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# Does perceived ecological integrity affect restorative health outcomes? An examination of visitor experiences in diverse environments in an Ontario Protected Area

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# An examination of visitor experiences in diverse environments in an Ontario Protected Area

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## Abstract

The human health and well-being benefits associated with nature contact is well established. Parks and other forms of protected areas contribute significantly to these benefits by providing access to nature. However, limited research has been done on how different environments within protected areas (e.g., forests, coasts, areas being restored) and the perceived quality (i.e., ecological integrity) of these environments affect the health and well-being outcomes of visitors. This study builds on previous work to better understand how visitor experiences provided by diverse natural and built environments in Pinery Provincial Park affect perceived restorative outcomes as one aspect of health and well-being, using a self-reported *in-situ* survey. Tablet computers were used to capture visitor responses at intercept points in different ecosites, identified using Ecological Land Classification (ELC) data. The survey included a modified Restorative Outcome Scale (ROS) to measure participant's well-being and mood as well as scale questions concerning perceived ecological integrity and species richness, socio-demographics, and overall health factors. Results revealed high overall restorative outcomes from contact with nature in the park. The type of environment and length of stay had little influence on visitor's perceived restorative outcomes. However, restorative outcomes were perceived to be greater by women than men. Visitors reported high restorative outcomes irrespective of their self-reported state of mental and physical health. The perceived integrity of the environment had the greatest impact on reported outcomes. Visitors who perceived an environment to have higher ecological integrity, species richness, or naturalness also reported higher restorative outcomes. These results underscore the important links between human health and ecological integrity and point to a need to better understand the synergies between managing for ecological integrity and visitor experiences in protected areas.

**Key Words:** restorative outcomes; ecological integrity; environmental quality; parks and protected areas; park management; perceptions

# Acknowledgements

# Table of Contents

# List of Figures

## List of Tables

## List of Acronyms and Short Forms

BBM                Benefits-Based Management

CPC                Canadian Parks Council

EI                 Ecological Integrity

ELC                Ecological Land Classification

HPHP               Healthy Parks, Healthy People

IUCN               International Union for the Conservation of Nature

MECP               Ontario Ministry of Environment, Conservation and Parks

OMNR               Ontario Ministry of Natural Resources

Pinery             Pinery Provincial Park

PPCRA              Provincial Parks and Conservation Reserves Act

ROS                Restorative Outcomes Scale

# 1. Introduction

The benefits of nature contact for human health and well-being are now well established in the literature (Capaldi et al., 2017; Lovell et al., 2014; Marselle et al., 2019; Russell et al., 2013). Evidence from various fields (e.g., ecology, biology, environmental psychology, landscape design, psychiatry, and medicine) (Leung et al., 2018; Maller et al., 2009), points to the many physical, psychological, cognitive, social, and spiritual benefits nature provides (Bodin & Hartig, 2003; Fuller et al., 2007; Keniger et al., 2013; Lemieux et al., 2012), including restorative outcomes (Marselle et al., 2015).

In recent decades the Canadian population has exhibited a growing disconnect with nature, resulting in a shift towards a more sedentary lifestyle, characterized by self-centeredness (Gruhn et al., 2010), increased screen time, and rapid rates of change in physical activity and mental health, with no signs of slowing down (Public Health Agendy of Canada, 2011). Richard Louv (2005) describes the effects of disconnecting with nature as nature-deficit disorder. Visiting parks and other protected areas can help to address these challenges, and it is more important than ever that parks and protected areas be recognized for their significant contribution to human health and well-being by providing ideal venues to connect people with nature and derive benefits (Hassell et al., 2015; Romagosa et al., 2015).

Spending time in natural environments is known to provide benefits but exposure-response relationships are under-researched (White et al., 2019). Little guidance is offered on ideal visit characteristics, such as how frequently people need to connect with nature, and research is needed into the role dosage (e.g., length of visit) has on outcomes (Shanahan et al., 2016). Additionally, less is known about the contribution of different types of environments (e.g., coastal, forested, built) housed within parks and protected areas on health and well-being benefits. While the restorative outcomes of nature contact are better recognized, not all greenspaces are the same and some types of environments may have more of an impact on outcomes compared to others. The quality of an environment is also increasingly gaining traction as an important factor to consider in the contribution of benefits people derive from nature. Environmental quality has often been discussed in relation to aesthetics (Daniel, 2001; Gobster et al., 2007; Seresinhe et al., 2019), with less attention to the ecological quality of an environment,

such as ecological integrity, species richness (biodiversity), and naturalness (Marselle et al, 2016); important components of protected areas.

Park managers are often faced with the competing tasks of maintaining ecological integrity while balancing high rates of visitation. Within parks, a loss or degradation of ecological integrity could result in losses of personal, commercial, and societal benefits derived from parks. This underscores the need for more research on how natural resource conditions within parks influence visitor experience outcomes, including the restorative benefits derived from visitation.

A better understanding of the relationship between restorative outcomes and specific environments will help to improve both visitor experiences in parks and inform planning and management initiatives aimed at enhancing public understanding of the many benefits that result from establishing and maintaining protected areas including, for example, societal benefits (e.g., maintaining resource integrity) and personal benefits (e.g., those arising from direct use). The current study builds on previous work to address critical gaps in the research by analyzing visitor experiences within different natural and built environments in Pinery Provincial Park (Pinery for short) and reported restorative outcomes using a self-reported in-situ survey to gain insight into visitor perceptions.

This thesis has been organized into seven chapters: introduction, objectives, literature review, methods, results, discussion, and conclusion. Chapter one provided the research context with a brief introduction of the topic. The goals and objectives of this research are outlined in chapter two. Chapter three provides a literature review to situate the research and give context for relevant topics such as: parks and protected areas, visitor experiences and perceptions, human health and well-being outcomes, environment characteristics (i.e., type, quality), and visit characteristics (i.e., dosage). Chapter four describes the methodology used in this research, including the survey design, study site, data collection, and analysis. Chapter five presents the results of the research which will be discussed in chapter six, along with the study limitations, opportunities for future research, and recommendations for park planning and management based on these findings. The thesis will conclude with chapter seven, providing a brief summary and final reflections. The references used throughout this thesis are also listed with appendices for supplementary materials.

## 2. Objectives

The overall goal of this research is to better understand how visitor experiences provided by diverse natural and built environments in Pinery Provincial Park affect subjective human health and well-being outcomes. This goal will be achieved by using a self-report in-situ survey that captures:

1. The restorative outcomes (e.g., relaxation, alertness) perceived by visitors whilst experiencing different environments within the park (the "prescription").
2. The variations in the above by socio-demographic variables (e.g., age, gender) and self-reported physical and mental health.
3. The influence of perceived ecological integrity, naturalness, and species richness of environments on visitor experience and restorative outcomes.
4. The influence of length of visit (the "dosage") on visitor experience and restorative outcomes.

The hypothesis is that environments that are perceived to be more natural, with a higher ecological integrity or with a greater species richness, will be associated with greater perceived health and well-being outcomes, attributing to a better visitor experience. Longer visits to the park are also expected to be associated with greater perceived health and well-being outcomes and better visitor experiences. Results are intended to provide both the human health and parks communities with a more integrated and practical understanding of how human health and well-being outcomes are influenced by specific aspects of park environments. This information is also intended to be used to help inform visitor experience initiatives that integrate human health promotion in parks and other forms of protected areas. Recommendations will be provided, aimed at improving visitor experiences while at the same time, addressing resource management challenges related to ecological integrity. Examples include management planning, development and operations, research, targeted education and outreach, and collaboration strategies.

## 3. Literature Review

In recent decades, the population has exhibited a growing disconnect with nature and a more sedentary lifestyle, characterized by increased health concerns. There has been a shift towards more self-centeredness as well as a decline in intimacy and empathy rates in children (Gruhn et al., 2010). As the amount of time spent in front of screens continues to rise, time spent engaging in unstructured activity (i.e., outdoor play) is declining. The magnitude and rate of change in physical activity and mental health has been immense. While obesity rates climb (Public Health Agendy of Canada, 2011), chronic stress and anxiety are costing millions in workplace productivity. Many are at risk of long-term health problems due to a lack of Vitamin D (Canadian Park Council, 2014). Richard Louv (2005) described this phenomenon as nature-deficit disorder, referring to the personal, family, community, and societal impacts that result from disconnecting with nature.

Visiting parks and protected areas can help to address these challenges as time spent in nature has been found to offer a wide range of health and well-being benefits. The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 1948). For the purpose of this thesis, the concept of "health" is taken from the Ottawa Charter, defined as "*a resource for everyday living, which allows us to manage, to cope with, and even change our environments*" (World Health Organization, 1986, para. 4). The concept of "well-being" is defined as "*a state of successful, satisfying, and productive engagement with one's life and the realization of one's full physical, cognitive, and social-emotional potential*" (Gil & Bedini, 2010, p.17).  These terms are summarized in Table 1.

The Ottawa Charter for Health Promotion of 1986 advocated for the protection of natural and built environments as well as the conservation of natural resources as essential components in any health promotion strategy (Romagosa et al., 2015). The Charter recognizes health promotion as "*the process of enabling people to increase control over, and to improve, their health*," and positions that in order to reach a state of complete physical, mental, and social well-being, individuals must be able to identify and realize aspirations, to satisfy needs, and to change or cope with the environment (World Health Organization, 1986) (see Table 1). However, the attributes of natural environments which support these benefits, such as those in parks and other forms of protected areas, are not as well known.

*Table 1: The terms health, well-being, and health promotion defined* (World Health Organization, 1948, 1986).

| Terms | Definitions |
|---|---|
| Health | A resource for everyday living, which allows us to manage, to cope with, and even change our environments. |
| Well-being | A state of successful, satisfying, and productive engagement with one's life and the realization of one's full physical, cognitive, and social-emotional potential. |
| Health Promotion | The process of enabling people to increase control over, and to improve, their health. |

The following literature review will investigate provincial park management and the ways in which park environments contribute to the health and well-being of visitors to frame the research described in subsequent chapters. It will begin with a brief introduction to protected areas, focusing on provincial park planning and management as well as visitor experiences in Ontario. It will then explore the human health and well-being benefits of nature, specifically in parks, and examine restorative outcomes as a measure of health and well-being. Following this, consideration will be given to the influence different types of environments have on health promotion as well as the quality of the environment (i.e., ecological integrity, species richness, and naturalness). Finally, the influence dosage or length of stay has on visitor's reported benefits will be explored. The chapter will conclude with a summary of the knowledge gaps and expected contributions to be made by the current study.

### 3.1 Protected Areas in a Canadian Context

Protected areas play an important role in safeguarding ecosystem services, supporting economic development, and fostering a sense of place. These areas offer a variety of benefits to people such as wilderness, community, profit, recreation, and ecological, historical, and cultural preservation (Eagles & McCool, 2002; Standing Committee on Environment and Sustainable Development, 2017). Aspects of health and well-being are among the many benefits parks and protected areas provide. The International Union for Conservation of Nature (IUCN) (2008) defines a protected area as: "*a clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*" (p.8). The IUCN uses an internationally recognized classification system to group protected areas into six categories based on their management objectives:

- Category Ia: Strict Nature Reserve.
- Category Ib: Wilderness Area.
- Category II: National Park.
- Category III: Natural Monument or Feature.
- Category IV: Habitat/Species Management Area.
- Category V: Protected Landscape/Seascape.
- Category VI: Protected Area with Sustainable Use of Natural Resources (Dudley, 2008; Gray et al., 2009).

Category I parks have the highest level of ecological integrity and the least amount of human impact. Visitor interference becomes greater with each category (Eagles & McCool, 2002). In Canada, emphasis on park roles has changed as the values underlying park management have shifted from mainly recreation based, to that of ecological protection (Dearden & Rollins, 2009; Eagles, 2010). There is a growing appreciation of the link between visitation to parks and maintaining landscape integrity. It is now recognized that protected areas are part of a broader system and that visitation can be used to enhance the landscape if managed properly (Dearden & Rollins, 2009). In turn, such landscapes can provide services and benefits to visitors.

### 3.2 Provincial Park Planning and Management in Ontario

The *Provincial Parks and Conservation Reserves Act*, 2006 (PPCRA) guides the direction for provincial parks and conservation reserves in Ontario. According to the PPCRA (2006), provincial parks are established and managed with the following objectives: (1) To permanently protect representative ecosystems, ensuring ecological integrity is maintained; (2) Provide opportunities for sustainable outdoor recreation and economic benefit; (3) Provide opportunities for visitors to increase their knowledge and appreciation of Ontario's natural and cultural heritage, and (4) To facilitate scientific research and support monitoring of ecological change (*Provincial Parks and Conservation Reserves Act, S.O. 2006, c.12*. s. 2 (1)). In addition to emphasizing visitor experiences, the *Provincial Parks and Conservation Reserves Act* (2006) identifies maintenance of ecological integrity as the priority when planning and managing regulated protected areas (Aikman et al., 2011; *Provincial Parks and Conservation Reserves Act, S.O. 2006 c.12*. s. 5 (2)). Although these objectives are intended to complement one another, balancing this dual mandate can sometimes be challenging and lead to conflicts (OMNR, 2017).

Provincial protected areas account for approximately 10.2 million hectares of land and water representing 9.4% of Ontario's total area (Ministry of Environment, Conservation and

Parks [MECP], 2019). There are currently 335 regulated provincial parks, 295 regulated conservation reserves, 9 dedicated protected areas (regulated and non-regulated), and 11 wilderness areas in Ontario (MECP, 2019). Approximately one third of Ontario's regulated provincial parks are actively operational to provide recreation opportunities, facilities, and services to visitors (Aikman et al., 2011). The provincial parks are organized into six classes based on the specific features and purpose of the park. Table 2 provides a description of the six provincial park classes. With the exception of the recreation portion of Algonquin Park, all of Ontario's provincial parks fall into Category I, II, or III of the IUCN classification system based on park class (Aikman et al., 2011). The distribution of Ontario's protected areas by IUCN classification is summarized in Table 3.

*Table 2: Types of Ontario regulated provincial parks by park class (Aikman et al., 2011).*

| Park Class | Description | Number |
|---|---|---|
| Cultural Heritage | Protects elements of Ontario's distinctive cultural heritage in open space settings. Important for their cultural and historical value and to support interpretation, education, and research. | 6 |
| Natural Environment | Protects outstanding recreational landscapes, representative ecosystems and provincially significant elements of Ontario's natural and cultural heritage. Provides high quality recreational and educational experiences. | 80 |
| Nature Reserve | Protects a variety of ecosystems and provincially significant elements of Ontario's natural heritage including special or rare natural habitats and landforms. Protected for their natural value, to support scientific research and to maintain biodiversity. | 109 |
| Recreational | Provides outdoor recreation opportunities in attractive natural surroundings. | 65 |
| Waterway | Protects recreational water routes and significant terrestrial and aquatic ecosystems with associated natural and cultural features. Provides high quality recreational and educational experiences. | 62 |
| Wilderness | Protects large areas where nature can exit freely. Visitors mostly travel on foot or by canoe and leave little or no impact on the surrounding area. These parks offer unique and challenging wilderness experiences. | 8 |

Ontario's provincial parks are planned and managed by the Ministry of Environment, Conservation and Parks (MECP) (formerly part of the Ministry of Natural Resources), to protect natural and cultural values, conserve biodiversity, and support research and monitoring (Aikman et al., 2011). Ontario Parks was established as a branch of the OMNR in 1996 to be a business operating model for managing the provincial park system. With the ability to run on a more commercial basis, Ontario Parks has been able to introduce new activities which improve the financial self-sufficiency of parks and better serve park visitors (Moos, 2002).

*Table 3: IUCN classification of Ontario's regulated protected areas* (Aikman et al., 2011).

| IUCN Category | Number of Areas | Type of Ontario Protected Area |
|---|---|---|
| Ia Strict Nature Reserve | 109 | Nature Reserve Class Park |
| Ib Wilderness Area | 8 | Wilderness Class Park |
| II National Park | 80 | Natural Environment Class Park |
| | 62 | Waterway Class Park |
| | 65 | Recreational Class Park |
| | 294 | Conservation Reserves |
| III National Monument or Feature | 6 | Cultural Heritage Class Parks |
| | 11 | Wilderness Areas |
| IV Habitat/Species Management Area | 0 | |
| V Protected Landscape/Seascape | 0 | |
| VI Protected area with Sustainable Use of Natural Resources | 0 | |
| Not Applicable | | Algonquin Provincial Park Recreation/Utilization Zone |

Ontario provincial parks have paved the way for park management as the first provincial park system in Canada to use carrying capacity, zoning, and master planning (Eagles, 2010). In accordance with *Ontario Provincial Park Planning and Management Policies* (1992), a management plan is prepared for each park which defines the role and significance of the park, along with policy and zoning for the protection and management of resources, among other key considerations. The first master plan to be formally approved and implemented for a provincial or national park in Canada was the Pinery Provincial Park Master Plan in 1971 (Eagles, 2010). This introduced the concept of carrying capacity as Pinery's high visitation rates pushed development to its limits and ushered in the notion of quality recreational experiences; resulting in major changes to park operations and Ontario park planning in general. The Pinery Provincial Park Master Plan ultimately changed the overarching management emphasis from quantity of outdoor recreational activities to those of quality, which can still be observed in park operations today (Eagles, 2010; OMNR, 1986).

