A Mixed Methods Evaluation of the Pinery Provincial Park Smartphone Application Pilot Project

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Pinery Provincial Park is the first provincial park in the Ontario Parks system to launch a custom-built smartphone application. This application, titled “Explore Pinery,” was launched in January of 2016 and acts as an information dashboard for Pinery and encourages outreach and participation in citizen science activities. Despite the perceived success of this pilot project, it has not been systematically assessed or evaluated. A review of the literature shows that no comprehensive evaluation approach exists for unique and innovative projects such as this one. As such, a mixed methods evaluation was employed to holistically evaluate the Explore Pinery smartphone application. A qualitative analysis aimed to illuminate how Explore Pinery aids staff in achieving Pinery’s management objectives and a quantitative analysis aimed to understand how Explore Pinery influences visitor experiences. A thematic analysis illuminated a complex relationship between Explore Pinery and Pinery’s management objectives and that Explore Pinery encourages visitors to become environmentally responsible, dedicated park users. Regression analyses discovered that Explore Pinery does not detract from visitors’ nature connectedness, sense of place, and education levels. Attitude towards technology was revealed to be the most significant factor that determined if Explore Pinery positively impacted visitors’ experiences. Overall, Explore Pinery aids park staff in achieving on-going management objectives and best contributes to visitors with positive attitudes towards technology. Ultimately, park-specific smartphone applications are management tools that can be deployed by park managers to engage visitors in a modern world. This methodological approach can be used to evaluate future park-specific smartphone applications.

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Chapter 1: Introduction

1.1 Background

Humans are inherently connected to, and have relied upon, the natural environment for thousands of years (Robinett, 2014; Washington, 2013). This fundamental connectedness was ultimately established and maintained through living sustainably in the natural environment (Washington, 2013).

However, since the 1800s, an exponential trend of urban migration has emerged and continues to grow (Population Reference Bureau, 2016). 2008 marked the first time in human history where half of the world's population resided within urban environments (Population Reference Bureau, 2016). By 2050, it is predicted that 70% of the world's population will reside within urban environments (Population Reference Bureau, 2016). In Canada, more than 80% of Canadians lived in urban areas as of 2006 (Government of Canada, 2014).

The transition from rural to urban settlement has many implications, including the potential severing of a once fundamental connection to the natural environment (Louv, 2005). As a result, a variety of consequences present themselves, including a lack of environmentally based education, awareness, and empathy (Louv, 2005). This is problematic for many reasons, but was best described by Baba Dioum in 1968 during an address to the International Union for the Conservation of Nature and Natural Resources, when he said, "in the end we will conserve only what we love; we will love only what we understand; and we will understand only what we are taught."

People that do pursue nature-related experiences, whether they be a deliberate attempt to restore or maintain nature connections or not, have a variety of options which can include

visiting protected areas. Protected areas are defined as "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" (International Union for the Conservation of Nature, n.d., p. 1). Canadian protected areas that meet this definition are often owned and operated by government agencies, non-profit organizations, land trusts, and increasingly by indigenous communities (Indigenous Circle of Experts, 2018). In many cases, protected areas will also have an official park status, such as provincial or national park. In 2015, 1.05 million square kilometres of protected areas existed in Canada, which accounts for approximately 10.6% of terrestrial land and fresh water (Government of Canada, 2017). Targets have been set to increase the number of protected areas in Canada to 17% by 2020, which will match the global target set by the convention of biological diversity (Canadian Parks Council, n.d.; Convention on Biological Diversity, n.d.).

Parks and protected areas provide a plethora of direct and indirect benefits to humans (Lopukhine, 2008). Direct and widely acknowledged benefits include opportunities for recreation, outdoor education, immersion in nature, and the preservation of biodiversity (Ministry of Natural Resources, 1986; Lopukhine, 2008). Studies have also shown the social and mental health benefits of visiting parks, including increased emotional and psychological well-being (Mock, et al., 2016) as well as positive contributions toward childhood development (Lemieux, et al., 2012). Beyond these broad, widely recognized and accepted benefits, it is also worth mentioning that protected areas are key to the on-going stability of human and non-human life by protecting ecosystem services which provide clean air and fresh water (Lopukhine, 2008).

A variety of methods can be used by park agencies to attract new visitors and increase return visitation, such as marketing campaigns, outreach programs, and service improvements.

While traditional park operating methods may be effective, emerging technologies, such as smartphones, have largely unexplored potential (Rikala & Kankaanranta, 2014). Smartphones, which have emerged over the last two decades, have gained enough popularity to be considered ubiquitous and reasonably accessible to the general public (Zimmerman & Land, 2014; Land et al., 2015). The programmable applications (apps) that run on smartphones provide seemingly endless opportunities to create customized content that can be applied to nearly any situation (Land et al., 2015). Although introducing technology into protected areas has unexplored potential, it is important to recognize and consider possible consequences. One consequence is that technology consumes the attention of users to the point where they become disconnected from the environment they are in (Louv, 2005).

Today, few smartphone applications exist that are specifically designed for parks and protected areas. This lack of park-specific smartphone applications is likely due to a variety of combining factors including the following: slow incorporation of emerging technologies into government tool kits, limited park resources, limited knowledge of emerging technology, poor cell phone service, lengthy approval processes, and not enough visitors to justify the effort required, to name a few. However, one such application, titled 'Explore Pinery,' was publicly launched in January 2016 at Pinery Provincial Park, located in Grand Bend, Ontario, Canada (MacDonald, 2016).

Explore Pinery acts as an information dashboard for the Pinery which collects and synthesizes information from numerous sources into one convenient location. One of the initial intentions for creating the application was to inform visitors about educational programming and encourage them to participate in Pinery's many citizen science programs. Citizen science programs allow visitors to experientially participate in conservation projects by recording and

submitting observations. These projects facilitate hands-on learning and are designed with the intention of producing a dual outcome of informing visitors and collecting data for staff. Explore Pinery streamlines the process of participating in citizen science projects by allowing users to send in their information in real time. Explore Pinery also has the capability to collect users GPS coordinates thereby adding an additional level of accuracy to citizen science, which is often a problem with user submitted data (Cohn, 2008). Over time, a large number of submissions has the potential to better inform staff when making decisions around management objectives.

Despite the perceived success of this pilot project, it has not been systematically assessed in terms of its overall contributions toward achieving park management objectives and how it influences visitor experiences. This is problematic as innovative solutions should constantly be assessed to improve and build upon their relevance in larger contexts (Drucker, 1985; Miles & Cunningham, 2006). An evaluation of the Explore Pinery smartphone application is also likely to be useful for future expansion plans as well as for improving the application to better serve park managers and visitors alike.

1.2 Purpose Statement and Research Objectives

The purpose of this thesis is to evaluate the Pinery Provincial Park smartphone application pilot project titled “Explore Pinery”. This research will be guided through two research questions:

1) To what extent, if any, does the Explore Pinery smartphone application contribute to achieving park management objectives?
    a. How does Explore Pinery influence the park protection objective?
    b. How does Explore Pinery influence the heritage appreciation objective?

c. How does Explore Pinery influence the recreational opportunities objective?

2) How, if at all, does Explore Pinery impact visitors' nature connectedness, sense of place, education, satisfaction levels and overall experience?

These research questions were answered through two separate studies. The first research question was answered by conducting qualitative interviews with park staff and identifying themes and subthemes within their experiences. The second research question was answered by surveying visitors with a questionnaire and analysing their responses. The overall purpose of this thesis was to holistically evaluate the Pinery Provincial Park smartphone application to see how it performs as a management tool and a tool to improve visitor experiences.

1.3 Significance of Research

Evaluating the Pinery Provincial Park smartphone application 'Explore Pinery' has had several useful outcomes. First, this research provides a detailed account of the synergies of parks and protected areas, outdoor experiential education, citizen science, and innovative technologies as illustrated through the participants' real-world experience with Explore Pinery. This is potentially useful to anyone who works within one or more of these disciplines as a smartphone application can be used as a management tool to address issues faced within these disciplines. This is also useful for park managers, as smartphone applications can be particularly useful in protected areas, as illustrated by this study's findings.

Second, this research has produced literature that will be useful for parks and protected areas that are looking to develop, or have already developed, context-specific smartphone applications. A mixed methodological approach was used to holistically evaluate Explore Pinery that can be applied to parks with similar smartphone applications. This is important as very few,

if any, comprehensive evaluation approaches exist for evaluating park specific smartphone applications. Literature has also been produced that is relevant for outdoor recreationalists, such as the quantitative study looking at how technology influences sense of place and nature connectedness. The results from both the questionnaire and staff interviews provide a counter argument to the common critique of technology that it detracts from people's nature experiences. Literature from this study can be extended to the general public in that people, particularly those with positive attitudes towards technology, will benefit from current or future smartphone applications. The qualitative findings also have the potential to benefit the general public by making them aware of the range of opportunities that an application can facilitate for them.

This study has pushed the disciplinary boundaries of citizen science, outdoor education, and innovative technologies within parks and protected areas. This research has provided a sound justification for further research and development of park-specific smartphone applications, as evident in the qualitative and quantitative findings and results. This research ultimately contributes to engaging visitors in protected areas and fostering on-going appreciation for natural areas, such as parks, which contributes to their long-term sustainability.

Chapter 2: Literature Review

To fully understand how the Explore Pinery smartphone application operates and is situated within Pinery Provincial Park, it is first important to understand how parks and protected areas operate in Canada and the services they provide. This literature review will highlight the creation of parks and protected areas, how they are managed, the visitor services they provide, and how Explore Pinery fits within these systems. Evaluation approaches within parks and protected areas and its sub-disciplines will also be highlighted, as each is likely to have its own established theoretical, methodological, and comprehensive evaluation approaches. A comprehensive assessment of the Explore Pinery smartphone application will, therefore, need to draw on evaluation approaches from all these disciplines to yield robust conclusions.

2.1 Parks and Protected Areas

Banff National Park was established in 1883, marking the beginning of park management in Canada (Parks Canada, 2016). During the creation of Banff, expropriation of Indigenous lands occurred, and decisions were based on non-scientific data (Dearden & Rollins, 2009). These early unethical establishment practices stand in marked contrast to the plethora of ethical policies that exist today (Dearden & Rollins, 2009). In 1979, Canada made a policy revision to the National Parks Act which made ecological integrity the top priority to parks and protected areas management (Parks Canada, 2015). This monumental decision changed the focus of Canadian parks and protected areas to be ecologically driven and science-based (Dearden & Rollins, 2009).

In Ontario, several types of parks and protected areas exist, including Provincial Parks, Conservation Reserves, Dedicated Protected Areas, and Wilderness Areas. Ontario Parks owns and operates over 330 Provincial Parks covering 7.4 million hectares making them the largest

manager of protected areas in Ontario (Government of Ontario, 2015). Ontario Parks is guided by the Provincial Parks and Conservation Reserves Act (PPCRA) which outlines the objectives of these parks and what activities are permitted (Government of Ontario, 2016). The PPCRA outlines that the primary purpose is to:

> permanently protect a system of provincial parks and conservation reserves that includes ecosystems that are representative of all of Ontario's natural regions, protects provincially significant elements of Ontario's natural and cultural heritage, maintains biodiversity and provides opportunities for compatible, ecologically sustainable recreation *(Government of Ontario, 2016, p. 2).*

This act also declares six different types of parks and what the primary function of each is. Pinery Provincial Park falls under the classification of a natural environment park with the purposes of maintaining ecological integrity and protecting outstanding recreational landscapes (Government of Ontario, 2016). Pinery Provincial Park was one of the first provincial parks to have a management plan and today there are well over 150 management plans for parks across the province (Government of Ontario, 2018a). Provincial Parks are further classified into operating and non-operating parks. Approximately 70 operating parks exist in Ontario (including Pinery), many of which contain staff and a variety of visitor experiences. These visitor experiences are crucial for Ontario Parks, as approximately 85% of funding comes from visitor services such as camping fees, day-use parking permits, equipment rentals, and concessions (Government of Ontario, 2018b). To be able to maintain ecological integrity and visitor experiences, a variety of visitor management approaches are used.

2.2 Pinery Provincial Park Management Plan

The Pinery Provincial Park management plan was created in 1986 and was one of the first management plans in Canada (Government of Ontario, 2018a). The management plan outlines the goals of Pinery, park policies, resource management activities, client services, development principles, implementation strategies, and management objectives (Ministry of Natural Resources, 1986). Four management objectives are listed and include the following: (1) protection, to protect provincially significant elements of the natural and cultural landscape of Ontario; (2) heritage appreciation, to provide opportunities for exploration and appreciation of the outdoor natural and cultural heritage of Ontario; (3) recreation, to provide a variety of recreational opportunities in areas of outstanding recreational potential associated with the natural environment of Ontario; and (4) tourism, to provide Ontario's residents and out-of-province visitors with opportunities to discover and experience distinctive regions of the Province (Ministry of Natural Resources, 1986, pp. 1-2). The first three management objectives (protection, heritage appreciation, and recreation) provide the most direct impact on park activities and for the purpose of this thesis are key to understanding how the park operates. The following sections will outline each of the three management objectives in detail and highlight some of the activities associated with each objective.

2.2.1 Protection objective.

The protection objective is straight-forward as it sets out to preserve the natural and cultural features of Pinery. Some of Pinery's highlights include an oak savanna ecosystem, the Old Ausable Channel, freshwater coastal sand dunes, the Carolinian forest, archaeological sites, and numerous species at risk, to name a few (The Friends of Pinery Park, 2019). A variety of

practices are outlined in the Pinery management plan that further contribute to the protection objective such as noxious weed and non-native species control, insect and disease management, vegetation planting, and wildlife management (Ministry of Natural Resources, 1986).

2.2.2 Heritage appreciation objective.

The heritage appreciation objective creates opportunities for park visitors to explore Pinery by having access to infrastructures such as hiking trails, docks, signage, and interpretive programming (Ministry of Natural Resources, 1986). Outdoor education is also outlined in the management plan which encourages school groups to participate in programming that aligns with the park's protection objectives (Ministry of Natural Resources, 1986). To meet the heritage appreciation objective, the Natural Heritage Education department was created to provide both educational programming and resource management activities.

2.2.3 Recreation objective.

The recreation objective provides sustainable recreation opportunities for visitors. Examples include camping, canoeing, hiking, biking, fishing, cross-country skiing, and skating among others (The Friends of Pinery Park, 2019). The management plan also contains a section on water, where it outlines how the Old Ausable Channel was dammed to provide better opportunities for water-based recreation activities. It notes that the use of outboard motors is prohibited to help ensure sustainable recreation and limit environmental damage (Ministry of Natural Resources, 1986).

2.3 Visitor Demographics

Ontario Parks has conducted research on the types of people who visit parks and has found that visitors typically fall into one of five categories (Ontario Parks, n.d.). These categories also serve as "target audiences" which allow specific planning and marketing efforts to occur that are tailored for each group.

The first demographic is classified as "reluctants." These are visitors who generally enjoy being outdoors but are not familiar with camping or Ontario Parks (Ontario Parks, n.d.). Visitors in this group also have a need to be comfortable and generally are not aware of the opportunities in parks. Reluctants typically will not seek out information and are more likely to rely on recommendations from someone they trust. Many reluctants are located within the greater Toronto area, are new Canadians, and value their family time. Some of the challenges that relectants face include a lack of camping skills and knowledge as well as having limited equipment (Ontario Parks, n.d.).

"Core campers" are the next target group and are families aged 25-44 with children under the age of 18 (Ontario Parks, n.d.). Core campers return year after year to the same park and do not seek out new information as they are already familiar with the Ontario Parks websites and feel like they know everything. Most core campers choose the summer months to go on their camping trips and are primarily looking to spend time connecting with their family. Challenges associated with core campers include having less and less time available during the summer as well as hesitancy to experience new parks (Ontario Parks, n.d.).

The next group has been labeled as "adventurers." These are people who want to explore new areas and challenge themselves (Ontario Parks, n.d.). Adventurers are typically aged 35-55, have higher education and income, and are willing to travel long distances. Adventurers are also

driven to participate in their favourite activity regardless of the location. Information is not a problem for adventurers as they are willing to do research about the areas they plan to travel to. Adventurers often are not aware of other opportunities that Ontario Parks offers and are competitive among their community of like-minded people (Ontario Parks, n.d.).

Another target group has been labeled as “millennials” which includes people aged 15-35 (Ontario Parks, n.d.). Millennials grew up in a digital world and have different expectations and priorities compared to previous generations. Although millennials are driven to parks for personal fulfillment, a large part of their travel is based on various technologies. Millennials are also different from previous generations in that they do not consume traditional media and are used to instant feedback through their social circles. Millennials are generally excited to have new experiences but are not always thinking about Ontario Parks as one of their destinations. Millennials also have limited access to transportation and have a fear of being disconnected (Ontario Parks, n.d.).

The last group is characterized as “mature travellers” and are above the age of 50 (Ontario Parks, n.d.). Mature travellers used to visit parks regularly when they were younger but now have changing needs and require more comfortable accommodations. Mature travellers use traditional media but also know how to use the internet when planning their trip. Most people that fall into this category camp not only in the summer months but also throughout the year. Mature travellers typically do not seek out new information, but they do consider themselves life-long learners (Ontario Parks, n.d.).

2.3.1 Pinery Provincial Park visitor demographics.

Although Pinery Provincial Park reports statistics of annual usage, no official reports exist that outline the demographic makeup of Pinery's visitors. However, given my experience at Pinery Provincial Park over the last five years, connections can be made to the Ontario Parks report that outlines the five target audiences (Ontario Parks, n.d.).

Based on my experiences, the visitors at Pinery Provincial Park mainly fall into the reluctants, core campers, millennials, and mature traveller groups. It is possible that visitors who fall into the adventurer's category visit Pinery, although this group is far less likely to visit due to the limited number of intense outdoor experiences available. Pinery can also be considered a "front country" camping location as it is set up to support car and motorhome style camping. As such, adventurers are likely to be deterred as no "back country" camping experiences exist. Furthermore, Pinery receives over 600,000 visitors annually (Ontario Parks, 2011), which is another deterrent to adventurers due to overcrowding.

It is difficult to say for sure which one of the four groups is most abundant at Pinery. Based on a large number of beginner and family-oriented activities that exist within the park, it is likely that the core campers are the most abundant users of Pinery. However, different visitors use Pinery in different ways and times. During the offseason, a large proportion of campsites are used by the mature traveller group. During the summer, all groups use the beach, but a significant portion consists of core campers and millennials. Pinery has a variety of recreational opportunities that are relatively low risk, and as such a lot of reluctants take advantage of these activities such as canoeing, hiking, and swimming.

Although no official statistics exist that outline who Pinery's visitors are, other sources such as the Ontario Parks target audiences document and five years work experience help shed

some light. With over 600,000 visitors per year (Ontario Parks, 2011), it is entirely possible that all user groups utilize Pinery. However, based on the physical landscape and infrastructure within the park, it is easy to see how certain groups would benefit over others. Year to year it is easy to see the prevalence of certain groups over others, and how they change with the seasons.

2.4 Visitor Management

To ensure that all three management objectives are followed, the park deploys a variety of visitor management approaches. Visitor management refers to the strategies used to manage visitors during their park visit and ensure management objectives are followed. Potential negative impacts from not following the management objectives include crowding, unwanted behaviours, and destruction of the natural environment (Penz, 1975). As ecological integrity is the primary objective of Ontario Parks, visitor management strategies are typically used to reduce negative impacts on the environment. A variety of visitor management strategies are available to park managers, all of which can be categorized as either hard or soft barriers. Hard barriers consist of direct physical prevention (walls, fences, etc.) while soft barriers are non-direct and rely on modifying visitor behaviour (Halpenny, 2010). Soft barriers rely on an informed visitor to make morally correct decisions, such as staying on trails or not littering. For soft barriers to be effective, a variety of educational components need to exist so that visitors are continuously informed about the environmental consequences of certain behaviours. Examples include having informational signage, informative displays, outdoor education, and interpretation of cultural and natural features. A combination of both hard and soft barriers is likely to be the most effective at reducing negative environmental impacts, although the actual specific implementation methods are usually assessed on a site by site basis. Ontario Parks implements both hard and soft barriers to varying degrees based on a park's needs (Ministry of Natural

Resources, 1986). At Pinery Provincial Park, a variety of approaches are used including hard barriers such as exclusion fencing, clearly defined pathways, boardwalks, look-out structures, and strategically placed physical barriers (wooden, concrete, rocks, trees). A variety of soft barriers are also used including legal signage (no parking, do not enter, etc.), interpretive signage (trail guides and maps), educational programs (guided hikes, ask an expert, presentations, etc.), and citizen science activities (photo monitoring, bumblebee watch, bat reporting, etc.). Despite these comprehensive visitor management strategies, it is always difficult to ascertain how effective efforts are, as it is possible that visitors can avoid most soft barriers and get around hard barriers. Furthermore, the cumulative impact of so-called sustainable activities within Pinery has the potential to become unsustainable simply due to the vast number of people participating in them (Dearden & Rollins, 2009).

2.4.1 Park services.

Pinery Provincial Park (and indeed many other provincial parks) offer a variety of services to park visitors. Some services have multiple intended outcomes, such as offering outdoor education programs and citizen science activities which provide entertaining experiences and reinforce soft barriers.

2.4.1.1 Outdoor education.

The field of outdoor education, including its subfields of experiential outdoor education and natural heritage interpretation, has developed substantially despite its relatively recent inception in the early 1900s (Hammerman, 1980). This includes the growth of a significant body of literature devoted to the definition of outdoor education since different interpretations can lead to confusion with undesirable implications (Barnes, 2005; Adkins & Simmons, 2002; Priest, 1986). Outdoor education has been defined by the Definitions Project, a multi-organizational

institution that creates standardized definitions, as "education in, for, and about the outdoors" (Definitions Project, 2007, p. 8). It is also noted that the term is sometimes inappropriately used synonymously with adventure-based education and environmental education (Definitions Project, 2007, p. 8). Prior to this universal definition, outdoor education was commonly defined in terms of outdoor sensory experiences that achieve what indoor teaching cannot (Hammerman, 1963; Hutchins, 1962; Priest, 1986).

Discrepancies between the sub-fields of outdoor education also exist. Experiential outdoor education and natural heritage interpretation are very similar in that they both provide education in, for, and about the outdoors. Although no formal distinction exists, experiential outdoor education generally requires physical involvement whereas natural heritage interpretation does not. It has been argued, however, that effective interpretation often will be experiential (National Park Service, 2007). Regardless of the subtleties between experiential outdoor education and natural heritage interpretation, both occur within Pinery to fulfill the management plan objective of providing opportunities for heritage appreciation (Ministry of Natural Resources, 1986).

Natural heritage interpretation within Pinery Provincial Park consists of conveying complex information to park visitors in a manner that facilitates "revelation based upon information" (Moscardo, 1996, p. 377; Roberts, Mearns, & Edwards, 2014). This approach fosters the generation of memories that are often attached to historical, cultural, and natural spaces, places, and resources (Hunter, 2015). Natural heritage interpretation within parks and protected areas owes its existence and development to the historical works of John Muir, Enos Mils, Freeman Tilden, and others (National Park Service, 2007). Freeman Tilden forever changed the discipline with his monumental 1957 book, *Interpreting Our Heritage*, which established six fundamental interpretive principles (National Park Service, 2007). These

principles have stood the test of time and remain relevant today both in literature and practice (National Park Service, 2007; Larson, 2011; Staiff, 2014). Interpretation within parks and protected areas create a variety of important benefits (Hunter, 2015; Moscardo, 1996) which can be characterized as short and long term. In either case, behaviour changes are the driver in providing benefits to both the people who have the experiences and the environment in which those experiences occur (Roberts, Mearns, & Edwards, 2014). Short-term benefits are those that dissipate after the interpretation experience and do not have any lasting impacts. Short-term benefits include increased personal satisfaction and reduction of overcrowding which often causes negative environmental impacts (Moscardo, 1996).

Long-term benefits are those that exist indefinitely after the experience, although they are often subtle (Roberts, Mearns, & Edwards, 2014). The most recognizable long-term benefits that result from interpretation are when conservation-oriented attitudes, goals, and ethics are fostered in youth leading to environmental action and leadership (Hunter, 2015; Roberts, Mearns, & Edwards, 2014).

Recently, outdoor education as a discipline has gained popularity thanks to an influential work by Richard Louv entitled, *Last Child in the Woods* (2005), in which the term "nature deficit disorder" was coined to describe the growing disconnection of children from the natural world. Outdoor education seeks to address this problem through place-based learning, a theoretical approach to experiential learning that seeks to foster nature connectedness by exploring ideas of location, locale, and sense of place in an education setting (Anderson, et al., 2015; Land, et al., 2015). Nature connectedness is the degree to which one feels connected to the natural environment (Mayer & Frantz, 2004). Several research studies have determined that nature connectedness is well correlated with well-being (Howell, Passmore, & Buro, 2013; Mayer &

Frantz, 2004). The theory of nature connectedness was based on the biophilia hypothesis proposed in 1984 which predicted that psychological health is influenced by relationships to nature (Howell, Dopko, Passmore, & Buro, 2011).

