management and technology use.

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CHAPTER 1: INTRODUCTION

The rise of romanticism and transcendentalism in the 19th century was the basis for people in western culture to seek opportunities to reconnect with nature (Jensen & Guthrie, 2006). It was during this time when policies were implemented to conserve natural resources, dedicate public lands as "national reserves," and develop urban and national parks (Jensen & Guthrie, 2006; Shultis, 2001). People were looking for a way to escape the pollution and urbanization of the Industrial Revolution (Shultis, 2001; Ewert & Shultis, 1999). Today, people are still using outdoor recreation to escape. Escaping everyday life and spending time engaging and integrating with nature has been found to have an abundance of benefits. Being exposed to natural stimuli (e.g., sunsets) facilitates attention restoration (Berman et al., 2008; Kaplan, 1995). Nature gives one a sense of being away, having relief from everyday responsibilities, and escaping to a different place (Tennessen & Cimprich,1995). Outdoor experiences aid in bettering mood, decreasing stress and improving wellness (Orsega-Smith et al., 2004; Hansmann et al., 2007; Tyvrväinen et al., 2014). Green spaces also provide areas that invite physical activity, which can help combat chronic diseases and obesity (Kaczynski et al., 2007; Cohen et al., 2007).

Today, more outdoor recreationists are choosing to remain virtually connected to their everyday responsibilities by bringing personal technology devices into the great outdoors, a time traditionally associated with unplugging. This study defines personal technology as any portable device, such as cell phones, smart

watches, laptops, fitness trackers, and mp3/ iPods. These devices benefit recreationists by allowing them to gather information about a forest or park, stay connected with friends and family, track physical activity, and feel more comfortable and safer. However, there are concerns along with the benefits of technology, such as an increase in risky behaviors (e.g., bear selfies (Millward, 2014)) and visitors being distracted. For example, two Pokémon Go users accidentally walked off a cliff while playing the game (Delzo, 2016).

As a relatively new phenomenon, there is much to learn about technology's impact on outdoor recreation. This study seeks to answer the following questions: What are recreationists' attitudes towards technology in a forest setting? How are people using technology while recreating? What types of technology management are people most likely to support? Does forest context affect forest technology attitudes, behaviors, and management support? Is technology in nature viewed or used differently across demographics? Should recreation managers make accommodations for these new technologies? Understanding the answers to these questions and questions like them will allow recreation managers to make more informed decisions about personal technology. The following section will explore the complex relationship between technology and outdoor recreation. Two study frameworks- *the Cognitive Hierarchy* and the *Recreation Opportunity Spectrum*- will also be reviewed.

CHAPTER 2: LITERATURE REVIEW

History of Technology in Outdoor Recreation

Historically, various forms of technology have played a vital role in how people recreate in the outdoors. Advances in transportation (e.g., trains and cars) gave people access to national parks and other recreation sites that they were previously unable to access (Jensen & Guthrie, 2006; Shultis,2001). The development of synthetic materials, lightweight foods, and metal alloys (initially designed for the military) eliminated the weight of equipment and supplies, allowing recreationists to travel to new places in safety and comfort (Ewert & Shultis, 1999). Today's devices including smartphones, GPS, and drones, have changed modern outdoor recreation and shifted visitors' expectations for their experience (Ewert & Sibthorp, 2014; Martin, 2017).

Benefits of Technology in Outdoor Recreation

Access to personal technology, specifically information technology devices, may allow people to spend more time recreating. A 2017 survey of campers in North America found that 37% of campers expressed that technology (specifically cellular service and Wi-Fi) allow them to spend on average an additional two days camping (Kampgrounds of America, 2017). That number increased to 44% of campers being able to spend almost an extra week camping in 2018 (Kampgrounds of America, 2018).

Personal technology may also give some people the confidence to attempt experiences outdoors they may never try without it (e.g., going off trail) (Martin, 2017). The term "camping curious" is used to describe someone who is interested in camping but is afraid to try something new (Kampgrounds of America, 2018). Seeing friends, or others with whom they relate, posting photos and videos on social media while camping can help break down mental barriers among those who want to try it (Kampgrounds of America, 2018). Satellite phones, cell phones, two-way radios, and personal locators (e.g., personal locator beacons) allow people to call for rescue or at least assistance if needed. Those same devices also enable visitors to communicate with friends, family, work, or school.

Additionally, personal technology provides a way for recreationists to obtain information about a site. Access to cellular service, internet, and satellite television enables participants to stay informed about recreation options, rules and regulations, and the weather (Ewert & Shultis, 1999). Visitors are also able to reserve campsites online, get virtual tours, and see pictures and videos of past experiences from other recreationists. For recreation managers, visitors' use of personal technology during recreation provides new ways of monitoring use levels and patterns, reducing conflicts, and redistributing use (Ewert & Shultis., 1999). Social media allows information distribution and can inspire interest in the site (Martin, 2017).

Drawbacks of Technology in Outdoor Recreation

Although there are benefits associated with the presence of personal technology in outdoor recreation, research has identified several concerns (Ewert & Shultis, 1999; Wiley, 1995; Pope & Martin, 2011; Shultis, 2015; Borrie, 2000). Personal technology in the great outdoors increases the number of people able to use and access recreation sites, and makes more people aware of these sites. This increase can cause visitor congestion, lower experience satisfaction, expand environmental impacts, and promote the commercialization of natural spaces (Shultis, 2001). With more people taking advantage of outdoor recreation, more management is needed to attend to carrying capacity (Ewert & Shultis, 1999). In 2015, a National Park Service official explained some of the difficulties managers face (e.g., trash, overuse, trampling of vegetation, and the need to allocate additional resources to "lessen the flood') when a site becomes rapidly popular (Nosowitz, 2015). Exceeding ecological carrying capacity can degrade a place physically while exceeding the social carrying capacity can negatively impact visitor experience. For example, in a remote/wilderness setting, one would not expect to encounter crowds of people at a campsite or on a trail.

Technology has also led to a shift in how people appreciate natural spaces. This idea is captured in a quote by Ewert & Shultis (1999): "Most recreationists use technology to visit the backcountry, an increasing number visit the backcountry to use their technology" (p.28) (Ewert & Shultis, 1999). Commercialization of the great outdoors is apparent in the popular culture term "Instagram hikers," who are people

who go to a site to take pictures after seeing a place on social media (Nosowitz, 2015). Although few studies have been done on this phenomenon, several popular news websites (e.g., New York Times, Seattle Times, Outdoors Online) have published articles illustrating the visitor conflicts caused by using technology during recreation. A 2015 qualitative study found that limited use of communication devices for safety-related reasons (e.g., rescues, obtaining weather forecasts, making pick-up arrangements) was considered an appropriate behavior by forest visitors. Contrastingly, "chatting with friends or checking in at the office" were unanimously considered inappropriate (Shultis, 2015).

There are also concerns that visitors will rely on their devices rather than skills gained through experience. Borrie (2000) suggests that, before technology, recreationists “slowly” gained expertise through direct experiences over time. Technology speeds up our abilities and shelters us from direct experiences, creating what Ewert and Hollenhorst (1997) call “illusion of safety.” Without direct experiences, forest recreationists are unable to recognize the severity of situations they come across (Pope & Martin, 2011). Pope and Martin (2011) found that 55% of visitors in a California wilderness categorized themselves as “pro-technology,” feeling that technology increased one's safety in the wilderness. This "pro-technology" group would be more likely to use technology to request a wilderness rescue and would take chances that could increase risk if they had access to technology (Pope & Martin, 2011). The problem with this is that technology has limitations and does not guarantee rescue. Also, over-reliance on technology can

create a casual view of search and rescue, leading people to call for relief for non-emergencies (Pope & Martin, 2011).

Technology in Campgrounds

Several studies have been done on the use of personal technology (specifically mobile cellular devices) in tourism and recreation (Dickinson et al., 2016; Neuhofer et al., 2013; Lalicic & Weismayer, 2018; Nunes & Mayer, 2014; William and Shaw, 2009). Lalicic & Weismayer (2018) and Dickinson et al. (2016) describe people's relationship with their cellphone as one comparable to their relationships (e.g., friends, family, pets). Therefore, cell phones provide emotional support as well as function. Today's smartphones allow access to information, which is an integral part of tourism (Nunes & Mayer, 2014), anywhere data plans or WiFi are available. Many tourists (campers included) travel with their cell phones (Gretzel, 2010). In North America, 97% of campers reported having their cell phones with them during their stay (Kampgrounds of America, 2018). At the same time, many campers express a desire to escape the pressures of everyday life (Brooker & Jopppe, 2013, Kampgrounds of America, 2017). This desire suggests a disconnect between wanting to "get away from it all" and realizing the value of staying connected (Dickinson et al., 2016).

To complicate matters further, there appears to be a discrepancy in the meaning of "unplugging." In a recent survey (Kampgrounds of America, 2018), only 10% of campers in North America define unplugging as "having no access to any

technology." Another 34% explained that although they have their phones with them, they only use them in case of emergencies. Twenty-seven percent felt having only a cell phone, or smartphone for accessing information was "unplugging while camping." Thirty percent of campers defined unplugging as either taking time out of each day of camping to not use technology while still having access to it or having access to technology but not using it. The survey also found that more campers felt technology detracted from the camping experience rather than enhancing (Kampgrounds of America, 2018).

General Demographic Trends in Technology Use

Although most Americans have access to personal technologies (e.g., cellular phones, internet, television), various factors impact a person's acceptance and use of technology. The technology acceptance model (TAM) suggests that perceived functionality and ease of use influences a person's attitude toward new technology and its use (Davis et al., 1989). Research has shown that demographics (e.g., age, education, gender, race/ethnicity) influence acceptance of technology and how technology (specifically information and communication technology) is used (Porter et al, 2006; Brown, 2015; Czaja et al., 2006; Weiser, 2000, Yardi & Bruckman, 2012; Mossberger et al., 2003). These differences are reviewed below.

Age

Seventy-seven percent of American adults own a smartphone (Raine & Perrin, 2017). Looking further into age groups, 92% of 18-29-year old adults have a smartphone, while 88% of 30-49-year olds, 74% of 50-64-year olds, and 42% of people over 65 have smartphones. Some older adults shy away from technology because of a lack of experience using computers and the internet growing up. Learning the internet can create an anxiety-provoking situation, especially among elders that perceive a reduction in their cognitive capabilities to learn (Porter et al., 2006). Those perceived cognitive limitations are also met with physical changes that come with age. For example, declining eyesight and changes in motor skills can make using some forms of new technology difficult (Wagner et al., 2010). Older generations, namely Baby Boomers, may become frustrated with unfamiliar technology and are unlikely to try it again (Brown, 2015; Lee et al., 2011). Overall, older-people have more negative attitudes towards technology and do not have anxiety about having to regularly check in with digital devices (Rosen et al., 2013; Volkom et al., 2014). Despite this, older people can benefit from technology. Thayer and Ray (2006) found that senior citizens who used email to communicate with family members reported that they kept in touch with those family members more often than they had prior to using email. Approximately 56% of seniors using the internet use it to keep in contact and better their relationships with family (Howard et al., 2001). Brown (2015) completed a study of technology use in hotels, finding that all age groups use technology. The research described that Generation Y

(millennials) and Z (born between 1992-1975 and 1993 to present, respectively) bring their own devices, such as tablets, to share travel experiences with friends via social media. Baby Boomers and Generation X (born between 1962-1944 and 1974-1963, respectively) use the technology provided by hotels, are less likely to bring their own devices, and are primarily focused on wireless internet. All age groups desire technologies that expedite and improve services (Brown, 2015).

There are differences in how different age groups use technology. Older Americans prefer technology that meets their basic needs and enhances their capability for living independently (Brickfield, 1984). Young people use cell phones to text more than other age groups, while middle-aged adults are more likely to use them to talk (Van Volkm et al., 2013).

Not all older adults are uncomfortable with using technology. Studies have also found similarities in technology use across age groups. Madden et al. (2013), for example, found that adults under 50 are just as likely to use their cell phone to access the internet as teenagers (Madden et al., 2013). A study conducted by the Pew Research Center found that some older individuals have a similar level of proficiency in technology use as their younger counterparts (Zickuhr, 2011). A study from the University of Central Missouri compared ownership and use of technology between faculty and students and found that close to 50% of UCM students and faculty fall into moderate or heavy user categories (21 hours or more per week), with faculty online slightly more than students (faculty 49.2% and student 45.8%) (Ruleman, 2012). This study also found that younger students (18 to 19

years) use technology the least followed by older students (31 to 60 years), and the oldest faculty group (61+ years) used technology the most (Ruleman, 2012). The faculty was less likely "to avoid using new technologies" at 0.8% compared to 1.4% of students.

Education

Individuals with higher levels of education may be more comfortable with different types of technology (Czaja et al., 2006). A study focusing on media and technology use and attitudes found that in all cases more educated participants had more favorable attitudes towards technology and used technology more. Level of education positively correlated with smartphone usage, internet search, emailing, media sharing, text messaging, positive technology attitudes, and anxieties based on the absence of technology (Rosen et al., 2013).

Gender

In general, men and women both have positive attitude towards technology. However, men have been found to have slightly more positive view than women, specifically in self-efficiency (i.e., confidence in one's ability to properly use technology) (Cai et al., 2017). There are cultural components that influence the gender gap in technology attitudes (Makrakis, 1992; Li & Kirkup, 2007). For example, in a study comparing the computer and internet use and attitudes of students based on gender in a cross-cultural context (Chinese and British), there was a more significant gender gap in British groups than Chinese groups. The study

explained that this could be due to Chinese parents placing a high value on education, as well as, computer studies becoming popular in China (Li & Kirkup, 2007). The internet historically was characterized as being "masculine" (Silva, 2000) and although access today is equal, the Li & Kirkup (2007) study still found gender differences in both the cultures. In general, there is little difference in the amount of time males and females spend using technology. However, studies have found differences in how technology is used, and the specific devices preferred. Some literature found that men tend to use technology for entertainment, information, and leisure (Weiser, 2000; Papatrergiou & Solomonidou, 2005). For example, males play more video games, have more online friends, share more media, and have more anxieties when technology is absent (Rose et al., 2013). Other research indicates that women are more likely to use technology, namely the internet, as a communication tool (Jackson et al., 2008). Men tend to prefer technology that is marketed as being efficient, and females are more likely to enjoy technologies that are user-friendly (Wang & Wang, 2010).

Race/ Ethnicity

There is a significant gap in technology use by race/ethnicity according to research done in the United States. Some research has found that White-Americans own and use computers more than African-Americans (Yardi & Bruckman, 2012; NTIA, 2002). Latinos and African Americans are less likely to have access to technologies like home computers, email addresses, and internet at home than whites and Asians. Seventy-nine percent of white households have

computers, compared to 45% of African-American and 63% of Hispanic families (Anderson, 2015). Twenty-two percent of Latinos and 15% of African Americans rely on smartphones for internet access and do not have "traditional broadband" at home (Perrin, 2017). African-Americans use cell phones more. This cell phone use includes internet use, game playing, and use of social media sites. African-Americans also spend more time playing video games (Yardi & Bruckman, 2012). A 2001 internet use study involving college students of different races/ethnicities found that Asians on average had the highest hours of internet use, followed by Whites, Hispanics, and African-Americans (Korgen, 2001). However, compared to Asians, African-Americans had a significantly higher number of online friends and higher use of voice calls. Lastly, White-Americans had significantly higher negative attitudes towards technology compared to African-Americans (Rosen, 2013). A majority of African Americans reported viewing technology (e.g., the internet and computers) as being essential for "keeping up with the times" and economic opportunity (Mossberger et al., 2003). African Americans were also more likely to use computers to take online courses and search for employment compared to whites (Mossenberger et al., 2003). One of the reasons some minority groups may cling to their personal technology is to help bridge the digital divide (Perrin, 2017).

The Digital Divide in Urban and Remote Areas

Residency may influence people's personal technology attitudes and use. Urban and rural residents use technology differently, especially when it comes to the internet. Residency and cost are two of the most significant barriers to having an

internet connection (Haight et al., 2014). Thirty-nine percent of rural residents live without access to fixed broadband, compared to the 4% of urban residents (FCC, 2016). The causes for the differences in internet use based on residency is multifaceted (Salemink et al., 2017). Rural areas have a lower population density and are defined as having a population of fewer than 2,500 people and less than 500 people per square mile (Ratcliffe et al., 2016). That lower population density means that residents in these areas must pay more for high-speed internet (Park & Kim, 2015). Rural residents often have a lower income and may have less of a requirement for internet connection (Horrigan, 2010), which causes them to have to settle for slower internet like dial-up (Davison & Cotten, 2009). Rural residents also have limited access to cellular carriers compared to urban residents (Prieger, 2013). Rural residents are less likely to own multiple types of technology devices. Roughly one-third (29%) of rural adults report owning a computer (either desktop or laptop), a smartphone, a tablet, or having a home broadband connection (Perrin, 2017). This percentage is compared to the 40% of suburban and 42% of urban adults who own all four devices (Perrin, 2017). More rural residents do not use the internet or email than urban residents and suburban residents (20%, 14%, and 14% respectively) (Zickuhr, 2013).

The digital divide is not just between those of different economic means (Haight et al., 2014; Salemink et al., 2017). The level of technology use and engagement on social media sites are also different based on residency and areas where a digital divide exists (Haight et al., 2014). About three in five adult rural

residents (58%) report using the internet daily. Eighty-percent of urban residents reported the same frequency. Almost twice as many residents of rural communities (19%) say they "never go online" than residents of suburban communities (11%) and urban residents (10%) (Perrin, 2017). Brenner and Smith (2013) found that there were no significant differences in the percentage of overall social media users based on urban (74%), suburban (71%) and rural (69%) residency, but there were differences in the specific platform. For example, urban and suburban residents are more likely to be Twitter users than rural residents.

In contrast, rural residents use Pinterest more than urban residents (Duggan & Brenner, 2012). Rural residents are less likely to perceive the benefits of internet connectivity than their urban counterparts (Kim & Park, 2015). Kim and Park (2015) found that Korean urban and rural residents do not differ in the amount of time spent online nor their access to online services. However, there were differences in the use of devices that allow internet access. Urban users were active in content uploading and sharing, while rural users were more active in civic participation online. In the United States, Hindman (2000) found that urban residents are more likely to shop online.

Theoretical Framework

Cognitive Hierarchy

The cognitive hierarchy is one of several theoretical frameworks that can be used to understand people's behaviors. In the cognitive hierarchy, cognition and behaviors build off one another starting with values to attitudes, norms, and then

behaviors (Whittaker et al., 2006). The cognitive hierarchy considers the relationship between values, value orientations, attitudes, and norms; and how they influence behaviors (Vaske et al., 2012). An inverted triangle illustrates how these factors build on each other (Fig. 1).

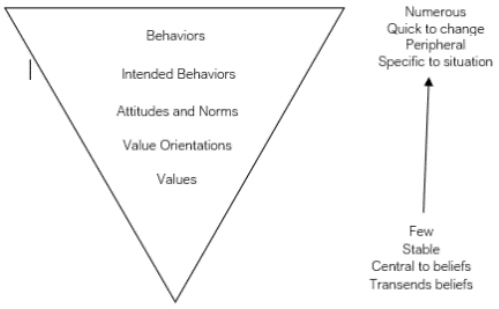

Figure 1- The Cognitive Hierarchy
adapted from Fulton et al. 1996 and Vaske and Donnelly 1999

Values are fundamental and the basis for beliefs and attitudes (Fulton et al., 1996). Values are "modes of conduct" preferred by individuals (Rokeach, 1973). Unlike the other elements in the model, values do not shift based on situations and personal experiences (Rockeach, 1973; Fulton et al., 1996). Whittaker et al. (2006) explains that someone who values honesty is expected to be "honest when completing IRS forms, conducting business deals, and interacting with friends" (p.517). Values are few in number and difficult to change (Fulton et al., 1996).

Value orientations are basic belief patterns about general objects (Manfredo et al., 2004). Theoretically, since there are a small number of values, many people with vastly different attitudes and behaviors can have the same value. Value orientations or basic beliefs give diverse meaning to abstract values. Fulton et al. (1996) uses the example of how two people can share the value of "universalism," which is defined as valuing equality and respect for others (Schwartz, 1992). For one-person universalism leads to the belief that all living creatures should be respected equally, thus influencing their positive attitude for animal rights. For

another person with the same value, their basic beliefs do not include nonhuman creatures in the value, influencing their negative attitudes towards animal rights (p. 28).

Attitudes are a positive or negative evaluation of some object (Whittaker et al., 2005). Attitudes precede and direct behavior. They are stronger than opinions and are both evaluative and cognitive. Salient points, consistency, direct experience, and identity strengthen attitudes. Attitudes stem from direct experiences and character. Norms are judgments about what is appropriate in a specific situation (Wittman et al., 1998; Zinn et al., 1998) or standards that people use to evaluate whether behaviors or conditions should occur (Vaske & Whittaker, 2004). Social norms are standards shared by members of a social group, while personal norms are an individual's expectations. The ability of a norm to predict behaviors is called the norm strength (Basman et al., 1996).

Cognitive Hierarchy in Natural Resources Management

The cognitive hierarchy has been used to help natural resources managers predict support or opposition from stakeholders when it comes to management actions (Vaske & Donnelly, 1999; Whittaker et al., 2006; McFarlane & Boxall, 2000). McFarlane & Boxall (2000) explains how values link to specific attitudes which then relate to management preferences. For example, individuals with values centered around life (biocentric) are more likely to support management that is protection-oriented (McFarlane & Boxall, 2000; Bourke & Luloff, 1994; Steel et al., 1994).

Studies have also found the attitudes are a good predictor of intended behaviors (Fulton et al., 1996; Vaske & Donnelly, 1999).