### 3.3 The Visitor Experience

Parks offer a variety of experiences for visitors including camping, recreation activities, education and interpretation programs, wildlife viewing, and more. The visitor experience is a complex interaction between people, their internal states, the activity they are undertaking, and the social and natural environment they find themselves in (Priskin & McCool, 2006). This

social-psychological phenomenon is influenced by visitor's expectations, the norms and values of their peers, and the attributes of the protected areas encountered during a visit (McCool, 2006). A satisfactory visitor experience often involves the opportunity to view the unique features of the protected area (i.e., wildlife, vegetation) as well as having access to infrastructure (i.e., pathways, viewing platforms) (Carbone, 2006; Eagles, 2002).

Visitors look for experiences at different levels of the conscious and subconscious based on complexity, visibility, and understandability, referred to as the recreation demand hierarchy. Recreation demand hierarchy (adapted from Driver and Brown 1978) exhibits four levels of demand ranging from superficial to complex (McCool, 2006). *Activities* are at the top and most superficial level. This is the type of recreation that can be observed (i.e., camping, hiking). The *setting* where the activity occurs is the second level of demand. At the third level are *experiences*, where people engage in specific activities within specific settings to achieve a desired experience and sense of satisfaction. It is in the deepest level of demand that visitors derive *benefits* from their experiences. Benefits are considered the improved conditions experienced by individuals or groups as a result of satisfactory recreational engagements (McCool, 2006). Situated in this level, are the health and well-being benefits visitors receive from time spent in nature.

Parks and protected area managers are faced with often competing tasks of ecosystem conservation and the provision of high-quality visitor experiences (Priskin & McCool, 2006). Visitation that is well managed can provide social, cultural, economic, and conservation benefits (Bushell & Griffin, 2006). Ontario Parks has adopted a revenue retention model (Moos, 2002), placing importance on visitor experiences in order to remain self-sustaining. Ontario provincial parks receive over 10 million visitors to their operational parks annually, with an almost even split between day-users and campers (Ontario Parks, 2019b). Parks rely on the revenue generated through items such as day-use and overnight visits, activities (i.e., canoe rentals), and merchandise to be able to maintain and expand the provincial park system. If experiences are unsatisfactory, there is a risk that visitors may feel less inclined to spend time and money in the parks, making the visitor experience an important component in the planning and management of these protected areas.

## 3.4 Human Health and Well-being Benefits of Nature

The benefits of nature contact for human health and well-being are now well established in the literature (Capaldi et al., 2017; Lovell et al., 2014; Marselle et al., 2019; Russell et al., 2013). Evidence from various fields (e.g., ecology, biology, environmental psychology, landscape design, psychiatry, and medicine) points to the many health benefits (Leung et al., 2018; Maller et al., 2009), indicating that time spent in nature helps to reduce the risk of obesity, cardiovascular and pulmonary disease, diabetes, stroke, cancer, musculoskeletal disease, depression, osteoporosis, anxiety, sleep problems, behavioural conditions, and degenerative conditions (Lemieux et al., 2012; Leung et al., 2018; Romagosa et al., 2015). Physical activity in a natural setting has been shown to be more beneficial and lead to more substantial relief of anxiety and depression (Bodin & Hartig, 2003). In addition to facilitating activities that provide physiological benefits to human health, interactions with green spaces and natural environments offer a range of psychological well-being (Fuller et al., 2007), cognitive, social, and spiritual benefits (Keniger et al., 2013). Lemieux et al. (2012) found visitation to natural settings were perceived to have important benefits for child development in relation to physical development, social knowledge and competency, and cognitive learning and language. There is growing evidence that feeling connected to nature is also linked to greater subjective personal well-being (Fretwell & Greig, 2019; Zelenski & Nisbet, 2014). The natural environment provides opportunities for more intense and varied experiences, often used as a space for therapeutic interventions (Marselle, Warber, et al., 2019). While the research on health and well-being benefits has grown substantially, few studies have considered the environmental setting these benefits are offered in, specifically those provided by parks and protected areas.

Beyond providing important ecosystem services (e.g., food, water, air quality) (Martinez-Juarez et al., 2015; Millenium Ecosystem Assessment, 2005), parks and protected areas also contribute significantly to human health and well-being by providing access to the natural environment. The literature shows that individuals benefit from contact with nature in a variety of ways, including viewing natural scenes, experiencing the natural environments, and having contact with plants and animals (Maller et al., 2008). All of these actions can generally be done within parks and protected areas (Lemieux et al., 2012; Maller et al., 2010; Romagosa et al., 2015) because they often provide relatively good accessibility, infrastructure, and services for visitation (Eagles & McCool, 2002). Parks provide an ideal venue to connect people with nature

and derive well-being benefits (Canadian Park Council, 2014). A summary of the contribution parks and protected areas make to human health and well-being is provided in Table 4.

*Table 4: A summary of the contributions of areas to human health and well-being (Maller et al., 2008; Romagosa et al., 2015).*

| Component of health/well-being | Contribution of parks and protected areas |
| --- | --- |
| Physical | Provide a variety of settings and infrastructure for various levels of formal and informal sport and recreation, for all skill levels and abilities (e.g., picnicking, walking, dog training, running, cycling, ball games, sailing, surfing, photography, birdwatching, bushwalking, rock climbing, camping, etc.) |
| Mental | Make nature available for restoration from mental fatigue; solitude and quiet; artistic inspiration and expression; educational development (e.g., natural and cultural history) |
| Spiritual | Preserve the natural environment for contemplation, reflection and inspiration; invoke a sense of place; facilitate feeling a connection to something beyond human concerns |
| Social | Provide settings for people to enhance their social networks and personal relationships from couples and families, to social clubs and organizations of all sizes, from casual picnicking to event days and festivals |
| Environmental | Preserve ecosystems and biodiversity, provide clean air and water, maintain ecosystem function, and foster human involvement in the natural environment (Friends of Parks groups, etc.) |

Given the well-being benefits derived from nature contact, initiatives are underway at international, national, and provincial scales to promote a better understanding of these benefits to visitors of parks and protected areas. Initiatives at an international scale are seeking to use nature as a health resource, such as the *Healthy Parks, Healthy People* movement, launched at the inaugural International Healthy Parks Healthy People Congress in 2010 (IUCN, 2019). This movement recognizes contact with nature as essential for human emotional, physical, and spiritual health and well-being, reinforcing the crucial role parks and protected areas play (Parks Victoria, 2015). The adoption of Resolution 39, *Healthy Parks Healthy People* at the IUCN World Conservation Congress 2012: to assume the *Healthy Parks, Healthy People* philosophy, further elevated this agenda (IUCN, 2019). In 2014, the IUCN World Parks Congress held in Sydney, Australia included Stream 3 on "Improving Health and Well-being: *Healthy Parks Healthy People*" (Parks Victoria, 2015). The *Promise of Sydney* represented the outcomes of the 2014 Parks Congress, marking an important milestone in the collaboration between park agencies and health partnerships. Ten recommendations (see Table 5) resulted from the *Healthy*

*Parks, Healthy People* stream including building evidence on connections between health and nature with research, strengthening of policies to promote nature's role in health, and the revitalized management of protected areas to improve biodiversity and maximize health outcomes (Parks Victoria, 2015). These recommendations were further reinforced with the adoption of Resolution 64 at the IUCN World Conservation Congress 2016, calling for improved cross-sector collaboration and methods of quantifying the benefits from nature (IUCN, 2019).

*Table 5: Recommendations from the Improving Health and Well-being: Healthy Parks Healthy People stream at the 2014 IUCN World Parks Congress* (Parks Victoria, 2015).

| 10 Recommendations from Stream 3 of the IUCN World Parks Congress 2014 |
| --- |
| 1. Continue to build the evidence base on the connections between health and nature through knowledge and research using accepted methodologies and share this widely with the conservation and health sectors, researchers, governments, businesses, non-government organizations and communities. |
| 2. Ensure better access by Indigenous communities to natural places that are special to them for health, spiritual well-being, and cultural connections. |
| 3. Learn from Indigenous and local communities, which have multi-dimensional approaches to health and well-being including connection to country and spiritual and traditional knowledge and practices. |
| 4. Integrate the preventative health contribution made by protected areas, including urban parks, into all development planning and accounting processes. |
| 5. Strengthen global, regional, national, and local policies to promote nature's role in health and well-being and address the universal right to nature for health. |
| 6. Establish and nurture coalitions of practitioners, policy makers, change leaders, and researchers from diverse sector to accelerate health and nature approaches at local, national, regional, and global scales. |
| 7. Revitalize the establishment, governance and management of marine and terrestrial protected areas, including urban parks, to improve biodiversity and maximize human health and well-being outcomes. |
| 8. Build the skills and capabilities across the health and protected area sectors. |
| 9. Use innovative mechanisms and experiences to connect children and youth to parks and protected areas to engender a love of nature and for the restorative and preventative health and well-being benefits provided by nature. |
| 10. Ensure that parks and protected areas offer diverse and inclusive opportunities for people to access and experience nature to improve their health and well-being. |

Nationally, the Canadian Parks Council (CPC) recognizes the benefits of connecting with nature and the role of Canadian parks and protected areas as an ideal venue for Canadians to benefit from nature contact. A 2014 report prepared by the CPC offers a renewed commitment by park agencies to have contact with nature an integral part of Canadian's daily lives. It suggests parks act as a natural hospital and form of medicine, a natural high (stress reduction),

classroom, and life support for environments among other beneficial factors (Canadian Parks Council, 2014).

Research at the provincial level shows anticipated human health and well-being benefits are a major motivating factor for decisions to visit a park or protected area (Lemieux et al., 2016), and advise for parks to form policies and management plans with public health organizations (Lemieux et al., 2015; Romagosa et al., 2015). Ontario Parks supports *Healthy Parks, Healthy People* initiatives through outreach and public events. For example, Ontario Parks has implemented *Healthy Parks, Healthy People Day*, offering free day use entry into all provincial parks. During these days, special events are often held at individual parks such as guided walks, outdoor exercise classes, and free rentals (Ontario Parks, 2017b). Ontario Parks has also adopted the 30x30 Challenge, taking place in the month of August, which encourages participants to commit to spending 30 minutes in nature every day for 30 days. This concept was created by the David Suzuki Foundation to inspire individuals to reconnect with nature while improving their health and mental well-being (Ontario Parks, 2017b). The challenge has been found to be successful, with participant's reporting benefits with nature relatedness, mood, and vitality as a result of increased regular nature contact (Nisbet, 2014).

## 3.5 Restorative Outcomes as a Measure of Health and Well-being

Recent studies suggest that the restorative outcomes of an environment may be an important element in enhancing well-being (Marselle et al., 2015). Restorative outcomes of a nature experience include reduced negative effects such as physiological discomfort and psychological stress, and an increase in positive effects (Marselle et al., 2016). Examples include increased relaxation, feelings of calm, and clear and clarified thoughts. According to Attention Restoration Theory (ART), there are two stages of a restorative experience. The first stage is attention recovery, which involves clearing one's mind and recovering focused attention. The second stage is reflection, which involves thinking about life matters and reflecting on one's goals (Kaplan & Kaplan, 1989; Marselle et al., 2019). Restorative outcomes can be measured through validated self-reported scales such as the Restorative Outcome Scale (ROS) (Takayama et al., 2014).

Kaplan & Kaplan (1989) argue that there are four components to the restorativeness of an environment: being away, extent, fascination, and compatibility. An important property of the restorative components is that they can discriminate between different environments (i.e.,

restoration is greater in one environment over another) (Laumann et al., 2001). The level of biodiversity, naturalness (Carrus et al., 2015), and emotional well-being (Marselle et al., 2013) have all been found to contribute to the restorative quality of an environment (Marselle et al., 2016). Unsurprisingly, environments that are preferred are more likely to be restorative (Kaplan & Kaplan, 1989).

Marselle et al. (2013, 2015, 2016, 2019) are now leading the way in comparing restorative outcomes with important environmental factors to determine the influence on health and well-being outcomes. Albeit, their work has primarily focused on walking in greenspaces. There is a need to go beyond this to better understand individual's perceived restorative outcomes as a result of different activities in a variety of environments, including parks and protected areas. The current research will focus on restorative outcomes as a measure of human health and well-being to narrow the scope of the study and build on the crucial work of Marselle. The remainder of this literature review will attempt to address restorative outcomes in discussing health and well-being benefits and environmental considerations (i.e., environment type, quality, dosage) where possible.

### 3.6 Health and Well-being Benefits of Nature in Diverse Environments

More research is needed to better understand the human health and well-being benefits of visitors and the role of distinct natural environments in health promotion (Lemieux et al., 2016; Marselle et al., 2013). Previous studies have provided the foundation for landscape-based influences of human health, arguing the increased benefits reported by people after spending time in nature compared to the built environment (Arnberger et al., 2018; Kaplan & Kaplan, 1989). While the benefits of nature contact are well known, not all greenspaces are the same and some types of environments may have more of an impact on well-being than others. Studies are beginning to emerge which attempt to highlight the role of different landscape types on individual's restorative outcomes (Arnberger et al., 2018; Marselle et al., 2013; Wyles et al., 2019). Some studies do suggest that different environments are associated with greater restoration and nature connectedness (Wyles et al., 2019), although the differences thus far have been relatively small compared to those between broader urban versus green spaces (Marselle et al., 2016). Others have found no significant difference in the benefits provided when comparing participant's perceptions and outcomes in one environment over another (Arnberger et al., 2018).

In the context of parks and protected areas, Lemieux et al. (2016) found visitors to Alberta Parks reported unique health and well-being benefits based on the distinct, natural environments of the protected area they were experiencing. The authors call for planners and managers to consider the roles of diverse natural environments of protected areas individually in providing health and well-being experiences and benefits for visitors. Wyles et al. (2019) found urban, rural, and coastal locations with designated status (i.e., nationally protected areas) were all associated with greater links to restoration than those not designated, underscoring the importance of protected areas in providing restorative outcomes. The role of distinct natural environments in providing health benefits and restorative outcomes remains an emerging area of study in the literature. Few studies have been conducted in North America (none in the Canadian context), with research predominantly taking place in Australia, the United Kingdom, and some parts of Europe (Lovell et al., 2015). Furthermore, the literature is inconsistent in the approaches used and scarcely examines the value of unique park environments, identifying an important gap the current study will address.

## 3.7 Role of Environmental Quality

The quality of an environment is increasingly gaining traction as an important factor contributing to the health and well-being outcomes humans derive from nature contact (Thompson Coon et al., 2001). Human health is one important factor for determining population well-being, and depends on the conditions of the ecosystem and its ability to provide adequate and healthy flows of ecosystem services (e.g., water, food, air quality) (Martinez-Juarez et al., 2015). Environmental quality has often been discussed in relation to aesthetics (Daniel, 2001; Gobster et al., 2007; Seresinhe et al., 2019), with less attention to the ecological quality of an environment. Ecological integrity, species richness (biodiversity), and naturalness are three indicators of environmental quality which provide an alternative approach, taking into consideration an environment's ecological health (Marselle et al., 2016). This section will explore ecological integrity, species richness, and naturalness as indicators of environmental quality and their relationship with parks and protected areas.

### 3.7.1 Ecological Integrity

Ecological integrity (EI) refers to, "a condition in which biotic and abiotic components of ecosystems, and the composition and abundance of native species and biological communities, are characteristic for their natural regions and rates of change, and ecosystem processes are

unimpeded" (*Provincial Parks and Conservation Reserves Act, S.O. 2006, c.12.* s. 2 (1)). Ontario Parks (2017a, para. 2) has simplified this definition, which will be used throughout this thesis: *"ecosystems that have integrity when they have their mixture of living and non-living parts and the interactions between these parts are not disturbed (by human activity)."* Ecological integrity can be considered within the three fundamental aspects of ecosystems: composition (abundance of native species and communities), structure (biotic and abiotic components), and function (ecosystem processes and rates of change) (Aikman et al., 2011). Ecosystems have integrity when their lands, waters, native species, and natural processes are intact (OMNR, 2017).