In summary, outdoor education is one of Pinery's management objectives which has multiple outcomes including reducing negative impacts on the environment and connecting visitors to the natural environment.

2.4.1.2 Citizen science.

Citizen science is the process of non-scientists voluntarily collaborating with scientists to collect, analyse, and share data (Jordan, Ballard, & Phillips, 2012; Cohn, 2008). The first recognized citizen science project, the annual Christmas Bird Count, was started in 1900 by the Audubon Society in the United States and is currently still operating as the largest citizen science project in the world (Audubon, n.d.; Bonney, et al., 2009). Although this project is highly successful, citizen science increase and popularity have only occurred within the past twenty years (Bonney, et al., 2009; Cohn, 2008). Long-term citizen science projects are particularly beneficial as they allow complex topics to be studied that require copious amounts of data over large temporal scales (Bonney, et al., 2009). This allows vast databases of information to be collected at minimal cost compared to more costly professional projects of equivalent size (Bonney, et al., 2009). Although citizen science projects may lack data quality in comparison to professional surveys, they still hold validity and are particularly effective at analysing long-term trends beyond the scope of most research projects (Bonney, et al., 2009). Citizen science projects also have the potential to foster relationships between scientists and non-scientists by providing authentic scientific experiences (Henderson, 2012; Bonney, et al., 2009).

In Pinery Provincial Park a variety of citizen science projects exist that range in size, duration, intended outcome, and time commitment from visitors. Some examples of the citizen science projects include the landscape photo-monitoring project, where individuals place their phone into a slot on top of a wooden post and take a picture; the wildlife sighting project, where individuals share sightings of flora and fauna they see in the park; the bat monitoring project, where visitors sign out a bat detector and record which species they hear with the detector; the bumblebee watch, where volunteers repeatedly catch bumblebees throughout the summer and record them; and the annual Christmas Bird Count, to name a few. Although the data from these projects are valuable, many also have the dual outcome of educating and providing meaningful experiences for visitors.

2.4.1.3 Innovative technologies.

New technologies have the potential to provide unexplored opportunities in a variety of different fields. Parks and protected areas use and rely upon a variety of technologies, including website reservation services, digital payment systems, and digital educational props to name a few. Smartphones are an emerging technology that have gained enough popularity and accessibility to those with modest economic means that they are now considered ubiquitous (Zimmerman & Land, 2014; Land, Zimmerman, Choi, Seely, & Mohney, 2015). Many park visitors carry smartphones with them, however, no park within the Ontario Parks system has taken advantage of this until now. Smartphones run programmable applications which provide an opportunity to develop seemingly endless amounts of customized content (Land, et al., 2015). This customization, in addition to the many powerful data recording tools that are increasingly built into smartphones, allows for easy data collection (Lane, et al., 2010) within parks and

protected areas. Overall, this open source data collection has the potential to better meet park management objectives as well as the needs of the visitors.

2.5 Overlap

Although the fields of parks and protected areas, outdoor education, citizen science, and innovative technology are well developed, negligible literature has examined their potential for synergy. Some literature has suggested that the pairing of these disciplines have potential, such as the integration of smartphones into outdoor learning (Lane, et al., 2010; Rikala & Kankaanranta, 2014). Several authors have also suggested that innovative methods will be required for continued success in parks and protected areas management, experiential outdoor education, citizen science, and technology (Bonney, et al., 2009; Drucker, 1985; Louv, 2005). To date, only one smartphone application exists within the Ontario Parks system. This application combines the disciplines of parks and protected areas management, outdoor education, citizen science, and innovative technology into a tool for Pinery Provincial Park.

2.5.1 Explore Pinery.

A smartphone application (app) for Pinery Provincial Park launched publicly in January 2016 (MacDonald, 2016). The app, titled "Explore Pinery," is available for download free on several major app distributing stores including iTunes, Google Play, and Blackberry World (MacDonald, 2016). As of April 24, 2018, a total of 4,112 visitors have downloaded Explore Pinery with 2,560 of those downloads coming from iTunes and 1,552 from the Google Play Store (Berkers, personal communication, 2018). The app can best be summarized as a dashboard for Pinery Provincial Park that provides easy access to information and education as well as the facilitation of citizen science projects (MacDonald, 2016). However, the app also contains several additional features such as GPS-enabled data submissions, step counters, notification

features and advertising capabilities. As of April 24, 2018, 362 user-based submissions were sent in through Explore Pinery (Berkers, personal communication 2018). Since the app's launch in January 2016, several improvements and updates have been made. Improvements are likely to continue indefinitely as more relevant services and new capabilities within the app are created. Therefore, due to the continuously changing nature of the app, it can be viewed as a project in motion.

2.6 Types of Assessments within Explore Pinery Subdisciplines

Choosing an appropriate evaluation approach for Explore Pinery is difficult as the app combines four disciplines, each with their own theory, methodology, and methods. The following sections highlight literature within each discipline and the evaluation approach used. This review of assessments proved useful as it highlights the range of evaluations as well as areas of overlap.

2.6.1 Parks and protected areas.

A sizeable area of literature originates from the mandates of governing organizations, such as Ontario Parks (Government of Ontario, 2016; Government of Ontario, 2015; Ministry of Natural Resources, 1986). The literature on parks and protected areas can be broken down into sub-categories which include environmental, social, economic, and political studies (Nepal, Verkoeyen, & Karrow, 2015; West, Igoe, & Brockington, 2006). Although all four of these themes are interconnected, environmental and social studies are more prominent in the literature.

Environmental studies are common in parks and protected areas because they serve as natural laboratories in which many earth and life science research opportunities exist (Government of Ontario, 2015). A review of the literature shows that a post-positivist paradigm

is often used in these studies along with a variety of quantitative methodologies such as statistical analysis, observational change, and experimental design when investigating environmental phenomenon (Halpenny, 2006).

Ecological integrity is a frequent theme of environmental studies and is assessed using a variety of methods. At large scales, remote sensing using Landsat (satellite) sensor imaging and vector analysis change are used (Fraser & Pouliot, 2009), while at smaller scales ecological integrity is assessed by monitoring a variety of predetermined factors (Timko & Innes, 2009). A study by Timko and Satterfield (2008) suggested that evaluations of the effectiveness of ecological integrity protocols within parks and protected areas should include both social and ecological measures as social support is often necessary for ecological sustainability.

Socially focused studies often focus on environmental education. For example, research conducted by Halpenny (2010) and Moghimehfar and Halpenny (2016), examined education focussed on place attachment as a means for fostering pro-environmental behaviours relating to place-based nature connectedness theories. Halpenny's study tested two theories using quantitative surveys to measure self-reported attitude change (Halpenny, 2010).

Environmental and social studies such as these all shed light on the range of options and opportunities available to park managers to achieve their main ecological integrity objective. In many parks and protected areas, sustainable recreation opportunities are offered (Ministry of Natural Resources, 1986; Government of Ontario, 2016).

2.6.2 Outdoor education.

A review of the literature shows that the effectiveness of outdoor education is often assessed in a variety of ways which include both quantitative and qualitative methods. For

example, Harun and Salamuddin (2013) used an experimental design and statistical analysis to assess the degree to which outdoor education fostered soft skills.

A study from Australia examined how interpretation can reduce ecological impacts at a world heritage site (Littlefair & Buckley, 2008). This experimental study assigned five different minimal-impact interpretation programs to numerous visitor groups and measured the extent to which low-impact behaviours resulted.

Long-term benefits were highlighted in a study of undergraduate students in the United States which assessed the degree to which early-life experiences affected environmental attitudes and beliefs (Ewert, Place, & Sibthorp, 2011). This approach used a stratified random sample to select participants for a questionnaire that focused on environmental attitudes and their long-term impacts (Ewert, Place, & Sibthorp, 2011).

High-level evaluation of natural heritage interpretation programs has also been carried out. For example, in the United States, the National Parks Service (NPS) evaluated the effectiveness of several of their long-term interpretive plans by conducting surveys with NPS staff (Wells, 2008, p. 285). Each plan was evaluated, and follow-up phone interviews were conducted which yielded both quantitative and qualitative results (Wells, 2008).

Assessing and evaluating nature connectedness is largely done using the nature connectedness scale. This scale was proposed and evaluated by Mayer and Frantz (2004) who used a series of case studies to analyze its effectiveness in portraying how individuals feel connected to nature. Their findings indicate that the nature connectedness scale is a single factor, multi-item scale that has high reliability and is easily administered (Mayer & Frantz, 2004).

2.6.3 Citizen science.

Although the first citizen science projects started in the early 1900s, literature on citizen science is fairly recent and emerging (Bonney, et al., 2009; Cohn, 2008). A large portion of the citizen science literature focuses on case studies and best management practices rather than on in-depth overall evaluations (Ottinger, 2010; Bonney, et al., 2009; Bonter & Cooper, 2012).

The issue of data quality and usability within citizen science projects has provoked the need for various methods of assessing project validity and success. This is evident in the literature as several studies have focused on ways to evaluate effective citizen science projects and their data.

A study by Gallo and Waitt (2011) examined the degree to which participants were engaged in citizen science projects. Their methodology included examining the number of entries provided by citizens and compared this to those completed by scientists. In this case, engagement was found to be successful as justified by an increase to the overall database by a factor of 1.5 as contributed by citizens (Gallo & Waitt, 2011). Although examining the total number of entries as a gauge of success is the most direct method, Gallo and Waitt (2011) note that it can fail to account for the varied in-depth knowledge gained that results in educational outcomes, changes in attitude perception, and overall conservation ethics.

A study by Bonter and Cooper (2012) examined the validity of a large-scale citizen science dataset when compiled through smart filters that specifically aimed to reduce invalid data entries. Their findings suggest that smart filters work extremely well at catching ‘suspicious’ data entries, however, incorrect data entries that are not suspicious were accepted as valid. They also

note that professional validators were required to correct suspicious invalid entries (Bonter & Cooper, 2012).

Gardiner et al., (2012) examined citizen science generated data from both the United States and United Kingdom and tested the accuracy of submissions by having them checked by professionals and applying statistical analysis. Although errors existed, they were easily corrected and allowed the researchers to determine that citizen science is the most cost-effective data gathering technique if data validation processes occur (Gardiner et al., 2012). Another study by Galloway, Tudor, and Vander Haegen (2006) similarly used statistical analysis to determine the degree to which accuracy was obtained.

An article by Jordan, Ballard, and Phillips (2012) has taken a broader view of evaluating citizen science and addresses several key issues for effectively assessing citizen science projects. They state that focused evaluation plans should be developed and include ensuring that "(1) learning goals are aligned to project activities (and vise versa), (2) learning outcomes are well-articulated, and (3) both are attainable through identification of relevant indicators (measures of success for achieving desired outcomes)" (Jordan, Ballard, & Phillips, 2012, p. 308). They further state that comprehensive approaches must be used that consider a variety of scales including making evaluations at the participant, program, and community level (Jordan, Ballard, & Phillips, 2012). Lastly, they address the benefits of these evaluation systems such as increased program success and potential socioecological resilience.

However, few studies have evaluated this by-product of citizen science projects. In many cases, educational outcomes, such as knowledge and appreciation gain, are an important and a prioritized objective (Henderson, 2012; Gallo & Waitt, 2011). Many examples are present in the

literature that describe the range of educational benefits that occur through citizen science projects (Oberhauser & LeBuhn, 2012), however, few studies have focused specifically on the effectiveness of citizen science projects at providing educational outcomes.

2.6.4 Innovative technologies.

Several recent studies have examined the effectiveness of incorporating smartphones and similar devices into various educational settings using a variety of methods.

A study by Land and Zimmerman (2015) examined three situations where mobile devices were used to foster learning. To measure learning, they used an analytical framework that looked at conversations generated from their participants (Land & Zimmerman, 2015). All sessions were video recorded, transcribed, and coded using a theoretical approach from a coding model. This approach was based entirely on qualitative data, as controls were not established that would allow for reasonable statistical comparisons between samples (Land & Zimmerman, 2015).

A similar study assessed how technology-enhanced learning differs from traditional learning within a field-based environmental science curriculum (Anderson, et al., 2015). A mixed methods approach was used to "paint a more representative picture of the educational experiences and learning outcomes" in their study (Anderson, et al., 2015, p. 8). Commonalities in vocabulary were then analysed and compared between each iteration of the study and results indicated that technologically enhanced learning provided higher test scores (quantitative) and higher desire for sharing experiences (qualitative) (Anderson, et al., 2015).

Kurti, Milrad, and Spikol (2007) used a design-based research methodology that examined children's experiences when using mobile technology in an outdoor learning environment as well

as the potential for other educational contexts. Their results indicate that children are receptive to using technology in educational contexts particularly when done in a stimulating 'fun' way.

In another project, a case study approach was used to assess a nature-oriented smartphone application specifically designed for early childhood development. This application was evaluated using a learning framework which consisted of three levels of outcomes and benefits that resulted from the application enhanced learning (Rikala & Kankaanranta, 2014).

Given the relatively recent advent of mobile technologies, it is perhaps not surprising that a wide variety of methods for evaluating their effectiveness for outdoor learning are still being explored.

2.7 Assessing Explore Pinery

Although a variety of methods and methodologies exist for evaluating components found within Explore Pinery, it does not appear as if any studies have evaluated all components that Explore Pinery facilitates simultaneously. Furthermore, it appears that no studies have examined the overall contributions and impacts of innovative smartphone applications that aim to foster experiential outdoor education through the use of citizen science within parks and protected areas specifically, nor is there research which addresses the methodological approach best suited for this type of research.

To effectively assess Explore Pinery, a variety of methodologies, methods, and measures were incorporated from each discipline into a comprehensive research design. A pragmatic mixed methods case study analysis of the Explore Pinery smartphone application was chosen as it was flexible enough in design that multiple areas of assessment could be used. To answer the first research question of how Explore Pinery helps facilitate the achievement of management

objectives, semi-structured interviews were used. To answer the second research question, a quantitative visitor questionnaire was used that measured five main areas including the degree of outdoor education and awareness, sense of place, nature connectedness, satisfaction, and overall experience. These approaches are best suited to answer the research questions as they incorporate elements from each of the four sub-disciplines that Explore Pinery combines. Furthermore, this approach was practical and comprehensive.

The following sections will elaborate on the quantitative visitor questionnaire variables and why it is important that they were assessed. Following this, a methodology chapter outlines how each variable was specifically assessed.

2.7.1 Education and awareness.

The primary mandate of Ontario Parks is to maintain, restore, and protect ecological integrity within the land they govern (Government of Ontario, 2015). This primary mandate is achieved through several objectives, one of which is education resulting in awareness (Government of Ontario, 2016). As several studies have shown, park visitors are likely to lessen their impact on the park if they are made aware of how to do so (Halpenny, 2006). As Explore Pinery facilities access to multiple types of information, including how to reduce one's impact on the park, it is possible that environmentally friendly behaviours could be encouraged. However, just because Explore Pinery facilitates easy access to information does not mean that it is being accessed and used. Therefore, assessing the degree to which users feel Explore Pinery contributed to their education and awareness of the park provided a measure of awareness as well as possible intent to participate in environmentally positive behaviours.

2.7.2 Sense of place.

Sense of place is a complex and vague concept (Shamai & Ilatov, 2005; Shamai, 1991). Sense of place can loosely be defined as a bundle of complex meanings, symbols, and qualities that are associated (consciously and unconsciously) with a location (Shamai & Ilatov, 2005, p. 468). Sense of place is also developed through lived experiences which often lead to place attachment (Shamai & Ilatov, 2005).

Sense of place is an important variable to assess, as Explore Pinery has the potential to influence how visitors experience the park. In addition to education facilitating pro-environmental behaviours, research has also shown that having a strong sense of place, as determined through place identity, place affect, and place dependence, can also be a predictor for pro-environmental behaviours (Halpenny, 2006). As Explore Pinery has the potential to influence visitors' sense of place, it also, by extension, has the potential to facilitate pro-environmental behaviours. Having visitors conduct pro-environmental behaviours within Pinery is important as it contributes to the protection management objective.

2.7.3 Satisfaction.

Visitor satisfaction is an important variable as it ultimately decides if visitors are going to return (Zabkar, Brencic, & Dmitrovic, 2010). Pinery can be defined as a tourist destination as it contains a variety of services, experiences, and products that people consume under the Pinery Provincial Park identity (Zabkar, Brencic, & Dmitrovic, 2010). Defining Pinery as a tourist destination is useful as it allows satisfaction to be modeled within the tourism literature.

One of the largest factors that contributes to satisfaction is the opportunity for tourists to participate in their favourite activities which facilitate social interactions, skill development,

personal goal achievement, and memory generation (Halpenny, 2006). In parks and natural areas, the perceived environmental health is also a contributing factor to satisfaction (Halpenny, 2006; Eisenhauer, Krannich, & Blahna, 2000; Kaltenborn & Williams, 2002). Having satisfied visitors is important as visitor satisfaction is strongly correlated with behavioural intentions, such as returning to a destination (Zabkar, Brencic, & Dmitrovic, 2010). Having satisfied Explore Pinery users could similarly contribute to increasing dedication among visitors as well as the frequency of visitation (Zabkar, Brencic, & Dmitrovic, 2010).

2.7.4 Nature connectedness.

Feeling connected to the natural environment is important as it is considered "a key component of fostering ecological behaviour" (Mayer & Frantz, 2004, p. 504). Assessing nature connectedness of both Explore Pinery users and non-users is important as it will shed light on the much broader issue of using technology in natural environments. Using technology in nature is seen by many as controversial (Levin, 2017; Schwab, et al., 2016; Emerson, 2017) as it has the potential to amplify a growing disconnection from nature (Louv, 2005). However, some argue that technologies have the potential to foster greater support for conservation (Fletcher, 2017).

Explore Pinery has the potential to either exacerbate nature disconnection or contribute to a stronger sense of natural connection. Although the intention of Explore Pinery was to increase the connectedness to nature that visitors feel it is possible that the opposite is achieved. New technologies almost always produce unintended negative consequences (Shultis, 2001), so it is important to consider the nature connectedness variable. Connectedness to nature is assessed through the nature connectedness scale developed by Mayer and Frantz in 2004. This measure is discussed in more detail in the methods sections.

2.7.5 Overall experiences.

Although satisfaction and overall experiences are similar in nature, they are considered two different constructs within this thesis. Research has suggested that measuring satisfaction tends to incorporate people's overall experiences as well as how satisfied they are with those experiences (Weiss, 2002; Lindgaard & Dudek, 2003). This is problematic as these two different, yet closely related, constructs are combined leading to a lost opportunity to explore potential relationships between overall experiences, satisfaction, and other variables (Weiss, 2002; Lindgaard & Dudek, 2003). Weiss (2002) argues that an important distinction exists when understanding satisfaction which is that satisfaction is described as an attitude towards something and not a person's affective reaction. Following this, attitude is understood as a general evaluation based on several sources of information. This distinction is important for assessing Explore Pinery as it provides more detail in evaluating how the application impacts visitors.

Separating satisfaction and overall experiences are also beneficial as it allows the theory of self-efficacy to predict several outcomes. Self-efficacy is described as how people are driven to solve their own problems when possible (Bandura, 1977). The more someone can successfully solve a problem the more self-efficacy they achieve. This is useful in the Explore Pinery case as it describes the relationship that park visitors potentially develop while using the application. The common problem that park visitors face is that they require more information to be able to enjoy park activities. Explore Pinery is a convenient tool that visitors use to get information at their leisure. The more someone uses Explore Pinery the more they are able to solve their information shortages which in turn boosts their self-efficacy.

Based on the ability of Explore Pinery to provide information and boost the self-efficacy of visitors, several additional outcomes can be hypothesized. A study of student online learning modules showed that when students have higher levels of motivation (attitude) they achieved higher levels of technology self-efficacy (Wang, Shannon, & Ross, 2013). Furthermore, the combination of self-efficacy and attitude led to higher levels of satisfaction and better final grades. This model can be applied to Explore Pinery in that visitors with positive attitudes towards technology are more likely to have higher self-efficacy leading to higher satisfaction and better overall experiences.

Chapter 3: Methodology

This chapter will outline the ontological foundations, epistemology, methodology, and methods used for evaluating the Pinery Provincial Park smartphone application. A detailed justification is provided for the unique evaluation approach used. This chapter will follow Berbary and Boles' (2014) scaffolding for humanist research where possible.

3.1 Evaluation Approach

As demonstrated in the literature review, a variety of approaches are used to evaluate projects within the innovative technology, parks and protected areas, citizen science, and outdoor education disciplines. The combination of these disciplines into a single project presents a challenge wherein no clear evaluation approach presents itself. Furthermore, as the Explore Pinery app is a pilot project, no similar examples exist after which the evaluation approach can be modeled. As such, a pragmatic mixed methods evaluation approach was chosen which used both qualitative and quantitative methods to evaluate two separate components of the Explore Pinery smartphone application. This approach solved the problem of having no comprehensive evaluation model as a template. The overarching benefit of this pragmatic mixed methods evaluation was that each method was specifically designed to enable a better understanding of the complex social phenomena created by the Explore Pinery smartphone application (Hillman & Radel, 2018, p. 225).

3.2 Philosophical Foundations

This section will outline the philosophical schools of thought being followed and address the incongruences that accompany mixed methods research. Typically, mixed methods research incorporates elements of pragmatism, wherein decisions are made concerning the merging of

theory and practice (Bryman, 2008; Greene, 2008; Onwuegbuzie & Leech, 2005; Hillman & Radel, 2018).

This thesis is situated within a realist ontology which states that the world and objects within the world exist regardless of peoples' acknowledgement of them (Crotty, 1998; Schwandt, 2015). A realist ontology is congruent with both post-positivist and constructivist epistemologies which are used separately within this mixed methods thesis (Pernecky, 2016; Crotty, 1998). Often, the philosophical counterpart to qualitative research is a form of constructivism/constructionism, and the counterpart for quantitative research is post-positivism (Maxwell & Mittapalli, 2015). The combination of these epistemologies in mixed methods research is problematic as each has its own set of assumptions and truths. To account for these incongruences, some mixed methods researchers follow a critical realist ontology which seeks to set aside incongruences and focus on high-level explanation and insights (Hillman & Radel, 2018, p. 228). Although a critical realist ontology could work within this thesis, incongruences would arise when tracing a critical realist ontology through the epistemological, theoretical, and methodological levels of this mixed methods design which could lead to a less rigorous and robust theoretical framework (Berbary & Boles, 2014). For example, a critical realist ontology provides opportunities to "communicate across philosophical and methodological divides" associated with quantitative and qualitative research (Hillman & Radel, 2018, p. 228). Although this could be justified within this thesis, this research is designed in a way to meet the highest level of theoretical rigour possible which has no philosophical and methodological divides in the first place (Berbary & Boles, 2014). This is accomplished by completing each method independently from each other, which allows the quantitative and qualitative methods to each have rigorous and robust epistemologies, theories, and methodologies. This approach of completing essentially two separate studies technically

makes this thesis a mixed methods evaluation and not a true mixed methods research study as defined by mixed methods scholars, wherein data from two different methods are combined to answer a single research question (Hillman & Radel, 2018). Therefore, although critical realism is often a convenient choice for mixed method researchers, this thesis followed a realist ontology, which allows each method to retain its own rigour and robustness.

For the first method, a social constructivist epistemology was followed which is described as individuals seeking meaning within their world and developing subjective meanings of their experiences which are directed towards certain objects (Creswell, 2007, pg. 24). These meanings are also influenced by social and historical contexts within individual lives but are not forced upon the individual (Creswell, 2007, pg. 24). In this case, social constructivism can be thought of as follows: park staff use Explore Pinery within their job to achieve management objectives. Each staff member, therefore, develops their own meanings and understandings of the app, as well as their own subjective meanings of their experiences using the app. Interactions with other staff members also help to influence the meanings someone develops, but the meanings are not forced upon the staff member.

For the second method, an objectivist epistemology was followed which is described as a process to falsify findings through a scientific method (Crotty, 1998). A scientific method involves making sound, bias-free decisions regardless of the subject matter (natural verse human sciences) that employ quantitative mathematical practices and analyses based on the objects of the study (Crotty, 1998).

As outlined by Berbary and Boles' (2014) scaffolding for humanist research, theory is the next component of a research project that follows ontology and epistemology. The qualitative

components of this thesis follow a general interpretivist theory which allows me as the researcher to investigate a social phenomenon and construct meanings from the phenomenon that contribute towards a better understanding (Schwandt, 2015; Crotty, 1998). This type of theoretical lens embraces biases which allows information within a very specific context to be highlighted and shared.