The recreation activities people choose to participate in may have an association with natural resources attitudes. For example, non-consumptive recreationists are more likely to have biocentric values and support preservation management than consumptive recreationists (McFarlane & Boxall, 2000; Jackson 1986; Tarrant et al., 1997). Vaske et al. (2001) found that the cognitive hierarchy can predict management support from value orientations and norms of different demographics (e.g., gender and length of residency). It is useful for managers to understand the specific values that relate to specific attitudes, which can be affected by context; if they are trying to predict the responses to specific management actions. General values and attitudes are useful in predicting reactions to general management actions but less effective with specific actions (Whittaker et al., 2006). There are some concerns that as technology continues to advance and interactions with nature occur less society's values towards will natural resources change (e.g., becoming simplistic and less complex) (Manfredo & Fulton, 1997).

Recreation Opportunity Spectrum (ROS)

The ROS is a framework used by the US Forest Service and other agencies for understanding the relationship between the specific settings people choose to recreate and the intended desired experiences. For example, a person seeking

solitude, challenge, and self-reliance is more likely to choose a campsite that is in a large undeveloped setting that is difficult to access and offers few facilities than an easily accessible developed site with many amenities and social interactions. The ROS is divided into six classes: Urban (U), Rural (R), Roaded Natural (RN), Semi-Primitive Non-Motorized (SPNM), Semi-primitive Motorized (SPM), and Primitive (P). ROS classes are arranged along a continuum, as are the individual criteria. The setting characteristics include physical (type of access, remoteness, and size of the area), social (number of people encountered), and managerial (visitor management, level of development, and naturalness) (ROS User Guide, 1982).

People select recreational activities and locations that align with their motivation (e.g., relaxation or escape) (Schreger et al., 1984; Vogelsong et al., 1998). The ROS confirms that there is a relationship between activity, location, and experience (Kil et al., 2015). Visitors to different recreation sites (urban to wilderness) have different trip characteristics, norms, and expectations (Ewert, 1998; Hoss &Brunson, 2000). For example, the greater distance a person must travel to a site, the less tolerant they are of encounters with others (Ewert &Hood, 1995; Kil et al., 2015). These expectations can also be influenced by how the site is being used (e.g., day use or overnight) (Cságoly, 2016). Recreationists in different settings, however, may value the same attributes. For example, urban respondents and semi-primitive non-motorized respondents in a 2009 study both rated site beauty and paths as important for physical activity but valued the quality of facilities differently (Wilhem et al., 2009).

CHAPTER 3: CONCEPTUAL FRAMEWORK

The purpose of this study is to examine differences in attitudes towards personal technology in nature, intended technology behaviors, and support for potential technology management actions across forest contexts: remote forests and urban-proximate forests and across demographics (i.e., age, education, gender, and race). In addition, this study seeks to identify whether forest technology attitudes can predict support for potential technology management actions and forest technology behaviors. The conceptual framework for this study is presented in Figure 2.

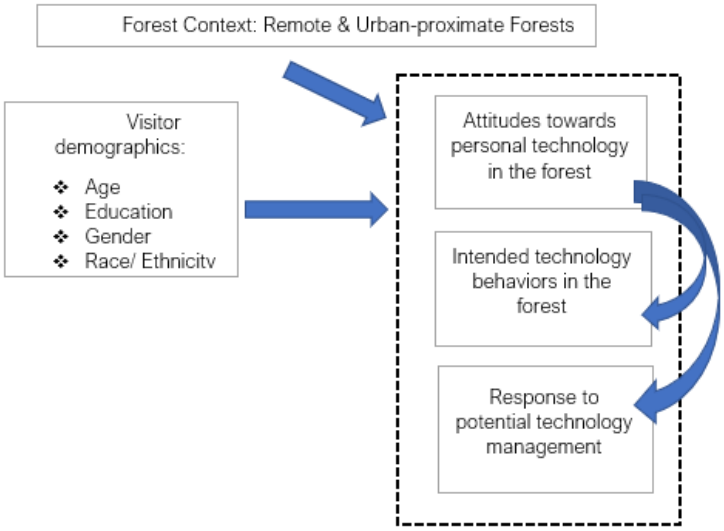

Figure 2- Conceptual framework for the overall study

Research Objectives

Following this conceptual framework, the objectives of the study are to:

I. Determine whether attitudes towards personal technology in the forest, intended forest personal technology behaviors, and preferences of potential technology management actions differ across forest contexts.

II. Determine whether attitudes towards personal technology in the forest, intended forest personal technology behaviors, and preferences of potential technology management actions differ among visitors based on their demographic characteristics (i.e., age, race/ ethnicity, gender, education).

III. Establish whether attitudes towards personal technology in nature can predict personal technology behavior and response to management actions.

Research Questions/ Hypotheses

Based on the literature reviewed, the study will test the following hypotheses:

Research Question #1: Do forest visitors' technology attitudes, intended technology behaviors, and preferences in potential technology management differ across forest context (remote to urban)?

H_o: Forest visitor attitudes towards personal technology, intended personal technology behaviors, and preferences in potential technology management will have no difference across forest contexts.

H_1: Visitors of urban-proximate forests have more pro-personal technology attitudes, greater intended use of personal technology, and higher support for management that supports personal technology use compared to visitors of a remote forest.

Research Question #2: Do forest visitors with varying demographic characteristics have different forest technology attitudes, intended forest technology behaviors, and preferences in potential forest technology management?

H_0: Attitudes towards personal technology in the forest, intended technology behaviors, and support for potential technology management actions will not differ based on visitor demographics.

H_2. Personal technology attitudes, behaviors, and management support will differ based on visitor demographics.

Research Question #3: Can forest visitors' personal technology attitudes reliably predict visitors' intended personal technology and support for potential personal forest technology management?

H_0: Attitudes towards personal technology in the forest cannot adequately predict support of potential technology management.

H_3: Personal technology attitudes in the forest context can effectively predict either support or opposition to potential technology management actions and intended use for personal technology in the forest.

CHAPTER 4: METHODS

Questionnaire Development

Data for this study were collected using a six-page, self-administered questionnaire, over the course of ten weekends (Friday to Sunday) throughout June, July, and August 2017. Beforehand in April 2017, approval from the UWSP Institutional Review Board for the Protection of Human Subjects was received. All project personnel completed the required training for the protection of human subjects. The questionnaire was developed in partnership with managers in the Chequamegon- Nicolet National Forest and the Forest Preserves of Cook County. Questions measured attitudes towards forest-specific technology use, intended technology behaviors, and support for potential technology management actions. Motivations for visiting, technology use in everyday life, and demographics (i.e., age, education, gender, and race/ethnicity) were also measured.

Attitudes

Questions measuring attitudes towards technology in a forest setting were adapted from the Media and Technology Use and Attitude Scale (MTUAS) (Rosen et al., 2013). Participants of the original study were university students and community members in the Los Angeles area. The questionnaire from the LA study had 66 media and technology behavior items and 11 attitude items. The attitudes from the original study focused on technology attitudes in a general sense. In this

study, items were modified to be forest/ recreation specific (Table 1; Appendix A; Appendix B).

Table 1- Original and modified technology attitude items

Original Attitude Items	Modified Attitude Items
I feel it is important to be able to find any information whenever I want online	I feel it is important to be able to find any information I want about the forest /preserves
I feel it is important to be able to access the internet any time I want	I feel it is important to be able to access the internet anywhere in the forest/ preserves
I think It is important to keep up with the latest trends in latest technology	I think it is important to keep up with the latest in outdoor technology
I get anxious when I don't have my cell phone	I get anxious when I don't have my cell phone with me in nature
I get anxious when I don't have the internet available to me	I get anxious when I don't have the internet available to me in nature
I am dependent on my technology	I am dependent on my personal technology when in nature
New technology makes life more complicated	New technology makes being in in nature more complicated
New technology makes people more isolated	New technology makes being in nature more isolated in the outdoors
General technology attitudes items (Original Attitude Items) from the MTUSA (Rosen et al., 2013) along side the forest- specific technology attitude items (Modified Attitude Items) used in this study	

Behaviors

Intended forest technology behaviors were gauged using a five-point Likert-type response scale ranging from "very unlikely" to "very likely." A variety of behavior items (14 in total) were used on the questionnaire to capture the diversity in the possible ways to use personal technology in the forest. Some items were forest-specific (e.g., using apps to learn about the forest), some used for communication (e.g., checking phone messages), and some for entertainment (e.g., playing digital games). The questionnaire included behaviors that require cell phone service or data/wireless internet connection and others that do not. The

questionnaire also included the likelihood not to use any personal technology or to "unplug" (Appendix A; Appendix B).

Management Actions

Items for potential technology management actions ranged from integrating technology into the visitor experience in the form of visitor displays and educational programs, providing both paper and online maps, and expanding wireless internet access (Wi-Fi); to using technology to replace traditional methods to distribute information, like apps taking the place of paper maps and informational signs. At the other end of the management spectrum is establishing technology-free zones. Respondents ranked their support or opposition using a five-point Likert scale ("strongly oppose" to "strongly support") (Appendix A; Appendix B).

Demographics

The questionnaire had a demographic section where participants reported their preferred gender using categorical multiple choice, age using open-ended response, the highest level of education in the form of multiple choice, and their race(s)/ethnicity(ies) using a series of binary responses. Everyday technology use was also measured. These items were also adapted from the MTUAS (Rosen et al., 2013). The response options were modified from the original questionnaire, which measured responses using a ten-point Likert scale ranging from "never" to "all the time." This study used a five-point Likert scale ranging from "never" to "all the time" (Table 2; Appendix A; Appendix B).

Table 2- Original and modified everyday technology items

Original Everyday Technology Items	Modified Everyday Technology Items
Send and receive text messages on mobile phone	Text message
Send, receive, and read e-mails	Send/ receive emails
Check your Facebook page or other social networks	Use social media
Watch TV shows, movies, etc. on a TV set	Watch television
Make and receive mobile phone calls	Talk on the phone
Search the internet for information on any device	Search the internet
Everyday technology behaviors (Original Everyday Technology Items) from the MTUSA alongside the everyday technology items used in this study (Modified Everyday Technology Items)	

Site Selection

Forests included in this study were the urban-proximate Forest Preserves of Cook County (FPCC), surrounding Chicago, Illinois, and the remote Chequamegon-Nicolet National Forest (CNNF), located in northern Wisconsin. In the ROS, urban settings like the FPCC are characterized by offering many social encounters, well-delineated (usually with asphalt) roads, a dominance of human-made structures, and clear evidence of management. Remote forests like CNNF are a blend of both roaded natural and semi-primitive motorized settings according to the ROS classification. A roaded natural setting is characterized by having a rustic theme blend with natural landscape, subtle or minor evidence of human-caused modification, a moderate to high degree of user interaction, and provisions for comfort and convenience. The semi-primitive motorized setting consists of a natural appearing setting, solitude, remoteness with risk, little onsite control and restriction, and low user encounters (ROS User Guide, 1982). Specific survey sites were

selected within each forest based on geographic representation and level of use. Recreation managers at CNNF and FPCC provided guidance on these sites.

Data Collection

Chequamegon-Nicolet National Forest

Based on the guidance given by forest managers in CNNF, data were collected at campgrounds. CNNF offers a range of camping experiences, including opportunities for dispersed camping, campground camping, RV camping, and group camping. This study sampled from campgrounds offering modern conveniences and primitive campgrounds. The Boulder Lake Campground is a popular developed site (located in the southeast portion of the CNNF). Namekagon Campground, Day Lake Campground, and Two Lake Campground are a collection of more primitive sites (located in the northwestern part of the CNNF) (green area in Fig. 3). Both campgrounds have defined campsites for tents, campers, and RVs that include a picnic table and fire pit. Both campgrounds also have beaches adjacent to lakes, boat launches, and hiking trails. Activities available at both locations include bicycling, fishing, kayaking/canoeing, hiking, and boating. Both campgrounds have limited cellular coverage. Boulder Lake has paved loops, electric sites, and shower

Figure 3- CNNF study sites

houses with several flush toilets, in addition to the pit toilets scattered throughout the campground. The primitive campgrounds at Namekagon, Day Lake, Two Lake have solar-powered wells and pit toilets.

To collect data from the campgrounds in CNNF, surveyors, dressed in University of Wisconsin-Stevens Point apparel walked around the campground twice a day- once in the morning, once in the evening- to ask visitors (18 years of age or older) who were outside of their lodging if they would be interested in participating in the study. In the afternoons, a table was set up with a sign identifying the project on the adjacent beaches of both campgrounds. The person in the group with the most recent birthday was asked to complete the survey. No incentives were used in CNNF to encourage participation. A record was kept of response and non-response in both forests, as well as variables that could help explain nonresponse, such as group size, the number of children and pets if any, and visitor comments, if any.

Forest Preserves of Cook County

FPCC is divided into five zones: Northwest, North, Central, Southwest, and South. Visitors in the Northwest, North and Southwestern Zones (Fig. 4), were surveyed at campgrounds, nature centers, and day use areas. Only adults 18 years or older were recruited to participate. Campgrounds in the FPCC were developed, offering heated cabins, shower houses with flush toilets, sites for tents, campers, and RVs, RV dump stations, and a gift shop that sold both souvenirs and camping

supplies. This layout was consistent throughout the zones. Campground staff offered programs such as campfires and guided hikes. Day use areas included picnic groves and trails used for exercise. The nature centers were family-friendly environments that offered interactive exhibits, live animals, and environmental programs.

Figure 4- Breakdown of the zones of the FPCC study sites

At campgrounds, surveyors (dressed in University of Wisconsin-Stevens Point apparel) walked through camping loops twice a day (once in the morning, once at night) to ask visitors who were outside of their lodging if they were interested in participating in the study. In addition, at the campgrounds, data were collected at the campfire programs hosted by FPCC staff. In the afternoons, participants were intercepted at nature centers and day use areas. At these sites, a table (with a sign reading "Forest Visitor Connections to Technology Study") was set up near entrances. Participants were systematically selected in high use areas (i.e., every fifth person to pass the table), and the person with the most recent birthday was asked to complete the survey. Incentives, such as granola bars, cold water, and FPCC souvenirs were used to encouraged participation. A record was kept of response rates, as well as variables that may explain nonresponse, such as group size, the number of children and pets, and visitor comments.

Analysis

Data were analyzed using IBM SPSS statistics 24. A Shapiro-Wilk test of normality indicated that the responses to the questionnaires were not normally distributed. All items tested had p-values < 0.05. For the first two research objectives, a similar process was followed first to explore differences between forest contexts and demographic characteristics, respectively, with regard to items measuring attitudes toward personal technology in the forest, intended personal technology behaviors, and preferences for potential technology management actions. For research objective two and three, each set of attitudes, intended behavior, and management items were reduced through factor analysis into subscales. Due to the similar processes used, the analysis methods below explain the procedures used for research objectives one and two together, followed by the analysis for research objective three (Table 3). Appropriate tests to compare survey items according to forest context, campsite type, and demographic characteristics were conducted (Table 3). Tests employed include Kruskal-Wallis H and Mann-Whitney U tests, followed by pairwise comparisons when a significant difference was identified. Effect Sizes was calculated manually using the formula ($d=z/(\sqrt{N})$) and interpreted using the Cohen's effect size estimate (Bodiszek, N.D.; Laken, 2013).

Table 3 - Data analyzed, methods of analysis, and subsamples being analyzed of each research objective

Research Objective	Data analyzed	Methods	Subsamples Included in Analyses
1	Survey items by forest context and campsite type	Kruskal-Wallis test for normality; pairwise comparisons	Campers only, both forests
2	Survey items by demographic characteristics	Kruskal-Wallis test for normality; pairwise comparisons; Mann-Whitney U test	All urban forest respondents
3	Attitude, intention, and management factors	Factor analysis; Multiple linear regression	1)Remote-Primitive Forest 2)Remote-Developed Forest 3) Urban-Proximate Forest

Research Objective 1: Connections to Personal Technology Across Forest Contexts

The responses from campers in both the remote forest and the urban-proximate forest were analyzed to compare technology attitudes and intended behaviors first across forest contexts (Figure 5). This process was then repeated to examine differences in item responses across demographic characteristics (Figure 6). For research objective one, only campers were included in the analysis, since camping is an activity offered in both forests. Comparing recreationists that were participating in the same activity was important because technology attitudes and behaviors may differ across activities. For example, runners may favor fitness trackers over other devices, while those searching for geocaches may prefer GPS. The remote forest offered two types of camping experiences (i.e., developed and primitive); because of this, the two camping experiences were analyzed separately. In the end, the forest specific technology attitudes, forest technology behaviors, and support for potential technology management actions of the *remote-primitive*

campground, the *remote-developed campground*, and the *urban-developed campground* were analyzed to identify any differences. An illustration of the variables being analyzed can be found in Figure 5.

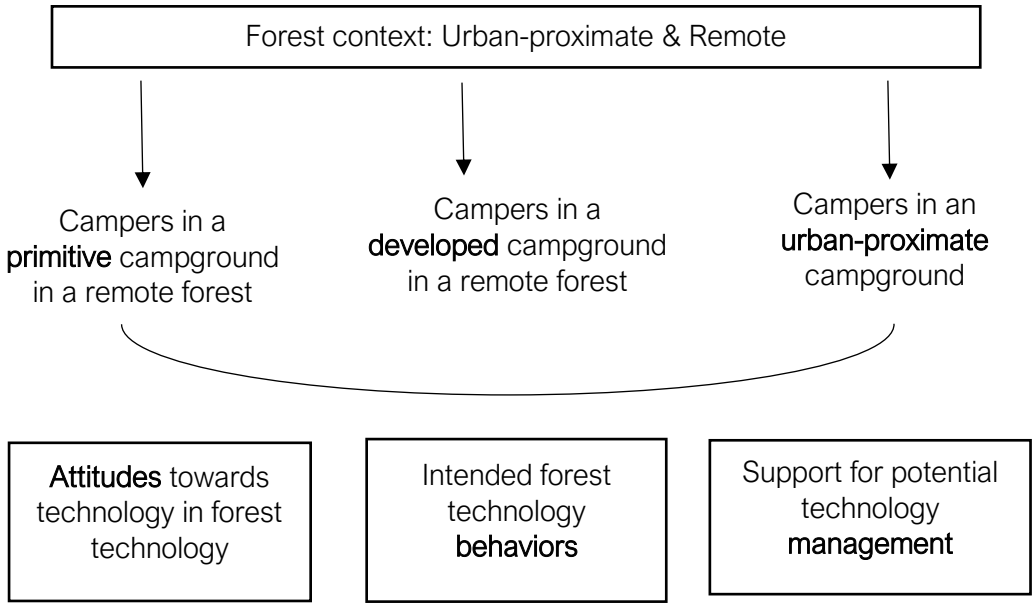

Figure 5- Illustrations of variables being analyzed to determine whether visitors' forest technology attitudes, behaviors, and management support differ across forest contexts

Objective 2: Connections to Personal Technology Across Demographic Characteristics

The responses of participants from the urban-proximate site, Forest Preserves of Cook County (FPCC) were analyzed to determine whether technology attitudes, behaviors, and management support differ across demographics. FPCC offers a diversity of recreation activities and draws in visitors from diverse backgrounds. These backgrounds include a variety of ages, education levels, genders, and races/ ethnicities. An illustration of the variables being analyzed can be found in Figure 6.

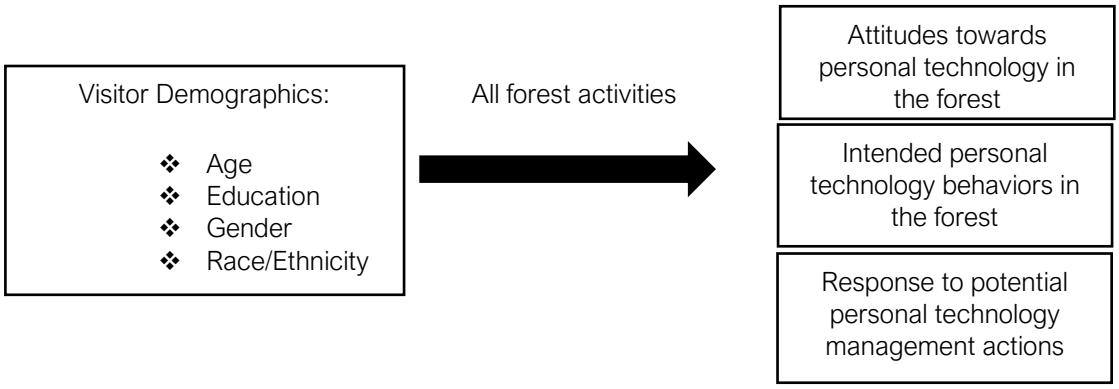

Figure 6- Illustration of variables being analyzed to determine whether visitors' forest technology attitudes, behaviors, and management support differs across demographics

Demographics

To understand how age might be related to personal technology attitudes, behaviors, and management preferences, respondents were categorized into their generation. People born into the same generation share similar generalized cultural values, traits, and attributes (The Center for Generational Kinetics, 2016). Taylor (2014)- defines generations based on one's birth year: *Silent Generation* between 1928-1945, *Baby Boomers* between 1946-1964, *Generation X* between 1965-1980, and *Millennials* or *Generation Y* between 1980 to the present.

Grouping Items

Before running any statistical tests, items measuring attitudes, behaviors, and management preferences were grouped to create subscales. The purpose of creating subscales was to analyze if there were overall differences in similar attitudes, behaviors, and management preferences. Attitudes towards personal technology in the outdoors were based on Rosen et al.'s (2013) Media and Technology Use and Attitude Scale. Following the methods of the original scale, items from the questionnaire were combined into three attitude subscales labeled

as: *technology anxiety/dependence*, *positive technology attitudes*, and *negative technology attitudes* (Table 4). Subscales with a Cronbach's α score of 0.6 or greater were considered reliable (Cronbach, 1951).