Following the lead of Canada's National Parks Act (*S.C. 2000, c.32*), ecological integrity was first embedded into Ontario legislation in 2006 with the *Provincial Parks and Conservation Reserves Act* (PPCRA). The PPCRA describes two fundamental principles to guide the planning and management of all provincial parks and conservation reserves: (1) to maintain and restore ecological integrity where possible and, (2) to provide opportunities for consultation. Included in the planning and management principle for ecological integrity, the PPCRA states the maintenance of ecological integrity shall be priority and the restoration of ecological integrity shall be considered (*Provincial Parks and Conservation Reserves Act, S.O. 2006 c.12.* s. 5 (2). Once a provincial park or conservation reserve is established, the requirement to maintain and restore ecological integrity in these areas takes effect (OMNR, 2017). Ontario Parks, along with the Ministry of Environment, Conservation, and Parks (MECP) are responsible for measuring changes in protected areas and determining whether ecological integrity is being maintained (Aikman et al., 2011). The key marketing goals of Ontario Parks include increasing visitor awareness, park use, and exceeding expectations without compromising ecological integrity (Moos, 2002).

When the ecological integrity is compromised, the diversity of a habitat becomes vulnerable and the ability of the ecosystem to provide goods and services is compromised (Ontario Parks, 2017a). This can have implications for the health and well-being of communities, impact the economy, and lead to the local extinction of plant and animal species (Ontario Parks, 2017a). When the ecological integrity of an ecosystem is compromised, humans and wildlife are unable to derive benefits from the system such as food, fibre, and medicine as well as clean air and water (Ontario Parks, 2017a). The quality of the ecosystem is degraded and the balance between biotic and abiotic components broken. Within parks, a loss or degradation of ecological

integrity could result in losses of personal, commercial, and societal benefits derived from parks. This underscores the need for more research on how natural resource conditions within parks influence visitor experience outcomes, including the health and well-being benefits derived from visitation. To the best of the author's knowledge, no studies have considered ecological integrity specifically as an indicator of environmental quality that can be measured with self-reported restorative outcomes. While ecological integrity remains an important aspect of protected area monitoring, especially in Ontario, most studies to date have focused on species richness and naturalness as indicators of environmental quality.

### 3.7.2 Species Richness

The relationship between actual or perceived biodiversity and well-being benefits is not well known (Keniger et al., 2013; Lovell et al., 2014). *Ontario's Biodiversity Strategy* defines biodiversity as the variety of life, expressed through genes, species, and ecosystems, shaped by ecological and evolutionary processes (Aikman et al., 2011; Ontario Biodiversity Council, 2010). The benefits humans derive from biodiversity are called ecosystem services. Ecosystem services are categorized into provisioning services, regulating services, supporting services, and social/cultural services (Ontario Biodiversity Council, 2010). These services provide humans with food, water, climate control, and most importantly for the purposes of this review, recreational, aesthetic, and spiritual benefits. Figure 1 situates the intrinsic connection between well-being and biodiversity, along with the activities and environments which they intersect. The IUCN and Convention on Biological Diversity recognize protected areas as some of the most effective measures to conserve biodiversity and sustain ecosystem processes (OMNR, 2017).

A systematic review by Lovell et al. (2014) of the health and well-being benefits of biodiverse environments found limited evidence that biodiverse environments promote better health and well-being, calling for further interdisciplinary research which highlights the ecosystem services, goods, and processes in which biodiversity could contribute to health and well-being outcomes. The relationship between perceived species richness and restorative outcomes, however, has been shown to be positive (Marselle et al., 2019). Studies have found that higher levels of plant, butterfly, and bird species richness, perceived by individuals, can enhance a person's feeling of restoration (Dallimer et al., 2012; Fuller et al., 2007). Dallimer et al. (2012) stated that perceptions of high biodiversity were consistently met with positive

psychological well-being while the influence of actual biodiversity on well-being was mixed, indicating that individual's perceptions of an environment play an important role.

*Figure 1: Health map for the local human habitat: connections between human health and well-being and biodiversity (Morrison et al., 2017).*
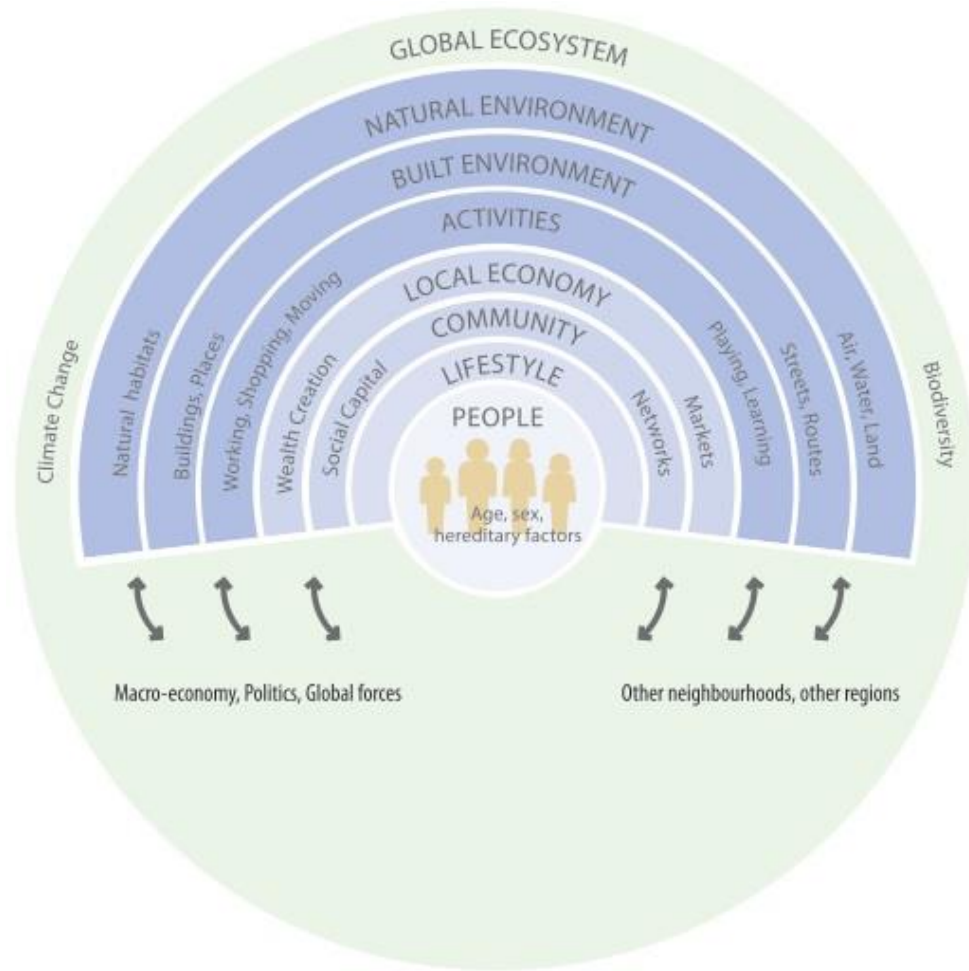


Few studies have specifically explored biodiversity and perceived restorative outcomes and those that have, have been inconclusive to date (Marselle et al., 2016). The links between biodiversity and restorative outcomes in diverse environments within Ontario requires further exploration to highlight the importance of biodiversity and health relationships in the province (Morrison et al., 2017). This indicates there is a need to further explore the relationship between perceived species richness and individual's self-reported restorative outcomes, which will be addressed to some degree in the current study.

### 3.7.3 Naturalness

With a growing body of literature on the human health and well-being benefits of nature, it is well established that the naturalness of an environment provides positive outcomes (refer to *section 3.4* of this chapter). People express greater benefits and happiness in natural environments compared to urban or indoor environments (Marselle et al., 2015). Perceived naturalness of an environment has been found to be associated with a greater sense of well-being, although not always the case (Marselle et al., 2015). There is a small but growing body of literature which links perceived naturalness to restorative outcomes. Studies indicate that perceived restorative outcome scores were higher in natural environments compared to urban spaces (Carrus et al., 2013; Hartig et al., 1997; Marselle et al., 2016). Some have indicated a strong correlation between environments which are perceived to be more natural as also being perceived as more restorative (Carrus et al., 2013). Lamb and Purcell (1990) found perceptions of naturalness went beyond evidence of human intervention in an environment and cautioned that the differences between ecological naturalness and perceived naturalness must be considered when making decisions about management. Up until this point, studies have primarily focused on comparing built environments and greenspaces when discussing the influence of perceived naturalness on human health and well-being. There is a need for further research to not only explore perceived ecological integrity, species richness, and naturalness as indicators of environmental quality and their influence on individual's restorative outcomes, but to do so within the context of parks and protected areas.

### 3.7.4 Visitor Perceptions of Environmental Quality

As eluded to in the sections above, visitor perceptions are an important component in determining the role environmental quality has on restorative outcomes (Dallimer et al., 2012). Perceptions can be defined as: "*the way an individual observes, understands, interprets, and evaluates an object, action, experience, individual, policy, or outcome*" (Bennet, 2016). Perceptions of environmental quality can indirectly influence visitors' engagement in recreational activities (Pendleton et al., 2001), and impact their ability to receive a satisfactory experience (McCool, 2006), including benefits (restorative outcomes). These perceptions are important for strengthening positive connections with nature, as individuals will be more likely to visit areas they perceive to be of high environmental quality (Hvenegaard et al., 2009).

Although this has become a popular method of data collection (Marselle et al., 2019), the relationship between visitor perceptions and quantified measurements of environmental quality are not well-known, and literature cautions this should be factored in when making decisions about management (Lamb & Purcell, 1990). Nevertheless, visitor perceptions can offer insights into public preferences and understanding of the natural environment and have been found to be an important factor in public support for conservation. Bennett (2016) argues research on perceptions can inform courses of action to improve conservation and governance. Studies of individual's perceptions have been found to provide important insights into observations, understandings, and interpretations of social impacts, and ecological outcomes of conservation (Bennet, 2016).

### 3.8 Time Spent in Nature

The amount of time spent in nature may also play an important role in deriving health and well-being outcomes but exposure-response relationships to nature are under-researched. In medical terms, nature can be considered the "prescription", whereas time spent, and frequency of visit can be considered the "dosage". Little guidance is offered on how much or how frequently people need to connect with nature to receive benefits, although there is some evidence that repeated time spent in nature does offer increased benefits. Participants in a Finnish study, based on the methods conducted by Lemieux et al. (2015), reported a higher emotional well-being than those who spent less time in nature (Korpela et al., 2014). Higher levels of physical activity were also linked to duration and frequency of visits. People who had longer visits to green spaces, were reported to have lower rates of depression and high blood pressure, while individuals who visited more frequently were found to have greater social cohesion (willingness to cooperate with others in order to prosper) (Shanahan et al., 2016). Fretwell & Greig (2019) found childhood experiences of nature, frequency of nature contact, and nature-related hobbies had positive connections with individual's feelings of nature relatedness.

A recent study published by White et al. (2019), suggests spending at least 120 minutes (two hours) in nature a week is associated with good health and well-being. This study compared nature exposure (i.e., minutes in nature over a seven-day period) with participant's self-reported health and subjective well-being to provide a quantifiable measure to the exposure-response relationship. The authors found the type of activity (i.e., meditating, walking) and the division of time (i.e., two-hour block or 30-minute intervals) did not impact individual's ability to receive

benefits. This is important because understanding the dosage of nature needed to receive benefits could help to support evidence-based recommendations to policy makers regarding the amount of time required to be spent in nature per week to promote positive health and well-being outcomes (White et al., 2019).

In a parks and protected areas context, the amount of time spent in nature will be determined by a visitor's length of stay (i.e., day-use or overnight camping). A visitor day refers to a person visiting a park or protected area for one day of activities, typically 12 hours but this could vary (Eagles, 2002). A person who stays in the park for longer (overnight camper), will have different needs and impacts when compared to day-users (Eagles, 2002; Parks Victoria, 2015). Length of stay matters when discussing the benefits to visitors as the experiences may differ for different kinds of users. Recall that visitors derive benefits at the deepest level of demand, when the experience is satisfactory. There is a need to better understand the impact duration spent in park environments has on restorative outcomes.

### 3.9 Summary of Gaps in the Research

While the literature is growing, studies on human health and well-being continue to focus on urban and suburban parks or greenspaces (Carrus et al., 2015; Marselle et al., 2013; Seresinhe et al., 2019; Shanahan et al., 2016), with few concentrating on the values of protected areas specifically. There is a need to better understand the influence of location, duration, and frequency of nature experiences (Nature for All, 2018). Studies which investigate the role different types of environments (e.g., savanna, forest, dune) play in providing benefits are limited, especially in the context of parks and protected areas. While the research by Lemieux et al. (2015) revealed substantial health and well-being benefits derived from nature contact within Alberta's protected areas, it did not consider the different types of natural and built environments that visitors use within the park (e.g., campsites, trails, beaches, visitor centre). Additionally, research is needed on the role environmental quality and ecosystem health has on influencing the health and well-being outcomes of visitors through indicators of ecological integrity, species richness, and naturalness.

This thesis intends to address these gaps by contributing to the growing research being published on the human health and well-being benefits associated with nature contact. In particular, it will address a critical gap in the literature on the influence of different natural and built environments for well-being, specifically restorative outcomes, and will offer insights into

whether certain types of environments within parks provide greater outcomes over others. The research will also explore visitor perceptions of ecological integrity, naturalness, and species richness in park environments as indicators of environmental quality. Overall, it is expected that the results will provide Ontario Parks with important information that can be used to assess policy and management options, and their impact on the distribution of benefits provided by parks (personal, societal, etc.).

# 4. Methods

## 4.1 Methodological Framework

This research used a place-based, case study design to assess the influence of diverse environments in protected areas on visitors self-reported restorative outcomes. The multiplicity of ecological, economic, and social dimensions in protected areas are place-specific and should be studied within the context of that place (Baxter & Jack, 2008). The research adopted a positive approach to measuring health-related factors, guided by the methodology of Lemieux et al. (2012, 2015, 2016), to focus on health and well-being assets (i.e., restorative outcomes) rather than deficits. In-person surveys used tablet computers and interview questions to gather and analyze data related to the research objectives. The methodological framework of this study is outlined in Figure 2.

## 4.2 Survey Design

This research used in-person self-reported surveys completed on tablet computers to capture visitor experiences and self-reports of health and well-being outcomes *in-situ*. Harvest Your Data iSURVEY and droidSURVEY apps were used to administer the survey on Apple and Android devices, respectively. This data collection tool works offline, storing data until it can be uploaded to the data set through an internet connection (Harvest Your Data, 2017). Tablet computers were used for data collection based on the methodology of Lemieux et al. (2012, 2015, 2016), reducing the burden associated with traditional paper-and-pencil techniques. Tablet-based survey data collection is considered to save in costs and time compared to paper-based data collection. The average time per interview drops considerably using tablets (Leisher, 2014), allowing for more responses to be collected per day on average. The portability, battery life, and data storage capacity make tablets an attractive and convenient method of data collection for face-to-face surveys (Leisher, 2014). Tablets offer the ability to easily track user compliance and response rates with time stamping and reduce data coding errors (Doherty et al., 2014) with immediate data entry and consistency in survey skip coding and branching logic (Leisher, 2014). In turn, the time spent cleaning data in preparation for analysis is reduced. In addition to tablets, two of the survey questions were verbally administered by researchers to all participants allowing for more detailed, open-ended responses. The structured wording ensured all participants were asked identical questions but provided participants the opportunity to be

specific and fully express themselves (Turner, 2010). Participants provided their responses verbally while researchers transcribed their comments verbatim.