In the quantitative components of this thesis, the theory of self-efficacy is used (Bandura, 1977). It should be noted that this type of theory has many differences when compared to a qualitative theory and does not fit within Berbary and Boles' (2014) scaffolding for humanist research. For example, a theory in a postpositivist study is specific, testable, and predictive, whereas a theory in a qualitative oriented epistemology examines findings through a particular lens (Schwandt, 2015). In this thesis, the theory of self-efficacy and general interpretivist theory each enable a specific, and contrasting, type of information to be discovered and illuminated, both of which contribute to a comprehensive evaluation that neither method could provide alone.

3.3 Case Study Methodology

This case study methodology was informed by the mixed methods evaluation wherein each method focused on a specific element of the case. A case study methodology was also chosen as it aligns well within both constructivist and objectivist epistemologies (Baxter & Jack, 2008; Yin, 2009), and focuses on answering "how" and "why" questions (Yin, 2009; Baxter & Jack, 2008). For this specific research, a case study methodology allows "how" questions to be asked and answered, for example, how does Explore Pinery influence the achievement of park management objectives (qualitative), and how does Explore Pinery impact visitors' experiences (quantitative). Furthermore, a case study methodology was selected as several criteria outlined

by Yin (2003) match the complex research situation surrounding the Explore Pinery smartphone application. For example, it is not (pragmatically) possible to manipulate the behaviour of the park supervisors/managers, there are complex contextual conditions that are connected to the research, and the boundaries are unclear between how the phenomenon (Explore Pinery) and the context (park staff & visitors) interact (Yin, 2003). Therefore, an evaluation of the Explore Pinery smartphone application is well suited for case study research.

As in all case study research, it is important to define the case and describe it well (Miles & Huberman, 1994; Baxter & Jack, 2008). In this research, the case is Pinery Provincial Park which is located south of Grand Bend, Ontario, and is approximately twenty-five square kilometres in size (The Friends of Pinery Park, 2018). The park was established in 1959 and is currently classified as a natural environment park, meaning that the priorities of the park are to "protect outstanding recreational landscapes, representative ecosystems and provincially significant elements of Ontario's natural and cultural heritage and to provide high quality recreational and educational experiences" (Ontario Government, 2006, p. 4). Pinery receives over 600,000 visitors annually, making it the third busiest park in the Ontario Parks system (Ontario Parks, 2011). Pinery contains an impressive array of significant natural features including "over 757 plant, 325 bird and 60 butterfly species" (The Friends of Pinery Park, 2018, p. 1). In addition to the impressive number of species, Pinery contains several significant natural areas including "a globally rare Oak Savanna ecosystem; freshwater coastal dunes; habitat for endangered species; and the largest protected forest in southwestern Ontario" (The Friends of Pinery Park, 2018, p. 1). Pinery Provincial Park also delivers a large range of interpretive programs which educate visitors about the park's natural heritage.

It is also important to describe the units of analysis, which in this case are how staff and visitors interact with the Explore Pinery smartphone application. To understand how staff and visitors interact with Explore Pinery, it is first important to understand exactly what Explore Pinery is and does. Explore Pinery is an application designed for smartphones and tablets. It is free to download and was designed with accessibility in mind. The app came about as there was a need to have a more convenient way for visitors to access diffuse pieces of information during their visit to Pinery. There was also a continual effort to engage more visitors in education-based programs, and an application appeared to be one of many potential ways to achieve this. Therefore, the app acts as an information dashboard for the Park which contains relevant information visitors often need during their stay. It also allows visitors to participate in citizen science projects, such as submitting wildlife sightings through photo documentation. On the staff side, wildlife sightings among other data can be used to create databases which have the potential to inform management decisions. The application also allows staff to engage with visitors electronically and provide follow-up information on data submissions. Although Explore Pinery has many additional features and uses, these are thought to be the ones most used. The Natural Heritage Education department at Pinery manages the Explore Pinery application and has the greatest invested interest, as Explore Pinery's content was developed to be congruent with the department's activities and responsibilities.

'Binding' a case study is also important as it describes what the specific case is not (Yin, 2009; Baxter & Jack, 2008). For this thesis, activities in Pinery that are not influenced by Explore Pinery are not considered to be part of the case. Other provincial parks in Ontario are also not included in this case because Pinery Provincial Park is the only park in the Ontario Parks system that has a smartphone application.

Now that the case is defined, it is important to realize there are several different types of case studies (Baxter & Jack, 2008). This case study is intrinsic, as I have interest and investment in understanding the overall case (Stake, 1995), as well as exploratory, as the Explore Pinery application is being evaluated with no single set of clear anticipated outcomes (Yin, 2009). Therefore, this thesis employs an intrinsic, exploratory case study methodology to holistically understand the complex social phenomena surrounding the Explore Pinery smartphone application (Yin, 2009 p.4).

3.4 Research Ethics

This research received approval from the University of Waterloo's Office of Research Ethics (Appendix 1). Approval was also obtained from Ontario Parks to conduct research in a provincial park (Appendix 2). Staff participants for the qualitative component were recruited via email and were given pseudonyms to keep their identity hidden. Participants for the quantitative questionnaire were recruited by setting up an information booth in high traffic areas. Once the booth was approached by a visitor, they were asked if they wanted to participate in a study on how technology is used in Pinery. Both qualitative and quantitative participants were presented with an information letter and were required to sign a consent form before participating. All data recording and storage occurred in compliance with the University of Waterloo Ethics Board's guidelines, which included having all data locked in a secure location.

It is important to recognize my positionality and how it ethically situates me within this research. My educational background is in geography and environmental management with specializations in earth systems science and parks. Through the University of Waterloo Co-op program, I have had several opportunities to work in parks and protected areas at both the provincial and federal level. I have also worked at Pinery Provincial Park for four summer

seasons and some part-time work year-round in the Natural Heritage Education department. This department is responsible for delivering educational programming and undertaking resource management objectives, which I participated in extensively. While working in the Natural Heritage Education department, I formed working relationships with the supervisors which allowed me time to learn their leadership styles and general personalities quite well. From working closely with the supervisors, I've also learned that we share a set of values when it comes to conservation and education.

While working in the summer of 2015, I hypothesized the potential benefits that a smartphone application could yield within Pinery. I then proposed that a Pinery specific smartphone application be funded, which The Friends of Pinery Park agreed to. While on seasonal contracts, I developed the smartphone application which also was used as part of my undergraduate thesis. In January 2016, we publicly launched Explore Pinery which continues to be used by park visitors and staff alike.

Given my combined experiences, I am very well situated to conduct this research as I am the most familiar with the Explore Pinery app and have a very comprehensive understanding of how the Natural Heritage Education department operates. As such, I have an in-depth knowledge of the potential pros and cons that a Pinery specific smartphone application could have on the Natural Heritage Education department, and how this translates to broader park issues. Given the relationships and shared values I have with the park supervisors that participated in the qualitative research, I was able to understand and interpret topics that we discussed with ease. Ultimately, my positionality and closeness to the participants, smartphone app, and Pinery allowed me to complete a tactful analysis that represents the experiences and opinions of the participants.

The following methods sections are divided into separate chapters. The first chapters will outline the qualitative methods, procedures, and analyses used, while the proceeding chapters will outline the methods, procedures, and analyses used for the quantitative component. Splitting these sections is done intentionally to facilitate better flow and readability within each of the selected methods.

Chapter 4: Qualitative Study

4.1 Qualitative Methods

The qualitative component of this thesis consisted of a series of semi-structured interviews. The intent of these semi-structured interviews was to illuminate how Pinery Provincial Park staff understand the role of the Explore Pinery app in influencing their ability to achieve park management objectives.

4.1.1 Qualitative interviews.

A qualitative semi-structured interview technique was used as it allowed for open-ended questions to be asked which prompted participants to respond with a wide range of answers (Roulston, 2010). A semi-structured interview was also used as it provided opportunities for me to ask both scripted and non-scripted probe questions to further unpack the participants' answers (Roulston, 2010; Tracy, 2013). This approach was consistent with my purpose and qualitative research question, as I aimed to understand how Explore Pinery influences park management objectives based on the experiences and opinions of the Natural Heritage Education Supervisors. A semi-structured interview allowed questions directed towards each management objective to be asked while leaving the discussion open enough for participants to respond in a variety of ways. I was then able to ask probing and follow-up questions to further solicit the type of information I was after. This approach would not have yielded the type of information I was after if a fully structured or fully unstructured interview approach had been used (Roulston, 2010). Methodologically, semi-structured interviews fit well within case study research as they allowed for opportunities to investigate participants' opinions rather than strictly behaviour events (Yin, 2009). Exploring the opinions of my participants was particularly important in this case study research as the information they provided directly addressed my first research question.

The semi-structured interview guide was designed in a way that focused on each of the three management objectives as core questions (Creswell, 2013) (see appendix E). This approach allowed the interview to be guided towards answering the research question, but still permit flexibility of possible answers (Creswell, 2013; Tracy, 2013). Tracy (2013) outlines several characteristics for developing good interview questions upon which mine were based. While developing my interview guide I made sure that the questions were clear and simple, focused on one concept at a time, were open-ended, neutral, and were followed by probe questions (p.164-165).

The first question focused on the protection management objective and how Explore Pinery influences environmental protection within the park. This question is related to many of the park's conservation initiatives such as species at risk management and reporting, invasive species removal, and habitat improvement. The second question focused on the heritage appreciation management objective and the influence that Explore Pinery has. This question is related to the many education programs that cover a variety of nature-related topics offered at Pinery, such as children's programs, presentations, guided hikes, and historical theatre programs. The third question is related to the recreation management objective and the influence that Explore Pinery has on recreation. The final question asked participants to consider how Explore Pinery creates or overcomes barriers within the park. This was left intentionally vague to facilitate a variety of possible answers and to uncover any type of information that might have been missed from the previous questions.

4.1.2 Qualitative procedures.

Criterion sampling allowed me to select participants based on several criteria (Creswell, 2013) including (1) holding a supervisor position, (2) having in-depth knowledge of the Explore

Pinery app, and (3) having in-depth knowledge of how the Natural Heritage Education Department operates. Holding a supervisor position was important as specific aspects of a supervisor's job are tied directly to all management objectives but primarily the protection and heritage appreciation objectives. Therefore, supervisors are expected to be knowledgeable of the management objectives and activities that are carried out by the park to meet these objectives.

Having an in-depth knowledge of Explore Pinery was extremely important for several reasons. First, Explore Pinery was launched in January 2016 which means that few staff are likely to be familiar and comfortable with the app. There are a number of reasons for this, some of which include the following: (1) staff not having enough time to understand Explore Pinery's features and potential applications, (2) a staff member's job does not interact with the app in any way, (3) staff members do not have an interest, and (4) a staff member is not competent with technology or is not issued a park cell phone. Second, it was important that staff members realise the scope and capabilities of Explore Pinery as they would then be able to see connections and potential uses for the app that have not yet been created. This allows insights to be gained that would only be possible for those who are both very familiar with the ins and outs of Explore Pinery and the management objectives.

Being familiar with the Natural Heritage Education Department was the last selection criteria as this department is responsible for designing and implementing all the protection and heritage appreciation management related activities. The department is also responsible for recreation activities, although to a lesser extent wherein they assess the sustainability of recreation activities and ensure they do not compromise the protection objective.

Due to the limited number of staff at Pinery, few options existed for interview candidates. Furthermore, very few staff actually met the three criteria outlined above which were key to facilitating an interview that would be likely to provide insightful, well-informed opinions and experiences. The three individuals who met all three stringent criteria were identified and contacted for an interview. All three staff members who were contacted agreed to participate and were interviewed on December 16th, 2018. Each participant was given a pseudonym to keep their identity confidential and all interviews were audio recorded and transcribed using a digital recording device (Roulston, 2010).

Interviews occurred in a private staff room, located at Pinery Provincial Park in the Visitor Centre. Each participant was offered the chance to schedule the interview at a neutral and confidential location (Roulston, 2010), however, all participants wanted the interview within the visitor centre, near their work stations for convenience. The interview was strategically located within the Visitor Centre private lunch room which is one of the few areas in the building that has a closed door and is quiet. It is my assumption that the participants had discussed participating in the interview with each other beforehand as they each knew when the other participants were available and helped coordinate the best times to have each person interviewed. This occurred despite my efforts to keep confidentiality within the participants. Participants did not have an opportunity to discuss the details of other participants' interviews before they themselves were interviewed as the busy schedule that day had participants coming and going right before and after the interview occurred. This allowed each participant to not be influenced by the previous participant's interview (Roulston, 2010). Although controlling for bias was not important in this qualitative research study, I do believe that each interview was genuine and not

influenced by the previous participant's interview and answers, as there was no opportunity to discuss them with each other.

The first participant, Victoria, holds an undergraduate degree in Ecology and Evolution and a master's degree in biology. Victoria has over 9 years of experience at Pinery and a variety of related experiences before working at Pinery. Victoria has a quiet yet knowledgeable leadership style and focuses primarily on resource management tasks. Victoria's interview lasted approximately 29 minutes. As the first interview, I felt nervous despite rehearsing my interview guide several times (Tracy, 2013; Roulston, 2010). I had a pen and note pad to take notes, however, I found it extremely difficult to write down useful notes and think of probe questions in real time that were based on what the participant was saying instead of my pre-written, not-so-useful in the moment, interview guide probes. I made the decision then, to put my full attention on what the participants were saying and respond with well thought out probes that unpacked topics they covered. I further justified this in that I would much rather have an audio recording that includes well thought out probes that unpack the participant's answers than poorly written notes and poor probe questions.

The second participant, Ron, holds both an undergraduate and a master's degree in Biology and has over 15 years of experience at Pinery. Ron has many accomplishments such as academic publications, field guide publications, and several awards to name a few. Ron has a knowledgeable leadership style and uses humour in most situations which creates an enjoyable work environment. Ron also has a lot of strategic visions for future and current Natural Heritage Education projects which staff are eager to work on. Ron's interview lasted approximately 39 minutes and had a more energetic feel to it when compared to the first interview. Ron had just come in from outside and had missed his lunch break and he asked if he could eat while in the

interview which I agreed to. Ron's interview was coherent, and he had well-formulated answers that incorporated many connections to various projects, management objectives, and ideas. The interview gave me a sense that he has previously thought about many of the questions I asked as his answers had significant depth and insight to them. Many of Ron's answers tied directly back to the management objectives themselves and why Ontario Parks exists in the first place. I believe the amount of depth in his answers reflect that he has worked for Ontario Parks the longest and is also a spokesperson for conservation both within and outside of Pinery.

The last participant, Emily, holds a science undergraduate degree and has approximately 8 years of experience at Pinery, however, only half a year of experience as a supervisor. Emily has a quiet and knowledgeable leadership style and gets along with staff very well. Emily's work has an outdoor education focus to it. Emily's interview occurred last and was approximately 31 minutes long. My relationship with Emily is different than that with Victoria and Ron, as Emily and I have been peers for many years. This appeared to have influenced the interview in that I felt we both may have been shy and nervous. Some of my large-scale open-ended questions appeared confusing for Emily, so I adapted my interview style and focused more on targeted open-ended questions. This approach resulted in more back and forth chatting about various projects associated with management objectives as opposed to lengthy one-sided stories.

After the interviews were completed and transcribed, a member check occurred. Member checks happened in the form of an email approximately 2 weeks after the interview occurred. I asked each participant to review the transcript carefully and to ensure (1) they were accurate and reflected the conversations we had had during our interview, and (2) to add any comments or additional feedback that might have been missed in the interview (Birks & Mills, 2011). All

participants indicated that the transcripts were accurate and that they did not have anything further to add.

Although these interviews were few in number and relatively short in length, this is justifiable in that (1) strict participant selection criteria existed where there were only three possible people who met all criteria, (2) the interviews reached a saturation point where participants felt they had no more to add, and (3) the interviews covered enough material to answer the research questions.

4.1.3 Qualitative analysis.

A thematic analysis was used to analyse the data which identified deeper meanings within participants' experiences and allowed for the creation of themes (Braun & Clarke, 2006; Creswell, 2007). This thematic approach was chosen over grounded theory based on arguments made by Braun and Clarke (2006), wherein a thematic analysis does not need to "subscribe to the theoretical commitments of a full-fat grounded theory, which requires analysis to be directed towards theory development" (p. 81). In the context of this pragmatic research, a thematic analysis is sufficient as the identification of themes is enough to answer the research questions. This thematic analysis followed a six-step process outlined by Braun and Clarke (2006). First, the interviews were audio recorded and transcribed. I read through each transcript multiple times to gain familiarity with them. I found this step of familiarizing myself with the transcripts very useful in some of the later analysis steps. Before step two, I decided to read through the transcripts again and divided verbatim excerpts from the transcripts into three different sections as they related to each of the three management objectives (See Figure 1). It is important to note that the entire analysis process occurred three separate times (once for each management objective) and that the outcome (themes) were independent for each section. It should also be noted that it was anticipated that each section would have its own unique themes.

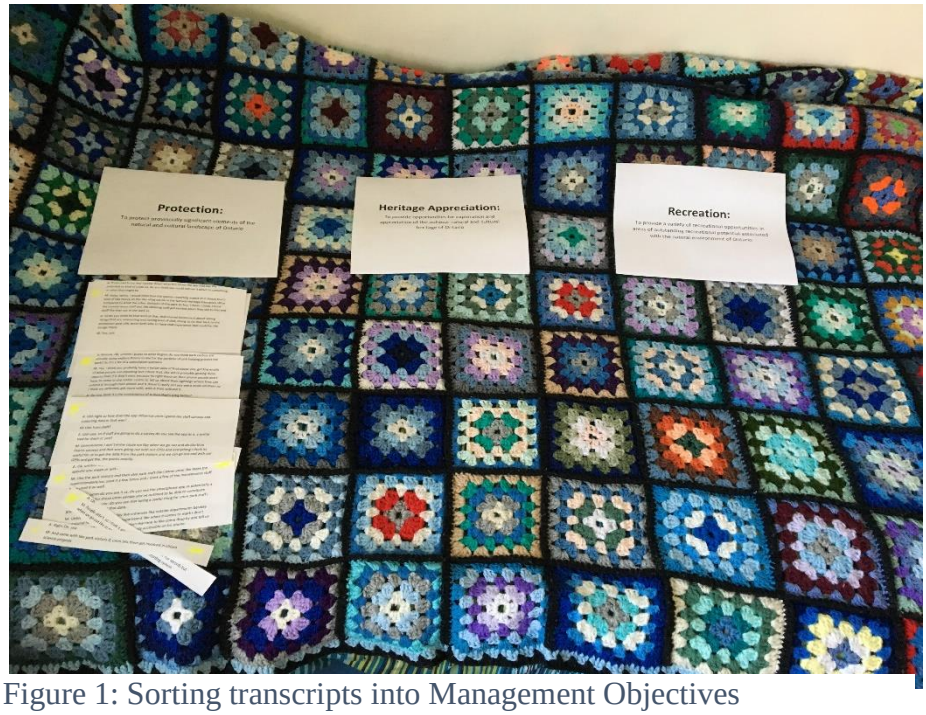

Figure 1: Sorting transcripts into Management Objectives

After dividing all the content into the management categories I moved onto step two, which involved reading each line of the transcripts again and assigning a code word to each line which was written on the right-hand margin of the page (Figure 2). With each code word, I attempted to summarize the main ideas of the sentence and in some cases assigned two code words when multiple ideas were present.

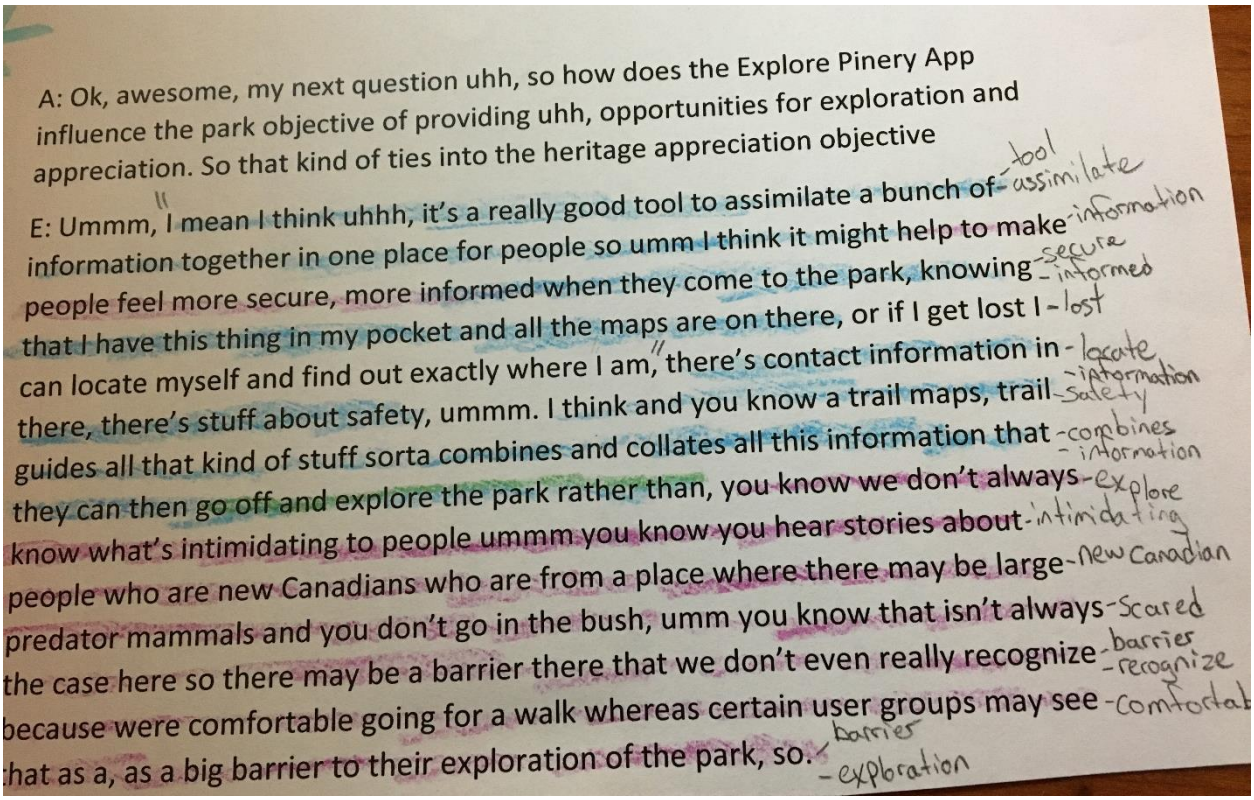

Figure 2: Assigning Code words (at this point in time the blue, green, and purple highlights were not present)

Next, for step three, I compiled every single code word into a Microsoft Office word document which was printed and cut into individual pieces. As noted above, each management objective section was kept separate from each other. In other words, although every code word was printed and cut out, they all stayed within their respective section. After each code was cut out, I laid them out on a desk (Figure 3) and began to make categories by grouping similar words (Figure 4). Once all code words were put into a category, I assigned a category summary word for each group of codes. These category summary words were typed, printed, and cut so that they could be sorted for step four.