Table 4- FPCC visitors' forest technology attitude subscales, questionnaire items, and Cronbach's Alpha

Attitudes: To what extent do you agree or disagree with the following statement?	
Technology anxiety/ dependence attitudes (α=0.835)	
	I get anxious when I don't have my cell phone with me in nature
	I get anxious when I don't have the internet available to me in nature
	I am dependent on my personal technology when in nature
Positive technology attitudes (α=0.720)	
	I feel it is important to be able to find any information I want about the forest preserve online
	I think it is important to keep up with the latest trends in outdoor technology
	I feel that my time in nature is enhanced because of technology
	I feel it is important to be able to access the internet anywhere in the forest preserve
	New technology makes being in nature more safe
Negative technology attitudes (α=0.787)	
	New technology detracts from people's enjoyment of the outdoors
	New technology makes people more isolated in the outdoors
	New technology makes being in nature more complicated

Groups for intended technology behaviors and management preferences were sorted using principal content analysis (PCA) with varimax rotation. The PCA highlighted the relationship between the questionnaire items and behavior/ management preference groups (i.e., factors). Factor loadings were considered significant if they were higher than 0.5 (Whiting et al., 2017). Items were added/ removed from categories (factors) to ensure the Cronbach α were over the cutoff of 0.6. Intended personal technology behaviors were divided into three subscales: *forest-specific*, *non-forest specific*, and *disconnected* (Table 5). Personal

technology management preferences were split into four subscales: *pro-technology*, *integrating technology*, *internet access*, and *anti-technology* (Table 5).

Table 5- FPCC visitors' intended forest technology behaviors and forest technology management support subscales, questionnaire items, and Cronbach's Alpha

Behavior: How likely is it that you will do each of the following while visiting the forest preserves?	
Forest-specific technology behaviors (α=0.819)	
	Use apps to learn about the forest
	Search online for information about the area
	Search online for forest rules and regulations
Non-forest specific technology behaviors (α=0.837)	
	Use a fitness tracker
	Post pictures/ videos on social media
	Use GPS for navigation
	Read an eBook
	Watch television
	Check social media sites
	Check phone messages
	Check email messages
	Listen to music
Disconnecting technology behaviors	
	Unplug from personal technology
Management: To what extent do you support or oppose the following potential management actions in the forest preserve?	
Pro-technology management (α=0.772)	
	Replacing educational signs with apps
	Replacing paper maps with online versions
Integrating technology management (α=0.777)	
	Proving both paper maps and online maps
	Integrating technology into visitor center displays
	Integrating technology into educational programs
Internet access management	
	Expanding wireless internet access (Wi-Fi)
Anti-technology management	
	Establishing technology free zones

Scoring Responses

To get an overall understanding of visitor feelings for each category listed above; responses to the items that correspond to the subscales were aggregated to create a score. This score gives an overall understanding of visitors' relationship with each subscale. To achieve this- Likert scale responses were assigned a numerical value (Table 6).

Table 6- Conversion of questionnaire items to numerical values for attitudes, behaviors, and management subscales

	Questionnaire Responses	Numerical Value Assigned
Attitude Subscales • *Anxiety/dependence technology attitudes* • *Positive technology attitudes* • *Negative technology attitudes*	Strongly disagree	-2
	Disagree	-1
	Neutral	0
	Agree	1
	Strongly agree	2
Behavior Subscales • *Forest-specific technology behaviors* • *Non-forest specific technology behaviors* • *Disconnected technology behaviors*	Very unlikely	-2
	Unlikely	-1
	Neither unlikely nor likely	0
	Likely	1
	Very likely	2
Management Subscales • *Integrating technology management* • *Pro-technology management* • *Internet access technology management* • *Anti-technology technology management*	Strongly oppose	-2
	Oppose	-1
	Neutral	0
	Support	1
	Strongly support	2

Objective: 3 Technology Attitudes as a Predictor for Technology Management Support and Intended Behaviors

The responses of all participants in all forest contexts were analyzed to determine whether forest technology attitudes predict support for potential technology management actions and behaviors. The purpose of using all respondents was to identify if attitudes were a more effective predictor in one forest context than the other. The three forest contexts being compared are the urban-proximate forest, developed-remote forest, and primitive-remote forest. The variables being analyzed are illustrated in the figure below (Fig. 7).

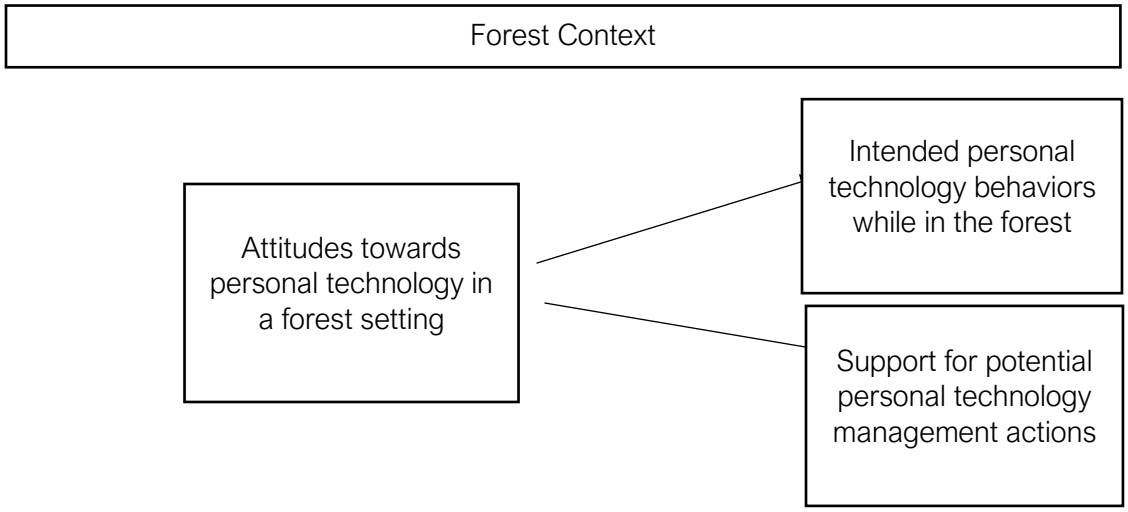

Figure 7- Illustration of the variables analyzed to determine whether visitors' attitudes can be used as an effective predictor of their forest technology management support and behaviors

Spearman's correlation test was performed to test the relationship between forest visitors' attitudes towards personal technology in the forest setting, intended technology behaviors, and technology management preferences. Once a moderate (.10-.30) to strong (>.30) correlation was established between 1) the attitudes and management preferences, and 2) attitudes and intended personal technology

behaviors, a principal component analysis (PCA) highlighted the relationship between similar variable items (i.e., factors), creating attitude and management categories. Factor loadings were considered significant if greater than 0.5 (Whiting et al., 2017). Reliability analysis, using Cronbach's α score (Cronbach, 1951), was used to measure consistency among questionnaire items. Alpha scores of 0.6 were considered acceptable for the creation of categories. Factor loadings were adjusted to meet cutoff criteria for reliability analysis, either items were moved or deleted. Multiple linear regression was performed to determine whether attitudes can predict management preferences and intended technology behaviors. Since these data sets do not meet the normality assumption of the multiple linear regression model, the bootstrapping function in SPSS was used.

CHAPTER 5: RESULTS

Of the 205 visitors intercepted in CNNF, 181 completed surveys were collected for a response rate of 89%. In FPPC, 352 visitors were approached, and 262 surveys were completed for a response rate of 74.5%.

Research Objective 1: Connections to Personal Technology Across Forest Contexts

Sixty-four of the 181 respondents in CNNF were campers at the primitive campgrounds (Namekagon, Day Lake, and Two Lake) and 107 were from the developed campground (Boulder Lake). At FPCC (urban-proximate forest), 85 of the 262 were intercepted at campgrounds. Table 7 summarizes camper characteristics in the two forests, and across three camping types. Median group size was larger in FPCC (Med= 13) than CNNF (Med= 4). This difference was most likely due to large groups like family reunions and boy/cub scouts that frequent FPCC campgrounds. FPCC campers were more ethnically diverse, with n=3 Asian (4.9%), n=13 African American (21.3%), and n=4 Latino (6.6%) comprising 33.3% of the sample. At CNNF, respondents were over 90% white.

Table 7-Remote and urban-proximate campers characteristics and demographics

	Remote- Primitive Campground (N=64)	Remote- Developed Campground (N=106)	Urban-proximate-Developed Campground (N=85)
% Group Type: Family	67.2%	74.5%	43.5%
First time visit to the site	35.9%	30.2%	45.9%
Median # of previous visits	2.00	2.00	1.00
Mean age	47.08	46.20	42.33
% Education (college +)	61.3%	50.5%	75.1%
% Female	55.7%	53.2%	44.4%
% White	90.6%	91.7%	66.7%

There were some differences in everyday technology use among visitors to the different campgrounds. Of the seven day-to-day technology activities, three were significantly different ($p<0.05$) across sites (Table 8). Campers in the *urban-proximate-developed campground* reported being more likely to talk on the phone, text message, and search the internet in everyday life than campers in the remote forest campgrounds. The campers using the *remote- primitive campground* were the least likely to engage in these activities. Campers in both forest contexts sometimes or rarely unplug from their technology in everyday life. However, Cohen's effect size value suggested that the differences in everyday activities found between the *urban-proximate-developed campground* and *remote-developed campground indicated* low practical significance. Differences between the campers in the *urban-proximate-developed campground (UDC)* and the *remote-primitive campground (RPC),* on the other hand, suggested moderate, practical effect (Table 8).

*Table 8-Kruskal-Wallis test and pair wise comparison for mean **everyday technology use** of campers across forest contexts and camping type*

	Remote-Primitive Campground (N=64)	Remote-Developed Campground (N=106)	Urban-Proximate-Developed Campground (N=85)	Sig. p-value	Effect Size RDC & UDC	Effect Size RPC & UDC
Talk on the phone	.50[a] *SD.=0.94*	.67[a] *SD.=1.09*	.96[b] *SD.=0.97*	**.010**	-.138*	-.253**
Text message	.78[a] *SD.=1.23*	1.01[a] *SD.=1.20*	1.34[b] *SD.=.91*	**.015**	-.125*	-.239**
Search the internet	.78[a] *SD.=1.07*	.99[a] *SD.=1.16*	1.16[b] *SD.=1.03*	**.046**	-.067*	-.209**
Send and receive emails	.83 *SD.=1.34*	.99 *SD.=1.20*	1.29 *SD.=1.03*	.076	-	-
Use social media	.36 *SD.=1.49*	.64 *SD.=1.40*	.76 *SD.=1.23*	.244	-	-
Unplug from personal technology	-.25 *SD.=1.07*	-.51 *SD.=1.05*	-.41 *SD.=1.08*	.298	-	-
Watch television	.34 *SD.=1.22*	.63 *SD.=1.20*	.60 *SD.=1.09*	.328	-	-

-2= never, -1= rarely, 0= sometimes, 1= often, 2= all the time
Bolded= p-value < 0.05 (statistically significant)
Means with a different superscript letter are different at p<0.5 following pairwise comparison

RPC= Remote- Primitive Campground, RDC= Remote- Developed Campground, UDC= Urban Developed Campground
* low effect size= $|effect\ size|$< 0.2
** moderate effect size= 0.2< $|effect\ size|$> 0.5

Attitudes Towards Personal Technology in the Forest Settings

Out of the eleven attitude items on the questionnaire, eight were significantly different across camping contexts (Table 9). There were significant differences in attitudes that related to technology anxiety/ dependence and pro-technology attitudes, but no significant difference when it came to negative technology attitudes. For seven of the eight significant items, campers in the *urban-proximate-*

developed campground were different from campers in the two remote campgrounds, which were similar to each other. Overall, urban campers were ambivalent in their anxiety/dependence and pro-technology attitudes. Remote campers disagreed with anxiety/dependence and pro-technology attitude items. The Cohen's effect size value suggested the differences in all anxiety/dependence technology attitudes between urban campers and remote campers (both developed and primitive) had moderate, practical significance, as shown in Table 9. In all but one of the pro-technology attitudes, the Cohen's effect size suggested that the differences between urban campers and both types of remote campers had moderate, practical significance. Campers in the *remote-primitive campground* had negative attitudes (disagreed more strongly) about new technology making nature more safe. The difference between urban campers and remote-primitive campers suggested moderate, practical significances, while, the differences between the remote-developed campers and the remote- primitive indicated low practical significance.

Table 9- Kruskal Wallis test and pairwise comparison for mean ***forest technology attitudes*** *of campers across forest contexts and camping type*

	RPC (N=64)	RDC (N=106)	UDC (N=85)	Sig. p-value	Effect Size UDC & RDC	Effect Size UDC & RPC	Effect Size RDC & RPC
Anxiety w/ no cell phone in nature *(anxiety/ dependence)*	-1.19[a] *SD.= .96*	-.93[a] *SD.=1.00*	-.07[b] *SD.= 1.12*	<.001	-.363**	-.479**	-
Anxiety w/ no internet in nature *(anxiety/ dependence)*	-1.30[a] *SD.= 1.01*	-1.04[a] *SD.=1.03*	-.40[b] *SD.=1.08*	<.001	-.289**	-.412**	-

Access internet anywhere in the forest *(pro-technology)*	-1.10[a] *SD.=1.13*	-.82[a] *SD.= 1.20*	-.02[b] *SD.=1.22*	**<.001**	-.321**	-.428**	-
Keeping up with latest trends in outdoor technology *(pro-technology)*	-.49[a] *SD.=1.00*	-.36[a] *SD.=1.04*	.14[b] *SD.=1.07*	**<.001**	-.233**	-.293**	-
Time in nature is enhanced by technology *(pro-technology)*	-1.00[a] *SD.=1.11*	-.78[a] *SD.=1.01*	-.19[b] *SD.=.87*	**<.001**	-.267**	-.347**	-
Find information about forest online *(pro-technology)*	49[a] *SD.=1.12*	.66[a] *SD.=.96*	1.07[b] *SD.=.87*	**.001**	-.217**	-.265**	-
Dependence on technology when in nature *(anxiety/ dependence)*	-1.08[a] *SD.= 1.08*	-.92[a] *SD.= 1.00*	-.28[b] *SD.=1.11*	**.001**	-.287**	-.353**	-
New technology makes nature more safe *(pro-technology)*	2.70[b] *SD.=1.25*	3.20[a] *SD.=1.07*	3.31[a] *SD.=.99*	**.010**	-	-.238**	-.190*
Technology makes being nature more complicated *(negative)*	.05 *SD.=1.20*	-.01 *SD.= 1.04*	-.20 *SD.=1.02*	.198	-	-	-
Technology detracts from people's enjoyment in the outdoors *(negative)*	.67 *SD.= 1.26*	.65 *SD.=.99*	.49 *SD.=1.02*	.305	-	-	-
Technology makes people more isolated in the outdoors *(negative)*	.22 *SD.=1.02*	.31 *SD.=1.05*	.21 *SD.=1.12*	.747	-	-	-

-2= strongly disagree, -1= disagree, 0= neutral, 1= agree, 2= strongly agree

Bolded= p-value < 0.05 (statistically significant)

Means with a different superscript letter are different at p<0.5 following pairwise comparison

RPC= Remote- Primitive Campground, RDC= Remote- Developed Campground, UDC= Urban Developed Campground

* low effect size= $|effect\ size|$< 0.2

** moderate effect size= 0.2< $|effect\ size|$> 0.5

Intended Forest Personal Technology Behaviors

Twelve of the fourteen forest technology behaviors on the questionnaire were significantly different across camping contexts (Table 10). All five forest-specific behaviors (e.g., using apps to learn about the forest) were significantly different across settings. While different, the average visitor responses were negative in all contexts, indicating an unlikelihood to use personal technology to gather information about either forest. Three of the four technology behaviors that allowed visitors to remain connected with friends, families, and followers (e.g., post pictures and videos on social media) were significantly different across contexts. Sending emails was the only connective behavior that was not significantly different. Three of the four leisure activities, like watching television and listening to music, were significantly different across contexts. In all contexts, visitors were unlikely to read eBooks or watch TV, although the average likeliness across forest and camping contexts for these behaviors were significantly different. Listening to music was the most likely leisure activity across forest contexts. Campers in the *remote-developed campground* were more likely to listen to music than campers in the *urban-proximate-developed campground* and *remote-primitive campground*. The Cohen's effect size value suggests that the differences in the likelihood of listening to music between the participants in the *remote-primitive campground* and participants in both the *urban-proximate-developed campground* and *remote-primitive campground* had low practical significance. Playing digital games was not significantly different ($p>0.05$), campers in all forest contexts were unlikely to

engage. Urban campers were more likely to use most forms of personal technology in the forest compared to campers in the remote forest. Urban campers are significantly less likely to unplug from technology than remote campers (see values in Table 10).

*Table 10- Kruskal-Wallis test and pairwise comparison for mean **intended technology behaviors** of campers across forest contexts and camping types*

	RPC (N=64)	RDC (N=106)	UDC (N=85)	Sig p-value	Effect Size UDC & RDC	Effect Size UDC & RPC	Effect Size RDC & RPC
Use apps to learn about the forest (forest-specific)	-1.30[a] *SD.=1.09*	-1.11[a] *SD.=1.04*	-.49[b] *SD.=1.34*	**.000**	-.234**	-.323**	-
Use a fitness tracker (forest-specific)	-1.04[a] *SD.=1.35*	-1.04[a] *SD.=1.40*	-.22[b] *SD.=1.53*	**.000**	-.273**	-.360**	-
Search online for information about the area (forest-specific)	-.80[a] *SD.=1.44*	-.47[a] *SD.=1.40*	.00[b] *SD.=1.41*	**.002**	-.159*	-.275**	-
Use GPS for navigation (forest-specific)	-.48[a] *SD.=1.62*	-.49[a] *SD.=1.49*	.12[b] *SD.=1.49*	**.009**	-.204**	-.194*	-
Search online fore forest rules and regulations (forest-specific)	-.88[a] *SD.=1.43*	-.88[a] *SD.=1.18*	-.44[b] *SD.=1.32*	**.028**	-.166*	-.182*	-
Post pictures/videos on social media (connective)	-.80[a] *SD.=1.35*	-.41[a] *SD.=1.41*	.20[b] *SD.=1.47*	**.000**	-.213**	-.334**	-
Check social media (connective)	-1.50[b] *SD.=.96*	-.97[a] *SD.= 1.26*	-.53[a] *SD.=1.38*	**.000**	-	-.382**	-.222**
Check phone messages (connective)	-.59[a] *SD.=1.47*	.02[a] *SD.=1.33*	.16[b] *SD.1.36*	**.005**	-.055*	-.245**	-
Check email messages (connective)	-1.00 *SD.=1.27*	-.74 *SD.=1.42*	-.48 *SD.=1.52*	.119	-	-	-
Watch television (leisure)	-1.76[b] *SD.=1.05*	-1.42[a] *SD.=1.05*	-1.27[a] *SD.=1.10*	**.003**	-	-.285**	-.178*
Read an eBook (leisure)	-1.29[a] *SD.=1.21*	-1.36[a] *SD.=1.11*	-1.01[b] *SD.=1.26*	**.042**	-.175*	-.141*	-

Listen to music (leisure)	.05[b] *SD.=1.51*	.64[a] *SD.=1.33*	46[a] *SD.=1.50*	**.046**	-	-.142*	-.194*
Play digital games (leisure)	-1.59 *SD.=.87*	-1.31 *SD.=1.14*	-1.19 *SD.=1.20*	.058	-	-	-
Unplug from personal technology (disconnected)	.63[a] *SD.=1.32*	.48[a] *SD.=1.35*	-.16[b] *SD.=1.44*	**.001**	-.219**	-.268**	-

-2= very unlikely, -1= unlikely, 0= neither likely nor unlikely, 1= likely, 2= very likely
Bolded= p-value < 0.05 (statistically significant)
Means with a different superscript letter are different at p<0.5 following pairwise comparison
RPC= Remote- Primitive Campground, RDC= Remote- Developed Campground, UDC= Urban Developed Campground
* low effect size= $|effect\ size|$< 0.2
** moderate effect size= 0.2< $|effect\ size|$> 0.5

Significant differences in forest-specific personal technology behaviors existed between urban and remote campers, although the magnitude of the differences vary. Significant differences in connective behaviors were also found between urban campers and remote campers. The Cohen's effect size value suggested that differences in posting pictures/videos on social media across all forest contexts had moderate, practical significance. Differences in checking social media and phone messages had low significance between urban campers and remote-developed campers, while differences were moderately significant between urban campers and remote-primitive campers. Except in the case of checking social media, campers staying in the *remote-primitive campground* were significantly different from the *remote-developed campground* and the *urban-proximate-developed campground*. In leisure activities like watching television and listening to music, campers staying at the *remote-primitive campground* were significantly different from campers in both the *remote-developed campground* and *urban-*

proximate-developed campground. Differences in watching television were moderately significant between *urban-proximate-developed campground* and *remote-primitive campground* according to Cohen's effect size value. Differences among remote campers suggested low practical significance. Urban campers were significantly different in their likelihood to read an eBook during their stay; although, the differences had low significance according to Cohen's effect size value (Table 10). Campers using the *remote-developed campground* and *remote-primitive campground* were similar in their likeliness to unplug while camping. Campers staying at the *urban-proximate-developed campground* were divergent from the campers in the both remote campgrounds regarding disconnecting (Table 10), these differences were moderately significant (Table 10).