*Figure 2: Methodological framework of the study.*
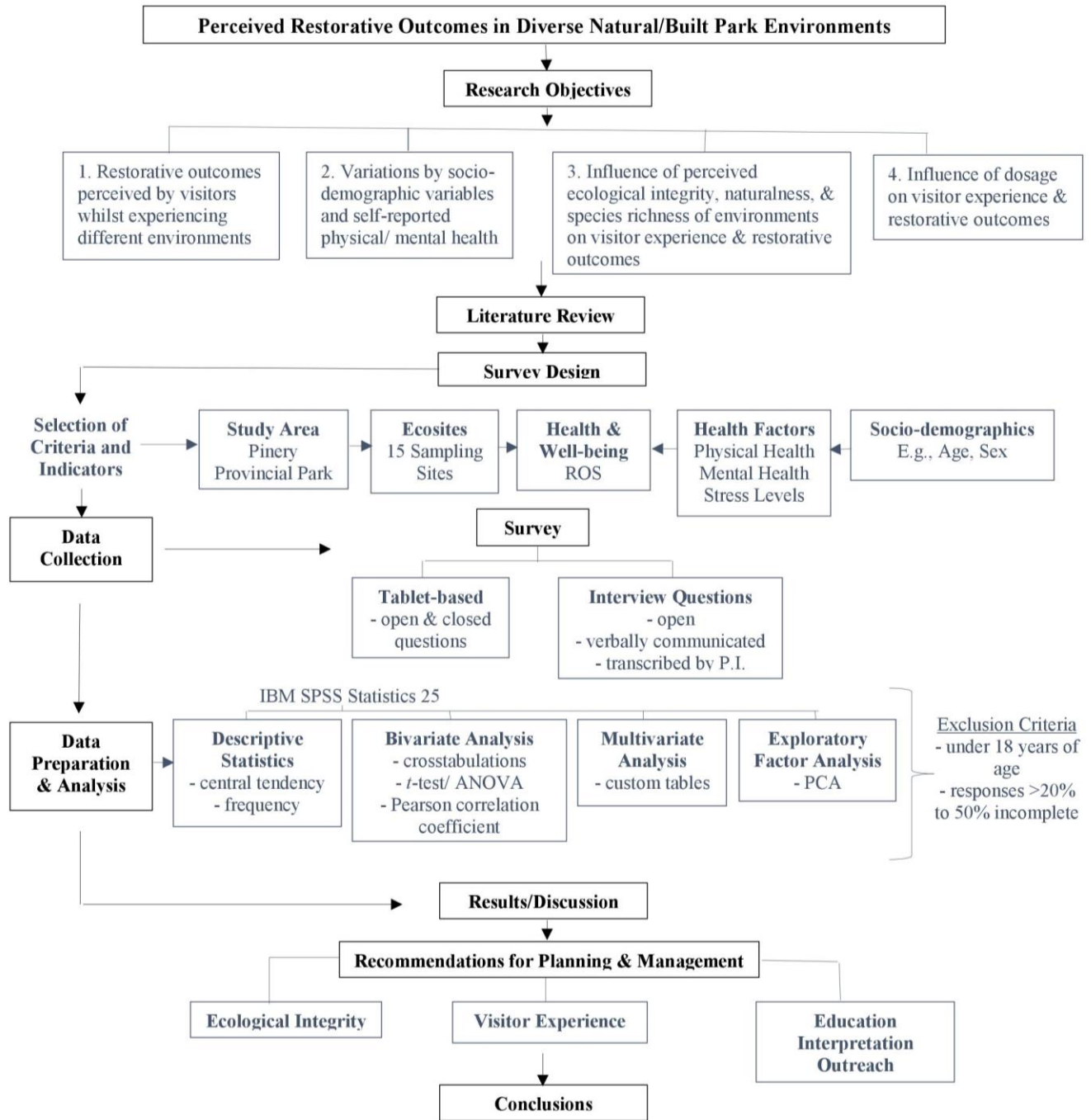
The survey consisted of three parts: 1) *in-situ* questions on participant perceptions of restorative outcomes associated with experiences in diverse natural environments; 2) participant background questions; and, 3) verbal response questions on participant experiences. In total, there were 34 questions the participants could complete, depending on routing (i.e., skip-logic). The full survey can be found in Appendix A.

For part one, a modified Restorative Outcome Scale (ROS) (Korpela et al., 2010; Takayama et al., 2014) was used to measure the well-being and mood of the participant while in the environment (see Figure 3). Self-reported scale measures have been widely adopted to measure well-being, mood, and feelings. Examples of possible scales are summarized in Table 6. The literature was consulted to determine an appropriate scale in which the ROS was found to best align with the research objectives of this study. The ROS is used to investigate restorative emotional and cognitive outcomes in an environment (Takayama et al., 2014) and has been validated through previous studies related to nature contact and human health (Hartig et al., 1998; Korpela et al., 2008; Korpela et al., 2010; Takayama et al., 2014). The simple and concise scale is ideal for participants when measuring well-being in natural environments to reduce the risk of impeding the visitor experience (Kahneman & Krueger, 2010; Kim & Fesenmaier, 2015). The ROS phrasing and seven-point Likert scale were modified to reflect the experiential component of the study. For example, *"I feel calmer after being here"* was changed to *"I feel calmer here."* Participants indicated their level of agreement or disagreement with the ROS statements using a 5-point Likert scale ranging from "*strongly disagree*" to "*strongly agree*" with an option to select *"neither"*.

Part one of the survey also asked about indictors of environmental quality to support the study's research objectives in determining the role quality plays in visitor's perceived restorative outcomes. Participants were asked to rate the perceived naturalness of the environment they were experiencing *(Purely artificial = 1, Mostly artificial = 2, Mix of natural & artificial = 3, Mostly natural = 4, Purely natural = 5)* and the species richness of the environment from "*strongly disagree*" to "*strongly agree*" with an option to select *"neither".* The questions were adapted from Marselle et al. (2016), moving to a 5-point Likert scale to better align with other scales used in this study. Participants were asked to rate the perceived ecological integrity *(Very low ecological integrity = 1, Low ecological integrity = 2, Moderate ecological integrity = 3, High ecological integrity = 4, Very high ecological integrity = 5)* of the environment using a 5-point

Likert scale as shown in Figure 4. Participants were provided the Ontario Parks (2016) definition of ecological integrity: "*ecosystems that have integrity when they have their mixture of living and non-living parts and the interactions between these parts are not disturbed*" (para. 2). Including this definition in the survey ensured background information was delivered clearly and reliably by all surveyors over the course of the sampling period to minimize researcher bias. In addition to ecological integrity acting as an indicator of environmental quality, it is one of four main objectives in the development and management of parks (*Provincial Parks and Conservation Reserves Act, S.O. 2006, c.12.* s. 2 (1)), making this a priority for Ontario Parks.

*Figure 3: Example of modified Restorative Outcomes Scale (ROS) used to measure participants perceived health and well-being.*

*Figure 4: Example of Likert scale used to measure perceived naturalness of the environment experienced.*

*Table 6: Summary of well-being measurement scales.*

| Scale | Purpose/ Measurement | Discipline | Sample Questions | Validated | # of Questions |
|---|---|---|---|---|---|
| Exercise-Induced Feeling Inventory (EFI) | Revitalization and tranquility; positive emotions | Psychology | Rate on a 5-point Likert scale: Ex., Calm, relaxed, revived, refreshed | No | 4 |
| Multidimensional Mood Questionnaire | Momentary mood | Health Sciences | Rate on a 5-point Likert scale: Ex., Pleasant, unpleasant, calm, tense, wakefulness, tiredness mood | Yes | 12 |
| Negative Mood Scale (NMS) | Negative emotions | Psychology | Rate on a 5-point Likert scale: Ex., Worried, anxious, angry, irritated | Yes | 4 |
| Perceived Restorativeness Scale (PRS) | Restorative components of an environment | Psychology | Rate on a 10-point Likert scale: Ex., "Spending time here gives me a break from my day-to-day routine" "My attention is drawn to many interesting things here" "Being here fits my personal inclinations" | No | 5 |
| Positive and Negative Affect Schedule (PANAS) | Positive and negative feelings and emotions | Psychology | Rate on a 5-point Likert scale: Ex., Distressed, irritable, alert, inspired, active | Yes | 20 |
| Profile of Mood States (POMS) | Psychological distress by mood states | Psychology | Rate on a 5-point Likert scale: Ex., Tension, anxiety, depression, anger, hostility, fatigue | Yes | 6 |
| Restorative Outcome Scale (ROS) | Restorative emotional and cognitive outcomes in a given environment | Psychology | Rate on a 7-point Likert scale: "I feel calmer after being here" "My concentration and alertness clearly increase here" "I get new enthusiasm and energy for my everyday routines from here" "I can forget everyday worries here" and "Visiting here is a way of clearing and clarifying my thoughts" | Yes | 6 |
| Subjective Vitality Scale (SVS) | Vitality | Sociology | Rate on 7-point Likert scale: "I feel alive and vital" "I have energy and spirit" "I look forward to each new day" | Yes | 7 |

Note: Adapted from (Myles, 2016). Sources: (Bodin & Hartig, 2003; Courvoisier, 2012; Takayama et al., 2014).

Part two of the survey contained background questions on socio-demographics and visit characteristics to obtain a better understanding of the sample population and address two of the study's research objectives (e.g., objective 2 and 4). This included demographic questions about visitors such as age, sex, place of residence, annual household income, and highest level of education received. Questions also included visit characteristics such as length of stay, number of visits, size and type of group, and motivations for the visit. Participants were asked to self-report on their mental health, physical health *(poor = 1, fair = 2, good = 3, very good = 4, excellent = 5),* and the amount of stress in their lives in the seven days leading up to the visit *(Not at all stressful = 1, Not very stressful = 2, A bit stressful = 3, Quite a bit stressful = 4, Extremely stressful = 5).* Participants could also answer *"Don't know"* or *"Can't recall"* to questions respectively. The background questions were informed from similar studies by Lemieux et al. (2016) which examined the health benefits of visitor experiences in Alberta's protected areas. Using similar background questions provided consistency and allowed for comparisons between these studies during analysis.

The third and final part of the survey consisted of two questions which were verbally administered by researchers to all participants. Participants were asked to describe how the environment they were currently experiencing made them feel and if there was anything that could make the experience better. These questions allowed participants to offer personal anecdotes and observations valuable to researchers and park managers in recommendations moving forward. Participants had the option to skip or omit any questions they preferred not to answer and could withdraw from the study at any time by not submitting responses. Surveys that were not saved and submitted properly by participants (i.e., participants did not click the *Submit* button on the tablet) were automatically discarded by the iSURVEY and droidSURVEY applications.

Two permits were required to conduct this research: a research permit from Ontario Parks and ethics approval from Wilfrid Laurier University. A letter of authorization to conduct research in a Provincial Park or Conservation Reserve was obtained from Ontario Parks on April 29, 2016. Ethics approval was obtained from the Research Ethics Board at Wilfrid Laurier University (REB # 4942) on June 27, 2016. The survey was pilot tested at Pinery Provincial Park in the spring of 2016 with approximately 30 visitors, similar to those likely to be sampled in the larger data collection. Pilot testing helped to identify issues not obvious to the researcher related

to response rates, connectivity, device compatibility, and critically examined the clarity of the instructions and questions provided to participants (Vaske & Neddham, 2008). The survey was piloted on mobile phones; however, researchers found them to be unreliable (e.g., missed prompts, poor internet connectivity, and low response rates) and later switched to tablet computers. A final check for errors was performed prior to administering the survey in the larger data collection.

## 4.3 Study Site - Pinery Provincial Park

The study was conducted in Ontario, Canada at Pinery Provincial Park. Pinery is classified as a Natural Environment Park and IUCN Category II (Aikman et al., 2011; Dudley, 2008). The Pinery is 2532.5 hectares in size, located on the southeast shore of Lake Huron in Lambton County, south of Grand Bend (see Figure 5) (OMNR, 2016). Located in the Southern Deciduous Forest Region, Pinery Provincial Park represents several significant provincial and national features (OMNR, 1986) including a globally rare oak savanna ecosystem, freshwater coastal dunes, and the largest protected forest in southwestern Ontario (The Friends of Pinery Park, 2017). More than 757 plant, 325 bird, and 60 butterfly species can be found there (The Friends of Pinery Park, 2017). Pinery attracts over half-a-million visitors annually, the fourth highest of 335 provincial parks in the province (Ontario Parks, 2019a). An extended discussion of the study site is provided here to help set context for the survey design.

Pinery Provincial Park is a popular vacation destination and day-use spot that offers visitors a variety of recreational opportunities and amenities. These opportunities include 10 kilometres of beach divided into day-use and campground access, 10 nature trails, 38 kilometres of ski trails, canoeing, kayaking and hydrobiking, fishing, cycling, and a year-round interpretive program (The Friends of Pinery Park, 2017). Many of the facilities are wheelchair accessible including some trails. The Pinery offers a variety of amenities for visitors including a general store and restaurant, laundromat, firewood, a picnic shelter, rental shops for canoes, kayaks, hydrobikes, bicycles and cross-country skis, and a year-round visitor centre featuring nature exhibits. The park has three designated campgrounds totaling over 1,000 campsites. This includes 400 electric sites and many pull-through sites, 10 group sites, and 12 yurts with a heated tent, bunk beds, electricity, barbeque, and picnic shelter provided (The Friends of Pinery Park, 2017). Figure 6 provides a map of the park highlighting these amenities and recreational opportunities.

*Figure 5: Location of Pinery Provincial Park with regional context (Aikman et al., 2011).*

A classification system is used to organize parks and protected areas with similar characteristics into categories that define their role in providing opportunities for environmental protection, recreation, heritage appreciation, and tourism (OMNR, 1992). Within provincial park classifications, zoning is commonly used to assist in effective park planning and management. Zoning allows for targeted management approaches within a protected area, grouping areas with common management needs. This can be helpful when there are specific natural features to protect or areas of extensive public use (OMNR, 2014). Six different park zones exist, assigned based on detailed inventories of the natural, cultural, and recreational resources within a protected area. Table 7 provides a description of all six park zones. The presence or absence of particular zones depend on the philosophy and objectives of the park classification (OMNR, 1992).

*Table 7: Park zones used in the planning and management of Ontario provincial parks with descriptions (OMNR, 1992).*

| Park Zone | Description |
| --- | --- |
| Natural Environment Zones (NE) | Natural, cultural, and aesthetic landscapes in which minimum development is required to support low-intensity recreational activities. |
| Development Zones (D) | Provides the main access to the park including facilities and services for a wide range of day-use and camping activities. They will constitute a relatively small portion of individual parks. |
| Wilderness Zones (WI) | Wilderness landscapes of appropriate size and integrity which protect significant natural and cultural features and are suitable for wilderness experiences, as well as a protective buffer with an absolute minimum of development. |
| Nature Reserve Zones (NR) | Any significant earth and life science features which require management distinct from that in adjacent zones, as well as a protective buffer with an absolute minimum of development. |
| Historical Zones (HI) | Any significant historical resources which require management distinct from that in adjacent zones; they will support minimum development required for visitor exploration, appreciation, and scientific research. |
| Access Zones (A) | Serve as staging areas where minimum facilities support the use of nature reserve or wilderness zones and less developed natural environment and historical zones. |

Pinery is divided in three zones: Nature Reserve, Natural Environment, and Development. The Development zone accounts for 27% of the total area in the Park and applies to all areas with existing facilities including the campgrounds and day-use areas. The Natural Environment zone accounts for 20% of the total area of the Park and includes aesthetic landscapes with significant natural features that require minimal developments for low-intensity

recreational activities (OMNR, 2016). Finally, Nature Reserve zones account for 53% of the total area and include the most significant and representative landscapes that require long-term stewardship. The Nature Reserve zones are divided into 5 subsections: low dune ridge zone, lakeshore dune zone, dune meadows zone, ausable lowlands zone, and the Burley wet meadows zone (OMNR, 2016). This zoning is used to guide the management of the park.

The ecosystems in Pinery can be further divided into specific subgroups called ecosites based on their unique features. Ecological Land Classification (ELC) systems organize ecological information based on bedrock, climate, physiography, and vegetation (OMNR, 2007). Within ELC hierarchy, ecosites can be applied to land use planning at municipal levels. Ecosites are landscape areas consisting of typical, recurring associations of vegetation types and stable physical landform combinations, appropriate for mapping between the scales of 1:8,000 and 1:20,000 (Government of Ontario, 2009). Using existing ELC data provided by park staff, 19 unique ecosites and one unclassified area were mapped in Pinery Provincial Park (e.g., dry-fresh mixed woodland) depicted in Figure 7. At least 15 of these ecosites are accessible to park visitors. Some ecosites are limited to select areas (e.g., fresh-moist lowland deciduous forest ecosite), while others are more prominent, such as the floating-leaved shallow aquatic ecosite (Old Ausable Channel) which bisects the entirety of the park (The Friends of Pinery Park, 2017). These ecosites were used to identify sampling locations and allowed for comparisons of visitor's self-reported restorative outcomes while immersed in different types of environments.