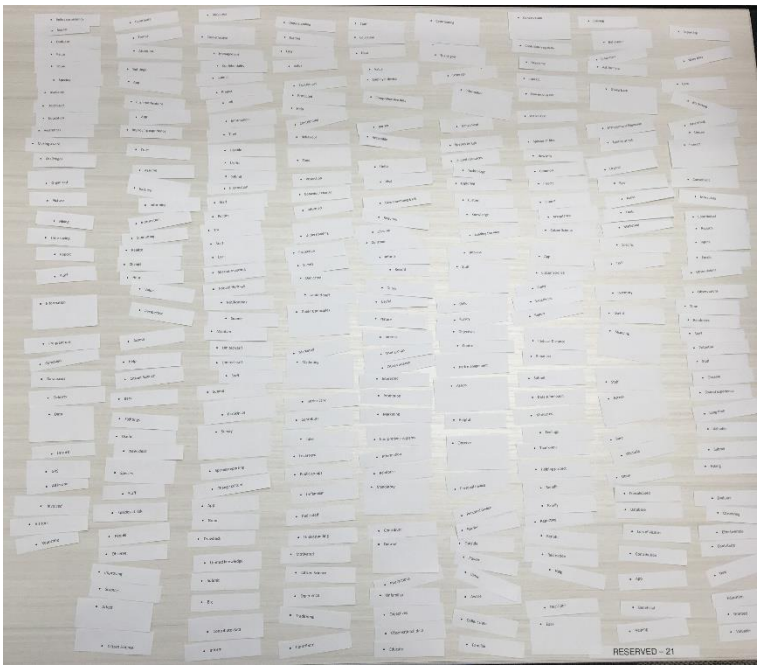

Figure 3: Thematic Analysis Code Words

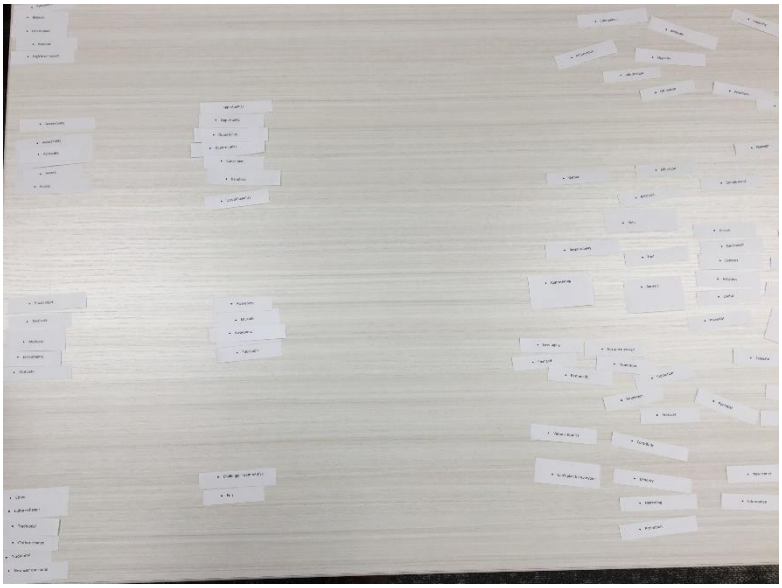

Figure 4: Categories Being Formed From Code Words

Step four involved taking all the category summary words and grouping them by similarity which formed the basis for each theme (Figure 5). As seen in Figures 5, 6, and 7, each management objective ended up having three groups of categories that were similar to each other. Each group of categories was summarized within each management objective. Starting with the protection objective, the groups of categories were summarized as information, exploration, and innovation. To my surprise, both the heritage appreciation and recreation objectives were also best summarized as information, exploration, and innovation. The original transcripts, codes, and categories were then checked again to see if they were congruent with the three generated themes. I then went through all transcripts with highlighters (blue, green, and purple) and highlighted any text that related to a particular theme (see Figure 1 above).

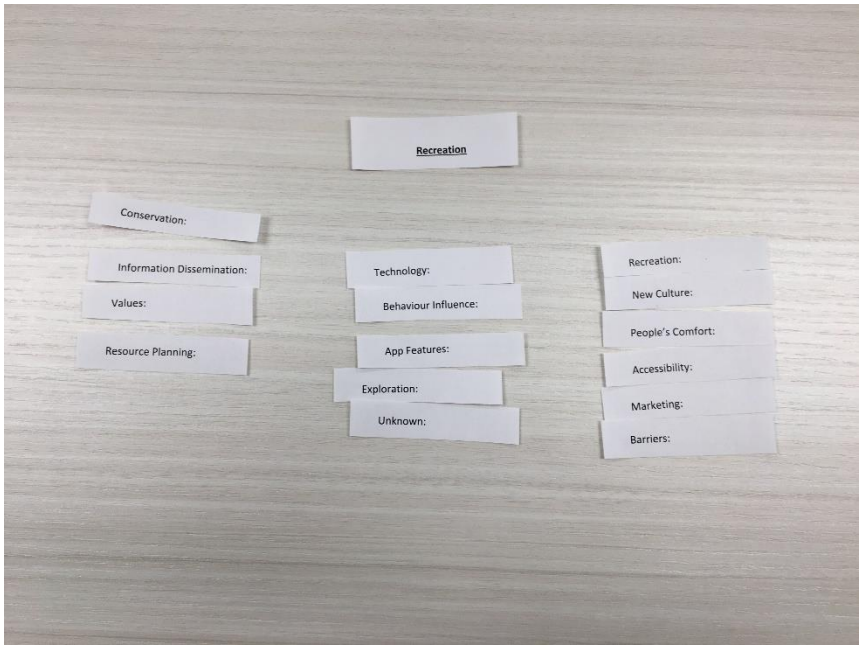

Figure 5: Categories Grouped by Potential Theme

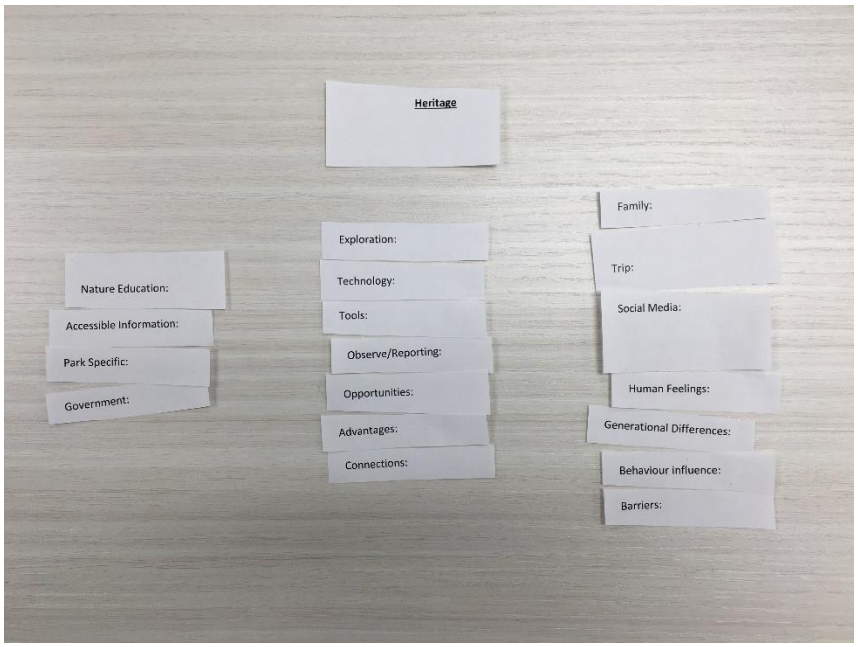

Figure 6: Categories Grouped by Potential Themes

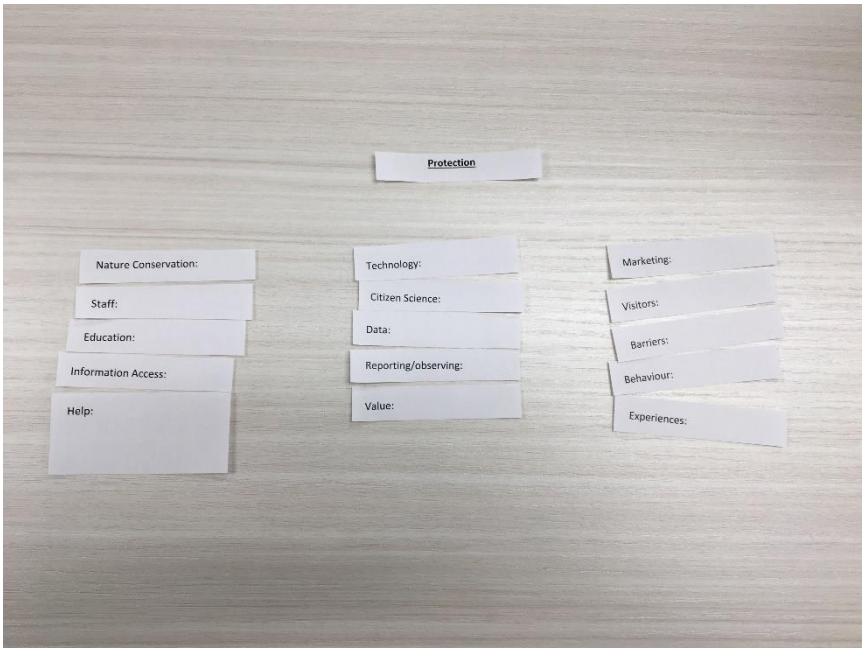

Figure 7: Categories Grouped by Potential Theme

Step five involved analyzing the themes and developing clear descriptive names (Braun & Clarke, 2006). The information theme was developed into “providing information access”, the exploration theme was developed into “facilitating opportunities for exploration”, and the

innovation theme was developed into “innovative experiences”. I then compiled all quotes relating to each theme into one document and coloured the quotes based on who said them. Ron was assigned blue text, Victoria green text, and Emily orange text. From here, I cut out each quote which allowed me to better sort the text in a way that flowed and made the most sense based on my interpretations (See Figure 8). These three developed themes are the backbone to the findings of this study.

The final step six, is outlined in the following findings section where quotes are selected that illustrate the strength of these themes as they exist through the staffs’ perceptions of how Explore Pinery interacts with the management objectives.

4.1.4 Step five and six re-evaluation.

Initially step five and six were structured in a way to highlight how each theme was present throughout all the management objectives. Each theme was structured with three subheadings which were “Protection”, “Heritage Appreciation”, and “Recreation.” This process occurred nine times, once for each management objective within each of the three themes. While writing the initial findings section, I found it difficult to decide where to include different types of information because they applied under multiple management objectives and multiple themes. Upon finishing the write up of the findings, it came to my attention that the way information was presented in my findings section was in some cases duplicated and/or not fully fleshed out. This resulted in a re-examination of the structure and layout of the findings section. It was then decided that I would remove the rigid management objective sub-headings present throughout each theme section, and instead develop sub-themes that combined similar information in one place, regardless of how many management objectives it relates to. I started this process by reading through my entire findings section and each time I found a topic that could be a sub-

theme I wrote it down. As I was reading, it was apparent that several sub-themes were present throughout different management sections and that several sub-themes overlapped with the themes.

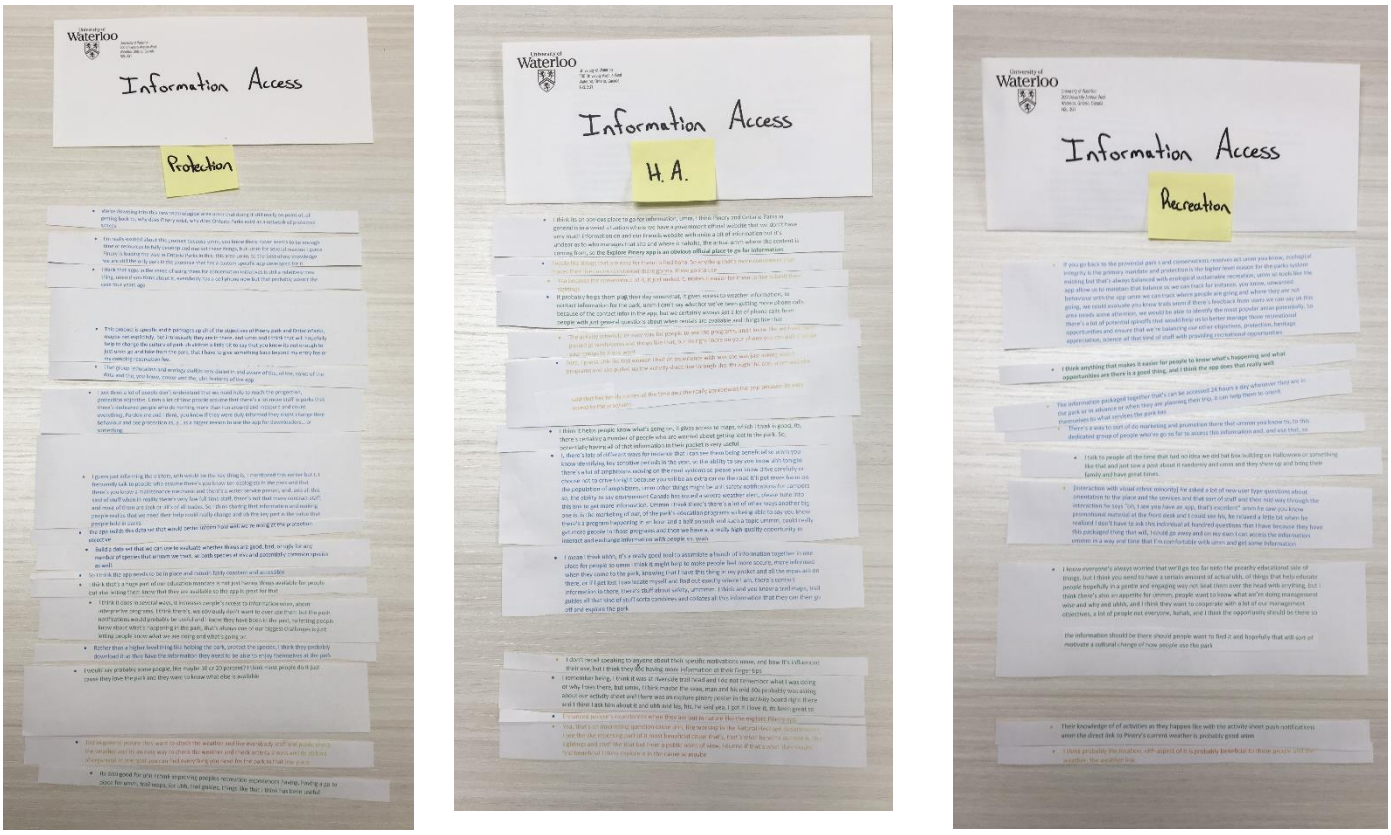

Figure 8: Information Theme - Three subheadings with sorted quotes in order

I then realized that the best way to display this type of information was through a three-way Venn diagram. As I was constructing the Venn diagram, I also realized that the areas that overlapped could be thought of as outcomes and not just subthemes. These subtheme outcomes were “informed visitors”, “visitor exploration”, and “new user groups.” The area where all three of these themes and subthemes overlapped became “dedicated users.” This subtheme representation better displays the relationships and fluidity of the topics than the initial rigid management objective sections. From here, I took every quote and placed them in the subtheme that it best referred to (Figure 9).

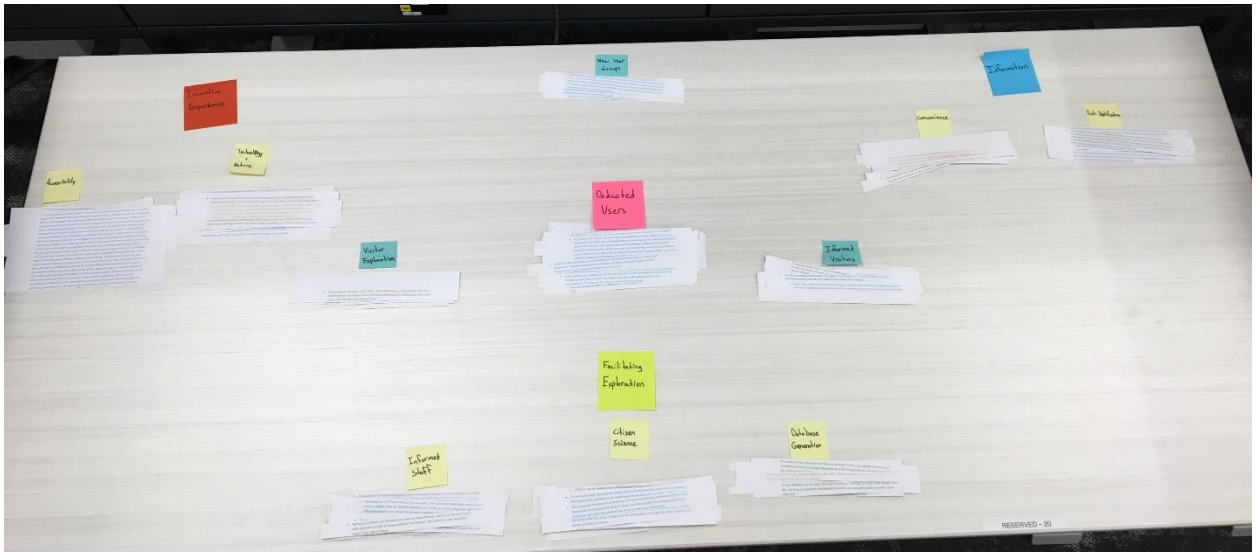

Figure 9: Subthemes and Outcomes Quote Sorting

Chapter 5: Qualitative Findings

5.1 Introduction

After re-evaluating the initial findings structured by management objectives, a different thematic analysis occurred which highlighted subthemes and outcomes. These findings are outlined below by demonstrating through participant quotes the three main themes and each of their non-overlapping subthemes, which is then followed by subthemes that overlap across themes (which can be thought of as outcomes), and finally by describing the single subtheme (or outcome) that overlaps between all themes. This can best be conceptualized by Figure 10 which visually shows the relationships between themes and subthemes.

When understanding Figure 10, it is important to acknowledge how my personal experiences and connections to Explore Pinery influence the findings. Given that I created Explore Pinery and have worked in the Natural Heritage Education department for approximately five years, I too have insights into how the app operates within Pinery and the types of experiences it facilitates. Therefore, I have structured the findings in a way that best highlights the positive outcomes Explore Pinery facilitates as seen through the eyes of my participants. Following Braun and Clarke's (2006) thematic analysis allowed similar types of information to be grouped together to form themes and subthemes which I then labelled based on my understanding of the staff's perceptions of how Explore Pinery interacts within Pinery. It is likely that someone without my experience would not be able to analyse the data in a similar way, as they would lack the experience and knowledge of how the education department functions and how the application fits within it.

Figure 10: Conceptualization of Themes, Subthemes, and their Interactions

5.2 Information Access

The "providing information access" theme summarizes information that is made available to both park visitors and staff. This theme covers both the types of information provided as well as the way it's provided. Generally, a lot of information is made available through Explore Pinery which acts as a major distributor of valuable park information. Examples of information made available to visitors through Explore Pinery include services and amenities, educational program opportunities, and information about participating in citizen science, to name a few. Information is also exchanged between park visitors and staff, who can then have multiple conversations about anything park related. Information passed onto staff from visitors also

comes in the form of data which then allows staff to choose how they act on the information provided. A subtheme within the information access theme is 'push notifications' which refers to Explore Pinery's ability for staff to send specific types of information to certain people, based on their geographic location. However, a bigger part of the information access theme is the subtheme of convenience. Pinery staff indicate that the information access Explore Pinery provides users is extremely convenient in a variety of ways.

5.2.1 Convenience.

The convenience subtheme is illustrated firstly by Victoria who notes that the lack of a clear place for park visitors to go for information is confusing which originates from "a weird situation where we have a government official website that we don't have very much information on, and our Friends website with quite a bit of information but it's unclear as to who manages that site" (Victoria). This lack of a streamlined process makes *"*the Explore Pinery app an obvious official place to go for information" (Victoria). Before Explore Pinery existed, visitors may have had to spend "hours and hours to mine through various websites and sources of information" (Ron), but now "the information is packaged together [and] can be accessed 24 hours a day whenever they are in the park" (Ron). This allows visitors to "find everything [they] need for the park in that one place" (Emily). Furthermore, visitors can plan their trip in advance which can "help them to orient themselves to what services the park has" (Ron). While visitors are at Pinery, they have a variety of convenient tools at their disposal. One tool is "an easy way to check the weather" (Emily) and the ability to pull up the activity schedule which makes it "an easy way for people to see the programs" (Emily) offered by the park. Although the activity schedule is posted at certain locations in the park, Explore Pinery puts it "right there on your phone you can pull it up on your campsite if you want" (Emily) which means people do not

physically have to go searching for them. Explore Pinery also "improv[es] people's recreation experiences by having a go-to place for trail maps [and] trail guides" (Victoria). While out exploring the park, visitors can also submit wildlife sightings through the Explore Pinery app instead of coming to the visitor centre to report them. Emily particularly liked this feature "because the convenience of it, it makes it easier for them to submit their sightings" which is beneficial because "maybe they have the intention of reporting it but, a day goes by in their trip and they don't want to take the time out to come to the visitor centre" but since "it's on the app they can instantaneously report it" (Emily). Emily also noted that the wildlife reporting feature is convenient for staff too as she's "used it when [she's] gone for a hike but not been working" and exclaimed that "I have it in my pocket so I'm able to report" things. This is also illustrated by the superintendent of Pinery Provincial Park as he has also used this feature which Emily commented on, "I don't know if he would have necessarily taken the time to come drop by and tell us about things he's seen if it wasn't easily accessible on his phone". In summary, Explore Pinery provides convenient access to information for both park visitors and staff alike. "People like things that are easy for them to find" (Emily), "like having more information at their fingertips" (Victoria) "so anything that's more convenient that makes their lives more convenient they're going to use" (Emily).

5.2.2 Push notifications.

Push notifications are a specific feature within Explore Pinery that give staff "the ability to get a customized message out to the subset of users who have downloaded the app" (Ron). These messages can also be Geo-fenced meaning that the message is only sent out to people within a certain location, for example just people located within Pinery Provincial Park. This feature has a variety of applications and fits well within the providing information access theme as it

"increases people's access to information" (Victoria) and "lets people know about what's happening in the park" (Victoria) which is "always one of our biggest challenges". Push notifications also provide an opportunity to specifically "market the park's education programs" (Ron) which can occur "as they happen" (Victoria). Victoria noted that people "are very susceptible to having something pop up on their phone" (Victoria) and that if notifications were sent early enough it could make people think "that sounds like fun we should go do that this weekend" (Victoria). Sending advanced notifications "could really get more people to those programs and then we have a really high-quality opportunity to interact and exchange information with people" (Ron). Another opportunity that push notifications create is the ability to inform people about "key sensitive periods in the year" (Ron) such as "there's a lot of amphibians moving on the road systems so please drive carefully or choose not to drive tonight" (Ron) which will "put more harm on the population of amphibians" (Ron). Lastly, there is also the chance to send out "safety notifications for campers" (Ron) such as "Environment Canada has issued a severe weather alert, please tune into this link to get more information" (Ron).

5.3 Facilitating Opportunities for Exploration

The facilitating opportunities for exploration theme represents many of the ways that Explore Pinery encourages visitors to participate in park activities as well as provide data for park staff. Explore Pinery allows visitors to participate in quick citizen science programs (such as submitting wildlife sightings) as well as integrating with pre-existing programs (such as the bat monitoring program). These programs have the potential to increase visitor participation which ultimately leads to richer experiences associated with exploring the park itself.

Facilitating opportunities for exploration for staff, however, is conceptualized not as physically exploring the park more, but rather having the opportunity to explore the data

generated from the visitor citizen science programs. Over time, these databases have the potential to allow staff to gain insights into species distributions and occurrences which ultimately leads to more informed management decisions. Park staff made several suggestions that the information created by citizen science has a lot of potential to be beneficial to Pinery and Ontario Parks in general.

5.3.1 Citizen science.

The citizen science sub-theme illustrates the ways in which Explore Pinery facilitates participation in the many citizen science programs offered at Pinery. Citizen science is beneficial for many reasons, including contributing to the "Ontario Parks mandate that's improving science, and citizen science has been a huge [way]" (Victoria) to do so which involves the submission of "people's incidental sightings" (Victoria) which are then "tie[d] to individual programs like the bat detector program" (Victoria). These incidental wildlife sightings are extremely valuable despite the potential for visitors to not realize the value of their contributions. "The fact that we're asking people to submit sightings hopefully conveys that those things are valuable" (Ron) and "probably helps them to sort of consciously recognize that it's valuable" (Ron). Ron noted that most park visitors probably don't download Explore Pinery specifically for the citizen science features, but instead "probably download it so they have the information they need to be able to enjoy themselves at the park". However, "that doesn't mean that they couldn't be converted to being somebody who sees the value of contributing information" (Ron). If information about visitor contributions "was fed back to them in some way in some kind of report or summary" (Ron) it "would leverage [people to] start doing more data collection submission[s]" (Ron). Some visitors, however, "are particularly interested in the citizen science part" (Victoria) of Explore Pinery. These people are generally "happy to submit information"

(Victoria) for different types of citizen science projects or even other types of information such as if "there's a tree down over a trail, or if they see a hazard somewhere" (Victoria). The ability "to include a photo [within a wildlife submission] is fantastic" (Victoria) because often "people obviously have no idea what they are seeing or we just, can't trust it without a photo" (Victoria). One particular example is people who "think they've seen a rusty patch [bumblebee] when honestly they probably haven't" (Victoria). Emily notes that the species at risk and roadkill reports are "my favourite part" and that these types of submissions "reinforce the [management] objectives" (Emily). Overall, Explore Pinery facilitates participation in citizen science programs which as noted by Emily, results in the park "probably getting more reports than if [Explore Pinery] didn't exist because its right there on their phone and it doesn't really put any extra strain on [visitors] so I think we definitely get more" submissions.