Potential Forest Personal Technology Management Actions

Out of the seven potential technology management actions, four were significantly different across forest contexts (Table 11). All those differences were found for management actions that integrate technology into recreation management (e.g., providing both paper and online maps and integrating technology into educational programs). The effect size suggested the differences between campers at the *urban-proximate-developed campground* and campers at the *remote-primitive campground* were moderate (Table 11), but of low significance between the two remote camping types (Table 11). Urban campers were more supportive of expanding wireless internet compared to respondents at both camping types in the remote forest.

Campers in the *urban-proximate-developed* campground and campers in the *remote-developed campground* were similar in their support for integrating technology into visitor displays and educational programs, while campers in the *remote-primitive campground* were less supportive of these ideas. Urban campers were more supportive for the providing both paper and online versions of maps than remote campers.

Table 11- Kruskal-Wallis test and Pairwise comparison camper's mean support for ***potential technology management actions*** *of campers across forest contexts and camping types*

	RPC (N=64)	RDC (N=106)	UDC (N=85)	Sig. p-value	Effect Size UDC & RDC	Effect Size UDC & RPC	Effect Size RPC & RDC
Expanding wireless internet access	-.19[a] *SD.=1.20*	.01[a] *SD.=1.22*	.54[b] *SD.=1.09*	**.001**	-.207**	-.292**	-
Integrating technology into visitor center displays	.23[b] *SD.=1.03*	.55[a] *SD.=.81*	.78[a] *SD.=.89*	**.001**	-	-.292**	-.180*
Integrating technology into educational programs	.44[b] *SD.=.99*	.71[a] *SD.=.77*	.91[a] *SD.=.87*	**.007**	-	-.251**	-.130*
Providing both paper and online maps	.85[a] *SD.=1.02*	1.00[a] *SD.=.77*	1.21[b] *SD.=.86*	**.047**	-.152*	-.181*	-
Replacing paper maps with online versions	-.79 *SD.=1.06*	-.59 *SD.=1.07*	-.33 *SD.=1.17*	.058	-	-	-
Replacing educational signs with apps	-.97 *SD.=1.00*	-.65 *SD.=1.04*	-.57 *SD.=1.10*	.067	-	-	-
Establishing technology free zones	.31 *SD.=1.10*	.12 *SD.=1.06*	.36 *SD.=1.22*	.269	-	-	-

-2= strongly oppose, -1= oppose, 0= neutral, 1= support, 2= strongly support

Bolded= p-value < 0.05 (statistically significant)

Means with a different superscript letter are significantly different at p<0.5 following pairwise comparison

RPC= Remote- Primitive Campground, RDC= Remote- Developed Campground, UDC= Urban Developed Campground

* low effect size= $|effect\ size|< 0.2$

** moderate effect size= $0.2< |effect\ size|> 0.5$

Research Objective 2: Connections to Personal Technology Across Visitor Demographics

Of the three zones studied in the FPCC, 16.8% of respondents came from the North Zone, 24.4 % from the Northwest Zone, and 58.8% from the Southwest Zone. Campers made up 30.2% of research participants, 41.2% were nature center visitors, and 28.6 % were using the day use areas (e.g., trails, picnic groves, and open fields). Walking (72.9%) and viewing nature (60.3%) were the most common activities study visitors participated in during their stay. The most common use of personal technology in the forest was posting pictures/ video on social media, with 45.5% of visitors reporting being likely or very likely to do so. In everyday life, personal technology use, especially information and communication technologies (e.g., cell phones and computers) was common among all visitors. Over 78% of respondents reported texting, sending/receiving emails, and searching the internet all the time. Less than half never or rarely unplug in their everyday lives.

Four age groups were generated based on the data: Silent Generation (N=2, <1%), Baby Boomers (N=58, 23.2%), Generation X (N=102, 40.8%), and Millennials or Generation Y (N=90, 36.0%). The Silent Generation was underrepresented and therefore were not included in data analysis. Education categories included some high school (N=1, <4%), high school or GED (N=23, 9.1%), some college or business/trade school (N=40, 15.7%), college or business/trade school N=101, 39.8%), some graduate school (N=18, 7.1%), graduate/professional degree (N=71, 28.0%). Some high school was excluded from

data analysis due to small sample size. Gender categories consisted of male (N=101, 39.6%) and female (N=154, 60.4%). Race/ethnicity was analyzed with four groups: Asian (N=12, 5.4%), African American/Black (N=26, 11.6%), Latino/Hispanic (N=28, 12.5%), and White (N=158, 70.5%).

Differences in Visitors' Personal Technology Attitude Subscales Based on Visitor Demographics

Out of the three attitude subscales, one was significantly different across generational groups (Table 12). There was a statistically significant difference between generational groups and their forest technology anxiety/ dependence attitudes (X^2=7.169, p=.028) (Table 12), with a mean rank of 135.57 for Millennials, 128.82 for Generation X, and 104.03 for Baby Boomers. Generation X and Millennials were statistically similar in their forest technology anxiety/ dependence technology attitudes (p= .516), while Baby Boomers were the different group (Baby Boomers - Generation X, p=.036; Baby Boomers - Millennials, p= .009). It is worth noting that although the means were significantly different, the magnitudes of those differences were not large. Table 12 shows that the effect sizes of the differences between Baby Boomers and Generation X were low, and the difference between Baby Boomers and Millennials were moderate. On average all generations disagreed with having technology anxiety and dependence.

Table 12-Kruskal-Wallis test and pairwise comparison for visitors' mean ***forest technology attitude subscales*** *across generational groups*

	Millennials (N=90)	Generation X (N=102)	Baby Boomers (N=58)	Sig. p-value	Effect Size BB & MIL	Effect Size BB & GX
Anxiety/ Dependence Technology Attitudes	-.39[a] *SD.=1.02*	-.49[a] *SD.=1.00*	-.86[b] *SD.=.82*	**.028**	-.214**	-.166*
Positive Technology Attitudes	.11 *SD.=.75*	.12 *SD.=.77*	.13 *SD.= .74*	.998		
Negative Technology Attitudes	.25 *SD.=.87*	.26 *SD.=.90*	.15 *SD.=.85*	.853		

-2=Strongly disagree, -1= Disagree, 0= Neutral, 1= Agree, 2= Strongly Agree

Bolded= p-value < 0.05 (statistically significant)

Means with a different superscript letter are significantly different at p<0.5 following pairwise comparison

BB= Baby Boomers, GX= Generation X, Mill= Millennials

* low effect size= $|effect\ size|$< 0.2

** moderate effect size= 0.2 <$|effect\ size|$< 0.5

Table 13 and Table 14 show that there were no significant differences in any of the three forest technology attitude subscales based on education level or gender.

Table 13- Kruskal-Wallis test and pairwise comparison for visitors' mean ***forest technology attitude subscales*** *across education levels*

	HS Graduate or GED (N=23)	Some College, Business or Trade School (N=40)	College, Business or Trade School (N=101)	Some Graduate school (N=18)	Master's, Doctoral, or Professional Degree (N=71)	Sig. p-value
Technology Anxiety/ Dependence Attitudes	-.20 *SD.=1.14*	-.48 *SD.=1.01*	-.59 *SD=.97*	-.74 *SD.=.88*	-.61 *SD.=.94*	.305
Positive Technology Attitudes	.05 SD.=.93	.31 *SD.=.75*	.01 SD.=.78	.12 *SD.=.48*	.15 *SD.=.69*	.267
Negative Technology Attitudes	.21 *SD.=.98*	.25 *SD.=.82*	.20 *SD.=.86*	.39 *SD.=.79*	.25 *SD.=.89*	.599

-2=Strongly disagree, -1= Disagree, 0= Neutral, 1= Agree, 2= Strongly Agree

Bolded= p-value < 0.05 (statistically significant)

Table 14- Mann- Whitney test and pairwise comparison for visitors' mean ***forest technology attitude subscales*** *across genders*

	Female (N=154)	Male (N=101)	Sig. p-value
Technology Anxiety/ Dependence Attitudes	-.58 *SD.=1.00*	-.51 *SD.=.96*	.488
Positive Technology Attitudes	.07 *SD.=.75*	.16 *SD.=.75*	.332
Negative Technology Attitudes	.29 *SD.=.87*	.14 *SD.=.88*	.162

-2=Strongly disagree, -1= Disagree, 0= Neutral, 1= Agree, 2= Strongly Agree
Bolded= p-value < 0.05 (statistically significant)

There were significant differences in positive forest technology attitudes (X^2=13.863, p=.003) and anxiety/dependence technology attitudes (X^2=25.323, p=.000) based on race/ethnicity (Table 15). For anxiety/dependence technology attitudes, Whites had a mean rank of 98.95, Latinos-126.63, Asians-149.04, and African Americans -57.96. Table 15 illustrates that White respondents were significantly different from the other groups. Post-hoc tests showed that Whites have more negative technology attitudes compared to other groups. The effect size of the differences between White respondents and Asian respondents as well as the differences between White respondents and African American respondents suggested that the differences were moderately significant. However, differences in anxiety/dependence technology attitudes between White respondents and Latino respondents had low practical significance. On average African Americans had the most positive anxiety/ dependence technology attitudes. For positive technology attitudes, Asians had a mean rank of 140.25, Latinos - 137.73, African Americans- 133.75, and Whites- 101.65. White respondents were significantly different from the

other groups with disagreeing more with positive technology attitudes. The differences in positive technology attitudes between Whites and Asians, and Whites and African Americans were low, according to Cohen's Effect Size Value (Table 15). The differences between Whites and Latinos were moderate (Table 15).

Table 15- Kruskal-Wallis test and pairwise comparison for visitors' mean ***forest technology attitude subscales*** *across race/ethnicity*

	Asian (N=12)	Black or African American (N=26)	Hispanic or Latino (N=28)	White (N=157)	Sig. p-value	Effect Size W & A	Effect Size W & B	Effect Size W & L
Technology Anxiety/ Dependence Attitudes	-.03 [a] *SD.=86*	.17[a,] *SD.=.86*	-.31 [a,] *SD.=1.04*	-.73[, b,] *SD.=.96*	**.000**	-201**	-.321**	-.156*
Positive Technology Attitudes	.42[a] *SD.= .66*	.38[a] *SD.=.85*	.45[a] *SD.=.80*	.01[b] *SD.= .66*	**.003**	-.159*	-.174*	-201**
Negative Technology Attitudes	-.03 *SD.=.92*	.10 SD.=.86	.48 *SD.=.85*	.20 *SD.=.83*	.326	-	-	-

-2=Strongly disagree, -1= Disagree, 0= Neutral, 1= Agree, 2= Strongly Agree
Bolded= p-value < 0.05 (statistically significant)
Means with a different superscript letter are significantly different at p<0.5 following pairwise comparison
W= White, L= Latino, B= Black or African American, A= Asian
* low effect size= $|effect\ size|$< 0.2
** moderate effect size= 0.2 <$|effect\ size|$< 0.5

Differences in Visitors' Intended Forest Technology Behavior Subscales Based on Visitor Demographics

There were no significant differences in forest-specific technology behaviors (X^2=.356, p=.169), non-forest specific technology behaviors (X^2=2.972, p=.226), and disconnected technology behaviors (X^2=2.566, p=.277) based on age (Table 16).

Table 16- Kruskal-Wallis test and pairwise comparison for visitors' mean ***intended forest technology behavior subscales*** *across generational groups*

	Millennials (N=90)	Generation X (N=102)	Baby Boomers (N=58)	Sig. p-value
Forest-Specific Technology Behaviors	.70 *SD.=1.17*	-.56 *SD.=1.08*	-.89 *1.09*	.169
Non-Forest Specific Technology Behaviors	-.64 *SD.=.97*	-.72 *SD.=.77*	-.90 *SD.=83*	.226
Disconnected Technology Behaviors	-.08 *SD.=1.44*	.15 *SD.=1.42*	-.21 *SD.=1.46*	.277

-2= very unlikely, -1= unlikely, 0= neither unlikely nor likely, 1= likely, 2= very likely

Bolded= p-value < 0.05 (statistically significant)

Table 17 illustrates that respondents of different educational levels did not have significant differences in their forest-specific technology behaviors (X^2=3.232, p=.491) and disconnected technology behaviors (X^2 =5.651, p=.183). However, there were significant differences in non-forest specific behaviors (X^2 =12.041, p=.017) based on education level, with a mean rank of 167.43 for high school graduates or GED, 139.73 for some college, business, or trade school, 139.59 for college, business, or trade school graduates, 114.88 for some graduate school, and 120.85 for Master's, doctoral or professional degree. The effect size of the differences between HS Graduates or GED and the other levels of education suggested the differences were moderately significant (Table 17).

*Table 17 Kruskal-Wallis test and pairwise comparison for visitors' mean **intended forest technology behavior subscales** across education level*

	HS (N=23)	SCBS (N=40)	CBS (N=101)	SGS (N=18)	GS (N=71)	Sig p-value	Effect Size HS & SCBS	Effect size HS & CBS	Effect size HS & GS
Forest-Specific Technology Behaviors	-.54 *SD.=1.36*	-.54 *SD.=1.29*	-.78 *SD.=1.06*	-.36 *SD.=1.20*	-.87 *SD.=.99*	.491	-	-	-
Non-Forest Specific Technology Behaviors	-.23[b] *SD.=1.04*	-.59[a] *SD.=.94*	-.92[a] *SD.=.73*	-.57[a] *SD.=.95*	-.81 *SD.=.84*	**.032**	-.217**	-.280**	-.249**
Disconnected Technology Behaviors	-.04 *SD.=1.43*	-.41 SD.=1.55	-.01 SD.=1.36	-.50 SD.=1.26	-.13 SD.=1.51	.183	-	-	-

-2=very unlikely, -1= unlikely, 0= neither unlikely nor likely, 1= likely, 2= very likely
Bolded= p-value < 0.05 (statistically significant)
Means with a different superscript letter are significantly different at p<0.5 following pairwise comparison
HS= high school graduate, SCBS= some college, business, or trade school, CBS= college, business, or trade school graduate, SGS= some graduate school, GS= Master's, doctoral or professional degree
* low effect size= $|effect\ size|$< 0.2
** moderate effect size= 0.2 <$|effect\ size|$< 0.5

There were no significant differences in forest-specific technology behaviors (p=.202), non-forest specific technology behaviors (p=.147), and disconnected technology behaviors (p=.289) by gender (Table 18).

*Table 18- Mann- Whitney test and pairwise comparison for visitors' mean **intended forest technology behavior subscales** across gender*

	Female (N=153)	Male (N=101)	Sig. p-value
Forest-Specific Technology Behaviors	-.82 *SD.=1.07*	-.62 *SD.=1.14*	.202
Non-Forest Specific Technology Behaviors	-.66 *SD.=. 95*	-.87 *SD.=.68*	.147
Disconnected Technology Behaviors	.09 SD.=*1.46*	-.11 *SD.=1.41*	.289

-2=very unlikely, -1= unlikely, 0= neither unlikely nor likely, 1= likely, 2= very likely
Bolded= p-value < 0.05 (statistically significant)

There were no significant differences in the forest-specific technology behaviors (X^2= 6.789, p=.079) based on race/ ethnicity. However, non-forest specific technology behaviors were significantly different (X^2 =37.627, p=.000) based on race/ ethnicity. African Americans had a mean range of 161.04, Asians- 156.33, Latinos- 142.16, and Whites' mean range was 95.11. Table 19 illustrates that White respondents were different from the other groups. On average, White respondents were the least likely to engage in non-forest specific technology behaviors, while African Americans were the most likely. The post-hoc test shows that significant differences were between Whites and African Americans (p=.000), Whites and Latinos (p=.000), and Whites and Asians (A) (p=.002). Disconnected technology behaviors (X^2 = 9.443, p=.024) were also statistically different across races/ ethnicities. These differences were between Whites and Latinos (p=.039) and Whites and African Americans (p=.017) (Table 19). The effect sizes of the differences in the likelihood to disconnect while in the forest between White respondents and other races/ethnicities were low (Table 19).

Table 19- Kruskal-Wallis test and pairwise comparison for visitors' mean ***intended forest technology behavior subscales*** *across race/ethnicity*

	Asian (N=12)	Black or African American (N=26)	Hispanic or Latino (N=28)	White (N=157)	Sig. p-value	Effect Size W & A	Effect Size W & B	Effect Size W & L
Forest-Specific Technology Behaviors	-.25 *SD.=.98*	-.52 *SD.=1.17*	-.30 *SD.=1.32*	-.83 *SD.=1.03*	.079	-	-	-
Non-Forest Specific Technology Behaviors	-.27[a]	-.09[a]	-.38[a]	-.95[b]	**.000**	-.244**	-.335**	-.267**
Disconnected Technology Behaviors	-.33[a]	-.54[a]	-.43	.18[b]	**.024**	-.100*	-.171*	-.147*

-2=very unlikely, -1= unlikely, 0= neither unlikely nor likely, 1= likely, 2= very likely

Bolded= p-value < 0.05 (statistically significant)

Means with a different superscript letter are significantly different at p<0.5 following pairwise comparison

W= White, L= Latino, B= Black or African American, A= Asian

* low effect size= $|effect\ size|$< 0.2

** moderate effect size= 0.2 <$|effect\ size|$< 0.5

Differences in Visitor's Forest Technology Management Preferences Based on Visitor Demographics

There were no significant differences in respondent preferences for management based on their generation (Table 20). This included pro-technology management (X^2=3.128, p= .209), integrate technology management (X^2 =2.809, p=.245), anti-technology management (X^2= .676, p=.713, and internet access management (X^2=.108, p=.947).

*Table 20- Kruskal-Wallis test and pairwise comparison for visitors' mean **potential forest technology management subscales** across generational groups*

	Millennials (N=90)	Generation X (N=102)	Baby Boomers (N=58)	Sig.
Pro Technology Mgmt.	-.44 *SD.=.98*	-.41 *SD.=1.00*	-.63 *SD.=.94*	.126
Integrate Technology Mgmt.	.77 *SD.=.83*	.97 *SD.=.63*	.98 *SD.=.66*	.077
Internet Access Mgmt.	.40 *SD.=1.10*	.35 *SD.=1.10*	.34 *SD.=1.10*	.627
Anti-Technology Mgmt.	.11 *SD.=1.25*	.22 *SD.=1.10*	.10 *SD.=1.15*	.910

-2=very unlikely, -1= unlikely, 0= neither unlikely nor likely, 1= likely, 2= very likely
Bolded= p-value < 0.05 (statistically significant)

There were also no significant differences in pro-technology management (X^2=7.187, p=.126), integrate technology management (X^2=8.419, p=.007), anti-technology management (X^2=1.000, p=.910), and internet access management (X^2=2.596, p=.627) for education level (Table 21).

*Table 21- Kruskal-Wallis test and pairwise comparison for visitors' mean **potential forest technology management subscales** across education levels*

	HS Graduate or GED (N=23)	Some College, Business or Trade School (N=40)	College, Business or Trade School (N=101)	Some Graduate school (N=18)	Master's, Doctoral, or Professional Degree (N=71)	Sig. p-value
Pro Technology Mgmt.	-.22 *SD.=1.23*	-.29 *SD.=1.06*	-.46 *SD.=.93*	-1.06 *SD.=.89*	-0.51 *SD.=.51*	.097
Integrate Technology Mgmt.	.48 *SD.=.88*	1.07 *SD.=.67*	.93 *SD.=.72*	.87 *SD.=.89*	.91 *SD.=.58*	.100
Internet Access Mgmt.	.61 *SD.=1.08*	.49 *SD.=1.15*	.26 *SD.=1.03*	.25 *SD.=1.06*	.40 SD.=1.15	.370
Anti-Technology Mgmt.	.09 *SD.=1.35*	.21 *SD.=1.15*	.16 *SD.=1.02*	.33 *SD.1.37*	.13 *SD=1.14*	.601

-2=very unlikely, -1= unlikely, 0= neither unlikely nor likely, 1= likely, 2= very likely
Bolded= p-value < 0.05 (statistically significant)

Gender had no statistical differences in their preferences for pro-technology management actions (p=.130), integrate technology management actions (p=.563), and internet access management actions (.370). There were, however, significant differences in respondents' support for anti-technology management actions based on gender (p=.011) (Table 22). Although those differences were statistically significant, the effect size suggested the differences of support for anti-technology management actions were small (Table 22).

Table 22- Mann-Whitney test and pairwise comparison for visitors' mean ***potential forest technology management subscales*** *across gender*

	Female (N=153)	Male (N=101)	Sig. p-value	Effect Size F & M
Pro Technology Mgmt.	-.55 *SD.=1.00*	-.35 *SD.=.93*	.055	
Integrate Technology Mgmt.	.86 *SD.=.74*	.98 *SD.=.66*	.563	
Internet Access Mgmt.	.39 *SD.=1.05*	.33 *SD.=1.13*	.661	
Anti-Technology Mgmt.	.31[a] *SD.=1.13*	-.03[b] *SD.=1.17*	**.011**	-.159*

-2=very unlikely, -1= unlikely, 0= neither unlikely nor likely, 1= likely, 2= very likely

Bolded= p-value < 0.05 (statistically significant)

Means with a different superscript letter are significantly different at p<0.5 following pairwise comparison

F= Female, M= Male

* low effect size= $|effect\ size|$< 0.2

** moderate effect size= 0.2 <$|effect\ size|$< 0.5

Respondents of different races/ethnicities were not significantly different in their support of integrate technology management actions (X^2 =2.033, p=.565) and anti-technology management actions (X^2 =2.733, p=.435). There were differences in support of internet access management actions (X^2 = 24.375, p=.000) and pro-technology management actions (X^2=12.168, p=.007) by race/ ethnicity. For internet

access management actions, African Americans had a mean rank of 158.33, Latinos had 126.46, Asians had 122.67, and Whites had a mean rank of 98.57. The effect size of the differences in support for internet access management actions between Whites and Asians, and Whites and Latinos suggested low practical significance (Table 23). The differences between Whites and African Americans were moderate according to Cohen's Effect Size Value (Table 23). For pro-technology management actions, Asians had the highest mean rank at 159.50, followed by Latinos with 129.41, then African Americans with 121.94, and the lowest mean rank is Whites with 103.62. Regarding support for internet access management actions, Whites were only different from African Americans (p=.000) and Latinos (p=.026). These differences also occurred regarding visitors' support for pro-technology management (Whites-African Americans (p=.003) and Whites- Latinos (p=.048)). The differences between White respondents and Asian respondents were moderately different according to Cohen's Effect Size Table 23. The effect size of the difference between White respondents and African American respondents, and the effect size of White respondents and Latino respondents were low (Table 23).