Pinery Provincial Park was selected as the study site for this research due to the popularity of the park, number of distinct natural and built environments, and concerns over the management and future of the ecological integrity of the park. Pinery Provincial Park is classified as a Natural Environment Park. Aligned with the objectives of this land classification (S.O 2006 c. 12), the goal of Pinery is to protect an extensive, provincially significant, freshwater dune system with associated representative floral, faunal, and cultural features and to provide high quality educational and recreational experiences (OMNR, 1986). This goal is addressed through protection, heritage appreciation, recreation, and tourism objectives (OMNR, 1986). At the local scale, changes in land cover, pressures from outdoor recreation, and park development can cause stress, affecting the biodiversity and ecological integrity of a park (Aikman et al., 2011). The *Pinery Provincial Park Management Plan* (1986, 2016) emphasizes management of three significant ecosystems in addressing ecological integrity: the oak savanna, coastal dunes,

and Old Ausable Channel. Amendments to the *Park Management Plan* (2016) outlines several resource management actions taken to address ecological integrity including the management of vegetation, water, and landforms. A challenge facing Pinery is the ability to maintain ecological integrity while also accounting for relatively high levels of visitation.

Threats to ecological integrity are exacerbated by visitation. Visitor numbers have increased in the park from approximately 400,000 in 1985 (OMNR, 1986) to almost 600,000 visitors in 2018 (Ontario Parks, 2018). This results in increased usage of recreational facilities adding stress to environments. If ecological integrity is compromised, the diverse, species-rich environments that attract many visitors could be lost. This has the potential to lead to a reduction in overall park visitation and cause financial strain on park operations.

The popularity of Pinery Provincial Park and the number of distinct natural and built environments within it, provided a diverse study area to expand on past research in considering visitor's perceived restorative outcomes in protected areas. Concerns over the management of visitation and future of the ecological integrity and biodiversity in the park, offered a timely setting to explore the role these factors play in restorative outcomes and the implications for park management. Additionally, the long-standing relationship between Pinery Provincial Park and Wilfrid Laurier University provided the foundation for a strong partnership in undertaking this research.

*Figure 7: Ecosites in Pinery Provincial Park. ELC data provided by OMNRF (2016). Produced by T. King at Wilfrid Laurier University under License with the Ontario Ministry of Natural Resources and Forestry© Queen's Printer for Ontario, 2016.*
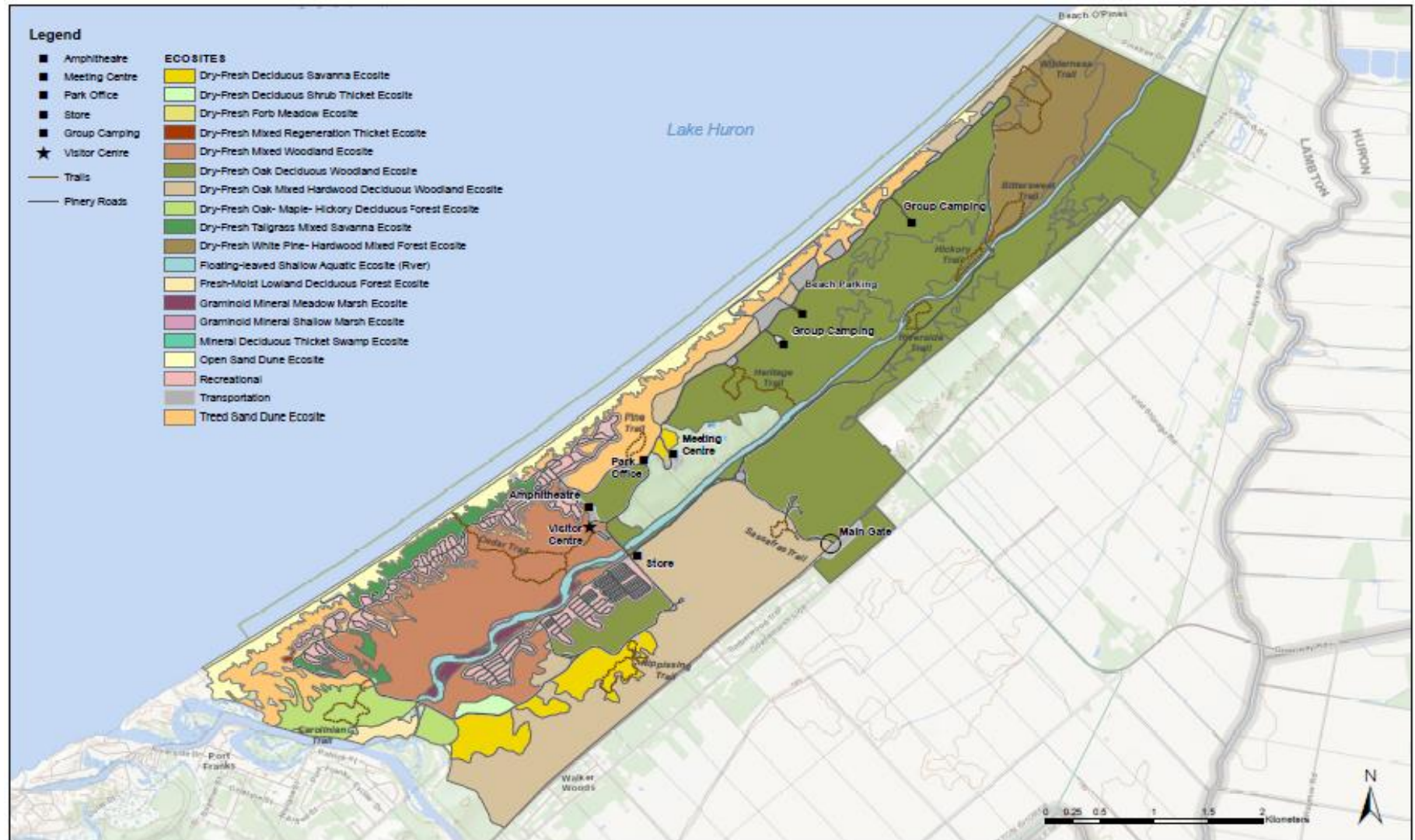
## 4.4 Sampling Method

Visitors at Pinery Provincial Park were surveyed between July 1 and Labour Day (September) of 2016. Surveying occurred over a total of 18 different days, consisting of six 3-day periods. To account for visitor needs and usage (e.g., meals, arrival, departure) and to enhance diversity of participants and their experiences in the park, surveying took place over a mix of weekdays and weekends including mornings, afternoons, and early evenings. Of the 19 unique ecosites within Pinery Provincial Park, 14 different ecosites were identified for this study with safe, visitor access for surveying including two classifications of recreational (e.g., visitor centre and campground) and open sand dune ecosites (e.g., day use and campground beaches). This accounted for variations in environments with the same classification to avoid over generalizing about attributes assigned by participants to their location. From the ecosite boundaries identified, 18 sampling locations were chosen to be representative of the variety of natural and built environments found within the park, as well as visitor experiences. A complete list of sampling locations with the corresponding ecosite classification can be found in Appendix B Table 1. Participants were surveyed on all ten nature trails, three campground areas, three beach areas, one lookout, and the park visitor centre (see Figure 8). Attempts were made to obtain an equal sample of all ecosites by periodically changing sampling locations.

A systematic sampling technique was used to ensure a high and representative sample size of park visitors. Systematic sampling refers to a probability sampling technique in which the researcher randomly selects the first unit (visitor) in a sample population and chooses subsequent units using a fixed sampling interval determined by the number of samples the researcher wishes to collect from the population (Harris & Jarvis, 2011). This sampling technique is less cumbersome and easier to perform in the field than the more common method of simple random sampling. The systematic approach to *in-situ* surveys reduces selection errors by field researchers and can provide more information as the sample tends to be more uniformly spread over the population (Vaske & Neddham, 2008). Potential respondents were approached on a next available basis (e.g., both the researcher and next adult were ready to continue surveying). Campers and day-use visitors were included in the study to compare visitor experiences within the park. Participants were required to be the age of majority (18 years of age or older) to take part in the study. Potential respondents were approached at various visitor user zones (e.g., campsites, trails, beaches, visitor centre), pre-identified by their unique ecosite classification.

Visitors were approached while immersed in, or immediately after being immersed in, an environment (e.g., at the end of a trail) to ensure surveying captured the visitor's experience in real time. A brief explanation of the study was provided, and procedures were followed to ensure confidentiality before inviting visitors to participate. The date, location, and number of refusals were also recorded at each sampling site of visitors who declined to participate in the survey.

*Figure 8: Examples of sampling locations (photos by Catherine Reining).*

All participants were provided an informed consent statement and agreed to participate in the study by clicking the *Start* button on the tablet computer to proceed to the survey. Each participant was assigned a unique identification code to ensure anonymity. The identification code was used throughout all parts of the survey to properly group participant's responses when preparing the data set for analysis. After completing the first two parts of the questionnaire on tablet computers, researchers administered two additional questions verbally and recorded the participant's oral responses to complete the survey. The open-ended, verbal questions were administered after the tablet portion of the survey to account for flow and allow participants to freely provide answers without constraints of word limits or other technological barriers. Researchers transcribed participant's responses verbatim to ensure authenticity and eliminate opportunities for researcher bias by misinterpreting responses or overgeneralizing (Taylor-Powell & Renner, 2003). The process to complete each survey took between five to ten minutes based on the speed of the individual being surveyed.

To encourage participation, incentives were offered in the form of a chance to win one of two $100 gift cards to a popular adventure equipment retailer. The winning ballots were drawn at the end of September 2016 and the winners were notified.

## 4.5 Sample Size

To minimize sampling error and allow a variety of analysis, a large sample size was sought. The target sample size for this study was approximately 400 participants in order to provide a 95% confidence level that estimates from the data would be within a ±5% margin of error. This is consistent with the sample size considered suitable for most parks, recreation, and human dimensions studies using a conservative 50/50 split approach (Vaske & Neddham, 2008). This approach assumes the population will be completely divided in their responses (e.g., 50% of the population will answer one way and 50% will answer another) and is used when the researcher has little or no knowledge about the diversity of characteristics and opinions of the population (Vaske & Neddham, 2008). Since the variability in responses was unknown in advance, the largest sample size was sought, given available resources and time.

## 4.6 Data Preparation

Following data collection, the survey responses were downloaded from Harvest Your Data where they had been stored by the platform during offline surveying until an internet connection could be established. The complete dataset was imported into IBM SPSS Statistics 25

for statistical analysis. All verbal responses collected during surveying were inputted into the electronic data set, matching the responses using the assigned participant identification codes, with the appropriate responses completed on tablet computers. To prepare for analysis, the quality of the data set was assessed and cleaned following the standards and guidelines identified by Vaske (2008) and Doherty (2004). Responses were flagged and excluded where the participant was under 18 years of age or in cases where too many questions were skipped to allow for enough analysis. As a general rule, 20% to 50% of missing data was accepted before excluding a respondent's entire response (Doherty, 2004; Richardson & Meyburg, 2003).

All variables in the data set were assigned names and descriptive labels based on the survey questions. Values were assigned to ordinal and nominal variables (i.e., *1.00 = Poor, 2.00 = Fair, 3.00 = Good, 4.00 = Very Good, 5.00 = Excellent*) to allow for quantitative analysis. The data was cleaned to correct for spelling and grammatical errors made by respondents while answering questions on the tablets. For example, postal codes were consistently formatted with capitals (i.e., L3M) and miscellaneous characters (i.e., @) removed, taking care not to change the participant's responses. This ensured SPSS could properly read the data and allowed for optimal analysis.

## 4.7 Data Analysis

Data analysis was guided by previous research on dimensions of human health and well-being using experience sampling methods (ESM) (Doherty et al., 2014; Lemieux et al., 2015, 2016; Takayama et al., 2014). A quantitative analysis of the data was performed using IBM SPSS Statistics 25. To assess the influence of Pinery's diverse natural and built environments on visitor experiences and perceived restorative outcomes, several response (dependent) and explanatory (independent) variables were defined. The response variable was identified as the perceived restorative outcomes, self-reported by visitors. The explanatory variables included the environment the participant was in as well as socio-demographic factors (e.g., age, sex) and overall health factors (e.g., self-reported physical and mental health). Explanatory variables also included the perceived ecological integrity, species richness, and naturalness of the environment as well as dosage (length of stay). A summary of these variables is provided in Table 8.

Descriptive statistics were run for each variable to gather basic distributional characteristics, calculating central tendency (i.e., mean) for continuous variables and frequency distributions for categorical variables (Vaske, 2008). This offered the researcher an opportunity

to draw initial comparisons between variables and provided information helpful for selecting subsequent statistical techniques.

Bivariate crosstabulations were performed to identify the relationship between categorical variables using a Chi-squared test at the 0.05 level of significance (e.g., nature importance and location). Bivariate analysis also included a means analysis using a *t*-test/ANOVA, at the 0.05 level of significance (e.g., ROS and length of stay). Correlation was calculated using the Pearson correlation coefficient, significant at the 0.05 level to determine how variation in the response variable is explained by the explanatory variables. A multivariate analysis was also performed using the IBM SPSS Custom Tables feature, running a means analysis at the 0.05 level of significance and creating multiple response sets. This allowed for several variables to be taken into consideration at a time, providing a more detailed exploration of the relationship between the explanatory variables and response variable.

Additionally, a principle component analysis (PCA) was used to uncover clusters of related variables. PCA is one type of exploratory factor analysis (EFA) commonly used in the social sciences to reduce a larger set of variables down to a smaller number of factors by finding strong patterns in the data set (Vaske, 2008). For a sample size greater than 300, an acceptable factor loading should be greater than 0.298 based on an alpha level of 0.01 (two-tailed) (Fields, 2013). The factor loading (correlation coefficient) is used as a gauge of the relevant importance of a given variable to a given factor. Squared factor loadings indicate what percentage of the variance in an original variable is explained by a factor (Fields, 2013). The factor loading was set to 0.300 and anything under that was eliminated to ensure a "*moderately strong*" to "*strong*" pattern. PCA assists in predicting population responses and customer segments with clustering, providing beneficial information to park managers for marketing and outreach.

*Table 8: List of variables analyzed.*

| | Variable Name | Label | Measurement Units |
|---|---|---|---|
| **Environment Variables** | Location | Natural/built environment participant is in during study period | Categorized: Wilderness Trail/Day Use Beach/ Visitor Centre/Burley Campground |
| | Naturalness Rating | Visitor perception of naturalness in environment | Scale: 1-Purely artificial to 5-Purely natural |
| | Ecological Rating | Visitor perception of ecological integrity in environment | Scale: 1-Very low to 5-Very high |
| | Environment Preference | Visitors preference to current location versus others in the park | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| | Species Richness | Visitors perception of amount of plant and animals versus other environments in the park | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| | Environment Feeling | How participants feel in environment | Text |
| **Restorative Outcome Scale Variables** | Outcome Calmer | In-situ well-being outcomes | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| | Outcome Restored Relaxed | In-situ well-being outcomes | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| | Outcome Enthusiastic Energetic | In-situ well-being outcomes | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| | Outcome Alertness Concentration | In-situ well-being outcomes | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| | Outcome Worries | In-situ well-being outcomes | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| | Outcome Clearer Thoughts | In-situ well-being outcomes | Scale: 1-Strongly Disagree to 5-Strongly Agree |
| **Dosage Variables** | Length of Stay | Days participants will spend in park | Numeric |
| | First Visit | First time visiting the Pinery | Categorized: Yes/No |
| | Days at Pinery | Number of days spent in Pinery in past 12 months | Numeric |
| | Days at Parks | Number of days spent in parks per year | Numeric |
| **Socio-Demographic Variables** | With Now | Who the participant is with at this location | Categorized: Spouse/Children/Friends/Co-workers |
| | Age | Age | Years |
| | Citizenship | Canadian citizen | Categorized: Yes/No |
| | Gender | Gender | Categorized: Male/Female/Other |
| | Residence | Where participants live | Categorized: Ontario/Other Province/USA/Other |
| | Education | Education | Categorized: None/High school/College/University/Above |
| | Employment | Current employment status | Categorized: Employed/Unemployed/Not in labour force |
| | Income | Estimated total household income | Categorized: Canadian dollars |
| | Primary Motivation | Primary motivation for visiting Pinery | Text |
| | Nature Importance | Importance of visiting natural areas | Categorized: 1-Very important to 5-Not important |
| **Overall Health Factors** | Mental Health | Self-reported general physical health | Scale: 1-Poor to 5-Excellent |
| | Physical Health | Self-reported general mental health | Scale: 1-Poor to 5-Excellent |
| | Stress Reported | Self-reported stress in 7 days prior to visit | Scale: 1–Not at all stressful to 5–Extremely stressful |
| **Experience** | Experience Better | Improvements to visitor experience | Text |

# 5. Results

This chapter outlines the empirical results of the study. The first two sections provide an overview of the sample population reported by participants in the visitor survey including demographic and visit characteristics, perceived health and quality of life, and perceived restorative outcomes. Sections three through six present results for the research objectives including: (1) participant's perceived restorative outcomes whilst experiencing different environments; (2) variations in perceived restorative outcomes by sociodemographic variables and self-reported health; (3) the influence of environmental quality in participant's restorative outcomes; and (4) the influence of dosage on visitor experience and restorative outcomes. The final section presents results on visitor patterns that emerged from the dataset.