5.3.2 Database generation.

The increase of citizen science participation facilitated by Explore Pinery ultimately results in an increased database for the park. Compared to traditional database generation, the app has "tremendous potential to really grow and expand the data set for park management" (Ron). "Over time more and more people get to interact with [the app]" (Ron) which "build[s] this sort of comprehensive data set over time" (Ron). Data submissions by visitors when compared to those of staff have the potential to significantly outnumber what park staff can contribute in terms of volume. Ron commented on this in saying:

> One of the things that strikes me is that the park may have five to ten employees who regularly contribute observations but there's three quarters of a million visitors annually and even if 1% of those people contributed that, that's far more than the park staff could necessarily do, you know, just in terms of effort.

There is also an opportunity to receive targeted data on specific species or groups of species, such as completing a "park inventory of insects" (Victoria) which would be useful because the park has "an excellent Lepidoptera (butterfly) inventory but everything else is pretty much unknown" (Victoria). This could result in staff receiving "a whole bunch of things we had no idea were around" (Victoria). Once visitors send in a submission, there is also the opportunity for staff to "go out and with our GPSs get the points exactly" which can increase the accuracy of the overall database.

5.3.3 Informed staff.

The increased database capacity that Explore Pinery facilitates provides staff with an opportunity to explore and evaluate new management approaches. The Natural Heritage Education department "is very dialed in and aware of the value of the data and the power of the features of the app" (Ron). For Ron, "the biggest part for me is that it contributes to the park data set that we have that would then inform management actions [and] decisions" which ultimately allows staff "to evaluate whether things are good, bad or ugly for any number of species that we track, so both species at risk and potentially common species as well" (Ron). This is key because "if you go back to the provincial parks and conservation reserves act, ecological integrity is the primary mandate and protection is the higher-level reason for the parks system existing" (Ron). Explore Pinery is a tool that "allow[s] us to maintain that balance so we can track for instance, unwanted behaviour" (Ron) as well as "where people are going and where they are not going". The databases generated through Explore Pinery also have the potential to act as a "control for staff-led initiatives" (Ron), which can be biased since staff "go out with specific skills and objectives to survey for a group of animals or plants" (Ron). By having the general public submit sightings for comparison, it allows staff to "evaluate the effectiveness of a park-led, staff-led

activity" (Ron). Being able to evaluate staff activities and balance protection is important because "Pinery has fantastic recreational opportunities, but using the park comes with a certain number of responsibilities and [staff] shouldn't neglect that side of things" (Victoria). After all, Victoria noted, "there's a reason Pinery was changed from a recreation class park to a natural environment class park".

An unexpected, yet important aspect that Explore Pinery also facilitates is the potential for better cohesion between departments. Emily noted that Explore Pinery could potentially facilitate unity and information between departments since "we don't necessarily interact with other divisions, I think it is a good way to try and breach those distances." This is key as often information is lost between departments despite everyone ultimately working towards the same goal.

5.4 **Informed Visitors**

The informed visitors subtheme combines information that overlaps between the "providing information access" and "facilitating opportunities for exploration" themes. The combination of these two themes can be thought of as an outcome since visitors conveniently gain access to information about park services, education programs, and protection initiatives as well as gain experience exploring the park through citizen science programs which further adds to their awareness. Ultimately, this combination results in park visitors that are more informed in comparison to those that do not have access to convenient information and diverse citizen science experiences. Emily recalled a time when she encountered a woman in Pinery who "pulled up the activity sheet through the app and said that her family comes all the time and she really appreciates the app because [of] its easy access to the programs". Similarly, Victoria encountered a man in his mid-thirties on Riverside Trail who asked a question about an activity

schedule and saw an Explore Pinery poster and proceeded to mention, “I [have] it, I love it, its been great”. Having convenient information can often bring people out to citizen science activities, such as bat box building. Victoria mentioned she “talk[s] to people all the time that had no idea we did bat box building on Halloween or something like that and just saw a post about it randomly and they show up and bring their family and have great times.” Park staff at the visitor centre often “get a lot of phone calls from people with just general questions about when rentals are available and things like that” which also goes to show a lack of information access exists. Having park information available through Explore Pinery is important as “it helps people know what’s going on… so potentially having all of that information in their pocket is very useful” (Victoria).

Generally, a lot of park visitors “don’t understand that [the park] needs help to reach the protection objective” (Ron) which can be worked upon through activities like citizen science. The problem comes from “people assum[ing] that there’s a lot more staff in parks” (Ron) and “that there’s dedicated people who do nothing more than run around and measure and count everything” (Ron). Having convenient information in Explore Pinery could inform people which “might change their behaviour and see protection as a bigger reason to use the app” (Ron). Ron noted that:

> [Explore Pinery] is a really good tool to assimilate a bunch of information together in one place for people, I think it might help to make people feel more secure, more informed when they come to the park, knowing that [they] have this thing in [their] pocket and all the maps are on there, or if I get lost I can locate myself and find out exactly where I am, there’s contact information in there, there’s stuff about safety.

Having a convenient app for visitors that "combines and collates all this information [which means] they can then go off and explore the park" (Ron) is really important because a "huge part of our education mandate is not just having things available for people but also letting them know that they are available" (Victoria). Victoria noted that "I think anything that makes it easier for people to know what's happening and what opportunities are [out] there is a good thing, and I think the app does that really well."

5.5 Innovative Experiences

The innovative experiences theme consists of park visitor experiences that have not previously existed or are altered in some way by Explore Pinery. Many of the new experiences make the park more accessible by changing circumstances that have allowed for barriers to exist. Since Explore Pinery is the first smartphone application designed for an Ontario Park, a variety of these innovative experiences also test the boundaries and perceptions of using technology in a traditionally technology-free natural area. However, staff suggest that using technology in the park is justified as it contributes positively to make the park more accessible.

5.5.1 Accessibility.

Explore Pinery promotes accessibility by packaging information and allowing many traditional barriers to be overcome. This is described by Ron in saying "once this information is consolidated and put onto a mobile device then there is an opportunity to really open up and get past a lot of traditional barriers." Traditional barriers are often related to "Maslow's order of needs" (Ron) where in "order to sort of expand and learn and be comfortable you've got to feel comfortable and situated, so knowing where you can get help, knowing how you can get in and out of the park, knowing where your campsite is, all that kind of stuff" (Ron) which "could be a barrier to people fully exploring and valuing the park, whereas if they have that information then

you know it allows them to move further and further into a sort of relationship with the park" (Ron). Emily concurred in mentioning that Explore Pinery "definitely overcomes some accessibility issues" and that it's an "easy way for people to see the programs" (Emily) offered by the park.

Despite Explore Pinery helping to overcome traditional barriers and promote accessibility, it should be noted that the app is not fully accessible, nor likely to ever be, to everybody. People who "aren't tech savvy, like the old generation [who] isn't as accustomed to using cell phones" (Emily) could have difficulties using the app. However, Emily noted that "there [are] older people that are really up on Facebook and social media and things like that" which does not rule out an entire generation from using the app. Another barrier that potentially exists is that not all visitors have smartphones, and not all staff are assigned smartphones. This is potentially overcome by having "a way for the park to have equipment that could be loaned out with the app on board" (Ron) which would allow visitors to use Explore Pinery even if they do not own a smartphone. For staff not assigned smartphones, they could have the attitude of "this is my personal device I pay for so [when] I'm at work I don't want to use it" which limits their participation and involvement with Explore Pinery. Ron noted that this is "definitely an area that could expand with more sort of explanation of the value of the app and the data" which could result in more smartphones being issued to staff. Despite these accessibility issues and potential solutions, there are some barriers that cannot be overcome yet. "If someone was visually impaired, that's a hard barrier that they may not be able to use the app" (Ron). Furthermore, "accessibility is an individual circumstance that you can't really plan for everybody out there because there are some people who have very unique accessibility needs or a combination thereof so what works for one person won't work for another" (Ron). Ron concluded in saying:

> Just the consolidated nature of all this diffuse information into one sort of dashboard is really the power of this… this is a chance to bring everything together and use technology to really allow people to get past these sort of initial needs and get onto appreciating our heritage or protecting park assets.

5.5.2 Technology and nature.

Using smartphone technology in natural areas is often controversial. Explore Pinery aims to "enhance people's experiences when they are out in nature" instead of detracting from it (Emily). "People are always going to have their phones on them" (Emily) and the main "idea is that you're out there and looking for things and then once you find something then you quickly snap a picture of it" (Emily) which is not going to "add any more significant time to how much phones take away" (Emily). Emily noted that "I don't think that the Explore Pinery app's going to make them look at their phone more than they would have anyways." Similarly, Victoria noted that she "see[s] people with their phones all the time but I don't see them stumbling into traffic with them or not appreciating what's around them." Similarly to other nature-oriented smartphone applications, Explore Pinery "ha[s] done a good job at maybe pulling out more people that necessarily don't go outside as much [who now] have gotten more outdoor time" (Emily). There are also "a lot of people who are getting into nature because of technology, so ebird helps, iNaturalist helps, hopefully Explore Pinery's helping" too (Victoria). Recently:

> there's a lot of talk about millennials specifically sharing photos of their trips and experiences and there's people who seem to think that makes it a more shallow experience that people are just going out to get the Instagram photo, but it can also encourage others to come and try and experience the same thing and you know anything

> that gets people outside and doing things, as long as it's not in a destructive way, I don't see how that could be a bad thing (Victoria).

Ultimately, "people can regulate their own input from technology" (Emily) and if "they want a technology-free experience in the wild then they just don't have to bring their phone with them" (Emily). It really comes down to "being an individual circumstance" (Ron) and:

> the beauty of this [app] is that it's not thou shalt kind of tool, its thou may, so I see it as something that it's there for people if they choose to download it and use it in the park and if not then they don't have to and can still come to the park and enjoy this space unconnected (Ron).

The Natural Heritage Education department at Pinery "does a good job of incorporating new technology" (Emily) which is tied to the budget Pinery has. Emily noted that "other parks don't have as much funding" which could allow them to "fall behind in technology" (Emily) which "I can see being a problem for Ontario Parks, if they don't keep up with the technology" (Emily). Spending resources on apps like Explore Pinery may seem wasteful to staff at other parks because they "might like how it was done in the old days and are resistant to change" (Emily), but people who think this are likely to "be a small minority in our group" (Emily). After all, "it's not like the app behaves like Pokemon Go and expects you to have your screen in front of your face as your walking, it's more of a gentle assist" (Victoria).

5.6 **Visitor Exploration**

The visitor exploration subtheme is a combination of the "facilitating opportunities for exploration" and the "innovative experience" themes. Visitor exploration combines these themes well because having opportunities for exploration and having new ways to have these experiences together encourage visitors to explore Pinery more. Explore Pinery "encourages

people to get out on walking trails more, then they're able to find things and see things like species at risk" (Emily). Ron described what exploring the park more could look like in saying that visitors get the "chance to interact with something amazing in the park" and "just soak that in for the wonder that it is, but then maybe they go oh… I should share this or report it" (Ron). Using the photo-monitoring posts (photomons) could also facilitate more visitor exploration by incorporating challenges related to them within Explore Pinery. "Some people might look at it like a challenge to try and find all the photomons around the park and explore the park and find them all" (Emily). "Something related to the 30 x 30 challenge" (Victoria) which encourages people to go outside and explore or adding "the ability to check off which trails you've hiked or something like that as a personal challenge" (Victoria) could "be something that would motivate people" (Victoria) to further explore the park. Having the ability to submit sightings through Explore Pinery also facilitates more exploration as "there's some people who would never have thought to submit sightings and… they're looking for something to do, and it might be a fun activity for them, to go out and look for things and submit what they find" (Victoria). Having more opportunities for visitor exploration using innovative experiences ultimately allows park visitors to "see more of the species… so that they can appreciate the resource more" (Emily).

5.7 New User Groups

The "new user groups" subtheme is situated where the providing information access and innovative experience themes overlap. Having increased information available in innovative ways allows existing and new park users, particularly untraditional park users, to overcome barriers and be more engaged in park activities. For new Canadians, "we don't always know what's intimidating… you hear stories about people who… are from a place where there may be large predatory mammals and you don't go in the bush" (Ron). These types of barriers are often

not “even really recognized” (Ron) by staff because they themselves are comfortable, but for new Canadians, they serve “as a big barrier to their exploration of the park” (Ron). Ron recalled a time when he “had an interaction with someone in the visitor centre who was… of a visual ethnic group that is traditionally not a known group of people who utilize Pinery” and who he assumed “was a relatively new user [as he] … asked a lot of new user type questions” (Ron). During this interaction, the individual said: “Oh, I see you have an app, that’s excellent” (Ron) which happened when “he saw promotional material at the front desk” (Ron). As the individual said this, Ron noticed that:

> He relaxed a little bit when he realized I don’t have to ask this individual all hundred questions that I have because they have this packaged thing that, I could go away and on my own I can access the information in a way and time that I’m comfortable (Ron).

Having increased access to information and innovative experiences together is important as demonstrated by Ron’s observations where “we’re seeing a bit of a culture change in Ontario Parks where traditionally I would argue that most users were longtime Ontario residents probably predominately Caucasian background” and now were “seeing a lot of newer user groups” (Ron).

5.8 **Dedicated Users**

The dedicated users theme is a cumulative combination of all themes and subthemes. This can be conceptualized as the three main themes (Information, Exploration, Innovative Experiences) having overlapping areas which form three subthemes which can also be thought of as outcomes. These three outcomes all contribute towards developing one main outcome theme which is “dedicated users.” The dedicated users theme, therefore, incorporates elements from all

subthemes and main level themes and can be thought of as an all-encompassing theme and most significant outcome.

Dedicated users are conceptualized as the most ideal type of park user who is likely to conform with all management objectives, have meaningful park experiences, and develop and grow a relationship with park. Although an example of a hypothetical ideal dedicated user does not exist, Explore Pinery encourages people to adopt behaviours of an ideal dedicated user. As seen in the above three themes and subthemes, dedicated users (both visitors and staff) are created by having access to information, opportunities to explore new initiatives, and experiences that are innovative and compelling. Explore Pinery facilitates all these components which ultimately "builds a constituency of dedicated park users who value the park and the species that are found within it" (Ron) which has potential to "affect their personal behaviour which then would affect others who witness them doing something that's potentially beneficial" (Ron). This could also apply to "some public groups that could be leveraged to support the app" that could "contribute observational data" (Ron) on large scales.

Having dedicated users is valuable for numerous reasons, one of which is that "having this dedicated group of park users who understand that they don't get a free ride, they don't just get to come in and experience all the wonder of Pinery and not ever do anything to value it" (Ron). This results in people who "instead of just see[ing] the park as something they use, they see the park as something they protect" (Ron). Often, "people assume there's ten ecologists in the park… when in reality there's very few full-time staff" (Ron). So "sharing that information and making people realize that we need their help could really change and the key part is the value that people hold in parks" (Ron). Explore Pinery is able to do this by helping to educate people "in a gentle and engaging way" (Victoria) which lets them know "what we're doing

management-wise and why" (Victoria) because often people "want to cooperate with a lot of our management objectives… and the opportunity should be there so the information should be there should people want to find it" (Victoria). This ultimately contributes to "motivate a cultural change of how people use the park" (Victoria). An example of what a culture change might look like for visitors was described by Ron in saying "I enjoy the park, I derive benefit from... whatever I'm doing so this is the least I can do to make sure that it's there for me personally and maybe for other people I care about." Ron also mentioned that he's "really motivated to try and move people to become not just visitors, but dedicated to the park and understanding … they can contribute more and still have great recreational, relaxing, recharging experiences."

Explore Pinery also has the potential to create dedicated park users outside of the traditional peak season. Currently, there's a "perception that parks are something that you use and go to from May to September" (Ron) however, "the app could really push the envelope value and utilize parks throughout all 12 months of the year" (Ron). Spreading out park visitors in the year could help "balance some of the pressure that is put on parks" (Ron) by simply reducing environmental degradation caused by crowding. Informed visitors could also choose to schedule their visits around natural cycles such as "breeding birds and invasive species and all that kind of stuff" (Ron) which would further relieve pressures on the park. Getting information out to visitors can simply be achieved in several ways, one of which is sending a push notification that "Pinery is open year-round" (Ron) or to "promot[e] winter activities" (Ron).

Using smartphone applications "for conservation initiatives is still a relatively new thing" (Ron) and Pinery is "delving into this new technological area [but] doing it still really on point of getting back to why Pinery exist[s]" (Ron). Pinery is "leading the way in Ontario Parks… [and is] still the only park in the province that has a custom specific app developed for it" (Ron).

Explore Pinery "is specific and it packages up all of the objectives of Pinery Park and Ontario Parks, maybe not explicitly, but intrinsically they are in there" (Ron). "The true measure of [Explore Pinery's] contribution will only be evident after a fairly lengthy time period" (Ron), but ultimately contributes back to why "Ontario Parks exist as a network of protected spaces" (Ron).

Chapter 6: Qualitative Discussion

The purpose of this qualitative study was to examine the ways in which Explore Pinery contributes to achieving park management objectives. The findings from the analysis, however, appear to answer a slightly different question, how does Explore Pinery contribute to the staff and visitors' experiences? The answer is that Explore Pinery contributes in a variety of ways which facilitate behaviours that align with the theoretical concept of an ideal dedicated park user. Unpacking these findings further, we are able to see that the original question, how does Explore Pinery contribute to achieving management objectives, is still able to be answered, although it requires further interpretations. The following section will draw clear connections between the above findings and how they relate specifically to each management objective.

6.1 Management Objectives

As mentioned previously, the management objectives that the research questions are based come directly from the Pinery Provincial Park management plan which was published in 1986 by the Ministry of Natural Resources. As illustrated through the findings, staff appear to approach management objectives not as individual pieces they are trying to achieve, but rather as an ongoing integrated approach that touches on components of several management objectives simultaneously. As such, it is challenging to identify exactly which elements of each theme and sub-theme apply to specific management objectives. Despite this, the following sections will describe how the above themes and sub-themes specifically align and contribute to specific management objectives. Examples of the most significant contributions will also be described.

6.1.1 Protection.

The protection management objective is to "protect provincially significant elements of the natural and cultural landscapes of Ontario" (Ministry of Natural Resources, 1986, p. 1). The facilitating opportunities for exploration, convenience, citizen science, database creation, informed staff, and dedicated users themes and sub-themes all contain elements that contribute to achieving the ongoing objective of protection. Having the convenience of a dataset created from citizen science submissions allows park staff to have a wealth of information that has the potential to influence management decisions. These decisions can potentially include, but are not limited to, resource allocation for stewardship projects, environmental monitoring, species distribution and tracking (including species at risk), controlling for invasive species, ecological restoration, and wildlife management.

6.1.1.1 Dedicated users.

Dedicated users have the potential to greatly contribute to the protection management objective. An ideal dedicated user is informed about the protection objective and behaves in a way that is consistent with the objective. This includes, but is not limited to, knowing the impacts of walking off trail and choosing to stay on the trail, knowing the impacts of littering and removing it where possible, knowing the importance of participating in citizen science projects and submitting species observations, and recognizing the value of encouraging other visitors to follow suit. As outlined in the above findings section, Explore Pinery encourages visitors to become dedicated users who will enact some, multiple, or all of these behaviours that are consistent with the protection management objective.

6.1.2 Heritage appreciation.

The heritage appreciation objective is "to provide opportunities for exploration and appreciation of the outdoor natural and cultural heritage of Ontario" (Ministry of Natural Resources, 1986, p. 1). Several themes and subthemes contribute to achieving the heritage appreciation objective including information access, convenience, push notifications, opportunities for exploration, citizen science, innovative experiences, accessibility, visitor exploration, informed visitors, and dedicated users. By having information that is convenient and accessible, visitors are more informed about the types of appreciation opportunities that exist, such as participating in citizen science activities which often lead to increased visitor education. Furthermore, having convenient access to information about park-led educational programs has the potential to increase attendance of these programs leading to more educated and engaged park users.

6.1.2.1 Dedicated users.

A dedicated user in the context of the heritage appreciation objective is someone who actively seeks out natural and heritage information through a variety of ways. This can include using guidebooks to learn about the park, attending interpretive park-led programs, or participating in citizen science projects. Through these activities, a dedicated user would have multiple opportunities to learn about various aspects of the park, including Pinery's ecology, history, geomorphology, species, natural processes, and active resource management activities.

6.1.3 Recreational opportunities.

The recreational opportunities objective refers to the park providing "a variety of recreational opportunities in areas of outstanding recreational potential associated with the

natural environment of Ontario" (Ministry of Natural Resources, 1986, p. 1). Themes and sub-themes that contribute to achieving the recreation objective include information access, convenience, facilitating opportunities for exploration, citizen science, informed visitors and dedicated users. By having convenient access to information about Pinery's many recreational opportunities, visitors can choose activities that suit their needs without compromising the management objectives of the park. Furthermore, visitors have an opportunity to participate in recreational activities such as citizen science that allow them to explore new areas of the park. Participating in these types of activities have the potential to be both enjoyable and educational.

6.1.3.1 Dedicated users.

An ideal dedicated user is equipped with the knowledge of all the types of recreation opportunities that exist in Pinery and engages in these sustainable activities. Although only sustainable activities are permitted in the park, visitors often engage in activities that are not sustainable, or at least not sustainable in the way they specifically carry them out. For example, an ideal dedicated user would only engage in activities the way they are meant to occur, such as having a campfire in a designated location. Similarly, many activities (canoeing, kayaking, swimming, etc.) allow visitors to be in areas that are not patrolled frequently, and the opportunity to damage or harass the environment easily presents itself. Dedicated users would be aware of the negative impacts that seemingly harmless activities can have on wildlife and choose to act in a non-harassing way. This can include choosing to not approach birds, turtles, mammals, and other commonly seen wildlife that are often harassed continuously by unaware, curious visitors.

6.2 Discussion Summary

The Explore Pinery smartphone application contributes to the ongoing achievement of Pinery's management objectives in several ways. The findings presented several themes, sub-

themes and overlapping outcomes based on what the participants discussed in the interviews. These themes, sub-themes, and outcomes contribute in a complex way to each specific management objective. As outlined above, each management objective is supported through several themes, sub-themes, and outcomes and the strength of these contributions from the themes to the management objective differ for each objective. The dedicated user outcome contributes to each management objective, but the way it contributes is specific to each objective. Overall, Explore Pinery contributes to the ongoing achievement of Pinery's management objectives by encouraging a variety of outcomes by gently pushing visitors to become dedicated users who actively follow and contribute to Pinery's on-going management objectives.

Chapter 7: Quantitative Method

The purpose of the quantitative section of this thesis is to examine if the Explore Pinery smartphone application impacts visitor experiences. For the purpose of this pragmatic research, five variables were selected to highlight a range of possible impacts facilitated by Explore Pinery which are nature connectedness, sense of place, education level, satisfaction, and overall experience. To assess these measures, Pinery Provincial Park visitors were surveyed.

7.1 Quantitative Questionnaire

Park visitors were surveyed in Pinery Provincial Park during the fall of 2017. Two separate versions of the visitor questionnaire were created. One questionnaire was designed for visitors who use the Explore Pinery smartphone app while the other survey was designed for visitors who do not use Explore Pinery. Both questionnaires were nearly identical and differed only when referencing the informational tool the visitor used, which were the Explore Pinery smartphone app (for app users) and the park information tabloid (for non-app users). A total of 121 visitors completed the app user questionnaire and 84 visitors completed the non-app user questionnaire.

Both visitor questionnaires contained a variety of control questions, a measure on sense of place, nature connectedness, education, satisfaction, and overall experience. In nearly all questions, a 5-point Likert Scale was used. The following sections outline these measures in more detail as well as how they were derived.

7.2 General Measures

Several participant profile questions were asked which included gender, age, highest level of education completed, if they were born in Canada (and if not a follow up question of how

many years living in Canada or are you a tourist), how many times have you visited Pinery, understanding and competence with technology, and attitude towards technology.

7.2.1 Sense of place.

Although it is difficult to assess sense of place and place attachment, it can be done in several ways. A study by Halpenny (2006) assessed sense of place (within a Canadian national park) by conceptualizing place attachment as an attitude comprised of place identity, place affect, and place dependence. Measures used in her study were based on the works of multiple earlier scholars and adapted to suit the situation. Furthermore, Halpenny's measures were implemented on a control group beforehand to test reliability. Results indicated that most of the scale items showed a high level of construct validity and reliability in measuring place attachment, place dependence and place identity, and were based upon those used in previous sense of place studies (Halpenny, 2006).

This thesis borrowed from Halpenny's (2006) measures and assessed sense of place through place identity, place affect, and place dependence.