*Table 23- Kruskal-Wallis test and pairwise comparison for visitors' mean **potential forest technology management subscales** across race/ethnicity*

	Asian (N=12)	Black or African American (N=26)	Hispanic or Latino (N=28)	White (N=157)	Sig. p-value	Effect Size W & A	Effect Size W & B	Effect Size W & L
Pro-Technology Mgmt.	-.17[a] *SD.=.54*	-.29[a] *SD.=.99*	-.11[a] *SD.=1.28*	-.59[b] SD.=.90	**.007**	-.229**	-.104*	-.140*
Integrate Technology Mgmt.	.86 *SD.=.52*	.87 *SD.=.96*	.73 SD.=.92	.96 SD.=.61	.565	-	-	-
Internet Access Mgmt.	.58[a] *SD.=.51*	1.23[a] *SD.=.86*	.71[a] SD.=1.12	.16[b] SD.=1.03	**<.001**	-.115*	-.343**	-.160*
Anti-Technology Mgmt.	.17 *SD.=.83*	-.12 *SD.=1.07*	.39 SD.=1.40	.17 SD.=1.10	.435	-	-	-

-2=strongly oppose, -1= oppose, 0= neutral, 1= support, 2= strongly support
Bolded= p-value < 0.05 (statistically significant)
Means with a different superscript letter are significantly different at p<0.5 following pairwise comparison
W= White, L= Latino, B= Black or African American, A= Asian
* low effect size= $|effect\ size|$< 0.2
** moderate effect size= 0.2 <$|effect\ size|$< 0.5

Objective 3: Technology Attitudes as a Predictor for Technology Management Support and Intended Behaviors

Urban-proximate Forest Visitor Overview

A third of respondents (30.2%) were intercepted at a campground, 41.2% were from nature centers, and 28.6% were from day use areas like trails, picnic groves, and open fields (Table 24). Respondent demographics can be found in Table 25. Overall, technology use was common among participants. More than 78% revealed that they text, email, and search the internet often or all the time. Participants had varied attitudes towards technology. Seventy-one percent of respondents agreed the that any information

Table 24- Frequency of visitor interception at FPCC site types

	Frequency	Percent
Campground	79	30.2
Nature Center	108	41.2
Day Use Sites	75	28.6
Total	262	100.0

about FPCC should be accessible online. Over half (53.1%) agreed that technology detracts from people's enjoyment of the outdoors, but a majority (46.3%) agreed that new technology makes being in nature safer. Overall, respondents were split on the likelihood that they would unplug during their visit, 39.3% expressed being very likely or likely to unplug, and another 39.3% were unlikely or very unlikely. The most common technology behavior people participated in was posting pictures/ videos on social media (45.5%). Respondents preferred management that blends new technology with traditional management techniques (over 70% either supported or strongly supported) and opposed management that replaces traditional communication methods with technology.

Table 25- FPCC respondent demographics

Age- in years	
Minimum	18
Maximum	79
Median	40
Mean	42.6
Standard Deviation	13.1
Education- %	
Some High School	.8%
High School graduate or GED	9%
Some college, business, or trade school	15.7%
College, business or trade school graduate	39.6%
Some graduate school	7.1%
Master's doctoral or professional degree	27.8%
Gender- %	
Female	60.4%
Male	39.6%
Other	0.0%
Race/ Ethnicity- %	
Asian	5.4%
African American or Black	11.6%
Latino or Hispanic	12.5%
White	70.5%

Remote-developed Forest Visitor Overview

One hundred seventeen respondents (64.6%) encountered in the remote forest were from the Boulder Lake campground (the developed campground in the remote forest). Most Boulder Lake respondents were visiting with a family group (73%) (Table 26). The most popular activities among respondents were camping (88.9%), swimming (77.8%), and walking (75.8%) (Table 27). Outside of the forest, technology use was heavily incorporated into participant's everyday life. Over 70% reported sending and receiving emails, searching on the internet, and texting either "often" or "all the time." Half of the respondents (50.4%) rarely or never unplug from their personal technology. Many respondents had relatively negative attitudes towards technology in the outdoors. Over 60% either strongly disagreed or disagreed that internet access is important to have while in the forest. The majority (73.3%) felt they were independent of their personal technology devices while in the forest. The most common use for technology was listening to music (64.6%). Over half of respondents (56.9%) revealed that it was either likely or very likely that they would unplug from their devices during their visit.

Table 26- Remote-developed forest (Boulder Lake Campground in CNNF) visitor demographics & visitor characteristics

% Group Type: Family	73%
First visit to remote forest- developed	29.6%
Median # of previous visits	2
Median group size	4
Mean age	46.02
% Education (college +)	51.8%
% Female	57.4%
% White	94.6%

Table 27- Top five activities among visitors of remote-developed forest (Boulder Lake campground in CNNF)

Activity	Percentage
Camping	88.9%
Swimming	77.8%
Walking	75.2%
Nature Viewing	75.2%
Hiking	40.2%

Remote-primitive Forest Visitor Overview

Sixty-four (35.4%) of the 181 respondents in the CNNF came from primitive campgrounds. Over two-thirds of respondents were visiting with family groups (Table 28) The most common activities among respondents at the primitive campsites were camping and fishing (85.9% and 70.3% respectively (Table 29). Engaging with nature (79.7%-enjoying sights and smells of nature,84.3%-being close to nature) and family (87.5%- doing something with my family, 75%- bringing family closer together) were the most reported motivations for respondents' visit to the forest. Respondents' attitudes towards personal technology in the outdoors were negative. Visitors reported having little dependence on personal technology (72.0%). However, over half (52.3%) revealed they felt they should be able to access any information about the forest online. The most common use for personal technology amongst participants was listening to music (42.2%). A majority of respondents (54.7%) intended to unplug during their stay in the forest. Overall, respondents preferred management actions that added technology to the management that already existed (75% strongly supported or supported having both paper maps and online maps, 53.2% supported integrating technology into educational programs). Over 40%

reported either strongly supporting or supporting the establishment of technology-free zones, followed by 39.3% being neutral on the matter.

Table 28- Remote-primitive forest (Namekagon Campground, Day Lake Campground, and Two Lake Campground in CNNF) visitor demographics & visitor characteristics

% Group Type: Family	67.2%
First visit to remote forest- primitive	35.9%
Median # of previous visits	2
Median group size	4
Mean age	47.08
% Education (college +)	55.45%
% Female	53.2%
% White	91.9%

Table 29- Top five activities among visitors of remote-primitive forest (Namekagon Campground, Day Lake Campground, and Two Lake Campground in CNNF)

Activity	Percentage
Camping	85.9%
Fishing	70.3%
Walking	51.6%
Swimming	48.4%
Hiking	39.1%

Personal Technology Attitude Categories Based on PCA

Urban- proximate Forest

Personal technology attitudes were initially sorted into three components (Table 30). The Cronbach's α of Component 3 did not reach the cutoff of .6 (Table 30). Due to similarities in the attitudes in Component 1 and Component 3 (e.g., pro-technology attitudes towards technology), it was considered appropriate to combine them. A Cronbach's α of .832 supported this combination for this new factor loading. Items in each component were averaged to create two attitude categories: *positive technology attitudes* and *negative technology attitudes* (Table 31).

Table 30 Urban-proximate forest respondents' forest technology attitude items with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3
Cronbach's Alpha	.843	.794	.497
Anxious w/ no internet in forest	**.851**	-.085	.136
Anxious w/ no cell phone in forest	**.779**	-.056	.041
Dependence on technology in the forest	**.846**	.041	-.049
Technology detracts enjoyment of nature	-.063	**.835**	-.158
Important to find information about forest online	-.047	.029	**.864**
Important to be able to access internet in the forest	**.769**	-.048	.263
Important to keep up with the latest trends in outdoor technology	.442	-.058	**.652**
Technology makes being in nature more complicated	-.093	**.805**	-.022
Technology makes people more isolated in the outdoors	-.027	**.860**	.049
Technology being nature being more safe	**.435**	-.168	.343
Time in nature is enhanced with technology	**.530**	-.259	.436
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6			

Table 31- Urban- proximate forest technology attitude categories with questionnaire items and Cronbach's Alpha

Positive Technology Attitudes Component 1	Negative Technology Attitudes Component 2
Cronbach's α	
.832	.794
Questionnaire Items	
Anxious w/ no internet	Technology detracts enjoyment of nature
Anxious w/ no cell phone	Technology makes being in nature more complicated
Dependence on technology in the forest	Technology makes people more isolated in the outdoors
Important to find information about forest online	
Important to be able to access internet in the forest	
Important to keep up with the latest trends in outdoor technology	
Technology being nature being more safe	
Time in nature is enhanced with technology	

Remote- developed Forest

Similarly, to the urban- proximate forest, attitudes towards personal technology in the remote- developed forest setting were sorted into 3-factor loadings (Table 32). The Cronbach's α for Component 3 did not meet the cut-off of 0.6. Component 3 was combined with Component 1 since all items share theme of pro-technology. The merging of the components strengthens the reliability of the factor loading (Cronbach's α=.806). The responses to the items under each component were averaged together. Component 1 consisted of *positive technology attitudes* in the forest setting and Component 2 consisted of *negative technology attitudes* (Table 33).

Table 32- Remote- developed forest respondents' forest technology attitudes with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3
Cronbach's Alpha	.786	.644	.548
Anxiety with no cell phone in nature	**.755**	.022	.142
Anxiety with no internet in nature	**.792**	-.088	.248
Technology makes being in nature more complicated	-.123	**.692**	.186
Dependent on technology when in the forest	**.793**	-.086	-.148
Technology detracts from people's enjoyment of the outdoors	-.109	**.769**	-.146
Time in nature is enhanced with technology	.448	-.017	**.507**
It is important to able to access internet anywhere in the forest	**.641**	-.155	.443
Technology makes people more isolated in the outdoors	.035	**.814**	-.182
It is important to keep up with the latest trends in outdoor technology	.323	-.173	**.631**
Technology makes being in nature more safe	**.482**	-.126	.365
It is important to find any information about the forest online	-.030	.042	**.765**
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6			

Table 33- Remote- developed forest technology attitude categories with questionnaire items and Cronbach's Alpha

Positive Technology Attitudes Component 1	Negative Technology Attitudes Component 2
Cronbach's Alpha	
.802	.644
Questionnaire Items	
Anxiety w/ no cell phone in nature	Technology makes being in nature more complicated
Anxiety w/ no internet in nature	Technology detracts from people's enjoyment of the outdoors
Dependent on technology when in nature	Technology makes people more isolated in the outdoors
Time in nature is enhanced with technology	
It is important to be able to access internet anywhere in the forest	
It is important to keep up with the latest trends in outdoor technology	
Technology makes being in nature more safe	
It is important to find any information about the forest online	

Remote- primitive Forest

In the remote- primitive forest, attitudes were initially divided into four components (factors) (Table 34). The Cronbach's alpha for Component 4 did not meet the cutoff of .6 and was combined with Component 3. This combination slightly decreased the reliability of Component 3 (Cronbach α=.710) (Table 35). This decrease still met the cutoff and therefore was still valid. Attitude items in each component were then averaged. Component 1 consisted of *negative technology attitudes*. Component 2 included attitudes of anxiety when technology is absent and dependence on technology in the forest (*technology anxiety/dependence attitudes)*. Component 3 had *positive technology attitudes* (Table 35).

Table 34- Remote- primitive forest respondents' forest technology attitudes with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3	Component 4
Cronbach's Alpha	.870	.804	.775	.484
Anxiety with no cell phone in nature	-.014	**.853**	.266	.034
Anxiety with no internet in nature	-.253	**.752**	.389	.038
Technology makes being in nature more complicated	**.843**	-.115	-.134	-.032
Dependent on technology when in the forest	-.062	**.815**	-.012	.134
Technology detracts from people's enjoyment of the outdoors	**.901**	-.065	-.001	.108
Time in nature is enhanced with technology	-.265	.508	**.577**	.254
It is important to able to access internet anywhere in the forest	-.082	.376	**.770**	.040
Technology makes people more isolated in the outdoors	**.902**	-.095	.058	-.033
It is important to keep up with the latest trends in outdoor technology	-.140	.190	.362	**.680**
Technology makes being in nature more safe	.102	.047	**.881**	.070
It is important to find any information about the forest online	.144	.040	-.059	**.883**
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6				

Table 35- Remote- primitive forest technology attitude categories with questionnaire items and Cronbach's Alpha

Negative Technology Attitudes Component 1	Anxiety/ Dependence Technology Attitudes Component 2	Positive Technology Attitudes Component 3
Cronbach' Alpha		
.870	.804	.710
Questionnaire Items		
Technology makes being in nature more complicated	Anxiety with no cell phone in nature	Time in nature is enhanced with technology
Technology detracts from people's enjoyment of the outdoors	Anxiety with no internet in nature	It is important to able to access internet anywhere in the forest
Technology makes people more isolated in the outdoors	Dependent on technology when in the forest	It is important to keep up with the latest trends in outdoor technology
		Technology makes being in nature more safe
		It is important to find any information about the forest online

Personal Technology Management Preference Categories Based on PCA

Urban- proximate Forest

Management preferences were sorted into three components (Table 36). Items in Component 1 relate to management actions that incorporate technology into the preexisting information distribution. Component 2 promotes the progress of technology and replacing old methods of information access with newer modern ones. Component 3 includes one item- establishing technology-free zones, which is a management technique that prohibits technology use. Items under each component were averaged together to create a management style: incorporate technology with current methods (referred to as *integrate technology management*), replace current methods with progressive technology (referred to as *progressive technology management*), and prohibit use of new technology in the forest (referred to as *limiting*

technology management). Expanding internet access (referred to as *internet access management*) was used as a fourth management style because it did not fit in with the other three-factor loadings (Table 37).

Table 36- Urban-proximate forest respondents' management action items with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3
Cronbach's Alpha	.778	.775	
Provide both paper and online maps	**.820**	-.176	.154
Replace paper maps with online versions	.079	**.875**	.131
Replace educational signs with apps	.090	**.865**	-.037
Integrate technology into visitor displays	**.823**	.304	-.106
Integrate technology into educational programs	**.820**	.195	-.063
Establish technology free zones	.127	.231	**.864**
Expand wireless internet access (wi-fi)	.259	.462	-.586
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6			

Table 37- Urban- proximate forest technology management categories with questionnaire items and Cronbach's Alpha

Integrate Technology Management Component 1	Progressive Technology Management Component 2	Limiting Technology Management Component 3	Internet Access Management Component 4
Cronbach's α			
.779	.775		
Questionnaire Items			
Providing both paper and online maps	Replace paper maps with online versions	Establish technology free zones	Expand wireless internet access (wi-fi)
Integrate technology into visitor displays	Replace educational signs with apps		
Integrate technology into educational programs			

Remote- developed forest

Preferences for potential technology management actions were divided into three components (factor loadings) (Table 38). Component 1 consisted of management actions that add progressive technology to replace existing forms of information distribution (referred to as *progressive technology management*). Component 2 contained management practices that incorporate new technology into current elements of the park (referred to *as integrate technology management*). Component 3 was comprised of management that prohibits technology use in the forest (referred to as *limiting technology use management*). Management styles were calculated by averaging the items under each factor loading (Table 39).

Table 38- Remote- developed forest respondents' management action items with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3
Cronbach's Alpha	.779	.690	
Provide both paper and online maps	-.435	**.643**	-.256
Replace paper maps with online versions	**.871**	.165	-.009
Replace maps with apps	**.865**	.101	-.104
Integrate technology into visitor displays	.388	**.807**	.009
Integrate technology into educational programs	.207	**.862**	-.004
Establish technology free zones	-.071	-.030	**.953**
Expand wireless internet access (wi-fi)	**.537**	.452	-.404
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6			

Table 39- Remote- developed forest technology management categories with questionnaire items and Cronbach's Alpha

Progressive Technology Management Component 1	Integrate Technology Management Component 2	Limiting Technology Use Management Component 3
Cronbach's Alpha		
.779	.690	
Questionnaire Items		
Replace paper maps with online versions	Provide both paper and online maps	Establishing technology free zones
Replace maps with apps	Integrate technology into educational programs	
Expand wireless internet access (wi-fi)	Integrate technology into visitor displays	

Remote-primitive Forest

Potential management actions were initially divided into two components (Table 40). Component 1 focused on management that integrates and broadens technology in preexisting management techniques (*integrate technology management*). Component 2 contained management actions that use new technology to replace current information distribution methods (*progressive technology management*). Establishing technology-free zones was treated as a separate item, as it did not fit into the other components (*limiting technology use management*) (Table 41).

Table 40 - Remote- primitive forest respondents' management action items with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2
Cronbach's Alpha	.852	.688
Provide both paper and online maps	**.815**	-.001
Replace paper maps with online versions	.423	**.671**
Replace maps with apps	.277	**.772**
Integrate technology into visitor displays	**.865**	.208
Integrate technology into educational programs	**.931**	.093
Establish technology free zones	4.25	-.736
Expand wireless internet access (wi-fi)	**.628**	.426
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6		

Table 41- Remote- primitive forest technology management categories with questionnaire items and Cronbach's Alpha

Integrate Technology Management Component 1	Progressive Technology Management Component 2	Limiting Technology Use Management Component 3
Cronbach's Alpha		
.852	.688	
Questionnaire Items		
Provide both paper and online maps	Replace paper maps with online versions	Establish technology free zones
Integrate technology into visitor displays	Replace maps with apps	
Integrate technology into educational programs		
Expand wireless internet access (wi-fi)		

Intended Personal Technology Behavior Categories Based on PCA

Urban-proximate Forest

Intended technology behaviors were initially sorted into four categories (Table 42). Component 3 and Component 4 were combined with Component 1 because all nine items involved technology that is non-forest specific (Cronbach α=.839). Component 2 was made up of behaviors that were specific to the forest.

Unplugging from personal technology was placed in its category because it did not relate to any other categories (Table 43).

Table 42- Urban-proximate forest respondents' intended technology behaviors with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3	Component 4
Cronbach' s Alpha	.813	.819	.634	.769
Use apps to learn about the forest	.290	**.809**	.162	.007
Check email messages	**.560**	.469	.045	.346
Check phone messages	.368	.347	.229	**.610**
Check social media	.407	.278	.246	**.602**
Read an eBook	**.709**	.389	.146	.072
Use a fitness tracker	.176	.068	**.735**	-.229
Use GPS for navigation	.152	.320	**.678**	.362
Listen to music	**.505**	.047	.480	.001
Play digital games	**.842**	.176	.115	.102
Post on SMS	.003	.178	**.687**	.362
Search online for information about the area	.114	**.884**	.137	.099
Search online for forest rules and regulations	.363	**.651**	.232	.086
Watch television	**.859**	.199	.121	.023
Unplug from personal technology	.080	.081	.055	-.786
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6				

Table 43- Urban- proximate intended forest technology behavior categories with questionnaire items and Cronbach's Alpha

Non-forest Specific Behaviors Component 1	Forest-Specific Behaviors Component 2	Disconnected Technology Behavior Component 3
Cronbach's α		
.836	.839	
Questionnaire Items		
Check email messages	Use apps to learn about the forest	Unplug from personal technology
Check phone messages	Search online for information about the area	
Check SMS	Search online for forest rules and regulations	
Read an eBook		
Use a fitness tracker		
Use GPS for navigation		
Play digital games		
Post picture/ video on social media		
Watch television		

Intended personal technology behaviors were initially divided into five components (Table 44). Component 1 contained behaviors that relate to communication and remaining connected. Component 2 consists of behaviors that were specific to the forest (referred to as *forest-specific technology behaviors*). Component 3, Component 4, and Component 5 had a low alpha score (Table 44). These components were combined with Component 1 since all involved *non-forest specific technology behaviors*. This combination was supported by a Cronbach's alpha of .722. Unplugging from personal technology made up its own category (*disconnected technology behaviors*) because it did not correlate with the other behaviors (Table 45)

Table 44- Remote-developed forest respondents' intended technology behaviors with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3	Component 4	Component 5
Cronbach's Alpha	.798	.795	.481		
Use apps to learn about the forest	.072	**.787**	.232	-.179	.193
Check phone messages	**.777**	.201	-.023	.012	-.078
Check SMS	**.850**	.105	.078	.090	.113
Play digital games	.372	.290	.213	-.577	-.019
Read an eBook	.130	.119	**.698**	.093	-.333
Check email messages	**.775**	.218	.091	-.219	-.087
Use a fitness tracker	.064	.030	**.785**	.000	.172
Use GPS for navigation	.155	.296	.186	**.765**	-.030
Listen to music	.084	.301	.385	-.039	.246
Post picture/ video on social media	**.542**	.013	.373	.312	.256
Search online for information about the area	.203	**.790**	.119	.301	.058
Search online for forest rules and regulations	.094	**.865**	-.035	.053	-.034
Watch television	.128	.135	.040	.010	**.862**
Unplug from personal technology	-.688	.065	-.127	-.006	-.229
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6					

Table 45- Remote- developed forest intended forest technology behavior categories with questionnaire items and Cronbach's Alpha

Non-forest Specific Technology Behaviors Component 1	Forest-Specific Technology Behaviors Component 2	Disconnected Technology Behaviors Component 3
Cronbach's Alpha		
.722	.795	
Questionnaire Items		
Check phone messages	Use apps to learn about the forest	Unplug from personal technology
Check SMS	Search online for information about the area	
Play digital games	Search online for forest rules and regulations	
Read an eBook		
Check email messages		
Use a fitness tracker		
Use GPS for navigation		
Listen to music		
Post picture/ video on social media		
Watch television		

Remote- primitive Forest

Intended personal technology behaviors were initially sorted into five components (Table 46). "Check social media" and "listen to music" were removed from Component 1 because the remaining were behaviors that related directly to the forest (*forest-specific technology behaviors*). This change was supported with an α score of .898. Unlike the urban-proximate forest and the remote-developed forest, Cronbach's α did not support the combination of components two through five to create a *non-forest specific technology behaviors* category. "Check social media" was transferred to Component 2 (Cronbach's Alpha= .733) (*communication-connective technology*). Component 3 related to behaviors that added to the experience, whether it was allowing respondents to navigate, or document and

share with friends and family (Table 47) (*experience enhancing technology behaviors*). Component 4 contained behaviors that can distract visitors (*distractive technology behaviors*). "Unplugging from personal technology" was separated into its own category (*disconnecting technology behaviors*). "Listen to music" and "read an eBook" had to be excluded from further analysis because they did not fit into any of the other components without dramatically lowering the Cronbach's Alpha and could not be combined into a separate category.