Overall, 467 adult visitors completed the survey during the study period and are included in the dataset for analysis. The survey response rate was 86%. Consistent with previous research, this high response rate can be attributed to in-person, onsite survey administration through tablet computers which are quick and accessible (Leisher, 2014), as well as the logistics of park settings (e.g., participants had time to participate) (Lemieux et al., 2016). Note that six respondents were excluded from the survey during data cleaning because they were under the age of 18.

## 5.1 Demographic and Visit Characteristics

The demographic and visit characteristics of the sample are presented in Table 9 and Table 10. Participants ranged in age from 18 to 81 with a mean sample age of 44 years. This is slightly higher than the average age of the Canadian population (41 years) (Statistics Canada, 2016a). There was a higher ratio of females than males (59.7% vs. 40.3%) and most respondents were residents of Canada (only 9.6% were non-residents), with 88.9% being residents of Ontario. There was a higher proportion of individuals with post-secondary degrees compared to population level statistics for Ontario (47.1% with a bachelor's degree or higher vs. 31.9% in the population) (Statistics Canada, 2016a), and a high proportion of individuals were employed (78.8% work for pay or are self-employed).

A large proportion of the sample (69.9%) were returning visitors to Pinery Provincial Park and the average length of stay was 3.7 days. This is fairly consistent with the average length of stay reported for Ontario Parks (3.5 days) and specifically Pinery (3.3 days) (Ontario Parks, 2018). The average group size was 6 people. This is high compared to the average group size in

most parks (3.5 people) (Ontario Parks, 2018). This may be attributed to visitors staying in the group camping area. Figure 9 displays the distribution of group size, showing a large portion of the sample (78.5%) reported to have between 1 and 6 people in their group. Here, the median value (4.0 people) provides a more representative average of group size. There was an almost balanced ratio of respondents who were accompanied by children to those who were not (52% and 48% respectively) and a large portion of the sample reported being accompanied by a partner (70.9%). Interestingly, the majority of the sample (95.5%) believed visits to natural areas to be an important part in improving various aspects of health and well-being. In comparing the results to recent studies, including campground visitor surveys from Ontario Parks (as demonstrated above), it would suggest that overall this sample is representative of the population of visitors to Ontario's parks and protected areas (Ipsos Public Affairs, 2012; Lemieux et al., 2015, 2016; Ontario Parks, 2018).

*Figure 9: Distribution of group size reported by participants (n=466).*
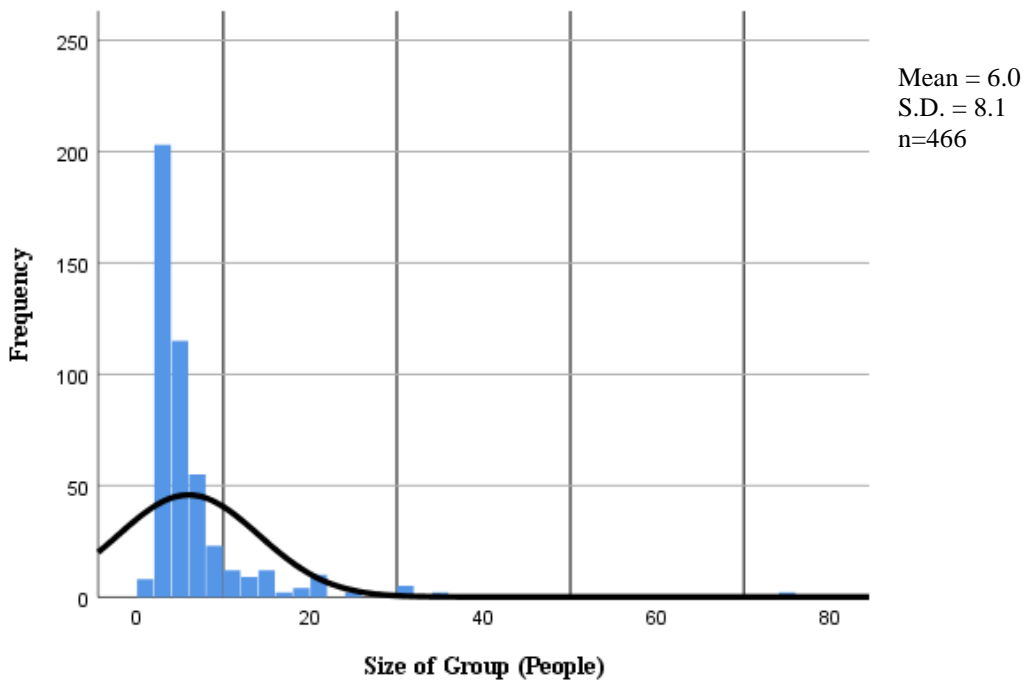
*Table 9: Sociodemographic and visit characteristics (n=467).*

| Variable | Variable Categories | n | % |
|---|---|---|---|
| Gender | Male | 188 | 40.3 |
| | Female | 279 | 59.7 |
| Education | Less than university | 247 | 52.9 |
| | Bachelor's degree | 114 | 24.4 |
| | Graduate degree | 106 | 22.7 |
| Employment status[1] | Employed | 368 | 78.8 |
| | Unemployed | 21 | 4.5 |
| | Not in labour force | 77 | 16.5 |
| Income[2] | Less than $25,000 | 20 | 4.3 |
| | $25,000 - $49,999 | 65 | 13.9 |
| | $50,000 - $99,999 | 161 | 34.5 |
| | $100,000 - $149,999 | 115 | 24.6 |
| | $150,000 or more | 90 | 19.3 |
| Live in Canada | No | 45 | 9.6 |
| | Yes | 422 | 90.4 |
| First visit to park | No | 326 | 69.8 |
| | Yes | 141 | 30.2 |
| Length of visit | One day or less | 127 | 27.2 |
| | More than one day | 340 | 72.8 |
| Accompanied by on visit[3] | No one | 9 | 1.9 |
| | Partner | 331 | 70.9 |
| | Children age 17 or less | 224 | 48.0 |
| | Other family | 117 | 25.1 |
| | Friends | 127 | 27.2 |
| | Co-workers | 2 | 0.4 |
| Nature Importance | Not important | 1 | 0.2 |
| | Somewhat not important | 0 | 0.0 |
| | Neutral | 20 | 4.3 |
| | Somewhat important | 96 | 20.6 |
| | Very important | 350 | 74.9 |

[1] One participant skipped the question on employment status. Missing = 1 (0.2%).
[2] 16 participants skipped the question on income. Missing = 16 (3.4%).
[3] Participants could select more than one option.

*Table 10: Means analysis of sociodemographic and visit characteristics (n=467).*

| Variable | Mean | S.D. |
|---|---|---|
| Age | 44.3 | 14.1 |
| Size of group | 6.0 | 8.1 |
| Days of current park visit | 3.7 | 3.2 |
| Current park visits in past 12 months | 4.0 | 6.7 |
| All park visits in past 12 months | 12.6 | 17.0 |

The distribution of survey responses by sampling location is presented in Table 11. The sampling locations were regrouped based on similarities in ecosite characteristics (i.e., all three campgrounds were combined into one variable), condensing the locations from 18 to 12. Attempts were made to obtain a balanced sample size across locations over the study period. The mean number of surveys collected by location was 39. The minimum number of surveys collected at a location was 8 (Pine Trail) and the maximum was 109 (Beaches and Cedar Trail Lookout) when locations were combined. This variance can likely be attributed to the popularity of different visitor access points. When asked if they preferred the environment they were in at the time of the survey, compared to other environments in the park, just over one half (52.9%) of participants agreed, with 36% remaining neutral (see Table 12).

*Table 11: Location of participant at the time of survey response (n=467).*

| Location | n | % |
|---|---|---|
| Campgrounds | 72 | 15.4 |
| Visitor Centre | 45 | 9.6 |
| Beaches + Cedar Trail Lookout | 109 | 23.3 |
| Sassafras Trail | 19 | 4.1 |
| Bittersweet + Wilderness Trail | 48 | 10.3 |
| Nipissing Trail | 34 | 7.3 |
| Carolinian Trail | 14 | 3.0 |
| Pine Trail | 8 | 1.7 |
| Cedar Trail | 28 | 6.0 |
| Hickory Trail | 25 | 5.4 |
| Heritage Trail | 21 | 4.5 |
| Riverside Trail | 44 | 9.4 |

*Table 12: Preference of location at time of survey response (n=458).*

|  | Environment Preference | |
|---|---|---|
|  | n | (%) |
| Disagree strongly | 12 | (2.6) |
| Disagree a little | 31 | (6.6) |
| Neither | 168 | (36.0) |
| Agree a little | 137 | (29.3) |
| Agree strongly | 110 | (23.6) |
| Total | 458 | (98.1) |
| Missing | 9 | (1.9) |

## 5.2 Perceived Health and Quality of Life

Self-reported physical/mental health and perceived stress levels in the seven days prior to the participant's visit are presented in Table 13 and Table 14 respectively. Just over one half (51.2%) of participants reported being in very good or excellent physical health. This value is lower than similar values for the Ontario population (60.8%) (Statistics Canada, 2016b). A high portion (71.7%) of participants reported being in very good or excellent mental health, very close to values for the Ontario population (70.0%) (Statistics Canada, 2016b). Some respondents (36%) reported having quite a bit or extreme stress within the seven days prior to their visit. This value is much higher compared to the average value (22.3%) reported for the Ontario population (Statistics Canada, 2016b).

*Table 13: Perceived state of physical and mental health.*

|  | Perceived State of Physical Health | | Perceived State of Mental Health | |
|---|---|---|---|---|
|  | n | (%) | n | (%) |
| Poor | 2 | (0.4) | 4 | (0.9) |
| Fair | 48 | (10.3) | 29 | (6.2) |
| Good | 178 | (38.1) | 97 | (20.8) |
| Very Good | 171 | (36.6) | 207 | (44.3) |
| Excellent | 68 | (14.6) | 128 | (27.4) |
| Total | 467 | (100.0) | 465 | (99.6) |
| Non-response | 0 | (0.0) | 2 | (0.4) |

*Table 14: Perceived state of stress in the 7 days prior to visit.*

|  | Perceived Stress Level Prior to Visit | |
|---|---|---|
|  | n | (%) |
| Not at all Stressful | 21 | (4.5) |
| Not very Stressful | 79 | (16.9) |
| A bit Stressful | 198 | (42.4) |
| Quite a bit Stressful | 126 | (27.0) |
| Extremely Stressful | 42 | (9.0) |
| Total | 466 | (99.8) |
| Non-response | 1 | (0.2) |

## 5.3 Perceived Restorative Outcomes related to Diverse Environments

A Restorative Outcome Scale (ROS) was used to measure participant's self-reported well-being and mood. The mean summary score of the six ROS statements was calculated (ranging from *"strongly disagree"* to *"strongly agree"*), consistent with previous research (Korpela et al., 2008, 2010; Takayama et al., 2014). The overall mean of 4.2 (S.D. = 0.6), indicating respondents tend to strongly agree/associate restorative outcomes. More interestingly, these values were cross-tabulated by location in the park, as shown in Table 15. Participants reported high restorative outcomes in all environments, with mean scale values ranging from 3.89 to 4.43 (see Figure 10). However, the differences by location were not statistically significant when tested using a two-sided test of equality for column means and p-value of 0.05. Thus, these results do not support that a difference in restorative outcomes exists by environment in the park.

Note that several iterations of the means analysis were performed with variations in groupings of the sampling locations. For instance, the locations were condensed to 4 visitor experience types (i.e., trails, beach, built, and campground) as well as expanded to all 18 sampling locations. While participant's reported restorative outcomes remained high, the variations in mean ROS scores between environments remained statistically insignificant at the 0.05 level.

*Table 15: Perceived restorative outcomes by location (n=467).*

| | **Location: Grouped into 12 ecosites** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Campgrounds *n=72* | Visitor Centre *n=45* | Beaches + Cedar Trail Lookout *n=109* | Sassafras Trail *n=19* | Bittersweet + Wilderness Trail *n=48* | Nipissing Trail *n=34* | Carolinian Trail *n=14* | Pine Trail *n=8* | Cedar Trail *n=28* | Hickory Trail *n=25* | Heritage Trail *n=21* | Riverside Trail *n=44* |
| **Restorative Outcomes Scale combined average** | **4.12$_a$** | **3.98$_a$** | **4.19$_a$** | **4.22$_a$** | **4.25$_a$** | **4.37$_a$** | **4.24$_a$** | **4.19$_a$** | **4.17$_a$** | **3.89$_a$** | **4.43$_a$** | **4.15$_a$** |
| I feel calmer here | 4.4$_a$ | 4.1$_a$ | 4.5$_a$ | 4.4$_a$ | 4.5$_a$ | 4.6$_a$ | 4.6$_a$ | 4.4$_a$ | 4.5$_a$ | 4.4$_a$ | 4.4$_a$ | 4.4$_a$ |
| I feel restored and relaxed here | 4.4$_a$ | 4.1$_a$ | 4.5$_a$ | 4.3$_a$ | 4.4$_a$ | 4.5$_a$ | 4.4$_a$ | 4.3$_a$ | 4.6$_a$ | 4.3$_a$ | 4.6$_a$ | 4.4$_a$ |
| I feel enthusiastic and energetic here | 4.1$_a$ | 4.0$_a$ | 4.1$_a$ | 4.5$_a$ | 4.3$_a$ | 4.4$_a$ | 4.1$_a$ | 4.4$_a$ | 3.8$_a$ | 4.0$_a$ | 4.6$_a$ | 4.0$_a$ |
| My concentration and alertness clearly increase here | 3.7$_a$ | 3.9$_a$ | 3.8$_a$ | 4.1$_a$ | 4.2$_a$ | 4.1$_a$ | 3.9$_a$ | 4.1$_a$ | 3.9$_a$ | 3.9$_a$ | 4.4$_a$ | 4.0$_a$ |
| I forget everyday worries here | 4.1$_a$ | 3.9$_a$ | 4.3$_a$ | 3.9$_a$ | 4.0$_a$ | 4.4$_a$ | 4.4$_a$ | 4.0$_a$ | 4.2$_a$ | 4.2$_a$ | 4.4$_a$ | 4.0$_a$ |
| My thoughts are clearer and clarified here | 3.9$_a$ | 3.8$_a$ | 4.0$_a$ | 4.1$_a$ | 4.1$_a$ | 4.2$_a$ | 4.1$_a$ | 4.0$_a$ | 4.0$_a$ | 3.9$_a$ | 4.4$_a$ | 4.0$_a$ |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p < 0.05$ in the two-sided test of equality for column means. Cells with no subscript are not included in the test. Tests assume equal variances.[1]

1. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

*Figure 10: Participant ratings of restorative outcomes, ecological integrity, and species richness by ecosite.*
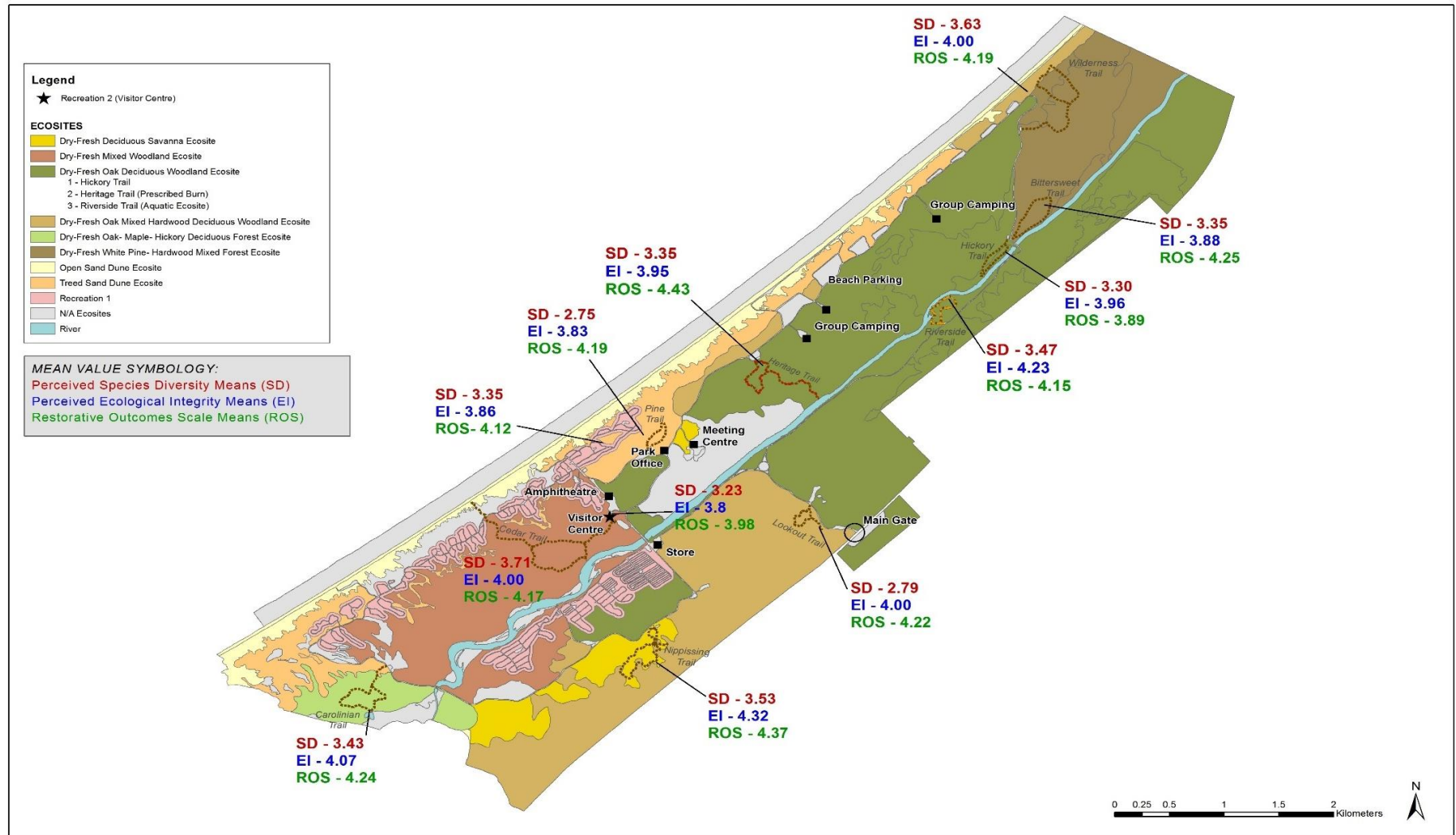


*ELC data provided by OMNRF (2016). Produced by T. King at Wilfrid Laurier University under License with the Ontario Ministry of Natural Resources and Forestry© Queen's Printer for Ontario, 2016.*

The mean ROS values were cross-tabulated by visitor's preference for the location they were in at the time of the survey, as shown in Table 16. Interestingly, the differences were statistically significant when tested using a two-sided test of equality for column means and p-value of 0.05. Significant differences were identified between participant's who do not prefer the environment, somewhat do not prefer the environment, do not have a preference/somewhat prefer the environment, and those who strongly prefer the environment. The association between preference of environment and restorative outcomes was positive ($r = 0.47$, $p<0.01$), suggesting these results do support that a difference in restorative outcomes may exist by visitor preference.

*Table 16: Relationship between restorative outcomes and preference of environment.*

| | Preference of Environment | | | | |
|---|---|---|---|---|---|
| | Disagree strongly | Disagree a little | Neither | Agree a little | Agree strongly |
| **Restorative Outcomes Scale combined average** | **$3.04_a$** | **$3.62_b$** | **$4.09_c$** | **$4.23_c$** | **$4.55_d$** |
| I feel calmer here | $3.0_a$ | $3.6_a$ | $4.4_b$ | $4.5_b$ | $4.8_c$ |
| I feel restored and relaxed here | $3.2_a$ | $3.8_b$ | $4.3_c$ | $4.5_c$ | $4.8_d$ |
| I feel enthusiastic and energetic here | $3.0_a$ | $3.6_a$ | $4.1_b$ | $4.1_b$ | $4.5_c$ |
| My concentration and alertness clearly increase here | $3.2_{a,b}$ | $3.3_a$ | $3.8_{b,c}$ | $3.9_c$ | $4.3_d$ |
| I forget everyday worries here | $2.8_a$ | $3.8_b$ | $4.1_b$ | $4.3_{b,c}$ | $4.5_c$ |
| My thoughts are clearer and clarified here | $3.1_a$ | $3.5_{a,b}$ | $3.8_b$ | $4.1_c$ | $4.4_d$ |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p< 0.05$ in the two-sided test of equality for column means. Cells with no subscript are not included in the test. Tests assume equal variances.[1]
1. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

## 5.4 Variations in Restorative Outcomes by Demographics and Self-reported Health

The mean ROS scores cross-tabulated by gender are presented in Table 17. In a comparison by gender, females reported higher perceived restorative outcomes than males (4.24 and 4.06 respectively).

*Table* 17: *Perceived restorative outcomes by gender (n=467).*

| | Gender | |
|---|---|---|
| | Male $n=188$ | Female $n=279$ |
| **Restorative Outcomes Scale combined average** | **4.06$_a$** | **4.24$_b$** |
| I feel calmer here | 4.4$_a$ | 4.4$_a$ |
| I feel restored and relaxed here | 4.4$_a$ | 4.5$_a$ |
| I feel enthusiastic and energetic here | 4.0$_a$ | 4.2$_a$ |
| My concentration and alertness clearly increase here | 3.8$_a$ | 4.0$_b$ |
| I forget everyday worries here | 4.1$_a$ | 4.2$_a$ |
| My thoughts are clearer and clarified here | 3.8$_a$ | 4.1$_b$ |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p<0.05$ in the two-sided test of equality for column means. Tests assume equal variances.[1]

1. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

The mean ROS scores cross-tabulated by participant's ratings of importance for visiting natural areas in improving health and well-being are presented in Table 18. Significant differences ($p<0.05$) are identified between participant's who rate visiting natural environments as somewhat important with those who rate visits very important. These results suggest there could be an association between perceived restorative outcomes and visitor opinions of the importance in visiting natural areas.

The mean ROS scores were cross-tabulated by gender, age, education, employment, income, residence, first visit, size of group, group characteristics (i.e., accompanied by partner, children, etc.), and importance of visiting nature. The differences in restorative outcomes by gender and opinions on nature visits are an important finding, as they appear to be the only demographic characteristics in the sample that contribute to variations in respondent's perceived restorative outcomes.

*Table 18: Relationship between restorative outcomes and visitor opinions of importance in visiting natural areas (n=467).*

| | Nature Importance Rating | | | | |
| --- | --- | --- | --- | --- | --- |
| | Not important | Somewhat not important | Neutral | Somewhat important | Very important |
| **Restorative Outcomes Scale combined average** | **3.83[1]** | **.[2]** | **3.64$_a$** | **3.93$_a$** | **4.27$_b$** |
| I feel calmer here | 5.0[1] | .[2] | 4.2$_{a,b}$ | 4.2$_a$ | 4.5$_b$ |
| I feel restored and relaxed here | 5.0[1] | .[2] | 4.1$_a$ | 4.1$_a$ | 4.5$_b$ |
| I feel enthusiastic and energetic here | 3.0[1] | .[2] | 3.7$_a$ | 3.9$_a$ | 4.2$_b$ |
| My concentration and alertness clearly increase here | 3.0[1] | .[2] | 3.4$_a$ | 3.6$_a$ | 4.0$_b$ |
| I forget everyday worries here | 4.0[1] | .[2] | 3.5$_a$ | 4.0$_a$ | 4.3$_b$ |
| My thoughts are clearer and clarified here | 3.0[1] | .[2] | 3.5$_a$ | 3.7$_a$ | 4.1$_b$ |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p < 0.05$ in the two-sided test of equality for column means. Cells with no subscript are not included in the test. Tests assume equal variances.[3]

1. This category is not used in comparisons because the sum of case weights is less than two.

2. This category is not used in comparisons because there are no other valid categories to compare

3. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

The perceived restorative outcomes were measured against visitor's self-reports of health and quality of life to explore how physical and mental health, along with stress levels, may be related to benefits from nature. However, the relationship between these variables was not statistically significant, suggesting that the restorative outcomes reported by visitors were high regardless of whether visitor's reported being in poor or excellent physical and mental health. A similar observation was made for the relationship between perceived restorative outcomes and stress levels prior to the visit, with restorative outcomes remaining high regardless of whether visitors reported no stress or extreme stress prior to the visit.

## 5.5 Role of Environmental Quality

Visitor ratings of environmental quality are reported in Table 19. A high proportion of respondents perceived the environment to be mostly or purely natural (82.9%). Only one respondent rated the environment they were in as purely artificial. A high portion of respondents also perceived the environment to have high or very high ecological integrity (75.8%). This is slightly lower than the naturalness ratings. Interestingly, no one reported the environment to have very low ecological integrity. Compared to naturalness and ecological integrity, the species richness ratings were lower. Close to half (42.4%) of the respondents remained neutral, while 36.2% of respondents perceived that there were more plant and animal species in the environment they were in at the time of the survey, compared to other areas of the park. Participant's average rating of ecological integrity and species richness are presented by location in Figure 10.

*Table 19: Environmental quality reported by participants (n=467).*

| Variable | Variable Categories | n | % |
|---|---|---|---|
| Naturalness | Purely artificial (1) | 1 | 0.2 |
| | Mostly artificial (2) | 4 | 0.9 |
| | Mix of natural & artificial (3) | 75 | 16.1 |
| | Mostly natural (4) | 294 | 63.0 |
| | Purely natural (5) | 93 | 19.9 |
| Ecological integrity | Very low ecological integrity (1) | 0 | 0 |
| | Low ecological integrity (2) | 6 | 1.3 |
| | Moderate ecological integrity (3) | 107 | 22.9 |
| | High ecological integrity (4) | 258 | 55.2 |
| | Very high ecological integrity (5) | 96 | 20.6 |
| More species richness here[1] | Disagree Strongly (1) | 27 | 5.8 |
| | Disagree (2) | 65 | 13.9 |
| | Neutral (3) | 198 | 42.4 |
| | Agree (4) | 115 | 24.6 |
| | Agree Strongly (5) | 54 | 11.6 |

[1] 8 participants skipped the question on species richness. Missing = 8 (1.7%).

The mean ROS values were cross-tabulated by three variables of environmental quality: naturalness, ecological integrity, and species richness, presented in Table 20, Table 21, and Table 22 respectively. Positive correlations between restorative outcomes and naturalness, ecological integrity, and species richness were all significant at the 0.01 level ($r = 0.23$, $r = 0.25$, $r = 0.32$ respectively). Thus, these results support that a difference in restorative outcomes exists by environmental quality in the park. The results suggest there may be an association between visitor's perceived restorative outcomes and their perceptions of an environment's quality.

*Table 20: Relationship between restorative outcomes and naturalness.*

| | Naturalness Rating | | | | |
|---|---|---|---|---|---|
| | Purely artificial | Mostly artificial | Mix of natural & artificial | Mostly natural | Purely natural |
| **Restorative Outcomes Scale combined average** | **2.50[1]** | **3.96$_{a,b}$** | **3.89$_a$** | **4.20$_b$** | **4.34$_{b,c}$** |
| I feel calmer here | 1.0[1] | 4.0$_{a,b}$ | 4.2$_a$ | 4.4$_{a,b}$ | 4.6$_b$ |
| I feel restored and relaxed here | 4.0[1] | 4.0$_{a,b}$ | 4.1$_a$ | 4.5$_b$ | 4.6$_{b,c}$ |
| I feel enthusiastic and energetic here | 3.0[1] | 4.3$_a$ | 4.0$_a$ | 4.1$_a$ | 4.3$_a$ |
| My concentration and alertness clearly increase here | 2.0[1] | 3.8$_{a,b}$ | 3.6$_a$ | 3.9$_a$ | 4.3$_b$ |
| I forget everyday worries here | 2.0[1] | 4.0$_{a,b}$ | 3.7$_a$ | 4.2$_b$ | 4.4$_{b,c}$ |
| My thoughts are clearer and clarified here | 3.0[1] | 3.8$_{a,b}$ | 3.7$_a$ | 4.0$_b$ | 4.2$_{b,c}$ |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p < 0.05$ in the two-sided test of equality for column means. Tests assume equal variances.[2]

1. This category is not used in comparisons because the sum of case weights is less than two.

2. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

*Table 21: Relationship between restorative outcomes and ecological integrity.*

| | Ecological Integrity Rating | | | | |
|---|---|---|---|---|---|
| | Very low ecological integrity | Low ecological integrity | Moderate ecological integrity | High ecological integrity | Very high ecological integrity |
| **Restorative Outcomes Scale combined average** | .[1] | $3.25_a$ | $4.05_b$ | $4.13_b$ | $4.46_c$ |
| I feel calmer here | .[1] | $3.3_a$ | $4.3_b$ | $4.4_{b,c}$ | $4.6_c$ |
| I feel restored and relaxed here | .[1] | $3.4_a$ | $4.3_b$ | $4.4_b$ | $4.7_c$ |
| I feel enthusiastic and energetic here | .[1] | $3.0_a$ | $4.0_b$ | $4.1_b$ | $4.4_c$ |
| My concentration and alertness clearly increase here | .[1] | $2.8_a$ | $3.7_{a,b}$ | $3.9_{b,c}$ | $4.2_c$ |
| I forget everyday worries here | .[1] | $3.2_a$ | $4.1_a$ | $4.1_a$ | $4.5_b$ |
| My thoughts are clearer and clarified here | .[1] | $3.0_a$ | $3.9_a$ | $4.0_a$ | $4.3_b$ |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p < 0.05$ in the two-sided test of equality for column means. Tests assume equal variances.[2]

1. This category is not used in comparisons because there are no other valid categories to compare

2. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

*Table 22: Relationship between restorative outcomes and species richness.*

| | Species Richness Rating | | | | |
|---|---|---|---|---|---|
| | Disagree strongly | Disagree a little | Neither | Agree a little | Agree strongly |
| **Restorative Outcomes Scale combined average** | $3.64_a$ | $3.95_a$ | $4.19_b$ | $4.23_b$ | $4.56_c$ |
| I feel calmer here | $3.6_a$ | $4.2_b$ | $4.5_{b,c}$ | $4.5_{b,c}$ | $4.8_c$ |
| I feel restored and relaxed here | $4.0_a$ | $4.2_{a,b}$ | $4.5_{b,c}$ | $4.5_{a,b,c}$ | $4.7_c$ |
| I feel enthusiastic and energetic here | $3.7_a$ | $4.0_a$ | $4.1_a$ | $4.2_{a,b}$ | $4.5_b$ |
| My concentration and alertness clearly increase here | $3.0_a$ | $3.7_b$ | $3.9_b$ | $4.0_{b,c}$ | $4.4_c$ |
| I forget everyday worries here | $4.0_a$ | $3.9_a$ | $4.1_a$ | $4.2_{a,b}$ | $4.6_b$ |
| My thoughts are clearer and clarified here | $3.5_a$ | $3.7_{a,b}$ | $4.0_b$ | $4.1_{b,c,d}$ | $4.4_d$ |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p < 0.05$ in the two-sided test of equality for column means. Cells with no subscript are not included in the test. Tests assume equal variances.[1]

1. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

## 5.6 Role of Dosage

The perceived restorative outcomes reported by participants were measured against dosage to explore if visitor's restorative outcomes varied by the amount of time spent in natural environments. The cross-tabulated means revealed no significant difference ($p<0.05$) between participant's perceived restorative outcomes and their length of stay. Thus, these results do not support that a difference in restorative outcomes exists by length of stay at the park (day-use or camping). The same analysis was run for days spent in Pinery in the past 12 months which also revealed no significant difference ($p<0.05$) between participant's perceived restorative outcomes and number of visits (i.e., first visit or returning visitors). Using Spearman's correlation coefficient, length of visit and days spent in Pinery were insignificant, but a weak positive correlation ($r_s = 0.13$, $p<0.01$) was identified between restorative outcomes and the number of days people spend in Provincial, National, and similar parks per year. A means analysis shows that the restorative outcomes reported by visitors is significantly different ($p<0.05$) between those who report spending only one day per year in park environments compared to those who reported spending 2 or more days (see Table 23). This suggests that visitors who spend more than one day in a Provincial, National, or similar park per year, may receive higher restorative outcomes.