7.2.2 Nature connectedness scale.

To be able to assess if Explore Pinery influences visitors' connection to the natural environment, a nature connectedness scale was used. The nature connectedness scale (NCS) was created in an attempt to bridge three commonly used measures that assess how people view themselves and the environment (Mayer & Frantz, 2004). The previous measures include the new environmental paradigm scale, inclusion of nature in the self, and the implicit associations test. Although each scale has its strengths, the NCS outperforms each measure in several ways

(Mayer & Frantz, 2004). For example, the NCS measures the individual experiential connection that people have with the environment as opposed to the new environmental paradigm, which measures people's cognitive beliefs around humans' environmental actions in general (Mayer & Frantz, 2004). The inclusion of nature in the self measure is a single item scale that is quite conceptually abstract in comparison to the NCS. Furthermore, reliability testing is not possible in the inclusion of nature in the self scale whereas the NCS has proven to be reliable (Mayer & Frantz, 2004). The implicit associations test has shown to produce low correlations between the measure and related predictable behaviours whereas the NCS predicts behaviours well (Mayer & Frantz, 2004).

7.2.3 Education.

As the Explore Pinery smartphone app is constantly changing, is not linked to curriculum objectives, and contains a variety of depths and types of information, assessing specific educational goals facilitated by the app is difficult.

A single item measure was used to assess education gained as facilitated by Explore Pinery. This measure consisted of four similar questions asking participants to self-report, "To what degree has Explore Pinery increased your knowledge in the following areas," which included perceived level of natural environment knowledge, educational program awareness, recreation opportunities, and park services and amenities. Although this measure has not been tested for reliability or validity, it will provide some degree of comparison between the perceived knowledge gain between app users and non-app users.

7.2.4 Satisfaction.

The purpose of the satisfaction measure is to assess visitors' satisfaction with Pinery and the degree to which Explore Pinery impacted their satisfaction levels. A holistic single item measure adapted from Halpenny (2006) was used as it encompasses previous place satisfaction measurement scales and was used in a similar context to this research. To increase validity, three separate aspects of satisfaction were measured which include the quality of the social environment, the quality of the natural environment, and opportunities to engage in favourite activities (Halpenny, 2006, p. 69). Two single-item measures were added following the format of Halpenny's (2006) measures, which are specific to Explore Pinery: the degree to which users are satisfied with the app as a whole, and the degree to which people feel Explore Pinery contributed to their overall satisfaction.

7.2.5 Survey administration and recruitment.

Ideally, this study would have randomly assigned visitors to the categories of Explore Pinery smartphone application user or only paper tabloid user. As this was not logistically or ethically possible, a questionnaire was delivered to everyone based on whether they had used the application or not. In accordance with the Ontario Parks permit that was issued, a survey information booth was set up at two different locations within Pinery Provincial Park. The primary location was inside the visitor centre and the secondary location was at the park store. As visitors approached the booth, they were offered the opportunity to participate in the research. Those that agreed to participate completed a consent form and were given either the app user or non-app user questionnaire. Visitors who used Explore Pinery also had the option of completing the questionnaire through the app itself. The online version was created using Survey Monkey,

an online survey-making tool. Participants had the option of leaving their email address to be entered in a draw to win one of four $25 gift cards to Mountain Equipment Co-op. This approach of having the questionnaire available through the app was beneficial as it helped ensure that only app users filled out the app user questionnaire. One of the limitations of not being able to assign the application to specific groups was that app users could also have used the paper tabloid during their visit, which would limit the degree to which differences between app and non-app users could be measured. Another limitation was that only visitors who approached the researcher's booth were asked if they wanted to participate in the study. Therefore, a true random sample of all Pinery's visitors did not occur, rather only those that expressed curiosity and were potentially curious were sampled. However, being on site in person was beneficial as it allowed participants to ask questions about individual survey components as well as questions about the entire study. Being on site also contributed to the response rate of participants. Almost all in-person questionnaires were fully answered while not all questionnaires completed through the app were fully answered.

7.3 Quantitative Analysis

The main purpose of the quantitative analysis is to examine how Explore Pinery impacts visitor experience. As such, a variety of comparisons between app users and non-app users were made. Bivariate correlations between app users and non-app users, as well as all correlations within each group, were conducted. Linear regression models were conducted to see if app use can predict sense of place, nature connectedness, education, satisfaction and overall experiences. Moderation analyses were conducted to look at the relationships between app usage, technology attitudes and overall experiences.

Chapter 8: Quantitative Results

A variety of analyses were run including t-tests, correlations, regression, and regression with moderation. The results of the t-tests indicated that there is no significant difference between app users and non-app users in terms of their nature connectedness levels, sense of place, and park education levels. Overall satisfaction levels, however, are significantly different in that app users have lower overall satisfaction in comparison to non-app users. The results also showed that app users have significantly more positive attitudes towards technology than those who do not use the app. A bivariate correlation analysis of just app users indicated that app use has a weak, positive correlation to technology competence. As reasonably expected, sense of place and nature connectedness show a moderate positive correlation. The strongest significant correlation in the matrix was competence with technology and attitudes towards technology which showed a positive moderate (.5) correlation. The first regression model looked at the degree to which the Explore Pinery app contributed to app users overall experience as a dependant variable.

8.1 Visitor Demographics

The following section outlines the demographic profiles of the participants who completed the visitor questionnaire. Table 1 shows the gender distribution of the questionnaire participants. Overall, more females participated in the questionnaire than males. Table 2 shows the average age of respondents which are similar for both app users and non-app users. Table 3 shows the education levels between app users and non-app users which are similar for each education level. The mean number of visits to Pinery are shown in table 4 which indicate that non-app visit Pinery more frequently. Table 5 shows the frequencies and percentages for app users and non-app users competence with technology, and table 6 reports their means and standard deviations.

88% of app users reported being able to either easily or very easily understand most technology while 67% of non-app users reported being able to either easily or very easily understand most technology. Table 6 shows the frequencies and percentages for app users and non-app users and table 7 reports the means and standard deviations. 87% of app users reported that they either enjoy or really enjoy technology while only 66% of non-app users reported that they enjoy or really enjoy technology.

Table 1
Gender Distribution of Survey Participants'

Response Options	Explore Pinery Users		Non-Explore Pinery Users		Total	
	Frequency	%	Frequency	%	Frequency	%
Male	47	38.8	29	34.5	76	37.1
Female	71	58.7	55	65.5	126	61.5
Other	0	0	0	0	0	0
Prefer not to say	1	.08	0	0	1	.5
Non-answer	2	1.7	0	0	2	1.0
Total	121	100	84	100	205	100

Table 2
Survey Participants' Age

	Explore Pinery Users	Non-Explore Pinery Users
M	44.94	46.02
SD	11.56	14.23

Table 3

Survey Participants' Highest Level of Education Completed

Response Options	Explore Pinery User		Non-Explore Pinery Users		Total	
	Frequency	%	Frequency	%	Frequency	%
High School	20	16.5	11	13.1	31	15.1
College	40	33.1	25	29.8	65	31.7
Undergraduate Degree	37	30.6	27	32.1	64	31.2
Graduate Degree	19	15.7	15	17.9	34	16.6
PhD/Medical Doctor	4	3.3	5	6.0	9	4.4
Other highly specialized education beyond PhD/MD	1	.8	1	1.2	2	1.0
Total	121	100	84	100	205	100

Table 4

Survey Participants' Number of Visits to Pinery Provincial Park

	Explore Pinery Users	Non-Explore Pinery Users
M	45.42	52.91
SD	108.77	123.30

Table 5

Participants' Self-reported Competence with Technology

Response Options	Explore Pinery User		Non-Explore Pinery Users		Total	
	Frequency	%	Frequency	%	Frequency	%
I have great difficulty with technology	0	0	0	0	0	0
I have some difficulty with technology	4	3.3	6	7.1	10	4.9
Neutral	10	8.3	21	25	31	15.1
I can easily understand most technology	51	42.1	38	45.2	89	43.4
I can very easily understand most technology	56	46.3	19	22.6	75	36.6
Total	121	100	84	100	205	100

Table 6
Participants' Self-reported Competence with Technology Mean and SD

	Explore Pinery Users	Non-Explore Pinery Users
M	4.31	3.83
SD	.76	.86

Table 7
Participants' Self-reported Attitude with Technology

Response Options	Explore Pinery User		Non-Explore Pinery Users		Total	
	Frequency	%	Frequency	%	Frequency	%
I really dislike technology	0	0	0	0	0	0
I dislike technology	3	2.5	28	33.3	31	15.1
Neutral	12	9.9	0	0	12	5.9
I enjoy technology	62	51.2	40	47.7	102	49.8
I really enjoy technology	44	36.4	16	19	60	29.3
Total	121	100	84	100	205	100

Table 8
Participants' Self-reported Attitude with Technology Mean and SD

	Explore Pinery Users	Non-Explore Pinery Users
M	4.31	3.83
SD	.76	.86

8.2 Measure Descriptive Statistics

The following tables show the specific measure and the sub-questions that contributed to each measure. The global measure is indicated by the bold font, whereas the non-bolded font below indicates the sub-questions. Table 9 shows the four dimensions that created the education measure for the app users who used Explore Pinery and non-app users who used the paper tabloid. Similarly, table 10 shows the four dimensions that created the satisfaction measure. The global combined measure for nature connectedness are shown in table 11. Table 12 shows the global sense of place measure as well as the three sub-scales within the global measure. Finally, table 13 shows the mean and standard deviations for app users and non-app users.

Table 9
Education (App or Tabloid) and Individual Questions

		Explore Pinery User	Non-Explore Pinery Users
Education	*M*	3.66	3.97
	SD	0.65	0.68
Environment	*M*	3.46	3.77
	SD	.82	.88
Education Programs	*M*	3.78	4.10
	SD	.77	.75
Recreation Opportunities	*M*	3.72	4.02
	SD	.73	.75
Services and Amenities	*M*	3.66	4.00
	SD	.82	.72

Table 10
Satisfaction Global Measure and Individual Questions

		Explore Pinery User	Non-Explore Pinery Users
Satisfaction	*M*	4.44	4.59
	SD	0.76	0.50
Overall Experience	*M*	4.62	4.89
	SD	.84	.41
Natural Environment	*M*	4.61	4.79
	SD	.82	.56
Social Environment	*M*	4.18	4.26
	SD	.98	.83
Recreation	*M*	4.33	4.44
	SD	.93	.80

Table 11
Nature Connectedness

	Explore Pinery User	Non-Explore Pinery Users
M	3.69	3.73
SD	0.47	0.46

Table 12
Sense of Place and Sub-scale Measures

		Explore Pinery Users	Non-Explore Pinery Users
Sense of Place	*M*	3.81	3.73
	SD	0.56	0.57
Place Identity	*M*	3.89	3.80
	SD	.70	.62
Place Affect	*M*	4.06	4.00
	SD	.58	.71
Place Dependence	*M*	3.27	3.23
	SD	.54	.59

Table 13
Explore Pinery Usage

	Explore Pinery User	Non-Explore Pinery Users
M	2.30	--
SD	1.07	--

8.3 T-tests

Independent sample *t*-tests were run for the nature connectedness, sense of place, satisfaction, and education variables.

The average nature connectedness level for app users was 3.69 (SD= 0.47) and the average nature connectedness level for non-app users was 3.73 (SD= 0.46). The results of the *t*-test show that the difference between app users and non-app users nature connectedness levels are not significant ($t(186) = 0.59$, p = n.s.).

The average sense of place level for app users was 3.8 (SD= 0.56) and the average sense of place level for non-app users was 3.73 (SD= 0.57). The *t*-test showed that there was no significant difference between app users and non-app users sense of place ($t(183) = -0.891$, p = n.s.).

The average overall satisfaction of app users was 4.44 (SD= .75) and the average overall satisfaction of non-app users was 4.59 (SD= .5). A *t*-test showed that there is no significant difference between overall satisfaction for app users and non-app users ($t(191) = 1.61$, $p < 0.05$).

The average self-reported park education level for app users was 3.66 (SD=.65) and the average self-reported park awareness education level for non-app users (paper tabloid users) was 3.97 (SD=.68). The results of the *t*-test showed that there were no significant difference between app users and non-app users self-reported park education levels ($t(190) = 3.26$, n.s.).

The average competence with technology for app users was 4.31 (SD= .76) and the average competence with technology for non-app users was 3.83 (SD=.86). The results of the *t*-test showed that there was no significant difference between app users and non-app users in terms of their understanding and competence with technology ($t(203) = -4.20$, n.s.).

The average attitude towards technology for app users was 4.21 (SD= .72) and the average attitude towards technology for non-app users was 3.52 (SD= 1.15). The t-test showed that there is a significant difference between app users and non-app users attitude towards technology. ($t(203) = -5.30$, $p < .001$).

For nature connectedness, sense of place, education level, and competence, there is no significant difference between app users and non-app users. However, there is a significant difference between app users' and non-app users' satisfaction and attitudes towards technology.

8.4 Correlations

Bi-variate correlations were calculated for six dependant variables to show the degree to which correlations are present. As seen in Table 14, few significant correlations exist. App usage has a weak, positive correlation to self-reported technology competence, and technology competence is moderately correlated with self-reported technology attitude. Sense of place and nature connectedness also show a moderate positive correlation. Finally, sense of place and overall satisfaction have a weak, positive correlation.

Table 14
Bivariate Correlations

Variables	Correlations					
	1.	2.	3.	4.	5.	6.
1. App Usage	--	.09	.21*	.11	.04	.19
2. Tech Competence		--	.50**	-.04	-.04	-.03
3. Tech Attitude			--	.03	.03	.12
4. Sense of Place				--	.48**	.23**
5. Nature Connectedness					--	.09
6. Overall Satisfaction						--

* p <.05, ** p < .01, ***p < .001

8.5 Regression Models

The following section outlines regression models that were conducted. Explore Pinery usage and visitor overall experiences were looked at, followed by Explore Pinery usage and visitor satisfaction.

8.5.1 Explore Pinery contributing to overall experience.

Regression analysis showed that app usage is significantly associated with Explore Pinery positively contributing to overall experiences (Table 15 model 1). In model 2 (Table 15),

app usage and attitude towards technology are significantly associated with Explore Pinery positively contributing to someone's overall experience.

Table 15. Unstandardized coefficients for regression models looking at the associations of demographics, app usage, technology competence, and technology attitude with Explore Pinery contributing to overall experiences

Regression Model					
Independent Variables	Model 1			Model 2	
	Coeff.		SE	Coeff.	SE
Constant	2.47	***	6.3	2.80 *	1.15
Age	.00		.01	.01	.01
Gender	.20		.14	.19	.14
Education	.03		.06	.02	.06
App Usage	.20	**	.07	.01	.48
Competence	.03		.10	.37	.22
Attitude	.07		.10	-.36	.23
App Usage X Competence	--		--	-.19	.11
App Usage X Attitude	--		--	.24 *	.12
Adjusted R^2	.07			.09	

A moderation analysis was conducted with the Process macro (Hayes, 2017) that looked at the effect of attitude towards technology and its impact on the amount Explore Pinery contributed to visitors' overall experience (Figure 11). The moderation model $F(8,96) = 2.34$, $p < .05$, $R^2 = .16$ found that approximately 16% of the variance was accounted for by the predictors. At low levels of attitude, app usage was $b = .73$, $t(105) = 1.77$, p = n.s. This indicates that low levels of attitudes do not significantly impact the effect app usage has on Explore Pinery contributing to visitors' overall experience. At high levels of attitude towards technology, app usage was $b = 1.21$, $t(105) = 2.34$ $p < .05$. This indicates that high levels of attitude towards

technology significantly impacts the effect that app usage has on Explore Pinery contributing towards overall experiences.

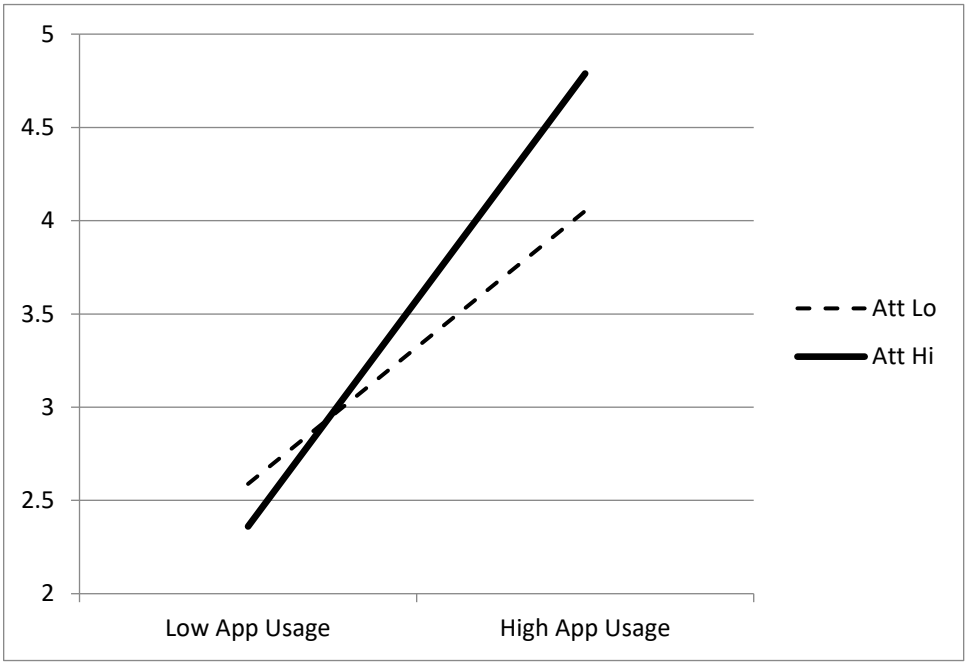

Figure 11: App usage and overall experience moderated by Attitude

Att Lo (b = .73, SE = .41, p < .08)

Att Hi (b = 1.21, SE = .52, p < .02)

8.5.2 Satisfaction of Explore Pinery.

Table 16 shows that app usage is significantly associated with contributing to visitors' increased satisfaction with Explore Pinery. Model 2 of Table 16 indicates that attitude and app usage combined is significantly associated with contributing to visitors' increased satisfaction with Explore Pinery.

Table 16. Unstandardized coefficients for regression models looking at the associations of demographics, app usage, technology competence, and technology attitude with overall app satisfaction

Regression Model						
Independent Variables	Model 1			Model 2		
	Coeff.		SE	Coeff.		SE
Constant	3.87	***	.89	6.51	***	1.62
Age	-.01		.01	-.01		.01
Gender	-.03		.20	.01		.20
Education	.01		.09	-.03		.09
App Usage	.27	**	.10	-1.06		.68
Competence	-.23		.14	-.04		.32
Attitude	.19		.14	-.64		.33
App Usage X Competence	--		--	-.14		.15
App Usage X Attitude	--		--	.45	**	.17
Adjusted R^2	.06			.11		

A moderation analysis was conducted with Process (Hayes, 2017) that looked at the effect of attitude towards technology and its impact on the amount that visitors are satisfied with Explore Pinery (Figure 12). The moderation model $F(8,96) = 2.68$, $p < .05$, $R^2 = .18$ found that approximately 18% of the variance was accounted for by the predictors. At low levels of attitude, app usage was $b = .29$, $t(105) = .50$, p = n.s. This indicates that low levels of attitudes do not significantly impact the effect app usage has on visitors being satisfied with Explore Pinery. At high levels of attitude towards technology, app usage was $b = 1.19$, $t(105) = 1.64$ $p <$ n.s. This indicates that at high levels of attitude towards technology the effect is large but is not statistically significant in terms of the effect that app usage has on visitors' satisfaction of Explore Pinery.

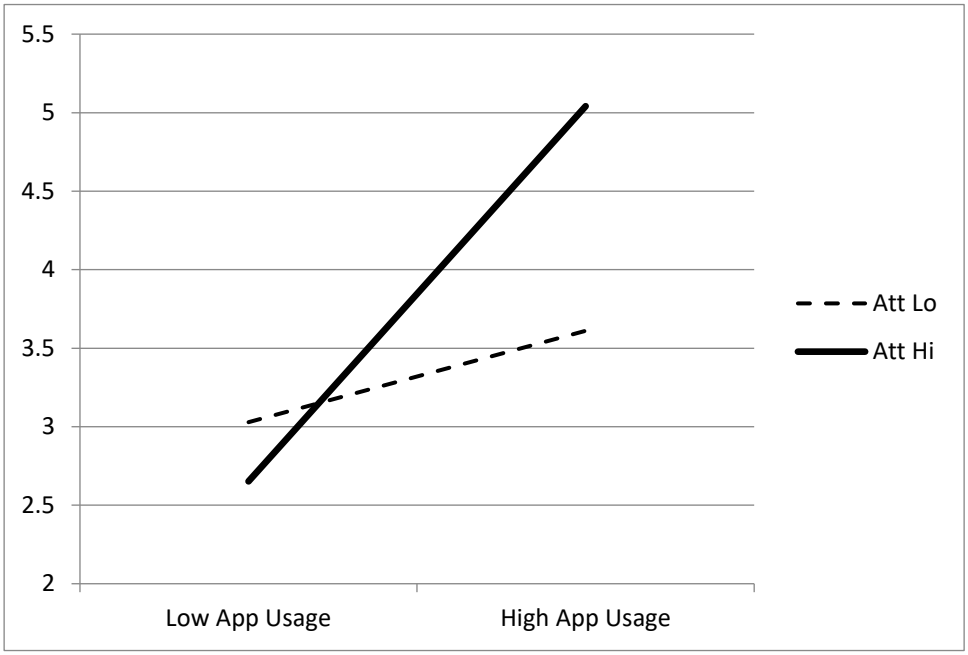

Figure 12: App usage and Explore Pinery satisfaction moderated by Attitude

Att Lo (b =.29, SE = 0.58, p < .62)

Att Hi (b = 1.19, SE = .73, p < .11)

Chapter 9: Quantitative Discussion

The purpose of the quantitative study was to determine if the Explore Pinery smartphone application influences visitors' nature connectedness, sense of place, education, satisfaction and overall experiences. Conducting t-tests found that there was no significant difference between app users and non-app users for the sense of place, nature connectedness, or education levels. These findings can be interpreted in different ways and are outlined below.

Evaluating nature connectedness provides evidence for whether Explore Pinery increases visitors' disconnection from nature or if it improves visitors' connectedness to nature. As it turns out, there was no difference between nature connectedness levels for app users and non-app users, which suggests that Explore Pinery does neither. This finding is inconsistent with both Louv's (2005) idea that technology leads to increased disconnection from nature, as well as Fletcher's (2017) idea that technology increases feelings of connectedness towards nature. Although this finding is inconsistent with both theories, the results themselves are not enough to disprove either one. Rather, this suggests that there is a way to use technology in natural settings that do not reduce nature connectedness, and that there is room for improvement within the Explore Pinery smartphone application for building nature connectedness of its users.

The sense of place measure provided insights into how Explore Pinery influences the experiences of visitors. The results indicated that sense of place levels are not statistically different for app users than they are for non-app users. This finding indicates that Explore Pinery does not influence sense of place when compared to non-app users. This suggests, by extension, that pro-environmental behaviours are not promoted as outlined by Halpenny (2006). However, this finding is not as disappointing as it may seem since the average sense of place level for app users is 3.81 out of 5, and the average level for non-app users is 3.73. Both groups experience

high levels of sense of place and as such are already likely to engage in pro-environmental behaviours. Therefore, we can conclude that although the app does not significantly increase the sense of place levels for app users above non-app users, neither does it detract from sense of place, thereby allowing app users to maintain their already high levels of sense of place. This finding further adds to the discussion on using technology in nature, as the results indicate that Explore Pinery does not detract from sense of place.

Measuring the self-reported awareness and education of visitors occurred to see if Explore Pinery was increasing the amount of knowledge that visitors have about Pinery. The results indicated that there was no significant difference between the knowledge of non-app users (tabloid users) and Explore Pinery users. At face value, this finding looks as if the app has failed at educating visitors about the park. However, another interpretation would be that Explore Pinery is equivalent to the park's tabloid at providing information, as both the app and tabloid users had similar levels of education awareness. In reality, it is likely that neither is the case, as problems exist with how the construct was measured. The education measure asked participants to self-report on how much the Explore Pinery increased their information about certain park components. One limitation to this measure was that app users may have also used the tabloid at some point in time or in conjunction with Explore Pinery, making it difficult to ascertain how much Explore Pinery has contributed to their knowledge. Overall, the education measure does not shed much light on how Explore Pinery contributes to park visitors' education and awareness about Pinery. However, it does indicate and provide some evidence that using technology in natural areas doesn't detract from park visitors' experiences.