Table 46- Remote-primitive forest respondents' intended technology behaviors with PCA results (factor loadings) and Cronbach's Alpha

	Component 1	Component 2	Component 3	Component 4	Component 5
Cronbach's Alpha	.765	.762	.651	.694	
Use apps to learn about the forest	**.813**	.067	.277	.224	-.002
Check phone messages	.426	**.721**	-.163	-.143	.157
Check SMS	**.626**	.263	.034	.159	.343
Play digital games	.030	.123	-.009	**.681**	.440
Read an eBook	.083	.038	.140	.020	**.889**
Check email messages	.242	**.740**	-.071	.242	.250
Use a fitness tracker	-.013	-.010	**.864**	.039	.070
Use GPS for navigation	.458	.011	**.569**	-.222	-.038
Listen to music	**.640**	-.276	-.157	.115	.182
Post pictures/videos on SMS	.435	.155	**.602**	.018	.361
Search online for information about the area	**.859**	.183	.103	-.062	-.038
Search online for forest rules and regulations	**.826**	.243	.206	-.028	.041
Watch television	.112	.053	-.033	**.903**	-.140
Unplug from personal technology	.108	-.724	-.237	-.086	.152
Bolded= factor loadings ≤ 0.5 Cronbach's Alpha cutoff= 0.6					

Table 47- Remote- primitive forest intended forest technology behavior categories with questionnaire items and Cronbach's Alpha

Forest-specific Technology Behaviors Component 1	Communication-connective Technology Behaviors Component 2	Experience-Enhancing Technology Behaviors Component 3	Distractive Technology Behaviors Component 4	Disconnecting Technology Behaviors Component 5
Cronbach's Alpha				
.898	.733	.651	.694	
Questionnaire Items				
Use apps to learn about the forest	Check phone messages	Use a fitness tracker	Play digital games	Unplug from personal technology
Search online for information about the area	Check SMS	Use GPS for navigation	Watch television	
Search online for forest rules and regulations	Check email messages	Post pictures/videos on SMS		

Regression Results

Technology Attitudes & Support for Potential Technology Management Actions

Urban- proximate Forest

Multiple linear regressions were performed to predict preferences for each management style based on visitor's *positive technology attitudes* and *negative technology attitudes*. *Integrate technology management techniques*, had a regression equation of ($F (2, 251) = 12.062$, $p < .05$) with an R^2 of .080. Forest technology attitudes explained 17.5% of the variance ($R^2=.175$, $F (2, 251) = 27.787$, $p<.05$ of *progressive technology management*. Forest technology attitudes explained about 14% of the variance in support of *limiting technology management* ($R^2=.147$, $F (251) = 21.608$, $p<.05$). About 24% of the variance in support for *internet access management* was due to visitor attitudes towards technology in the forest ($R^2=23.9$, $F (2, 251) =39.840$, $p>.05$).

After bootstrapping, *positive technology attitudes* were a significant predictor for three of the four management styles: support for *integrate technology management* (β=.260, p<.05) (Tables 48), *progressive technology management* (β=.554, p=.001) (Table 48), and *internet access management* (β=.642, p=.000) (Table 48). *Negative technology attitudes* were a significant predictor of support for *limiting technology management* (β =.513, p=.001) (Table 48).

Table 48- Urban- proximate forest bootstrapped coefficients for the four forest technology management categories based on forest technology attitudes

	B	Bias	Std. Error	Sig. (2- tailed)	BCa 95% CI (Lower)	BCa 95% CI (Upper)
Integrate Technology Management						
(Constant)	3.389	.012	.257	.001	2.916	4.083
Negative Technology Attitudes	-.096	-.002	.055	.215	-.173	.032
Positive Technology Attitudes	.260	-.003	.063	**.001**	.142	.374
Progressive Technology Management						
(Constant)	.960	-.009	.344	.005	.257	1.632
Negative Technology Attitudes	-.007	-.001	.070	.929	-.139	.129
Positive Technology Attitudes	.554	-.004	.086	**.001**	.376	.732
Limiting Technology Management						
(Constant)	1.323	.000	.412	.001	.504	2.070
Negative Technology Attitudes	.513	.004	.078	**.001**	.350	.669
Positive Technology Attitudes	.062	-.005	.103	.541	-.151	.254
Internet Access Management						
(Constant)	2.230	-.004	.438	.001	1.409	3.098
Negative Technology Attitudes	-.219	.000	.078	**.008**	-.369	-.060
Positive Technology Attitudes	.642	.001	.078	**.008**	.446	.835
Bolded= Sig. <.05						

Remote- developed Forest

Technology attitudes only explained about 4.3% of the variance on support for *integrate technology management* (R^2= .043, F (2,112) = 3.581, p=.031). Roughly thirty-six- percent (35.7%) of the variance in support for *progressive technology management* is attributed to respondent's forest technology attitudes (R^2=.357, F (2,112) = 32.654, p=.000). Attitudes towards technology in the forest accounted for 7.5% of the variance in respondents support for *limiting technology use management* (R^2=.075, F (2, 110) =5.561, p=.005).

After bootstrapping, neither *positive technology attitudes* (β=.152, p=.137) nor *negative technology attitudes* (β=-.117, p=.145) were significant predictors of support for *integrate technology management* (Table 49). Both *positive technology attitudes* (β=.738, p=.001) and *negative technology attitudes* (β=-.250, p=.028) were significant predictors for visitor's preferences for *progressive technology management*, especially for information distribution (Table 49). *Negative technology attitudes* (β=.341, P=.021) were a significant predictor of support for *limiting technology use management* (Table 49).

Table 49- Remote- developed forest bootstrapped coefficients for the three potential forest technology management action categories based on forest technology attitudes

Integrate Technology Management						
	B	Bias	Std Error	Sig. (2-tailed)	BCa 95% CI (Lower)	BCa 95% CI (Upper)
(Constant)	3.765	.006	.408	.001	2.944	4.587
Negative Technology Attitudes	-.117	-.002	.081	.145	-.265	.042
Positive Technology Attitudes	.152	-.001	.102	.137	-.048	.344
Progressive Technology Management						
(Constant)	1.586	-.002	.636	.015	.451	2.798
Negative Technology Attitudes	-.250	-.001	.115	**.028**	-.482	1.011
Positive Technology Attitudes	.738	.002	.132	**.001**	.458	1.011
Limiting Technology Use Management						
(Constant)	2.524	.010	.744	.001	1.265	4.022
Negative Technology Attitudes	.341	-.003	.146	**.021**	.028	.609
Positive Technology Attitudes	-.219	-.000	.167	.205	-571	.108
Bolded= Sig. <.05						

Remote- primitive Forest

Forty-three-percent of the variance in support for *integrate technology management* was explained by technology attitudes (R^2=.430, F (3,57) = 16.066, p=.000). Technology attitudes contributed 42.1% of the variance in preference for *progressive technology management* (R^2=.421, F (3,57) = 16.518, p=.000). About 13% of the variation in support of *limiting technology use management* was attributed to visitors' technology attitudes (R^2=.132, F (3, 56) = 3.979, p=.012).

Based on this model, *positive technology attitudes* were significant (β=.846, p=.001) predictors for visitor's preference for *integrate technology management* (Table 50). Both *positive technology attitudes* (β=.317, p=.032 and *technology anxiety/dependence attitudes* (β=.487, p=.001) were significant predictors for visitor

support for *progressive technology management* (Table 50). *Negative technology attitudes* (β=.332, p=.033) were a significant predictor for *limiting technology use management* (Table 50).

Table 50- Remote- primitive forest bootstrapped coefficients for the three potential forest technology management action categories based on forest technology attitudes

Integration Technology Management						
	B	Bias	Std. Error	Sig. (2-tailed)	BCa 95% CI (Lower)	BCa 95% CI (Upper)
(Constant)	1.538	.063	.612	.014	.441	2.994
Negative Technology Attitudes	-.028	-.010	.109	.791	-.242	.150
Positive Technology Attitudes	.846	-.008	.150	.001	.540	1.131
Technology Anxiety/Dependence Attitudes	-.133	-.003	.119	.248	-.341	.092
Progressive Technology Management						
(Constant)	.423	-.012	.505	.410	-.537	1.154
Negative Technology Attitudes	.000	.002	.119	1.000	-.186	.191
Positive Technology Attitudes	.317	-.009	.204	.031	.032	.530
Technology Anxiety/Dependence Attitudes	.487	.013	.109	.001	.278	.760
Limiting Technology Use Management						
(Constant)	2.097	.115	.806	.010	.653	2.756
Negative Technology Attitudes	.332	-005	.147	.003	.028	.606
Positive Technology Attitudes	.264	-.040	.248	.280	-.231	.615
Technology Anxiety/Dependence Attitudes	-.301	.001	.192	.107	-.698	.104
Bolded= Sig. <.05						

Technology Attitudes & Intended Personal Technology Behaviors

Urban- proximate Forest

Technology attitudes accounted for 12.3% of the total variation in respondents intended *forest-specific technology behaviors* (R^2= .123, F (2,254)

=18.890, p<.05). For *non-forest-specific technology behaviors*, a regression equation was found (f (2,255) = 44.338, p<.05) with a R^2 of .252. About 8% of the variance in respondent's likelihood to engage in intended *disconnected technology behaviors* (R^2= .084, F (2251) =12.661, p<.05) was explained by technology attitudes. After bootstrapping, *positive technology attitudes* were found to be a significant predictor *for forest-specific technology behaviors* (β=.514, p=.001) (Table 51) and *non-forest specific technology behaviors* (β=.568, p=.001) (Table 51). Both *positive technology attitudes* and *negative technology attitudes* were significant predictors for *disconnected technology behaviors* (β=-.460, p=.001 and β=.270, p=.020; respectively) (Table 51).

Table 51- Urban- proximate forest bootstrapped coefficients for the three intended forest technology behavior categories based on forest technology attitudes

Forest-Specific Technology Behaviors						
	B	Bias	Std. Error	Sig. (2-tailed)	BCa 95% CI (Lower)	BCa 95% CI (Upper)
(Constant)	2.624	-.002	.253	.001	2.130	3.115
Negative Technology Attitudes	-.084	.000	.077	.278	-.237	.074
Positive Technology Attitudes	.514	-.003	.094	**.001**	-.237	.683
Non-Forest Specific Technology Behaviors						
(Constant)	-.481	.060	-.174	.007	-.820	-.114
Negative Technology Attitudes	-.068	-.002	.052	.195	-.159	.021
Positive Technology Attitudes	.568	-.002	.061	**.001**	.451	.679
Disconnected Technology Behaviors						
(Constant)	-.938	.021	.352	.009	-.664	-.133
Negative Technology Attitudes	.270	-.007	.113	**.020**	.049	.460
Positive Technology Attitudes	-.460	-.003	.129	**.001**	-.701	-.216
Bolded= Sig. <.05						

Remote- Developed Forest

Attitudes toward personal technology in a forest setting accounted for 39% (R^2 =.390, F (2, 144) =38.035, p<.05) of the variance in respondent's likelihood to engage in non-*forest specific technology behaviors* during their visit. Over a quarter (26.5%) of the variation in *forest-specific technology behaviors* was explained by forest technology attitudes (R^2=.265, F 2, 114) = 21.944, p<.05). Variance in respondent's self-reported likelihood to engage in *disconnected technology behaviors* was 14.2% (R^2= .142, F (2, 113) =10.512, p<.05) based on their technology attitudes.

After bootstrapping, *positive technology attitudes* were found to be significant predictors for *non-forest specific technology behaviors* (β=.700, p=.001), *forest-specific technology behaviors* (β=.812, p=.001), and *disconnecting technology behaviors* (β=-.748, p=.001) (Table 52).

Table 52- Remote- developed forest bootstrapped coefficients for the three intended forest technology behavior categories based on forest technology attitudes

Non-Forest Specific Technology Behaviors						
	B	Bias	Std. Error	Sig. (2-tailed)	BCa 95% CI (Lower)	BCa 95% CI (Upper)
(Constant)	.441	.026	.312	.147	-.164	1.164
Negative Technology Attitudes	.025	-.005	.070	.727	-.112	.142
Positive Technology Attitudes	.700	-.005	.081	**.001**	.542	.840
Forest-Specific Technology Behaviors						
(Constant)	-.231	-.007	.414	.580	-1.064	.585
Negative Technology Attitudes	.117	-.002	.093	.202	-.063	.303
Positive Technology Attitudes	.812	.005	.106	**.001**	.607	1.026
Disconnected technology Behaviors						
(Constant)	4.982	.019	.730	.001	3.397	6.485
Negative Technology Attitudes	.118	-.001	.157	.446	-.197	.436
Positive Technology Attitudes	-.748	-.003	.190	**.001**	-1.083	-.396
Bolded= Sig. <.05						

Remote- Primitive Forest

About thirty-three-percent of the variation in *forest-specific technology behaviors* was attributed to respondents' attitudes towards personal technology (R^2=.332, F (3,59) =11.253, p<.05). Sixteen-percent (R^2=.160, F (3,59), p<.05) of the variance in *communication-connectivity technology behaviors* came from technology attitudes. Forest technology attitudes explained roughly 21% (R^2 = 20.9, F (3,59) =6.469), p<.05) of the variance in engaging experience-enhancing technology behaviors. Technology attitudes did not contribute to any of the variation in distractive technology behaviors (R^2= -.023, F (3,59) =. 534, p>.05). Technology attitudes contributed to 18.6% (R^2=.186, F (3,59) = 5.717, p<.05) of the variance in disconnecting technology behaviors.

Positive technology attitudes were significant predictors of *forest-specific technology behaviors* (β=.968, p=.001) (Table 53) and *experience-enhancing technology behaviors* (β=.717, p= .009) (Table 53). *Technology anxiety/dependence attitudes* were significant predictors for *disconnecting technology behaviors* (β=-.509, p=.004) (Table 53). According to this model, attitudes were not significant predictors of *communication-connectivity technology behaviors* (Table 53) and *distractive technology behaviors* (Table 53).

Table 53- Remote- primitive forest bootstrapped coefficients for the five intended forest technology behavior categories based on forest technology attitudes

Forest-Specific Technology Behaviors						
	B	Bias	Std. Error	Sig. (2-tailed)	BCa 95% CI (Lower)	BCa 95% CI (Upper)
(Constant)	-.247	-.003	.494	.592	-.1.187	.712
Negative Technology Attitudes	-.036	002	.099	.694	-.240	.178
Positive Technology Attitudes	.968	-.005	.195	**.001**	.581	1.340
Technology Anxiety/Dependence Attitudes	-.026	.004	.199	.899	-.41	.375
Communication-Connectivity Technology Behaviors						
(Constant)	.929	.002	.472	.037	.163	.815
Negative Technology Attitudes	-.071	-.007	.096	.463	-.263	.094
PositiveTechnology Attitudes	.291	.019	.226	.198	-.125	.815
Technology Anxiety/Dependence Attitudes	.307	-.016	.187	.106	-.054	.631
Experience-Enhancing Technology Behaviors						
(Constant)	.078	-.023	562	.870	-1.207	1.203
Negative Technology Attitudes	.079	.012	.244	.466	-.150	3.156
Positive Technology Attitudes	.717	-.007	.256	**.009**	.158	1.194
Technology Anxiety/Dependence Attitudes	.012	.012	.244	.964	-.441	.530
Distractive Technology Behaviors						
(Constant)	.092	.005	.405	.024	.189	1.800
Negative Technology Attitudes	.063	.000	.079	.415	-.099	.212
PositiveTechnology Attitudes	-.002	.000	.120	.986	-.257	.225
Technology Anxiety/Dependence Attitudes	.130	-.002	.158	.426	-.163	.421
Disconnected Technology Behavior						
(Constant)	2.447	.016	.997	.020	.711	4.475
Negative Technology Attitudes	.393	-.007	.193	.051	.005	-.168
PositiveTechnology Attitudes	.308	.009	.262	.235	-.188	.843
Technology Anxiety/Dependence Attitudes	-.509	-.007	.180	**.004**	-.893	-.168
Bolded= **Sig. <.05**						

Summary of Findings

The tables below illustrate the findings across forest contexts side by side. They show the coefficients of determination (R^2) for potential technology management actions and intended technology behaviors in the two forest contexts and sub-contexts (developed vs. primitive). It is noteworthy that the R^2 of the same variables increases or decrease across forest contexts. For example, *technology as a replacement management* increases from urban-proximate to remote-primitive.

Table 54- A summary of the R^2 values across forest contexts (attiudes --> management preferences)

Attitudes towards technology in the forest setting			
	Integrate technology management	Technology as a replacement management	Limiting technology management
Urban-proximate forest	.08*	.17**	.14**
Remote- developed forest	.043*	.357***	.075*
Remote-primitive forest	.43***	.421***	.132***
* Weak effect size ** Moderate effect size *** Substantial effect size			

Table 55- A summary of the R^2 values across forest contexts (attitudes → intended behaviors)

Attitudes towards technology in the forest setting						
	Forest-specific technology behaviors	Non-forest specific technology behaviors	Disconnected technology behaviors	Connective/ communication technology behaviors	Experience enhancing technology behaviors	Distractive technology behaviors
Urban-proximate forest	.123*	.252**	.084*	-	-	-
Remote-developed forest	.265***	.39***	.142**	-	-	-
Remote-primitive forest	.332***	-	.186**	.16**	.209**	-.023*
* Weak effect size ** Moderate effect size *** substantial effect size						

CHAPTER 6: DISCUSSION

Research Objective 1: Connections to Personal Technology Across Forest Contexts

The first study objective was to consider how campers' attitudes towards technology in the outdoors, intended technology behaviors, and support for potential technology management differ across forest (and camping) contexts. Overall, the findings confirm that differences in forest technology attitudes, intended behaviors, and support for management exist across forest contexts. It should be noted that the magnitude of those differences range from low to moderate.

Technology Attitudes

Interestingly, although there were differences in attitudes towards the beneficial aspects of technology, respondents had similar attitudes towards the drawbacks of technology. Stanis et al (2009) similarly found that respondents in an urban recreational setting and a semi-primitive motorized setting valued the same attributes (trails and vegetation) of very different sites. The shared attitudes about negative aspects of technology in the forest may relate with the desire for escape that motivates people to go camping. The view that technology degrades nature experiences may be universal. Perhaps the differences in pro-technology attitudes may come from the fact that bringing technology into the outdoors is a relatively new phenomenon, where social norms have not yet been established about what is appropriate and what is not. Although located in the remote forest, respondents

from the remote-developed campground had attitudes about personal technology that were like both the primitive campers and the developed-urban campers. For example, they were like the campers in the urban-proximate-developed campground in their attitudes about personal technology's ability to increase safety in the outdoors. At the same time, they were like campers in the remote-primitive campground in their views about the importance of keeping up with the latest trends in outdoor technology.

Intended Technology Behaviors

Campers in the remote- primitive campground were the most likely across contexts to unplug from personal technology. Urban campers were more likely to engage in checking phone messages and posting on social media. However, this does not mean that urban campers are more likely to engage in personal technology behaviors that enable connectivity. Visitors across all contexts reported being unlikely to check emails or social media during their stay. One of the reasons for the differences across contexts in the use of technology that promotes connectivity may have been the limited cell service in the remote forest. The results supported the notion that recreationists recognize some technologies as appropriate for the outdoors while others are not. Respondents across all settings were unlikely to engage in activities that are distractive (e.g., watching television or playing digital games). This type of selectivity in behaviors in the forest was supported by a 2015 study that found that recreationists agreed that short-term cell phone use for safety-

related reasons is appropriate while chatting with friends and checking in with work is inappropriate (Shultis, 2015).

Support for Potential Technology Management Actions

The results from the differences in support for potential technology management based on context showed that although personal technology plays a big part in people's everyday life, it is not embedded enough that recreationists want to entirely replace current management techniques for dispersing and displaying information with new technologies. People are becoming more acclimated with technology in the forest settings, which may explain why integrating technology was supported across forest and camping contexts. Although the results show there were significant differences, the average support for integrating technology was positive.

The idea of technology remaining separate from the great outdoors is also prominent in recreationists across the forest contexts. This notion was shown across forest contexts and camping contexts in respondents' slight support for the establishment of technology-free zones. Context does play a role in management support. Urban-proximate respondents supported having wireless internet, while respondents in the remote forest- primitive campground opposed it. This difference may be influenced by the cultural norms of these locations.