The satisfaction measure indicated that satisfaction levels of Explore Pinery users are significantly lower than that of non-app users. Zabkar, Brencic, and Dmitrovic (2010) found that

high levels of satisfaction lead to visitor dedication and return visits. With this understanding in mind, the results indicate that Explore Pinery decreases satisfaction levels of visitors leading to less visitation and dedication. However, even though satisfaction levels of Explore Pinery users are significantly lower than non-app users, the app users' levels are still extremely high. The average Explore Pinery user had a satisfaction level of 4.44 out of 5, and the average non-app user had a satisfaction level of 4.59 out of 5. Therefore, although satisfaction levels of app users are significantly lower than non-app users, both users still have extremely high satisfaction levels which may indicate that Explore Pinery users are just as likely to have high levels of visitor dedication and return visits. Although statistical significance was achieved, both satisfaction levels are high enough to be considered consistent with Zabkar, Brencic, and Dmitrovic's (2010) framework, wherein high levels of satisfaction are achieved and are likely to lead to visitor dedication and future visits.

The correlation analysis showed that few correlations exist, but that nature connectedness and sense of place have a moderate positive correlation. This is a logical finding as these two variables are somewhat similar in what they measure. The strongest correlation (.5) was between technology attitude and technology competence which is also a logical finding as these variables are closely related.

The first regression and moderation analyses showed that high levels of attitude towards technology significantly impacts the effect that app usage has on Explore Pinery contributing towards overall experiences. This finding is consistent with the theory of technology self-efficacy as positive attitudes lead to more app usage, which lead to high levels of technology self-efficacy and ultimately results in better overall experiences (Wang, Shannon, & Ross, 2013). Explore Pinery users who have positive attitudes towards technology build self-efficacy the more

they use the app which then contributes to their overall experiences. This finding is important as it not only confirms the theory of technology self-efficacy but also provides strong evidence that technology can be useful in natural environment settings. Literature has provided arguments both for and against using technology in natural settings (Louv, 2005; Levin, 2017; Schwab, et al., 2016; Emerson, 2017; Rikala & Kankaanranta, 2014), and this research demonstrates that technologies can be used in natural settings to increase visitors' overall experiences. While this finding is not definitive, it contributes further evidence towards resolving this debate. It shows that, in some situations, technology is beneficial particularly when visitors have positive attitudes toward technology.

The second regression and moderation analyses showed that high levels of attitude towards technology had a large effect on visitors' satisfaction with the Explore Pinery app. This finding was not statistically significant but was close at high levels of positive attitudes. Since statistical significance was not achieved, firm conclusions can not be drawn. However, this finding does provide some insights as it conforms to the theory of self-efficacy whereby the more someone uses Explore Pinery, the more they gain self-efficacy leading to more satisfaction with the app itself. Furthermore, this also contributes to the idea that technology can be useful to people in certain natural situations when their satisfaction increases the more they use an app.

In addition to the findings and evidence that smartphone technology can be beneficial in a natural park setting, some practical implications also exist. Pinery primarily contains four groups of users (reluctants, core campers, millennials, and mature travellers) and each group is likely to benefit from the application in different ways. Generally, anyone who has positive attitudes towards technology is likely to benefit from using the application. More specifically, reluctants and millennials are particularly well suited to benefit from using Explore Pinery. Reluctants were

identified as having a need for more awareness and comfort within the park and Explore Pinery has the potential to deliver information that facilitates awareness that can lead to comfort (Ontario Parks, n.d.). Furthermore, Explore Pinery has tremendous potential to benefit reluctants as they typically do not seek out information. By downloading Explore Pinery, someone in the reluctant category no longer needs to seek out information elsewhere as everything is included within the app. Millennials on the other hand, are continuously connected to technology throughout their park visit (Ontario Parks, n.d.). As such, Explore Pinery can be incorporated seamlessly into their visit, which would help alleviate their feeling of being disconnected. Additionally, Explore Pinery can encourage millennials to participate in activities that they may not have been previously aware of. As millennials are more likely to share their experiences within their personal networks, large numbers of people could potentially be made aware of the activities and experiences that exist at Pinery.

Overall, the outcomes of improved overall experiences and satisfaction that Explore Pinery facilitates can be predicted through the theory of self-efficacy. The Explore Pinery case study provides a compelling argument that smartphone technology can be effectively used in natural environment settings. Although anyone with positive attitudes towards technology can benefit from the app, park users who fall within the category of reluctants and millennials may potentially benefit the most.

Chapter 11: Conclusion

The overall purpose of this thesis was to holistically evaluate the Explore Pinery smartphone application using mixed methods. Mixed methods research presents many challenges and completing two separate studies allowed each perspective to maintain its own set of philosophical assumptions and values without compromise.

The first research question used a general interpretivist approach to see how Explore Pinery influences the achievement of park management objectives. The Provincial Parks and Conservation Reserves Act (2016) outlines the guiding principals for Ontario Parks and, by extension, Pinery Provincial Park. A specific management plan was developed for Pinery which further adds detail to how the park will operate (Ministry of Natural Resources, 1986). Several management objectives are highlighted in the management plan and ultimately all park activities can be traced back to these objectives. Interviews with staff revealed that Explore Pinery fills several gaps within the park and contributes to the on-going achievement of park management objectives. Explore Pinery contributes to management objectives by encouraging positive behaviours of visitors who use the app as well as by providing staff with data they previously did not have. Ultimately, Explore Pinery encourages visitors and staff to further develop their relationship with Pinery and become dedicated park users. Much debate exists as to whether smartphone technology belongs in outdoor settings such as parks (Louv, 2005; Levin, 2017; Schwab, et al., 2016; Emerson, 2017; Rikala & Kankaanranta, 2014), but these findings suggest that technology can be beneficially incorporated into parks and used as a management tool.

The second research question was assessed through a visitor questionnaire and statistical analysis to see if Explore Pinery influenced visitor education levels, sense of place, satisfaction, nature connectedness, and overall experiences. Based on previous literature, the theory of self-

efficacy was used to explain several outcomes including an increase of overall experiences and satisfaction (Bandura, 1977; Wang, Shannon, & Ross, 2013). Results indicated that using Explore Pinery does contribute to overall experiences and improved satisfaction when visitors have positive attitudes towards technology. This study also sheds light on the debate of using smartphone technology in natural environments, as positive outcomes were achieved by visitors who used Explore Pinery.

Each study answered its associated research question while addressing another question overall. Both studies provided evidence that using technology in parks and protected areas has the potential to produce positive outcomes. These findings counter many of the ideas that the use of technology in natural settings detracts from visitors' overall experiences. Furthermore, this research has demonstrated that park specific smartphone applications can be used by modern park managers to facilitate a variety of intentional outcomes that align with park management objectives and contribute to visitors' overall experiences.

9.1 Implications

This research has produced many implications for future research, practice, and evaluation. This research is likely to be the first study to evaluate a park-specific smartphone application and has set the stage for future evaluations. Tools like the Explore Pinery smartphone application can be used to predict outcomes by using the theory of self-efficacy. Future evaluations can also expand on the approach used in this thesis to achieve more detailed evaluations.

This research has tourism implications as it helps understand how visitor experiences are influenced by technologies and how certain technologies can increase positive experiences. This research also contributes to understanding how tourism operators, in this case park managers, can utilize technologies to help achieve their objectives. This research also helps understand how

changing visitor leisure behaviour can produce positive outcomes that result in better experiences that align with the goals of the tourism destination. As mobile technologies become more affordable, prevalent, and customizable, it increasingly makes sense to have these tools in place. Organizations with similar objectives to Pinery have the potential to receive similar benefits that Explore Pinery facilitates. Target audiences within Ontario Parks are key to understanding the types of people who use parks and protected areas. Several prominent groups have high potential to benefit from park-specific smartphone applications and this provides opportunities to offer targeted services that produce effective outcomes.

As technologies continue to be increasingly incorporated into park environments, it is important that they be continuously evaluated. This thesis has provided a methodological framework to use when evaluating future park-specific smartphone applications or related technologies as the mixed methods approach yields comprehensive multi-disciplinary results.

A sizable amount of literature and popular opinion supports the idea that technologies like smartphones should not be included nature. This thesis has provided two main counter-arguments, from different epistemological perspectives, that suggest using technology in natural environments can produce a range of positive benefits. These findings and results will be important going forward as they will hopefully change the minds of those who see technology having no place in parks.

Explore Pinery, the first park-specific smartphone application in the Ontario Parks system, has the potential to create dedicated park users. As demonstrated in this thesis, pushing the disciplinary boundaries of citizen science, outdoor education, and innovative technologies within parks and protected areas can produce multiple outcomes that benefit both park users and staff alike. This thesis has not only provided ground-breaking justifications for the development of

park-specific smartphone applications, but evidence of the value of both qualitative and quantitative evaluation methods as well. This research ultimately contributes to engaging visitors and fostering the ongoing appreciation for natural areas such parks, which contributes to their long-term sustainability.

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Appendix A: University of Waterloo Ethics Clearance

Dear Researcher:

The recommended revisions/additional information requested in the ethics review of your application for the study:

Title: A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project ORE #: 22417 Faculty Supervisor: Dr. Bryan Grimwood (bgrimwood@uwaterloo.ca) Faculty Supervisor: Dr. Steven Mock (smock@uwaterloo.ca) Student Investigator: Andrew MacDonald (aj8macdo@uwaterloo.ca)

have been reviewed and are considered acceptable. A University of Waterloo Research Ethics Committee is pleased to inform you this study has been given ethics clearance.

Best wishes for success with this study.

Erin Van Der Meulen, M.A.
Research Ethics Advisor
Office of Research Ethics
East Campus 5 (EC5), 3rd Floor
519.888.4567 ext. 37046
ervandermeulen@uwaterloo.ca

Appendix B: Ontario Parks Permit

Ontario

MINISTRY OF NATURAL RESOURCES AND FORESTRY

Ontario Parks
Provincial Services Division
659 Exeter Road, 4th Floor
London, ON N6E 1L3

Letter of Authorization to Conduct Research in a Provincial Park or Conservation Reserve

Date:
July 20th, 2017

Issued to:
Andrew MacDonald
University of Waterloo
Department of Recreation and Leisure Studies
35 Mary St. Kitchener, ON, N2H 3P9
Phone: 519-574-4769
Email: Andrew.j.macdonal@sympatico.ca

Authorization Valid:
August 1, 2017 – August 1, 2018

Project Title:
A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project

This letter is issued as authorization for the application that you have submitted for the research project titled "A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project" This authorization is valid for the following provincial parks and conservation reserves only:

Table 1 - Provincial Parks

Protected Area Name	Zone	Contact
Pinery Provincial Park	Southwest	Mark Custers, Park Superintendent Email: mark.custers@ontario.ca Phone: 519-243-8501

Protected Area Name	Zone	Contact
		Alistair MacKenzie, NHE/Resource Management Supervisor Email: Alistair.mackenzie@ontario.ca Phone: 519-243-8591

This authorization letter will serve for access and identification while conducting your research in these provincial parks and conservation reserves for the following persons:

Principal Investigator:
Andrew MacDonald

Field Researcher(s):
Dr. Bryan Grimwood, University of Waterloo
Dr. Steven Mock, University of Waterloo
Ontario Parks staff volunteers

This authorization to conduct research is subject to the following terms and conditions.

Project Specific Conditions

1. The principal investigator and/or their field persons must contact the designated contact (listed in the table above) **at least one week** prior to the requested visit to the protected area to conduct the authorized research.

General Conditions

2. The MNRF, including Ontario Parks, reserves the right to suspend, cancel, restrict the scope, or impose additional terms and conditions at any time during the research project.
3. It is the responsibility of the principal investigator to secure and maintain in good standing any other required authorizations and permits prior to initiating field research.
4. The principal investigator is responsible for all members of their field research team. All related field persons must also observe all conditions of this authorization.
5. The names of any additional field personnel not identified in this authorization must be provided to Jenni Kaija, Ontario Parks Southwest A/ Assistant Ecologist (jenni.kaija@ontario.ca), a minimum of 48 hours in advance of their being onsite.
6. Research authorization cannot be transferred to a third party without the prior written consent of MNRF.

7. The principal investigator and/or their field persons are not authorized to construct any facility, building or other devices unless as specifically authorized in the Project Specific Conditions above or other formal agreement with the MNRF.

While conducting research the principal investigator and field person will

8. Carry a legible copy of this authorization letter on their persons while conducting research in the protected area(s). All field persons must be in possession of a valid authorization letter before the field work commences and at other periods as stated in the authorization letter.
9. Conduct the research activities in a manner that protects the health and safety of researchers, other visitors, and MNRF staff. If there are any questions regarding health and safety concerns, please contact the designated protected area contact person to discuss the project prior to commencing field work.
10. Clean all clothing, equipment (vehicles, boats, sampling gear, etc.) and personal gear to prevent the introduction and spread of aquatic or terrestrial alien/invasive species prior to and after sampling within protected areas, including waterbodies and watercourses. This also applies after sampling in one location within a protected area (e.g., a waterbody) and before sampling in another area (e.g., another waterbody) in a protected area to prevent transfer within, between or out of protected areas. Species specific information and best practices are available at the Invading Species Awareness Program webpage.
11. Leave no garbage or other materials on site, and take care to avoid any impacts to natural or cultural values.
12. Domestic animals (e.g., dogs) may not accompany researchers in the protected area. Any exceptions must be discussed with the designated contact prior to arrival at the protected area.

Collection Conditions

13. The collection of any cultural or additional natural materials is prohibited. If you encounter any natural or cultural materials during your work in the protected area that may be previously unknown, you will notify the protected area contact indicated above, within 24 hours.
14. All location information will be collected in NAD83 UTM.

Reporting Requirements

1. A digital copy of all raw or summary data collected from the project to date, must be submitted to darren.ungar@ontario.ca with a copy to pascience@ontario.ca by December 31, 2017.
2. After project completion, a digital copy of all final research reports will be submitted to Darren.ungar@ontario.ca with a copy to pascience@ontario.ca by August 1, 2018.

3. Any relevant Species at Risk data will be submitted to the Natural Heritage Information Centre, MNRF, Peterborough, with a copy to pascience@ontario.ca. Species at Risk data must be kept confidential and must not be communicated with persons outside the Natural Heritage Information Centre.

Research projects may require additional permits or approvals (e.g., MNRF Wildlife Scientific Collector Authorization, *Endangered Species Act,* 2007 permit, etc.). Principal investigators and authorized field personnel must follow the terms and conditions of every permit or authorization required for the research project.

For questions regarding this authorization, please contact the **Protected Areas Research Analyst** at pascience@ontario.ca.

Failure to comply with the terms and conditions will result in the withdrawal of authorization and termination of the research project. The MNRF reserves the right to impose additional terms and conditions at any time during the term of the research project.

Authorized by

Melanie Milczynski
Manager, Ontario Parks, Southwest Zone

c.c.

Mark Custers, Park Superintendent, Pinery Provincial Park
Alistair MacKenzie, NHE & RM Supervisor, Pinery Provincial Park
Darren Ungar, A/ Zone Ecologist, Southwest Zone, Ontario Parks
Jenni Kaija, A/ Assistant Ecologist, Southwest Zone, Ontario Parks
Michelle Smith, Administrative Assistant, Southwest Zone, Ontario Parks
Sarah McGuire, Protected Areas Analyst, Protected Areas Section

Appendix A – Application to Conduct Research

-----Original Message-----
From: Andrew MacDonald [mailto:andrew.j.macdonald@sympatico.ca]
Sent: July-16-17 12:28 PM
To: Protected Area Science (MNRF)
Subject: Ontario Parks Research Application - Andrew MacDonald

Applicant Name: Andrew MacDonald

Affiliation: University of Waterloo, Department of Recreation and Leisure Studies

Email Address: andrew.j.macdonald@sympatico.ca

Business Address: 35 Mary St. Kitchener, ON, N2H3P9

Business Phone: 519-574-4769

Business Fax:

Home Address: 35 Mary St. Kitchener, ON, N2H3P9

Home Phone: 519-574-4769

Home Fax:

Project Title: A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project

Project Location: Pinery Provincial Park

Project Details: The research objectives of this Master's thesis are as follows:

1. To what extent, if any, does the 'Explore Pinery' smartphone application contribute to achieving park management objectives?
    a. How does Explore Pinery influence the park protection objective?
    b. How does Explore Pinery influence the heritage appreciation objective?
    c. How does Explore Pinery influence the recreational opportunities objective?
2. How effective, if at all, is 'Explore Pinery' at engaging visitors in experiential outdoor education, building sense of place, enhancing nature connectedness, and improving overall visitor experiences?

This research will be the first of its kind to comprehensively assess a park-specific smartphone application. Pinery Provincial Park is the first Ontario Park to develop a park-specific smartphone application which engages a variety of audiences while also contributing useful scientific data back to park managers. This research will explore how smartphone apps can be useful in achieving management objectives and how visitors incorporate them during their visits. This research will also generate literature that can be applied to other protected areas provincially, nationally, and internationally.

Please refer to the thesis proposal for more details on the importance and relevance of this research.

This research is a follow up to the Undergraduate Thesis which helped launch "Explore Pinery" titled "Improving Visitor Engagement within Parks and Protected Areas Using Innovative Technologies to Facilitate Citizen Science and Outdoor Education: A Case Study of Pinery Provincial Park" by Andrew MacDonald.

*There does not appear to be a way to attach files in this online form. I would be happy to email several supporting documents including (1) a thesis proposal (successfully defended), (2) visitor questionnaires, & (3) interviews guides. Is there an email I could send these documents to? Please let me know at andrew.j.macdonald@sympatico.ca. Thank You.

General Outline: A quantitative questionnaire will be given to visitors who choose to participate. Visitors will not be approached, and all participants will participate of their own free will. Next, semi-structured interviews will occur with senior park staff. These interviews are based around how the smartphone app "Explore Pinery" influences the achievement of park management objectives, as outlined in the Pinery Provincial Park management plan.

Procedures: Paper/online (through the "Explore Pinery" app) questionnaires are the only equipment being used with visitors. These are expected to have no impact on the park environment. In-person interviews with senior staff are also not expected to have any impact on the park environment.

From Date: August 01, 2017

To Date: August 01, 2018

Park Visitors Involved: Provincial park visitors will be involved in this research. Visitors have the option to participate and fill out a questionnaire. This questionnaire is non-intrusive, and asks questions that assess participants' satisfaction, sense of place, nature connectedness, and the degree to which they gained educational knowledge from the smartphone app. Please see attached a copy of the questionnaires. Two slightly different questionnaires are being administered depending on whether or not the participant has used the "Explore Pinery" smartphone app. These questionnaires can be filled out in approximately 5 minutes or less. Once participants complete the survey, or choose to withdraw part way through, they will have the opportunity to enter their email address into a draw to win 1 of 4 $25 gift cards to Mountain Equipment Coop. Participants will never be approached and asked to complete a survey. Instead, posters will be displayed indicating that the questionnaire is available to compete if they wish to do so. On some occasions, the researcher will set up a small table at the park store complex with a sign indicating that the questionnaire is available to complete if participants choose to do so.

Assistance from MNR: No accommodation, equipment, or travel assistance is required from the MNRF.

Consultants from MNR: Voluntary participation of select MNRF/Ontario Parks staff of Pinery Provincial Park will be required. Participation will involve a semi-structured interview lasting approximately 30 minutes. Between 4-6 participants are needed.

Licences Held: A full ethics approval is pending from the University of Waterloo. The project will not be started until full ethics clearance is received.

Performance Bonding: No

Persons Assisting: Andrew MacDonald – Principal Researcher Bachelor of Environmental Studies, University of Waterloo: Geography and Environmental Management, Earth Systems Science specialization, Parks option. Candidate for Master's in Recreation and Leisure studies, University of Waterloo. Resource Technician Level 1 – Pinery Provincial Park (4 years of experience at Pinery)

Contributions: Thesis proposal, administering interviews & questionnaires, final Master's thesis.

Dr. Bryan Grimwood –Supervisor
Associate Professor, University of Waterloo
Contributions: Supervise project, assist in the development of interview questions

Dr. Steven Mock – Committee Member
Associate Professor, University of Waterloo
Contributions: Development of surveys, review statistical findings

Note that the thesis proposal has been formally, and successfully, defended in front of Dr. Bryan Grimwood and Dr. Steven Mock.

Contributors: Ontario Graduate Scholarship University of Waterloo Presidents scholarship

Final Report Date: August 30, 2018

Applicant Agrees to abide by terms: Yes

Date: July 16, 2017

Signature: Signature of Course Director or Advisor or, if applicable, Agency/Company President, Chairperson or Manager:

Date Approved:

Granted Admin:

Approval Granted:

Supervisor Signature:

Date:

Manager Signature:

Manager Provincial Parks Planning and Research

Date:

Conditions:

Conditions of approval if applicable:

Validation:

Valid From/To:

Appendix C: Interview Recruitment Email

Hello,

My name is Andrew MacDonald and I am a Master's student working under the supervisions of Dr. Bryan Grimwood & Dr. Steve Mock in the Recreation and Leisure Studies Department at the University of Waterloo. I am contacting you because you are a senior staff member or manager at Pinery Provincial Park.

The reason that I am contacting you is because we are conducting a study on the Pinery Provincial Park Smartphone application, "Explore Pinery", as part of my thesis. We are currently seeking staff volunteers to participate in our study.

Participation in this study involves an in-person interview that will take approximately 30 minutes of your time. Interview questions will focus on how the Pinery Provincial Park smartphone application influences your job as it relates to the achievement of park management objectives, as outlined in the Pinery Provincial Park management plan. I would like to assure you that the study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee.

Please find attached an Information Letter which contains more details about this study. If you are interested in participating in this study, please reply to this email. The final decision about participation is yours.

Interviews can be scheduled throughout the fall of 2017, at your convenience.

If you are interested in participating, please contact me at aj8macdo@uwaterloo.ca and indicate when you would like to participate. I will then send a confirmation email indicating our interview time, and provide you with further information concerning the location of the study. If you have to cancel your appointment, please email me at aj8macdo@uwaterloo.ca*.*

Sincerely,
Andrew

Andrew MacDonald B.E.S.
University of Waterloo
M.A. Candidate – Recreation and Leisure Studies
Aj8macdo@uwaterloo.ca

Appendix D: Information and Consent Letter for Interviews

Information & Consent Letter

Title of Study: A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project

Student Investigator/Faculty Supervisor:
Principal Investigator: Andrew MacDonald, University of Waterloo, Department of Recreation and Leisure Studies. Email aj8macdo@uwaterloo.ca.
Faculty Supervisor: Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca

Invitation to participate/What is the study about?: You are invited to participate in a research study that assesses the Pinery Provincial Park smartphone application, "Explore Pinery." The objectives of this study are to see how the park-specific smartphone app affects visitors' level of engagement (sense of place, education, nature connectedness, and satisfaction) and to see how the app can be useful to park managers as a tool for achieving park management objectives. This research will be some of the first to look at how technology and smartphone apps are used in Provincial Parks.

Who may participate and role as a participant:
This study will involve interviews with Senior Pinery Provincial Park staff, including managers, as well as questionnaires to be completed by Pinery Provincial Park visitors. As a senior staff member, you are invited to participate in an interview that will take approximately 30 minutes of your time. The interview will be scheduled at a time and place of mutual convenience. With your permission, the interview will be audio recorded to facilitate collection of information, and later transcribed for analysis. Shortly after the interview has been completed, I will send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish. All information you provide is considered completely confidential. Your name will not appear in any thesis or report resulting from this study, however, with your permission anonymous quotations may be used. Please note that a copy of the study's results will be shared with Ontario Parks. This **does not** include interview recordings or transcripts, only final reports and data in aggregate format.

Rights as a participant:
Your participation in this study is voluntary. You may decline to answer any question(s) you prefer not to answer by requesting to skip the question. Further, you may decide to leave the interview at any time by communicating this to the researcher.

Will I receive anything for participating?:
You will not receive remuneration for your participation in the study.
Benefits of participating:
Participation in this study may not provide any personal benefits to you. This study will benefit the academic community/society in several ways:

- This is one of the first studies to assess park specific smartphone applications (apps);
- This research may provide justification for further exploration of technology in parks;
- This research may identify areas were visitor experiences can be improved.

Risks:
There are no anticipated risks with this study.

Protecting your confidentiality/What we will do with your data:
We will remove all information that could identify you from the data we have collected within 1 year of the collection date and delete it permanently. You can withdraw your consent to participate and have your data destroyed by contacting us within this time period. After this time, it is not possible to withdraw your consent to participate as we have no way of knowing which responses are yours. Additionally, you will not be able to withdraw consent once papers and publications have been submitted to publishers. Only those associated with this study will have access to these records which are secured by password protection. We will keep our study records for a minimum of 1 year. All records are destroyed according to University of Waterloo policy.

Ethics Clearance:
This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or oreceo@uwaterloo.ca.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact either myself or my supervisor."
Student Investigator: Andrew MacDonald, Email aj8macdo@uwaterloo.ca.
Faculty Supervisor: Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca

Consent Form: By providing your consent, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about a study conducted by Andrew MacDonald and Dr. Bryan Grimwood, University of Waterloo, Recreation and Leisure Studies. I have had the opportunity to ask questions related to the study and have received satisfactory answers to my questions and any additional details. I was informed that participation in the study is voluntary and that I can withdraw this consent by informing the researcher.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or oreceo@uwaterloo.ca. For all other questions contact Andrew MacDonald, email aj8macdo@uwaterloo.ca or Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca.