Research Objective 2: Connections to Personal Technology Across Visitor Demographics

The results from this study were inconsistent with the literature about demographics and technology use (Czaja et al., 2006; Rosen, 2013; Jackson et al., 2008, Weiser, 2000). The findings revealed that in an urban-proximate forest setting, attitudes towards personal technology, intended behaviors, and preference in management do not differ based on gender and education level. Although results from previous research state that individuals with high education have more positive technology attitudes and more significant use and acceptance of new technology devices (Czaja et al., 2006; Rosen et al., 2013), this research found the opposite. In non-forest specific behaviors where there were significant differences based on education, respondents with a college degree or higher were less likely to engage in these behaviors than those with a high school diploma or GED. This could be due respondents with higher education levels using their time in outdoor recreation as a form of escape from everyday life.

There were differences related to anxiety and dependence when technology was unavailable based on age/ generation. Older respondents have less anxiety when communication and information technology was not available in the forest compared to younger respondents. This lack of technology dependence may be due to older respondents not growing up using personal technology in their everyday lives. Also, they may have been recreating before technology in the outdoors became popular.

Due to the small sample size in minority groups, caution should be used in drawing conclusions based on race/ethnicity. That being said, the results from this study do support technology trends based on race/ethnicity. White respondents were the most likely to disconnect from their devices, compared to minority groups. One of the reasons some minority groups may cling to their personal technology is to help bridge the digital divide, giving them more equal opportunities to access information and communication (Perrin, 2017). Although the results show significant differences based on demographics, the magnitudes of those differences were either low or moderate. For example, although White respondents were different in their support for expanding wireless internet connection in FPCC, they still were supportive, on average. Nevertheless, these findings suggest that managers should be aware of potential demographic differences when making decisions about including and managing technology.

Research Objective 3: Technology Attitudes as a Predictor for Technology Management Support and Intended Behaviors

The findings did not consistently support the alternative hypotheses for this study, which stated that attitudes will be effective predictors for forest technology behaviors and technology management preferences. Although a majority of the models show attitudes are significant predictors for behavior and management preferences, there were some instances where the R^2 of the models was quite low. A coefficient of determination or R^2 between 0.02 and 0.129 correlates to data that

has a weak effect size. Between 0.13 and 0.259 is a moderate effect size, and R^2 above 0.26 is generally a high or substantial effect size (Cohen, 1992).

Forest technology attitudes did not predict support for integrating technology into management in the urban-proximate and remote-developed forest context. Technology attitudes were efficient predictors for preferences in management action and intended behaviors in the remote-primitive forest. The inconsistencies may reflect a consideration of other users. In the context of the cognitive hierarchy, respondents with negative attitudes towards technology in the outdoor setting in all forest contexts should support management that limits technology use. There may be other attitudes that are influencing support for potential technology management; for example, attitudes towards people's right to autonomy. A respondent may have overall negative attitudes towards personal technology in a forest setting but may not support establishing technology-free zones out of not wanting to impose their beliefs and attitudes on to others. Alternatively, they place high value on people's right to choose. This allows all visitors to choose whether they use technology and how it is used. This response works in vice-versa with participants with positive attitudes.

Forest technology attitudes may not be the most reliable predictors of intended technology behaviors because intended behaviors are easily changed based on the situation. For example, a person may have overall positive attitudes towards personal technology in the forest setting but may be likely to unplug during a forest visit to escape a particularly stressful work/ school week. Another example is a respondent

who may have overall negative forest technology attitudes but takes and posts photos and videos during a family reunion or another social gathering.

Another reason attitudes may not be consistent predictors is that they do not include intentions and norms (Nigbuer et al., 2010). Subjective norms (the sense that a person is expected to engage in a behavior) are ascribed to personal norms (behavioral expectations that people hold for themselves (Schwartz, 1973)). These subjective and personal norms can relate to the behaviors appropriate for recreation locations. Norms in an urban setting dictate technology use as proper behavior, and this may translate into nearby recreation sites. A visitor in an urban-proximate environment may have overall negative attitudes towards technology use in a forest setting, but because of the social norms related to technology use in an urban setting, may deem technology use in that specific location appropriate.

CHAPTER 7: CONCLUSION

Summary

The chapters of this thesis explored forest technology attitudes, intended technology behaviors, and support for potential technology management actions across forest contexts, camping settings, and demographic groups. The results found that the view that technology degrades experiences in nature may be universal across forest contexts. However, there were several significant differences in pro-technology and anxiety/ dependence attitudes. These differences had low to moderate effect sizes. Since personal technology in the outdoors is a relatively new phenomenon, attitudes and norms about what is not appropriate may still be emerging. Because of this, people may rely on their already established attitudes and norms for technology in urban settings and remote settings.

The first objective found that respondents from the urban-proximate developed campground were more likely to engage in using technology than those in the remote-primitive campground (e.g., post on social media and use apps to learn about the forest). Interestingly, respondents at the remote-developed campground had technology attitudes, intended behaviors, and support for management actions that were sometimes more similar to urban-proximate campers and other times more similar to primitive campers. They were more likely to disagree with pro-technology attitudes like primitive campers in the remote forest but were just as likely to listen to music as urban-proximate campers. Lastly, this section found that although personal

technology plays a significant role in people's everyday life, it has not transferred over into recreationists wanting to replace current management techniques with technology entirely. Integrating technology into management was supported across all forest contexts; this may be due to recreationists becoming more and more acclimated to technology. Additionally, forest visitors may recognize technology's benefits (e.g., cost savings on paper).

The second objective of this manuscript focused on differences in technology attitudes, intended behaviors, and support for potential technology management in the forest setting in different demographic groups in an urban-proximate forest. The results did not reflect general technology trends in everyday life based on gender and education. In contrast to education and technology use, this study found that on average respondents with college degrees or higher were less likely to use non-forest specific technology in the forest setting. Race/ethnicity appears to be the demographic trait related to the most forest technology differences. The technology trends in recreation align with those found in the literature. Overall, white respondents were found to be statistically different from other races/ethnicities. They were more likely to agree with negative technology attitudes, less likely to agree with pro-technology attitudes, and on average the most likely to unplug from personal technology in the forest. Although there were statistically significant differences based on demographics, it should be noted that those differences had either low or moderate effect size.

The third objective of this thesis was to determine if attitudes towards personal technology in the forest settings can predict intended technology behaviors and support for potential technology management. The results found overall that attitudes can predict behaviors and management actions, however the effect sizes were inconsistent across forest contexts. This can be due to respondents not wanting to force their views on others, thus giving people the option to choose based on their individual attitudes. Another factor is that attitudes were measured in a general sense (positive and negative), whereas respondents were asked about specific behaviors and management actions (i.e., using a cellphone, establishing technology-free zones). This may also have lowered the predictive value of the attitudes (Ajzen, 2010). There may be better predictors of behaviors and management support (i.e., subjective norms).

Overall the findings of this study suggest that recreationists are more alike than different in their forest technology attitudes, behaviors, and management views. However, forest context does matter, and views may change as technology continues to evolve and subjective norms shift. The results from this study offer some practical considerations for recreation managers. Technology should not be a replacement for current information dispersal methods in any forest context. However, recreationists support technology as a supplement to existing information/ communication technologies. Across forest contexts and demographics, having both online and physical maps were supported. It is important that when developing online versions of maps and forest information, they are compatible with different devices (e.g.,

laptops, cell phones, and tablets). Especially in urban-proximate forests, management should allow visitors to choose whether or not they use technology during their visit. This will assist in distributing technology equitably to different demographic groups where small but significant differences were identified.

Limitations

Surveys for this study were done in person, and there is a possibility of response bias. Efforts were made to minimize this possibility. No personal information was collected from respondents during the survey, and respondents completed questionnaires independently. Also, some of the subgroups compared in this study were small (e.g., Asian respondents). Larger sample sizes and sampling strategy targeted at increasing representation of subgroups may have helped to detect and interpreting differences. Caution should be used in interpreting these findings too broadly.

Future Research

Further research is required to understand visitor connections to personal technology across forest contexts. For example, a future study could examine the personal and subjective norms associated with technology in the outdoors. This could give managers a better understanding of what is guiding visitor technology behaviors and views. Looking at attitudes and behaviors across a broader range of backcountry and front country recreation locations could also be useful. Targeting specific demographic groups to get better representation is also recommended. Another area

to be addressed: identifying if there are discrepancies in the definition of unplugging in other recreation user groups (e.g., hikers, picnickers, bicyclists). Because technology in recreation and the culture around it are continuing to evolve, research should evolve along with it.

Literature Cited

Ajzen, I. (2011). The theory of planned behavior: Reactions and reflections. *Psychology and Health,* 26(2), 1113-1127.

Anderson, M. (2015). Technology device ownership. (2015). *Pew Research Center,* retrieved from http://www.pewinternet.org/2015/10/29/technology-device-ownership-2015/.

Basman, C. M., Manfredo, M. J., Barro, S. C., Vaske, J. J., & Watson, A. (1996). Norm accessibility: An exploratory study of backcountry and frontcountry recreational norms. *Leisure Sciences*, 18(2), 177-191.

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological science*, 19(12), 1207-1212.

Boduszek, D. (N.D.). Non-parametric tests in SPSS (between subjects). Retrieved from https://webzoom.freewebs.com/danielboduszek/documents/Nonparametric%20tests%20between%20subjects%20SPSS%20-%20D.%20Boduszek.pdf

Borrie, W.T. (2000). Impacts of technology on the Meaning of Wilderness. *USDA Forest Service Proceedings,* RMRS-P-14, 87-88.

Bourke, L. & Luloff, A.E. (1994). Attitudes towards the management of nonindustrial private forest land. *Society & Natural Resources.* 7(5), 445-457.

Brickfield, C.F. (1984). Attitudes and perceptions of older people towards technology. In *Aging and Technological advances* (pp. 31-38). Springer, Boston, MA.

Brooker, E., & Joppe, M. (2014). A critical review of camping research and direction for future studies. *Journal of Vacation Marketing,* 20(4), 335-351.

Brown, J.B. (2015). Technology demographics use across ages. Retrieved from https://www.hotelmanagement.net/tech/differences-and-similarities-tech-use-across-age-groups.

Cia, Z., Fan, X., & Du, J. (2017) Gender and attitudes toward technology use: A meta-analysis. *Computes & Education,* 105,1-13.

Cohen, J. (1992). A power primer. *Psychological bulletin*, *112*(1), 155.

Cohen, D. A., McKenzie, T. L., Sehgal, A., Williamson, S., Golinelli, D., & Lurie, N. (2007). Contribution of public parks to physical activity. *American journal of public health*, 97(3), 509-514.

Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika,* 16(3), 297-334.

Cságoly, Z. (2016). On the Edge of the Wild: Day and overnight visitors' setting preferences (Doctoral dissertation). Retrieved from https://skemman.is/bitstream/1946/23673/1/Zs%C3%B3fia%20Cs%C3%A1goly_ENR_MS.pdf.

Czaja, S.J., Charness, N., Fisk, A.D., Hertzog C., Nair, S.N., Rogers, W.A., & Sharit, J. (2006). Factors predicting the use of technology: Findings from the Center for

Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging,* 21(2), 333-352.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q 1989,* 13(3), 319-339.

Davison, E.L., & Cotton, S.R. (2009). Connection disparities: The importance of Broadband connections. In *Handbook of research on over coming digital divides: Constructing an equitable and competitive information society,* 346-358.

de Oliveira Nunes, M., & Mayer, V.F. (2014). Mobile technology, games and nature areas: The tourist perspective. *Tourism & Management Studies,* 10(1), 53-58.

Delzo, J. (2016). Men fall from cliff playing Pokémon Go. CNN. Retrieved from: http://www.cnn.com/2016/07/15/health/pokemon-go-players-fall-down-cliff/index.html

Dickinson, J.E., Hibbert, J.F., & Filimonau, V. (2016). Mobile technology and the tourist experience: (Dis)connection at the campsite. *Tourism Management,* 57, 193-201.

Driver, B.L. and Brown, P.J. (1978). The opportunity spectrum concept and behavioral information in outdoor recreation resource supply inventories: a rationale. In: Integrated inventories of renewable natural resources: proceedings of the workshop, January 1978 Tucson, Arizona (Edited by H.G Lund et al.). *USDA Forest Service, General Technical Report,* No. RM-55, 24-31 ref. fig., 34.

Duggan, M., & Brenner, J. (2013). The demographics of social media users, 2012 (Vol. 14). *Washington, DC: Pew Research Center's Internet and Life Project.*

Ewert, A. W., & Hood, D. (1995). Urban-proximate and urban-distant wilderness: an exploratory comparison between two 'types' of wilderness. *Journal of Park and Recreation Administration*, 13(2), 73-85.

Ewert, A. & Hollenhorst, S. (1997). Testing the adventure model: Empirical support for a model of risk recreation participation. *Journal of Leisure Research,* 21(2), 124-139.

Ewert, A. W. (1998). A comparison of urban-proximate and urban-distant wilderness users on selected variables. *Environmental Management*, *22*(6), 927-935.

Ewert, A. & Shultis, J. (1999). Technology and backcountry recreation: Boon to recreation or bust to management? *Journal of Physical Education, Recreation, & Dance,* 7(8), 23-28.

Ewert, A.W., Sibthorp, J., & Sibthorp, R.J. (2014). Outdoor adventure education: Foundations, theory, and research. *Human Kinetics.*

Federal Communications Commission ('FCC'). (2016). Broadband progress report. Retrieved from https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report.

Floyd, M.F., Nicolas, L., Lee, I., Lee, J.H., & Scott, D. (2006). Social stratification in recreational fishing participation: Research and policy implications. *Leisure Sciences,* 28(4), 351-368.

Fulton, D.C., Manfredo, M.J., & Lipscomb, J. (1996). Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife,* 1(2), 24-47.

Garst, B.A., Williams, D.R., & Roggenbuck, J.W. (2009). Exploring early twenty-first century developed forest camping experiences and meanings. *Leisure Sciences,* 32(1), 99-97.

Gretzel, U. (2010). Travel in the network: Redirect gazes, ubiquitous connections and new frontiers. *Post-Global Network and Everyday Life,* 41-58.

Haight, M., Quan-Haase, A., & Corbett, B.A. (2014). Visiting the digital divide in Canada: the impact of demographic factors on access to internet, level of online activity, and social networking site usage. *Information, Communication & Society,* 17(4), 503-519.

Hansmann, R., Hug, S. M., & Seeland, K. (2007). Restoration and stress relief through physical activities in forests and parks. *Urban forestry & urban greening*, 6(4), 213-225.

Hassell, S., Moore, S.A., & Macbeth, J. (2015). Exploring the motivations, experiences and means of camping in national parks. *Leisure Sciences,* 37(3), 269-287.

Hindman, D.B. (2000). The rural-urban digital divide. *Journalism & Mass Communication Quarterly,* 77(3), 549-560.

Horrigan, J.B. (2010). Broadband adoption and use in America. *Washington DC: Federal Communications Commission.*

Hoss, A. F., & Brunson, M. W. (2000). Meanings and implications of acceptability judgements for wilderness use impacts. In *In: Cole, David N.; McCool, Stephen F.; Borrie, William T.; O'Loughlin, Jennifer, comps. 2000. Wilderness science in a time of change conference—Volume 4: Wilderness visitors, experiences, and visitor management; 1999 May 23–27; Missoula, MT. Proceedings RMRS-P-15-VOL-4. Ogden, UT: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 128-133* (Vol. 15).

Howard, P.E., Raine, L., & Jones, S. (2001). Days and nights on the Internet: The impact of diffusing technology. *American Behavioral Scientist,* 45, 450-472.

Huang, C. & Confer J., (2009). Applying the Tourism Opportunity Spectrum model in nature-based tourism management. *Managing Leisure,* 14, 247-257.

Hussar, W.J., & Bailey, T.M. (2013). Projections of education statistics to 2021 (NCES 2013-008). *US Department of Education. Washington, DC: National Center for Education Statisitics.*

Jackson, E.L. (1986). Outdoor recreation participation and attitudes to the environment. *Leisure Studies,* 5(1), 1-23.

Jackson, L.A., Zhoa, Y., Kolenic III, A., Fitzgerald, H.E., Harold, R., & Von Eye, A. (2008). Race, gender, and information technology use: The new digital divide. *Cyberpsychology & Behavior,* 11(4), 437-442.

Jensen, C.R., & Guthrie, S. (2006) Outdoor recreation in American. *Human Kinetics.*

Johnson, C.Y., Bowker, J.M., & Cordell, H.K. (2001). Outdoor recreation constraints: An experimentation of race, gender, and rural dwelling. *Southern Rural Sociology,* 17, 111-133.

Joppe, M., & Brooker, E. (2013). Rural tourism: An internal perspective on challenges and innovation. *Journal of Tourism*, 14(1), 31-44.

Kaczynski, A. T., & Henderson, K. A. (2007). Environmental correlates of physical activity: a review of evidence about parks and recreation. *Leisure Sciences*, 29(4), 315-354.

Kampgrounds of America. (2017). North American Camping Report. Retrieved from https://www.rvda.org/App_Themes/RVDAMercury/docs/2017-north-american-camping-report%20reduced%205.pdf

Kampgrounds of America. (2018). North American Camping Report. Retrieved from https://koa.com/north-american-camping-report/.

Kaplan, S. & Kaplan, R. (1982). Environment and cognition. New York: Praeger

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of environmental psychology*, 15(3), 169-182.

Kil, N., Holland, S. M., & Stein, T. V. (2015). Experiential benefits, place meanings, and environmental setting preferences between proximate and distant visitors to a national scenic trail. *Environmental management*, *55*(5), 1109-1123.

Korgen, K., Odell, P., & Schumacher, P. (2001). Interest use among college students: Are there differences by race/ethnicity. *Electronic Journal of Sociology*, 5(3), 265-269.

Kowarik, I. (2018). Urban wilderness: Supply demand, and access. *Urban forestry & urban greening,* 29, 336-347.

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Frontiers in psychology*, *4*, 863.

Lalicic, L., & Weismayer, C. (2018). Being passionate about the mobile while traveling. *Current Issues in Tourism,* 21(8), 950-963.

Lee, B. Chen, Y., & Hewitt. (2011). Age differences in constraints encountered by seniors in their use of computers and the internet. *Computers in Human Behavior,* 27(3), 1231-1237.

Li, N., & Kirkup, G. (2007). Gender and cultural differences in Internet Use: A study of China and the UK. *Computers & Education,* 48(2), 301-317.

Madden, M., Lenhart, A. Cortesi, S. Gasser, U., Duggan, M., Smith, A., & Beaton, M. (2013). Teens, social media, and privacy. *Pew Research Center*, 21, 2-86.

Makrakis, V. (1992). Cross-cultural comparison of gender differences in attitude towards technology in Japan and Sweden. *Scandinavian Journal of Educational Research,* 36(4), 275-287.

Manfredo, M.J. & Fulton, D.C. (1997). A comparison of wildlife values in Belize and Colorado. *Human Dimensions of Wildlife*, 2(2), 62-63.

Manfredo, M.J. & Dayer, A.A. (2004). Concepts for exploring the social aspects of human-wildlife conflict in a global context. *Human Dimensions of Wildlife,* 9, 317-328.

Manning, R. E., Anderson, L. E., & Pettengill, P. (2017). Managing outdoor recreation: case studies in the national parks. CABI.

Martin, S. (2017). Real and potential influences of information technology on outdoor recreation, wilderness experiences, and management. *Journal of Parks and Recreation Administration,* 35(1), 98-101.

McFarlane, B. L., & Boxall, P. C. (1996). Exploring forest and recreation management preferences of forest recreationists in Alberta. *The Forestry Chronicle*, 72(6), 623-629.

McFarlane B.L. & Boxall, P.C. (2000). Factors Influencing Forest Values and Attitudes of two Stakeholder groups: The case of the Foothills Model Forest, Alberta, Canada. *Society & Natural Resources,* 13, 649-661.

Millward, D. 2014. Tourist warned of dangers of bear selfies. The Telegraph. Retrieved from: http://www.telegraph.co.uk/news/worldnews/northamerica/usa/11195687/Tourists-warned-of-dangers-of-bear-selfies.html

Mossberger, K., Tolbert, C. J., & Stansbury, M. (2003). Virtual inequality: Beyond the digital divide. *Georgetown University Press*.

Mossberger, K., Tolbert, C.J., & Gilbert, M. (2006). Race, place, and information technology. *Urban Affairs Review,* 41(5), 583-620.

National Telecommunications and Information Administration ("NTIA"). A nation online: How Americans are expanding their use of the internet. *Washington DC: US Department of Commerce.*

Neuhofer, B., Buhalis, D., & Ladkin, A. (2013). Experiences, co-creation, and technology: A conceptual approach to enhance tourism experiences. *CAUTH 2013: Tourism and Global Change: On the Edge of Something Big,* 562.

Nosowitz, D. (2015). Why 'Instagram hikers' are National Parks' saviors- and scourges. Retrieved from http://nymag.com/selectall/2015/12/why-outdoors-nerds-hate-instagram-hikers.html.

O'Neill, M. A., Riscinto-Kozub, K. A., & Van Hyfte, M. (2010). Defining visitor satisfaction in the context of camping oriented nature-based tourism—the driving force of quality!. *Journal of Vacation Marketing*, 16(2), 141-156.

Orsega-Smith, E., Mowen, A. J., Payne, L. L., & Godbey, G. (2004). The interaction of stress and park use on psycho-physiological health in older adults. *Journal of Leisure Research*, 36(2), 232-256.

Ortman, J.M., & Guarneris, C.E. (2009). United States population projections: 2000 to 2050. *United States Census,* 1-19.

Papastergiou, M. & Solomonidou, C. (2005). Gender issues in Internet access and favorite Internet activities among Greek high school pupils inside and outside school. *Computers & Education,* 44(4), 377-393.

Park, S. & Kim, G. (2015). Same access different uses, and the persistent digital divide between urban and rural internet users. *43rd Research Conference on Communications, Information and Internet Policy,* 1-21.

Payne, L.L., Mowan, A.J., & Orsega-Smith, E. (2002). An examination of park preferences and behaviors among urban residents: the role of residential location, race and age. *Leisure Science,* 24(2), 181-198.

Perrin, A. (2017). Smartphones help blacks, Hispanics bridge some-but not all- digital gaps with whites. *Pew Research Center,* retrieved from http://www.pewresearch.org/fact-tank/2017/08/31/smartphones-help-blacks-hispanics-bridge-some-but-not-all-digital-gaps-with-whites/.

Pope, K. & Martin, S.R. (2011). Visitor perceptions of technology, risk, and rescue in wilderness. *International Journal of Wilderness,* 17(2), 19-26.

Porter, C.E. & Donthu, N. (2006). Using technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics. *Journal of Business Research,* 59(9), 999-10007.

Prieger, J.E. (2013). The broadband digital divide and the economic benefits of mobile broadband for rural areas. *Telecommunications Policy,* 37(6-7), 483-502.

Raine, L., & Perrin, A. (2017). 10 facts about smartphones as the iPhone turns 10. *Pew Research Center,* retrieved from http://www.pewresearch.org/fact-tank/2017/06/28/10-facts-about-smartphones/.

Ratcliffe, M., Burd, C., Holder, K., & Alison Fields. (2016). Defining rural at the U.S. Census Bureau. Retrieved from https://www2.census.gov/geo/pdfs/reference/ua/Defining_Rural.pdf.

Rokeach, M. (1973). The nature of human values. New York: Free Press.

ROS User Guide. (1982). Retrieved from https://www.fs.fed.us/cdt/carrying_capacity/rosguide_1982.pdf

Rosen, L.D., Whaling, L.M., Carrier, N.A., & Rokkum, C.J. (2013). The Media and Technology Usage and Attitude Scale: An empirical investigation. *Computers in Human Behavior,* 29, 2501-2511.

Ruleman, A. (2012). Comparison of faculty and student ownership and use of technology. *Technical Services Quarterly,* 30, 38-55.

Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the digital age: A systematic literature review on unequal ICT availability adoption and use in rural areas. *Journal of Rural Studies,* 54, 360-371.

Schreyer, R., Lime, D.W., & Williams, D.R. (1984). Characterizingthe influence of past experience on recreation behavior. *Journal of Leisure Research,* 16(1), 34-50.

Schwartz, S.H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M.P Zanna (Ed.), *Advances in experimental social psychology,* 25, 1-66.

Shultis, J. (2001). The impact of technology on the wilderness experiences: a review of common themes and approaches in three bodies of literature. *USDA Forest Service Proceedings,* 110-118.

Shultis, J. (2001). Consuming nature: the uneasy relationship between technology, outdoor recreation, and protected areas. *The George Forum,* 18(1), 57-66.

Shultis, J.D. (2015). "Completely empowering": A qualitative study of the impact of technology in New Zealand. *USDA Forest Service Proceedings,* RMRS- P-74, 195-201.

Silva, E. B. (2000). The cook, the cooker and the gendering of the kitchen. *The Sociological Review*, 48(4), 612–629.

Steel, B.S., List, P., & Shindler, B. (1994). Conflicting values about federal forests: A comparison of national and Oregon publics. *Society & Natural Resources,* 7(2), 137-153.

Tarrent, M.A., & Cordell, K.H. (1997). The effect of respondent characteristics on general environmental attitude- behavior correspondence. *Environment and Behavior,*

Taylor, P. (2014) The next America: Boomers. Millennials, and the looming generational.

Tennessen, C. M., & Cimprich, B. (1995). Views to nature: Effects on attention. *Journal of environmental psychology*, 15(1), 77-85.

Thayer, S.E., & Ray, S. (2006). Online communication preferences across age, gender , and duration of Internet use. *Cyberpsychology & Behavior,* 9(4), 432-440.

The Center of Generational Kinetics. (2016). Generational breakdown: Info about all of the generations. Retrieved from http://genhq.com/FAQ-info-about-generations/.

Tyrväinen, L., Ojala, A., Korpela, K., Lanki, T., Tsunetsugu, Y., & Kagawa, T. (2014). The influence of urban green environments on stress relief measures: A field experiment. *Journal of Environmental Psychology*, 38, 1-9.

United States Census Bureau. (2010). Urban, urbanized area, urban cluster, and rural population, 2010 and 2000: United States. Retrieved from https://www.census.gov/geo/reference/ua/urban-rural-2010.html

Van Volkom, M. Stapley, C.J., & Malter, J. (2013). Use and perception of technology: Sex and generational differences in a community sample. *Educational Gerontology,* 39(10), 729-740.

Van Volkom, M. Stapley, J.C., & Amaturo, V. (2014). Revisiting the digital divide: Generational differences in technology use in everyday life. *North American Journal of Psychology*, 16(3), 557-574.

Vaske, J.J., & Donnelly, M.P. (1994). A value-attitude-behavior model predicting wildland preservation voting intentions. *Society & Natural Resources*, 12, 523-537.

Vaske, J.J., Donnelly, M.P., William, D.R., Jonker, S. (2001). Demographic influences on environmental value orientations and normative beliefs about national forest management. *Society & Natural Resources,* 14(9), 761-776.

Vaske, J. & Whittaker, D. (2004). Normative approaches to natural resources. *Society and natural resources: A summary of knowledge,* 283-294.

Vaske, J.J. & Manfredo, M.J. (2012). Social considerations in wildlife management. *Human Dimensions of wildlife management,* 43-57.

Vogelsong, H., Graefe, A.R., John Jr, J., Solan, D.S., & Kramp, J.K. (1998). Relationships between motivations, activities and settings: The recreation opportunity spectrum withing Delaware State Park System. In *Vogelsong, Hans G., comp, ed. Proceedings of the 1997 Northeastern Recreation Research Symposium; 1997 April 6-9; Bolton Landing, NY. Gen. Tech. Rep. NE-241. Radnor, PA: US Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 124-127.* (Vol. 241).

Wagner, N., Hassanein, K., & Head, M. (2010). Computer use by older adults: A multi-disciplinary review. *Computer in Human Behaviors,* 26, 870-882.

Walker, G.J., Deng, J., & Dieser, R.B. (2001), Ethnicity, acculturation, self-construcal, and motivations for outdoor recreation. *Leisure Sciences,* 23(4), 263-283.

Wang, H. Y., & Wang, S. H. (2010). User acceptance of mobile internet based on the unified theory of acceptance and use of technology: Investigating the determinants and gender differences. *Social Behavior and Personality: an international journal*, 38(3), 415-426.

Weiser, E.B. (2000). Gender differences in Internet use patterns and Internet application preferences: A two-sample comparison. *Cyberpsychology and Behavior,* 3(2), 167-178.

White, N.R., & White, P.B. (2004). Travel as transition: Identity and place. *Annals of Tourism Research,* 31(1), 200-218.

Whiting, J.W., Larson, L.R., Green, G.T., & Kralowec, C. (2017). Outdoor recreation motivation and site preferences across diverse racial/ ethnic group: A case study of Georgia state. *Journal of Outdoor Recreation and Tourism,* 18, 10-21.

Whittaker, D., Vaske, J.J., & Manfedo, M.J. (2006). Specificity and the Cognitive: Hierarchy: Value Orientations and he Acceptability of Urban Wildlife Management Actions. *Society of Natural Resources,* 19, 515-530.

Wiley, S.B. (1995) Repositioning the wilderness: Mobile communication technologies and the transformation of wild space. Paper presented at the Conference on Communication and the Environment, June 24-27, 2005, Jekyll Island, Georgia.

Wilhelm Stanis, S. A., Schneider, I. E., & Russell, K. C. (2009). Leisure time physical activity of park visitors: Retesting constraint models in adoption and maintenance stages. *Leisure Sciences*, *31*(3), 287-304.

Wittmann, K., Vaske, J.J., Manfredo, M.J., & Zinn, H.C. (1998). Standards for lethal response to problem urban wildlife. *Human Dimensions of Wildlife,* 3(4), 29-48.

Yardi, S. & Bruckman, A. (2012). Income, race, and class: exploring socioeconomic differences in family technology in family technology use. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems,* 3041-3050. ACM.

Zickuhr, K. (2011). Generations and their gadgets. *Pew Research Center,* retrieved from http://www.pewinternet.org/files/old-media/Files/Reports/2011/PIP_Generations_and_Gadgets.pdf.

Zickuhr, K. (2013). Who's not online and why. Retrieved from http://www.pewinternet.org/files/old-media/Files/Reports/2013/PIP_Offline%2520adults_092513_PDF.pdf

Zinn, H.C., Manfredo, M.J., Vaske, J.J., & Wittmann, K. (1998). Using normative beliefs o determine the acceptability of wildlife management actions. *Society and natural resources,* 11, 649-662.

Appendix A

Visitor survey: Forest reserves of Cook County- understanding forest visitor connections to technology

1. Is this your first visit to one of the Forest Preserves of Cook County sites?

   [ ] Yes
   [ ] No

2. Is this your first visit to this specific forest preserve?

   [ ] Yes
   [ ] No – If no, how many times have you visited this location in the past year?

   _____visits in past year

3. How long do you plan to spend visiting this forest preserve? (Check one.)

   [ ] Less than one hour
   [ ] One to two hours
   [ ] Half a day
   [ ] A full day
   [ ] Multiple days

4. How many people are in your group (including you) today?

   Group size: _____

5. What kind of group are you with today? (Check one.)

   [ ] Alone
   [ ] Family
   [ ] Friends
   [ ] Family and Friends
   [ ] Other (please specify):

6. In which activities did/will you participate during this visit? (Check all that apply.)

   [ ] Bicycling
   [ ] Birding
   [ ] Camping
   [ ] Canoeing/Kayaking
   [ ] Fishing
   [ ] Geocaching
   [ ] Hiking
   [ ] Outdoor learning
   [ ] Picnicking
   [ ] Running/Jogging
   [ ] Sports (soccer, baseball, football, etc)
   [ ] Viewing nature
   [ ] Walking
   [ ] Other (please specify):

7. Which of the above was/is your primary activity during this visit? (Please circle one in the list above.)

8. How important are the following as reasons for your visit to the forest preserve?

	Very unimportant	Unimportant	Neither unimportant nor important	Important	Very important
Being close to nature	☐	☐	☐	☐	☐
Having an affordable outing	☐	☐	☐	☐	☐
Getting away from social media	☐	☐	☐	☐	☐
Documenting my visit using technology	☐	☐	☐	☐	☐
Getting exercise	☐	☐	☐	☐	☐
Developing my knowledge of things here	☐	☐	☐	☐	☐
Learning more about nature	☐	☐	☐	☐	☐
Keeping physically fit	☐	☐	☐	☐	☐
Bringing my family closer together	☐	☐	☐	☐	☐
Enjoying the smells and sounds of nature	☐	☐	☐	☐	☐
Being free of the obligations of email/ phone	☐	☐	☐	☐	☐
Saving money	☐	☐	☐	☐	☐
Doing something with my family	☐	☐	☐	☐	☐
Sharing experiences with online friends	☐	☐	☐	☐	☐
Having an outing close to home	☐	☐	☐	☐	☐

9. How likely is it that you will do each of the following <u>while visiting the forest preserve</u>?

	Very unlikely	Unlikely	Neither unlikely nor likely	Likely	Very likely

Use a fitness tracker	☐	☐	☐	☐	☐
Post pictures/video on social media	☐	☐	☐	☐	☐
Use GPS for navigation	☐	☐	☐	☐	☐
Read an e-book	☐	☐	☐	☐	☐
Watch television	☐	☐	☐	☐	☐
Check social media sites	☐	☐	☐	☐	☐
Check phone messages	☐	☐	☐	☐	☐
Search online for forest rules and regulations	☐	☐	☐	☐	☐
Play digital games	☐	☐	☐	☐	☐
Check email messages	☐	☐	☐	☐	☐
Listen to music	☐	☐	☐	☐	☐
Use apps to learn about the forest	☐	☐	☐	☐	☐
Search online for information about the area	☐	☐	☐	☐	☐
Unplug from personal technology	☐	☐	☐	☐	☐

10. In everyday life, how often do you do each of the following activities?

	Never	Rarely	Sometimes	Often	All the time
Text message	☐	☐	☐	☐	☐
Send and receive emails	☐	☐	☐	☐	☐
Use social media	☐	☐	☐	☐	☐
Watch television	☐	☐	☐	☐	☐
Talk on the phone	☐	☐	☐	☐	☐
Search the internet	☐	☐	☐	☐	☐

Unplug from personal technology	☐	☐	☐	☐	☐

11. To what extent do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel it is important to be able to find any information I want about the forest preserve online	☐	☐	☐	☐	☐
I get anxious when I don't have my cell phone with me in nature	☐	☐	☐	☐	☐
I think it is important to keep up with the latest trends in outdoor technology	☐	☐	☐	☐	☐
I get anxious when I don't have the internet available to me in nature	☐	☐	☐	☐	☐
I feel that my time in nature is enhanced because of technology	☐	☐	☐	☐	☐
New technology detracts from people's enjoyment of the outdoors	☐	☐	☐	☐	☐
New technology makes people more isolated in the outdoors	☐	☐	☐	☐	☐
New technology makes being in nature more complicated	☐	☐	☐	☐	☐
I am dependent on my personal technology when in nature	☐	☐	☐	☐	☐
I feel it is important to be able to access the internet anywhere in the forest preserve	☐	☐	☐	☐	☐
New technology makes being in nature more safe	☐	☐	☐	☐	☐

12. To what extent do you support or oppose the following potential management actions on the forest preserve?

	Strongly oppose	Oppose	Neutral	Support	Strongly support
Expanding wireless internet access (Wi-Fi)	☐	☐	☐	☐	☐

Replacing educational signage with apps	☐	☐	☐	☐	☐
Replacing paper maps with online versions	☐	☐	☐	☐	☐
Establishing technology free zones	☐	☐	☐	☐	☐
Providing both paper maps and online maps	☐	☐	☐	☐	☐
Integrating technology into visitor center displays	☐	☐	☐	☐	☐
Integrating technology into education programs	☐	☐	☐	☐	☐

13. What is the zip code of your primary residence? _____

14. What is your gender?

[ ] Female
[ ] Male
[ ] Other (please specify):

15. What is your age?

_____Years

16. What is the highest level of education you have completed? (Check one.)

[ ] Some high school
[ ] High school graduate or GED
[ ] Some college, business or trade school
[ ] College, business or trade school graduate
[ ] Some graduate school
[ ] Master's, doctoral or professional degree

17. In what race/ethnicity would you place yourself? (Check all that apply.)

[ ] American Indian
[ ] Alaska Native
[ ] Asian
[ ] Black or African American

[ ] Hispanic or Latino
[ ] Native Hawaiian or other Pacific Islander
[ ] White
[ ] Other (please specify):

18. What additional online information, apps, or other technology would enhance your visits to the Forest Preserves of Cook County?

19. Do you have any other comments that you would like to share about your visit?

Appendix B

Visitor survey: Chequamegon- Nicolet National Forest- understanding forest visitor connections to technology

1. Is this your first visit to Chequamegon-Nicolet National Forest (CNNF)?

   [ ] Yes
   [ ] No

2. Is this your first visit to this site in the forest?

   [ ] Yes
   [ ] No – If no, how many times have you visited this location in the past year?

   _____visits in past year

3. How long do you plan to spend visiting CNNF? (Check one.)

   [ ] Less than one hour
   [ ] One to two hours
   [ ] Half a day
   [ ] A full day
   [ ] Multiple days

4. How many people are in your group (including you) today?

   Group size: _____

5. What kind of personal group are you with today? (Check one.)

   [ ] Alone
   [ ] Family
   [ ] Friends
   [ ] Family and Friends
   [ ] Other (please specify):

6. Are you visiting with a dog, cat or other pet? (Check all that apply.)

   [ ] Yes – If yes, what type of pet(s)?
   [ ] No

7. In which activities did/will you participate during this visit? (Check all that apply.)

   [ ] Bicycling
   [ ] Birding
   [ ] Camping
   [ ] Canoeing/Kayaking
   [ ] Outdoor learning
   [ ] Picnicking
   [ ] Running/Jogging
   [ ] Swimming

[ ] Fishing
[ ] Geocaching
[ ] Hiking
[ ] Viewing nature
[ ] Walking
[ ] Other (please specify):

8. Which of the above was/is your primary activity during this visit? (Please circle one in the list above.)

9. How important are the following as reasons for your visit to the forest?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Being close to nature	☐	☐	☐	☐	☐
Having an affordable outing	☐	☐	☐	☐	☐
Getting away from social media	☐	☐	☐	☐	☐
Documenting my visit using technology	☐	☐	☐	☐	☐
Getting exercise	☐	☐	☐	☐	☐
Developing my knowledge of things here	☐	☐	☐	☐	☐
Learning more about nature	☐	☐	☐	☐	☐
Keeping physically fit	☐	☐	☐	☐	☐
Bringing my family closer together	☐	☐	☐	☐	☐
Enjoying the smells and sounds of nature	☐	☐	☐	☐	☐
Being free of the obligations of email/ phone	☐	☐	☐	☐	☐
Saving money	☐	☐	☐	☐	☐
Doing something with my family	☐	☐	☐	☐	☐
Sharing experiences with online friends	☐	☐	☐	☐	☐
Having a rustic experience	☐	☐	☐	☐	☐
Having access to developed facilities and services	☐	☐	☐	☐	☐

10. How likely is it that you will do each of the following <u>while visiting the forest</u>?

	Very unlikely	Unlikely	Neither unlikely nor likely	Likely	Very likely
Use a fitness tracker	☐	☐	☐	☐	☐

Post pictures/video on social media	☐	☐	☐	☐	☐
Use GPS for navigation	☐	☐	☐	☐	☐
Read an e-book	☐	☐	☐	☐	☐
Watch television	☐	☐	☐	☐	☐
Check social media sites	☐	☐	☐	☐	☐
Check phone messages	☐	☐	☐	☐	☐
Search online for forest rules and regulations	☐	☐	☐	☐	☐
Play digital games	☐	☐	☐	☐	☐
Check email messages	☐	☐	☐	☐	☐
Listen to music	☐	☐	☐	☐	☐
Use apps to learn about the forest	☐	☐	☐	☐	☐
Search online for information about the area	☐	☐	☐	☐	☐
Unplug from personal technology	☐	☐	☐	☐	☐

11. In everyday life, how often do you do each of the following activities?

	Never	Rarely	Sometimes	Often	All the time
Text message	☐	☐	☐	☐	☐
Send and receive emails	☐	☐	☐	☐	☐
Use social media	☐	☐	☐	☐	☐
Watch television	☐	☐	☐	☐	☐
Talk on the phone	☐	☐	☐	☐	☐
Search the internet	☐	☐	☐	☐	☐
Unplug from personal technology	☐	☐	☐	☐	☐

12. To what extent do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I feel it is important to be able to find any information I want about the forest online	☐	☐	☐	☐	☐

I get anxious when I don't have my cell phone with me in nature	☐	☐	☐	☐	☐
I think it is important to keep up with the latest trends in outdoor technology	☐	☐	☐	☐	☐
I get anxious when I don't have the internet available to me in nature	☐	☐	☐	☐	☐
I feel that my time in nature is enhanced because of technology	☐	☐	☐	☐	☐
New technology detracts from people's enjoyment of the outdoors	☐	☐	☐	☐	☐
New technology makes people more isolated in the outdoors	☐	☐	☐	☐	☐
New technology makes being in nature more complicated	☐	☐	☐	☐	☐
I am dependent on my personal technology when in nature	☐	☐	☐	☐	☐
I feel it is important to be able to access the internet anywhere in the forest	☐	☐	☐	☐	☐
New technology makes being in nature more safe	☐	☐	☐	☐	☐

13. To what extent do you support or oppose the following potential management actions in the forest?

	Strongly oppose	Oppose	Neutral	Support	Strongly support
Expanding wireless internet access (Wi-Fi)	☐	☐	☐	☐	☐
Replacing educational signs with apps	☐	☐	☐	☐	☐
Replacing paper maps with online versions	☐	☐	☐	☐	☐
Establishing technology free zones	☐	☐	☐	☐	☐
Providing both paper maps and online maps	☐	☐	☐	☐	☐
Integrating technology into visitor center displays	☐	☐	☐	☐	☐
Integrating technology into education programs	☐	☐	☐	☐	☐

14. What is the zip code of your primary residence? _____

15. What is your gender?

[ ] Female
[ ] Male
[ ] Other (please specify):

16. What is your age?

_____Years

17. What is the highest level of education you have completed? (Check one.)

[ ] Some high school
[ ] High school graduate or GED
[ ] Some college, business or trade school
[ ] College, business or trade school graduate
[ ] Some graduate school
[ ] Master's, doctoral or professional degree

18. In what race/ethnicity would you place yourself? (Check all that apply.)

[ ] American Indian
[ ] Alaska Native
[ ] Asian
[ ] Black or African American
[ ] Hispanic or Latino
[ ] Native Hawaiian or other Pacific Islander
[ ] White
[ ] Other (please specify):

19. What apps do you use when visiting the forest? (Check all that apply.)

[ ] I don't use apps in the forest
[ ] Avenza maps
[ ] All Trails
[ ] Ebird
[ ] VVmapping
[ ] Other (please specify):

20. What additional online information, apps, or other technology that would enhance your visits to CNNF?