☐ I agree to my interview being audio recorded to ensure accurate transcription and analysis.

☐ I agree to the use of anonymous quotations in any thesis or publication that comes from this research

I agree of my own free will to participate in the study.

Participant's name: _____ Date: _____

Participant's signature: _____ Date: _____

Researcher's/Witness' signature: _____ Date: _____

Appendix E: Qualitative Semi-structured Interview

Qualitative Survey: Semi-structured Interview Guide

Disclaimer to participants: There are no right or wrong answers. Everything is useful, productive, and appreciated.

Question 1: How does Explore Pinery influence the park management objective of providing ***protection*** for significant elements of the natural and cultural landscape?

Sub-question 1: How does Explore Pinery influence the parks ability to collect data?

Potential Probes:

- In which ways do you feel park visitors are likely to contribute to collecting data?

Sub-question 2: In which ways do you think Explore Pinery could impact the way staff typically collect data?

Potential Probes:

- Are there any surveys that Explore Pinery could assist with?
- How do you think staff are likely to use it in their day-to-day activities?

Question 2: How does Explore Pinery influence the park management objective of providing opportunities for ***exploration and appreciation*** of outdoor natural and cultural heritage?

Sub-question 1: In which ways do you feel that Explore Pinery is effective, if at all, at providing exploration and appreciation opportunities?

Sub-question 2: In which ways do you feel that Explore Pinery is not effective at providing exploration and appreciation opportunities?

Sub-question 3: To what degree do you think visitors are downloading Explore Pinery for exploration and appreciation?

Potential Probes:

- For what other reasons do you think visitors are downloading Explore Pinery?

Question 3: How does Explore Pinery influence the park management objective of providing a variety of **recreational opportunities** in areas with high recreation potential?

Sub-question 1: How do you feel about the level of recreation opportunities that have been incorporated into Explore Pinery?

Potential Probes:

- In which ways do you think Explore Pinery should have a stronger recreation focus?
- What other priorities do you think Explore Pinery should focus on?

Question 4: To what extend do you think Explore Pinery **creates or overcomes barriers** to visitors overall experiences?

Sub-question 1: What do you think are some of the reasons visitors may choose to not use Explore Pinery?

Potential Probes:

- How could these barriers be overcome?
- In areas where Explore Pinery overcomes or reduces barriers, what could improve these even further?

Thank you very much for participating

Appendix F: Thank-you Letter to Interview Participants

University of Waterloo

July 9, 2017

Dear ***(Insert Name of Participant),***

I would like to thank you for your participation in this study entitled "A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project". As a reminder, the purpose of this study was to assess the Pinery smartphone application, "Explore Pinery," in terms of the level of engagement with visitors and potential usefulness for park managers.

The data collected during interviews will contribute towards a better understanding of how Explore Pinery influences the day-to-day and long term experiences of staff in terms of achieving park management objectives. Please note that a copy of the study's results will be shared with Ontario Parks. This does not include interview recordings or transcripts, only final reports and data in aggregate format.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions contact Andrew MacDonald at aj8macdo@uwaterloo.ca

Please remember that any data pertaining to you as an individual participant will be kept confidential. Once all the data are collected and analyzed for this project, the final results (which will not contain any personally identifiable information) will be shared with the research community through conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please provide your email address, and when the study is completed, anticipated by July 30, 2018, I will send you the information. In the meantime, if you have any questions about the study, please do not hesitate to contact me by email as noted below.

Andrew MacDonald

Department of Recreation and Leisure Studies,
University of Waterloo
Aj8macdo@uwaterloo.ca

Dr. Bryan Grimwood,
University of Waterloo,
Department of Recreation and Leisure Studies.
Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca

Appendix G: Questionnaire Recruitment Letter

Department of *Recreation and Leisure Studies*
University of Waterloo

INVITATION TO PARTICIPATE INRESEARCH ON THE USE OF SMARTPHONE TECHNOLOGY IN PINERY PROVINCIAL PARK

We are looking for volunteers to take part in a study of *Pinery's Smartphone Application, "Explore Pinery*".

You may participate in this study whether or not you have used the "Explore Pinery" app.

As a participant in this study, you would be asked to complete an anonymous questionnaire.

Your participation would involve a questionnaire that will take approximately 10 minutes of your time. You will be asked about your general experiences at the Pinery

In appreciation for your time, your e-mail address will be entered into a draw for the chance to win 1 of 4 $25 Mountain Equipment Coop gift cards.

For more information about this study, or to volunteer for this study, please contact:

Andrew MacDonald
Recreation and Leisure Studies,
University of Waterloo

Email: *aj8macdo@uwaterloo.ca*

This study has been reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee.

Appendix H: Questionnaire Recruitment Script

Questionnaire Recruitment Script for App Users and Non App Users

This script will be used while standing at a table in high traffic areas within Pinery Provincial Park. Once people approach the table, I will provide them with the following information:

Hello, my name is Andrew and I am a 2nd year Master's student in the Department of Recreation and Leisure Studies at the University of Waterloo. I am currently working on my thesis with Dr. Bryan Grimwood and Dr. Steve Mock. I am studying the impacts of park specific smartphone applications and how they can influence visitors sense of place, nature connectedness, education, and overall satisfaction. I am also looking at how smartphone apps can be useful for achieving park management objectives.

This research will hopefully lead to a better understanding of how technology fits into parks and protected areas.

If you volunteer as a participant in this study, you will be asked to complete an anonymous questionnaire that will take approximately 10 minutes. In appreciation of your time, participants will be entered into a draw for the chance to win 1 of 4 $25 Mountain Equipment Coop gift cards.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours.

If you are interested in participating, I can provide you with an information letter to learn more about this study. Following that, a consent letter will be provided if you are still interested in participating. Once you have reviewed and signed the consent letter, I will give the questionnaire to complete.

Thank you.

Appendix I: Information Letter for Online Questionnaire

Information Letter

Title of Study: A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project

Student Investigator/Faculty Supervisor:
Principal Investigator: Andrew MacDonald, University of Waterloo, Department of Recreation and Leisure Studies. Email aj8macdo@uwaterloo.ca.
Faculty Supervisor: Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca

Invitation to participate/What is the study about?: You are invited to participate in a research study that assesses the Pinery Provincial Park smartphone application, "Explore Pinery". The objectives of this study are to see how the park-specific smartphone app affects visitors' level of engagement (sense of place, education, nature connectedness, and satisfaction) and to see how the app can be useful to park managers as a tool for achieving park management objectives. This research will be some of the first to look at how technology and smartphone apps are used in Provincial Parks. Please note a copy of the study's results will be shared with Ontario Parks.

Who may participate and role as a participant:
Anyone 18 years of age or older who has visited Pinery Provincial Park may complete the questionnaire. This online questionnaire is to be completed by those who have used the "Explore Pinery" smartphone application. As a participant, you will be asked to complete a questionnaire that will take approximately 10 minutes. Examples of questions include how satisfied you are with your Pinery experience, how you feel about Pinery in general, and how you identify with 'nature'.

Rights as a participant:
Your participation in this study is voluntary. You may decline to answer any questions you prefer not to answer by leaving them blank and you may decide to withdraw your participation at any time during the questionnaire by not submitting your responses or by exiting the browser. Please be advised that because no identifying information (e.g. your name) will be associated with this data, it will not be possible to remove your data from the study once collected as we will have no way of identifying which responses were yours.

Will I receive anything for participating?:
In appreciation of the time you have given to this study, you can enter your e-mail address into a draw for 1 of 4 prizes. The prizes include a $25 Mountain Equipment Coop gift certificate.

Your odds of winning one of the prizes is based on the number of individuals who participate in the study. We expect that approximately 400 individuals will take part in the study. Information collected to draw for the prizes will not be linked to the study data in any way, and this identifying information will be stored separately, then destroyed after the prizes have been provided. The amount received is taxable. It is your responsibility to report this amount for income tax purposes.

Benefits of participating:
Participation in this study may not provide any personal benefits to you. This study will benefit the academic community/society in several ways:

- This is one of the first studies to assess park-specific smartphone applications (apps);
- This research may provide justification for further exploration of technology in parks;
- This research may identify areas were visitor experiences can be improved.

Confidentiality:
Your participation in this study is considered completely confidential. The questionnaire will not ask for your name or any other identifying information. Furthermore, all of the data will be grouped together and no individual could be identified from these summarized results. Only the research team and Ontario Parks will have access to the data, which will be stored on a password-protected computer. Research data will be retained for a minimum of one year. All records will be destroyed according to University of Waterloo Policy.

You will be completing the study by an online questionnaire operated by SurveyMonkey. When information is transmitted over the internet privacy cannot be guaranteed. There is always a risk your responses may be intercepted by a third party (e.g., government agencies, hackers). SurveyMonkey temporarily collects your computer IP address to avoid duplicate responses in the dataset but will not collect information that could identify you personally.

Ethics Clearance:
This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions please contact Andrew MacDonald, email aj8macdo@uwaterloo.ca or Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca.

Appendix J: Information Letter for Off-line Questionnaire

Information Letter

Title of Study: A Mixed Methods Assessment of the Pinery Provincial Park Smartphone Application Pilot Project

Student Investigator/Faculty Supervisor:
Principal Investigator: Andrew MacDonald, University of Waterloo, Department of Recreation and Leisure Studies. Email aj8macdo@uwaterloo.ca.
Faculty Supervisor: Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca

Invitation to participate/What is the study about?: You are invited to participate in a research study that assesses the Pinery Provincial Park smartphone application, "Explore Pinery". The objectives of this study are to see how the park-specific smartphone app affects visitors' level of engagement (sense of place, education, nature connectedness, and satisfaction) and to see how the app can be useful to park managers as a tool for achieving park management objectives. This research will be some of the first to look at how technology and smartphone apps are used in Provincial Parks. Please note a copy of the study's results will be shared with Ontario Parks.

Who may participate and role as a participant:
Anyone 18 years of age or older who has visited Pinery Provincial Park may complete the questionnaire. You may participate in this study whether you have used the "Explore Pinery" app or not. As a participant, you will be asked to complete a questionnaire that will take approximately 10 minutes. Examples of questions include how satisfied you are with your Pinery experience, how you feel about Pinery in general, and how you identify with 'nature'.

Rights as a participant:
Your participation in this study is voluntary. You may decline to answer any question(s) you prefer not to answer and you may decide to withdraw your participation at any time during the questionnaire, without penalty or loss of remuneration, by advising the researcher. Please be advised that because no identifying information (e.g. your name) will be associated with this data, it will not be possible to remove your data from the study once collected as we will have no way of identifying which responses were yours.

Will I receive anything for participating?:
In appreciation of the time you have given to this study, you can enter your e-mail address into a draw for 1 of 4 prizes. The prizes include a $25 Mountain Equipment Coop gift certificate. Your odds of winning one of the prizes is based on the number of individuals who participate in

the study. We expect that approximately 400 individuals will take part in the study. Information collected to draw for the prizes will not be linked to the study data in any way, and this identifying information will be stored separately, then destroyed after the prizes have been provided. The amount received is taxable. It is your responsibility to report this amount for income tax purposes.

Benefits of participating:
Participation in this study may not provide any personal benefits to you. This study will benefit the academic community/society in several ways:

- This is one of the first studies to assess park-specific smartphone applications (apps);
- This research may provide justification for further exploration of technology in parks;
- This research may identify areas were visitor experiences can be improved.

Risks:
There are no anticipated risks with this study.

Confidentiality:
Your participation in this study is considered completely confidential. The questionnaire will not ask for your name or any other identifying information. Furthermore, all of the data will be grouped together and no individual could be identified from these summarized results. Only the research team and Ontario Parks will have access to the data, which will be stored on a password-protected computer. Research data will be retained for a minimum of one year. All records will be destroyed according to University of Waterloo Policy.

Ethics Clearance:
This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions please contact Andrew MacDonald, email aj8macdo@uwaterloo.ca or Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca.

Appendix K: Consent Letter for Questionnaire

Consent of Participant

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about a study being conducted by *Andrew MacDonald, Dr. Bryan Grimwood, and Dr. Steve Mock* of the Department of *Recreation and Leisure Studies* at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted. I am aware that I may withdraw from the study before or during the questionnaire without penalty by advising the researcher of this decision.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions contact: Andrew MacDonald, Recreation and Leisure Studies, University of Waterloo. Email: aj8macdo@uwaterloo.ca

_____
Print Name

_____
Signature of Participant

_____
Dated at Pinery Provincial Park, Ontario

_____
Witnessed

Appendix L: App User Questionnaire

Explore Pinery User Questionnaire

Survey to be completed by adults 18 years and older.

1) Please select your gender:
    1. Male
    2. Female
    3. Other
    4. Prefer not to say

2) Please enter your age:

3) Were you born in Canada?
    1. Yes
    2. No

4) If No, how many years have you lived in Canada, or are you a tourist to Canada?
    1. Number of years living in Canada ___
    2. Yes, I am a tourist to Canada

5) Please select the highest level of education you have completed:
    1. High school
    2. College
    3. University – Undergraduate degree
    4. University – Graduate Degree
    5. PhD/Medical Doctor
    6. Other highly specialized education beyond university PhD/MD

6) Approximately how many times have you visited Pinery Provincial Park?

7) How would you rate your understanding and competence with most technology (smartphones, computers, devices, etc.)?
    1. I have great difficulty with technology.
    2. I have some difficulty with technology.
    3. Neutral
    4. I can easily understand most technology.
    5. I can very easily understand most technology.

8) How would you rate your attitude towards most technology (smartphones, computers, devices, etc.)?
    1. I really dislike technology.
    2. I dislike technology.
    3. Neutral
    4. I enjoy technology.
    5. I really enjoy technology.

9) On a scale of 1 to 5, how often do you use *Explore Pinery* **while at** Pinery?
    1. Never
    2. Once per visit
    3. Once per day
    4. Twice a day
    5. Three times a day or more

10) On a scale of 1 to 5, how often do you use *Explore Pinery* **while not at** Pinery?
    1. Never
    2. Once per visit
    3. Once per day
    4. Twice a day
    5. Three times a day or more

11) What Parts of Explore Pinery do you use most often? Please rank all from 1 (most used) to 4 (least used).

    Weather forecasts
    Education & program activities
    Citizen Science participation
    General park information

12) Please indicate the degree to which you agree or disagree to the following statements:
    A. *Explore Pinery* has increased the amount I know about the natural environment within Pinery Provincial Park
        1) Strongly disagree
        2) Disagree
        3) Neutral
        4) Agree
        5) Strongly agree

B. *Explore Pinery* has made me aware of the educational programs offered by Park Staff
    1) Strongly disagree
    2) Disagree
    3) Neutral
    4) Agree
    5) Strongly agree

C. *Explore Pinery* has made me aware of the variety of recreation opportunities offered within Pinery Provincial Park
    1) Strongly disagree
    2) Disagree
    3) Neutral
    4) Agree
    5) Strongly agree

D. *Explore Pinery* has made me aware of the park services and amenities that are offered within Pinery Provincial Park
    1) Strongly disagree
    2) Disagree
    3) Neutral
    4) Agree
    5) Strongly agree

E. *Explore Pinery* has contributed to my overall experience.
    1) Strongly disagree
    2) Disagree
    3) Neutral
    4) Agree
    5) Strongly agree

13) Please list as many Citizen Science Projects within Pinery as you can.

14) Where can you find information about educational programing?

15) Who are The Friends of Pinery?

Please answer each of the following questions in terms of the way you generally feel.

	Question	Very Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Very Satisfied
15	How satisfied are you with your overall visitor experience at Pinery?					
16	How satisfied are you with the quality of the natural environment at Pinery?					
17	How satisfied are you with the quality of the social environment at Pinery?					
18	How satisfied are you with the quality of the opportunities to participate in your favourite activities at Pinery?					
19	How satisfied are you with the Explore Pinery app?					

Please answer each of the following questions in terms of the way you generally feel. There are no right or wrong answers.

Using the following scale, in the space provided next to each question, simply state as honestly and candidly as you can what you are presently experiencing.

1 Strongly disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly agree

____ 1. I often feel a sense of oneness with the natural world around me.
____ 2. I think of the natural world as a community to which I belong.
____ 3. I recognize and appreciate the intelligence of other living organisms.
____ 4. I often feel disconnected from nature.
____ 5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.
____ 6. I often feel a kinship with animals and plants.
____ 7. I feel as though I belong to the Earth as equally as it belongs to me.

____ 8. I have a deep understanding of how my actions affect the natural world.
____ 9. I often feel part of the web of life.
____ 10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.
____ 11. Like a tree can be part of a forest, I feel embedded within the broader natural world.
____ 12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.
____ 13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.
____ 14. My personal welfare is independent of the welfare of the natural world.

Please indicate the degree to which you agree or disagree to the following statements:

	Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Visiting Pinery says a lot about who I am.					
2	When I visit Pinery, others see me the way I want them to see me.					
3	I identify strongly with Pinery.					
4	I feel Pinery is part of me.					
5	I feel I can really be myself when I am in Pinery.					
6	Pinery means a great deal to me.					
7	I feel strong, positive feelings for Pinery.					
8	I really miss Pinery when I am away too long.					
9	I feel relaxed when I am at Pinery.					
10	I am fond of Pinery.					
11	I feel happiest when I am at Pinery.					
12	Pinery is my favourite place to be.					
13	I get more satisfaction out of visiting Pinery than any other park.					
14	The things I do at Pinery I would enjoy doing just as much at a similar site.					
15	I wouldn't substitute any other area for doing the types of things I do at Pinery.					
16	Pinery is the best place for what I like to do.					

Thank you for participating in this research study

If you wish to be entered into a draw for 1 of 4 $25 gift cards to Mountain Equipment Coop, please leave your email address below

_____

If you would like a copy of the results, please leave your email address below:

_____

Thank you for participating in this "Mixed Methods Evaluation of the Pinery Provincial Park Smartphone Application Pilot Project" survey! Your feedback is extremely valuable.

If you indicated on the survey that you would like a copy of the results, they will be sent to you by email at the address you provided by July 1, 2018.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions or if you have general comments or questions related to this study, please contact Andrew MacDonald, Recreation and Leisure Studies department. Email aj8macdo@uwaterloo.ca

Appendix M: Non-app User Questionnaire

Non-Explore Pinery User Questionnaire

Survey to be completed by adults 18 years and older.

16) Please select your gender:
    1. Male
    2. Female
    3. Other
    4. Prefer not to say

17) Please enter your age:

18) Were you born in Canada?
    1. Yes
    2. No

19) If No, how many years have you lived in Canada, or are you a tourist to Canada?
    1. Number of years living in Canada ___
    2. Yes, I am a tourist to Canada

20) Please select the highest level of education you have completed:
    1. High school
    2. College
    3. University – Undergraduate degree
    4. University – Graduate Degree
    5. PhD/Medical Doctor
    6. Other highly specialized education beyond university PhD/MD

21) Approximately how many times have you visited Pinery Provincial Park?

22) How would you rate your understanding and competence with most digital technology (smartphones, computers, devices, etc.)?
    1. I have great difficulty with technology.
    2. I have some difficulty with technology.
    3. Neutral
    4. I can easily understand most technology.
    5. I can very easily understand most technology.

23) How would you rate your attitude towards most digital technology (smartphones, computers, devices, etc.)?
    1. I really dislike technology.
    2. I dislike technology.
    3. Neutral
    4. I enjoy technology.
    5. I really enjoy technology.

24) On a scale of 1 to 5, how often do you use the Pinery tabloid/educational flyers **while at** Pinery?
    1. Never
    2. Once per visit
    3. Once per day
    4. Twice a day
    5. Three times a day or more

25) On a scale of 1 to 5, how often do you use the Pinery tabloid/educational flyers **while not at** Pinery?
    1. Never
    2. Once per visit
    3. Once per day
    4. Twice a day
    5. Three times a day or more

26) Please indicate the degree to which you agree or disagree to the following statements:

    F. The Pinery tabloid/educational flyers have increased the amount I know about the natural environment within Pinery Provincial Park.
        1. Strongly disagree
        2. Disagree
        3. Neutral
        4. Agree
        5. Strongly agree

G. The Pinery tabloid/educational flyers have made me aware of the educational programs offered by Park Staff.
    1. Strongly disagree
    2. Disagree
    3. Neutral
    4. Agree
    5. Strongly agree

H. The Pinery tabloid/educational flyers have made me aware of the variety of recreation opportunities offered within Pinery Provincial Park.
    1. Strongly disagree
    2. Disagree
    3. Neutral
    4. Agree
    5. Strongly agree

I. The Pinery tabloid/educational flyers have made me aware of the park services and amenities that are offered within Pinery Provincial Park.
    1. Strongly disagree
    2. Disagree
    3. Neutral
    4. Agree
    5. Strongly agree

27) Please list as many Citizen Science Projects within Pinery as you can.

28) Please list all the sources from which you can find information about educational programming.

29) Who are The Friends of Pinery?

Please answer each of the following questions in terms of the way you generally feel.

	Question	Very Dissatisfied	Somewhat Dissatisfied	Neutral	Somewhat Satisfied	Very Satisfied
15	How satisfied are you with your overall visitor experience at Pinery?					
16	How satisfied are you with the quality of the natural environment at Pinery?					
17	How satisfied are you with the quality of the social environment at Pinery?					
18	How satisfied are you with the opportunities to participate in your favourite activities at Pinery?					

Please answer each of the following questions in terms of the way you generally feel. There are no right or wrong answers.

Using the following scale, in the space provided next to each question, simply state as honestly and candidly as you can what you are presently experiencing.

1 Strongly disagree
2 Disagree
3 Neutral
4 Agree
5 Strongly agree

____ 1. I often feel a sense of oneness with the natural world around me.
____ 2. I think of the natural world as a community to which I belong.
____ 3. I recognize and appreciate the intelligence of other living organisms.
____ 4. I often feel disconnected from nature.
____ 5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.
____ 6. I often feel a kinship with animals and plants.
____ 7. I feel as though I belong to the Earth as equally as it belongs to me.

____ 8. I have a deep understanding of how my actions affect the natural world.
____ 9. I often feel part of the web of life.
____ 10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.
____ 11. Like a tree can be part of a forest, I feel embedded within the broader natural world.
____ 12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.
____ 13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.
____ 14. My personal welfare is independent of the welfare of the natural world.

Please indicate the degree to which you agree or disagree to the following statements:

	Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Visiting Pinery says a lot about who I am.					
2	When I visit Pinery, others see me the way I want them to see me.					
3	I identify strongly with Pinery.					
4	I feel Pinery is part of me.					
5	I feel I can really be myself when I am in Pinery.					
6	Pinery means a great deal to me.					
7	I feel strong, positive feelings for Pinery.					
8	I really miss Pinery when I am away too long.					
9	I feel relaxed when I am at Pinery.					
10	I am fond of Pinery.					
11	I feel happiest when I am at Pinery.					
12	Pinery is my favourite place to be.					
13	I get more satisfaction out of visiting Pinery than any other park.					
14	The things I do at Pinery I would enjoy doing just as much at a similar site.					
15	I wouldn't substitute any other area for doing the types of things I do at Pinery.					
16	Pinery is the best place for what I like to do.					

Thank you for participating in this research study

If you wish to be entered into a draw for 1 of 4 $25 gift cards to Mountain Equipment Coop, please leave your email address below

_____

If you would like a copy of the results, please leave your email address below:

_____

Thank you for participating in this "Mixed Methods Evaluation of the Pinery Provincial Park Smartphone Application Pilot Project" survey! Your feedback is extremely valuable.

If you indicated on the survey that you would like a copy of the results, they will be sent to you by email at the address you provided by July 1, 2018.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions or if you have general comments or questions related to this study, please contact Andrew MacDonald, Recreation and Leisure Studies department. Email aj8macdo@uwaterloo.ca

Appendix N: Thank-you Letter to Questionnaire Participants

Visitor Survey Questionnaire Thank You

Thank you for participating in our "Mixed Methods Evaluation of the Pinery Provincial Park Smartphone Application Pilot Project" survey! Your feedback is extremely valuable. A copy of this project will be sent to Ontario Parks.

If you indicated on the survey that you would like a copy of the results, they will be sent to you by email at the address you provided by July 1, 2018.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22417). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions or if you have general comments or questions related to this study, please contact Andrew MacDonald, Recreation and Leisure Studies department, (aj8macdo@uwaterloo.ca) or Dr. Bryan Grimwood, University of Waterloo, Department of Recreation and Leisure Studies. Phone # 519-888-4567, ext. 32612; email bgrimwood@uwaterloo.ca