*Table 23: Relationship between restorative outcomes and days spent in Provincial, National, or similar parks per year.*

|  | Days Spent in Parks Per Year | | | |
|---|---|---|---|---|
|  | 1 Day | 2-3 Days | 4-7 Days | 8+ Days |
| **Restorative Outcomes Scale combined average** | **3.53a** | **4.16b** | **4.12b** | **4.23b** |
| I feel calmer here | 3.9a | 4.4a | 4.5a | 4.4a |
| I feel restored and relaxed here | 4.2a | 4.4a | 4.4a | 4.4a |
| I feel enthusiastic and energetic here | 3.3a | 4.2b | 4.1b | 4.2b |
| My concentration and alertness clearly increase here | 3.4a | 4.1a | 3.7a | 4.0a |
| I forget everyday worries here | 3.9a | 4.1a | 4.1a | 4.2a |
| My thoughts are clearer and clarified here | 3.7a | 4.0a | 3.9a | 4.1a |

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p<.05$ in the two-sided test of equality for column means. Cells with no subscript are not included in the test. Tests assume equal variances.1

1 Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

## 5.7 Visitor Profiles

A principle component analysis (PCA) was used to uncover clusters of related variables in a more multivariate analysis approach, as shown in Table 24. Included in the PCA were all environment, ROS, dosage, sociodemographic, and overall health variables, excluding variables with text measurements (refer to Table 8). Three components were extracted from the analysis which were considered statistically significant at the set limits (0.300). The first component represents 22.2% of the variance in the dataset. This component consists of visitors who tend to report being in *good* physical and mental health with *low* stress, whom perceive the naturalness and ecological integrity of the environment to be *high* and feel it is *moderately important* to visit natural areas for improving health and well-being. This group tends to report to receive *high* restorative outcomes from the natural environment.

The second component represents 18.7% of the variance in the dataset, and tends to consist of females that report being in *poor* physical and mental health with *moderate* levels of stress, whom perceive the naturalness and ecological integrity of the environment to be *moderately high* and feel it is *moderately important* to visit natural areas for improving health and well-being (the latter similar to component 1). This group tends even more so to report receiving *high* restorative outcomes from the natural environment.

*Table 24: Principle component analysis (PCA) of visitor patterns.*

| | Component | | |
|---|---|---|---|
| | **1** | **2** | **3** |
| Gender | | 0.429 | 0.466 |
| Physical health | 0.622 | -0.420 | 0.354 |
| Mental health | 0.642 | -0.466 | |
| Stress prior to visit | -0.371 | 0.426 | |
| Naturalness rating of environment | 0.468 | 0.403 | -0.472 |
| Ecological integrity rating of environment | 0.567 | 0.314 | -0.453 |
| Importance of visits to natural areas for improving aspects of health and well-being | 0.316 | 0.321 | 0.611 |
| Restorative Outcomes Scale combined average | 0.441 | 0.613 | |

Extraction Method: Principal Component Analysis.
3 components extracted.

Component 3 represents 14.9% of variance in the dataset. This component also consists of females but who report being in *moderately good* physical health, perceive the naturalness and ecological integrity of the environment to be *low* but feel that visits to natural areas are *very important* for improving aspects of health and well-being. Note that this component is not strongly associated with mental health, stress levels, and restorative outcomes (i.e., did not meet the cutoff of 0.300 and therefore, not included in this component). These three distinct components help to group visitors based on similar perceptions and behaviours and may informs visitor marketing and outreach.

# 6. Discussion

In this section, a critical examination of the results is provided concerning how visitor's restorative outcomes are influenced by specific aspects of park environments and visit characteristics. The chapter is organized into themes, guided by the four research objectives, which examine restorative outcomes in relation to types of environment, socio-demographics, environmental quality, and dosage. The chapter will then consider the limitations of the study, explore opportunities for future research, and offer recommendations around planning and management for park practitioners.

## 6.1 Restorative Outcomes from Visiting a Protected Area

Overall, the results of this study provide strong evidence that Pinery Provincial Park provides substantial restorative outcomes to visitors. The findings do support Wyles et al. (2019), who found environments with designated status (i.e., Pinery Provincial Park), were associated with greater links to restoration than undesignated areas. The results are generally consistent with the research of Lemieux et al. (2012) and Lemieux et al. (2015), who studied health motives and benefits of park visitors in Pinery and several Alberta provincial parks and recreation areas, finding participants reported significant improvements in health and well-being benefits from visiting the park. The restorative outcome results are also consistent with the more general literature concerning the value parks and protected areas hold in providing a space for people to connect with nature and derive health and well-being benefits (Canadian Park Council, 2014; Lemieux et al., 2015; Maller et al., 2010; Ontario Parks, 2017; Romagosa et al., 2015) and the more general connection between nature and restorative outcomes (Carrus et al., 2013; Korpela et al., 2010; Marselle et al., 2015; Marselle et al., 2013; Takayama et al., 2014). These findings suggest that restorative outcomes are an important element in enhancing health and well-being, providing a first step to understanding these benefits in relation to parks and protected areas.

Going a step further, one objective of this research was to identify what specific locations/environments within the park were associated with higher perceived restorative outcomes, addressing the question, "Does environment type matter"? This is important in identifying where visitors may derive the most benefit and perhaps point park managers in the direction of where best to focus finite human and financial resources. Interestingly, the results do not support that differences in restorative outcomes exist in the locations/environments chosen for study. However, the results do suggest there may be an association between perceived

restorative outcomes and environment preference. Visitors who preferred the location/environment they were in at the time of the survey, also tended to report higher restorative outcomes. This is consistent with Kaplan and Kaplan (1989) who found environments that are preferred are more likely to be restorative. The results suggest that being in the park anywhere provides an opportunity to receive restorative benefits, regardless of whether visitors choose to spend their time hiking on trails, swimming at the beach, or relaxing at their campsite. Alternatively, it may be that the locations chosen were just not different enough, or that accumulated benefits of visitation prior to being in any specific location, strongly influenced responses. Furthermore, the results suggest that visitors who feel it is important to visit a natural environment to improve health and well-being, also reported higher restorative outcomes. Therefore, visitors may already be more likely to receive restorative outcomes because of the "buy-in" to nature importance. These results are consistent with a limited body of literature that have found the type of natural environment is not a significant indicator of restorative outcomes (Arnberger et al., 2018; Marselle et al., 2013), though these studies focused on very specific environments such as meadows (Arnberger et al., 2018) or farmland (Marselle et al., 2013), with few focusing on the diverse environments within protected areas.

There may be several other reasons why no significant differences in restorative outcomes were observed between environments. The act of being away from day-to-day life and spending time in a different setting, may be enough. Additionally, the park setting is dominated by nature, which has been well established as a platform to derive health and well-being benefits, therefore, visitors are already being immersed in a restorative setting and may not perceive a significant difference between the environments within it. Furthermore, visitors have chosen to spend time at Pinery, suggesting there is already an element of compatibility with the environment, which also speaks to preference. Kaplan and Kaplan (1989) provide a useful explanation of the restorative outcomes visitors receive through Attention Restoration Theory (ART), arguing there are four components to the restorativeness of an environment: being away, extent, fascination, and compatibility. Natural environments are considered to provide especially good settings for attention restoration, because they contain stimuli that attract involuntary attention (i.e., situations that do not require cognitive effort). Pinery Provincial Park offers the components for a restorative environment by being a place to visit for an undetermined amount of time, away from everyday life, which provides the natural setting to derive benefits for those

who have the desire and resources to do so. Therefore, it is reasonable to consider that visitors would report agreement with statements such as: *"I forget everyday worries here"* and *"My thoughts are clearer and clarified here",* regardless of the type of park environment they are in. This is generally consistent with the research of Marselle et al. (2016), who found the restorative qualities of being away, fascination, and compatibility offered greater emotional well-being by having physical distance from everyday stressors.

These findings help to address a gap in the North American literature, and especially within Canada, on the role of environment types in providing restorative outcomes (Lovell et al., 2015), as it relates to diverse environments. However, further research is needed to support these findings and better understand the value of unique park environments. Lemieux et al. (2016) found visitors reported unique health and well-being benefits based on broad, but distinct natural environments when comparing outcomes between protected areas in Alberta. Future research may wish to build on this concept to compare the findings from this study, with similar studies on other protected areas (especially in Ontario), to determine if the protected area itself plays a role in distinguishing the outcomes visitors receive.

## 6.2 Everyone Will Benefit

The second objective of this research was to analyze the variations of visitor's perceived restorative outcomes by socio-demographic variables as well as self-reported health and quality of life. Overall, except for gender, the demographic analysis did not reveal any significant differences among visitors in their perceived restorative outcomes. Regardless of age, education, employment, levels of household income, first visit, size of group, and group characteristics (i.e., accompanied by partner, children, etc.), visitors reported high restorative outcomes, suggesting everyone has an opportunity to benefit from a visit to Pinery. In similar studies of health motives and benefits to park visitors, Lemieux et al. (2012) also found age did not affect perceived benefits of visitors to parks in Ontario and Quebec. However, the findings of the current study differ from the Alberta Parks study by Lemieux et al. (2015), which identified key differences in perceived benefits related to income and education. Lemieux et al. (2015) found higher income individuals and individuals with higher levels of education, perceived greater benefits in some regards (i.e., physical well-being).

With respect to gender, an interesting difference did emerge in the data. Females tended to perceive slightly greater restorative outcomes than males from their visit. This is consistent

with findings from Lemieux et al. (2012, 2015), noting females perceived greater benefits associated with their visits to parks, when compared to males. Furthermore, the results of this study suggest that females who receive higher restorative outcomes tend to perceive the environment to be natural with high ecological integrity and report poor physical and mental health, along with moderate levels of stress prior to their visit, but feel it is important to visit natural areas for improving health and well-being. This subgroup therefore exhibits greater room for improvement in terms of physical and mental health, along with stress levels, from their visit to the park.

The restorative outcomes of visitors were found to be high regardless of whether visitor's reported being in poor or excellent physical and mental health. A similar observation was made for stress levels prior to the visit, with restorative outcomes remaining high regardless of whether visitors reported no stress or extreme stress prior to the visit. Indicating, visitors will receive benefits regardless of their perceived physical/mental health and quality of life. This indicates that Pinery can serve as a space to maintain individual's health and well-being as well as being a mechanism to improve it by providing individuals with restorative outcomes.

Evidence is beginning to mount which suggests that all demographics have an opportunity to benefit from visiting a park environment, with even greater outcomes for females. There is a need for public health and park agencies to better understand the restorative benefits received by social and population subgroups so that informed policies and programs can be developed which support these outcomes (Lemieux et al., 2016). Pinery provides a variety of activities and programs for its visitors and should consider further tailoring programming to meet the needs of these subgroups and maximize the benefits received from visiting the park.

### 6.3 Healthy Parks, Healthy People: More than just a Phrase

Another objective of the research was to better understand the influence of naturalness, ecological integrity, and species richness on visitor's perceived restorative outcomes. Environmental quality is emerging in the literature as an important component to well-being outcomes and the environment. In addition to providing benefits to visitors, the quality of the environment is a key aspect in the mandate of provincial parks, guiding the decisions of park managers. Although correlation does not imply causation, there does appear to be an association between restorative outcomes and the perceived quality of environment. The results suggest that visitors that perceive an environment to be of greater naturalness, ecological integrity, or species

richness, also report higher perceptions of restoration. These results agree with similar studies by scholars such as Dallimer et al. (2012), Fuller et al. (2007), and Marselle et al. (2019), who found perceptions of higher species richness were associated with enhanced feelings of restoration. Carrus et al. (2013), concluded similar findings with regards to perceived naturalness. Marselle et al. (2016) may provide one explanation for the relationship between environmental quality and restorative outcomes. In a 2016 study conducted on a national walking program, the authors found that perceiving an environment as restorative may be a necessary step in the perception of naturalness and species biodiversity. Marselle et al. (2016) conclude that the perception of naturalness and biodiversity were felt as opportunities for a restorative experience by participants, leading to emotional well-being outcomes.

The results of this study revealed interesting insights into visitor's perceptions of Pinery's environmental quality. The percentage of participant's who felt there were more plant and animal species (species richness) in the environment they were surveyed in, was much lower when compared to ratings of naturalness and ecological integrity. One explanation is that participants may not have visited other environments in the park prior to completing the survey and therefore, had nothing to compare the environment to. Interestingly, no one reported the environment they were in to have very low ecological integrity. This could suggest visitors do not feel the ecological integrity of the park is low or they may require more information for this rating (i.e., comparison of environments, additional information on ecological integrity). Visitors also had different interpretations of naturalness. Some visitors felt environments free of human intervention were natural, while others based their ratings on the type of intervention, with one person stating: "[They consider] *boardwalks and stairs on trails to be natural because they were created using wood, which comes from trees."* While this does point to the challenges in relying on visitor perceptions (Lamb & Purcell, 1990), it is also good news for Pinery, indicating that visitors are enjoying their experience and feel that the park is a natural setting.

Visitors overall high ratings of the environment's naturalness, ecological integrity, and species richness invoke other considerations. For one, how well do visitors understand these concepts? Is it enough to draw conclusions about the quality of an environment? There is likely opportunity here for interpretation and outreach programs that better educate visitors on concepts of environmental quality. Additionally, how does visitor's perception of the environment compare with actual ecological measurements? In conversation with Pinery Park staff, visitor

perceptions appear to be somewhat consistent with expert opinions (personal communication, April 5, 2018), but further research and empirical evidence is needed to support this claim. Regardless, individual's perceptions of an environment clearly play an important role in self-reported restorative outcomes. Whether visitor's perceptions of the environment match ecological measures, the preference or feeling that an environment is of high quality, brings restorative outcomes. These findings agree with Dallimer et al. (2012), who stated perceptions of high biodiversity were continuously met with positive outcomes, while the influence of actual biodiversity was mixed.

To the researcher's knowledge, this is the first study to investigate perceived ecological integrity as a contributor to restorative outcomes. This is an important contribution to the literature on influences of environmental quality for well-being benefits, and more research is needed. It is also an important consideration for the monitoring and management of provincial parks. Park managers should take a holistic approach to managing park environments which support the natural integrity of the environment, while accounting for visitation. *Healthy Parks, Healthy People*, goes beyond a catchy phrase and should be used as a guiding principle for park management which recognizes the benefits a healthy environment has on ecosystem functions as well as visitor's health and well-being.

## 6.4 Getting the Right Dosage

The final objective of this research was to understand the influence of dosage (length of stay) on visitor experiences and restorative outcomes. Surprisingly, the results revealed no significant difference in the restorative outcomes received by length of stay, with both day-users and overnight campers, reporting high restorative outcomes. This suggests that visitors receive restorative outcomes regardless of their length of stay, the most important part is getting to the park environment. Alternatively, it may simply suggest that restorative outcomes come on rather quickly from the onset of arrival, and that the coarseness of duration measured in days was not sufficient to capture any variation.

The results did reveal interesting findings when comparing the number of visits to Provincial, National, or similar parks per year. Visitors who reported spending two or more days in a Provincial, National, or similar parks per year, were found to have higher restorative outcomes than those who reported only spending one day per year. Lemieux et al. (2015) also found visitors with a higher commitment to parks were more motivated to visit the park and

received greater outcomes from their visit. This may once again be attributed to an element of compatibility (Kaplan & Kaplan, 1989), creating a highly restorative environment for visitors who are committed to parks.

Although findings here indicate that any length of time in the park will offer restorative outcomes, recent studies advise spending at least 120 minutes (two hours) a week in nature is associated with health and well-being benefits (White et al., 2019). White et al. (2019) found that the type of activity and the distribution of time (i.e., 12 hours or 7 days), did not impact individual's ability to receive benefits. It is likely park visitors will spend at least 120 minutes in Pinery during their visit and therefore it is no surprise that they report receiving positive outcomes. These results help support evidence-based recommendations to policy makers regarding the amount of time required to be spent in nature (White et al., 2019), and provide a good marketing opportunity for park agencies. This 2-hour, weekly dosage means visitors can take advantage of day usage to receive benefits. This is especially important for individuals who do not have the resources or are less comfortable with camping as well as those who cannot get away from day-to-day life for longer periods of time. Pinery's diversity of amenities and activities provide countless options for park visitors to capitalize on when looking to obtain restorative outcomes.

### 6.5 Summary

In summary, the researcher hypothesized that environments that are perceived to be more natural, with a higher ecological integrity, or with a greater species richness, will be associated with greater perceived restorative outcomes, which the data supported. Longer visits to the park were also expected to be associated with greater perceived outcomes. However, the length of stay did not play a significant role. An unanticipated finding was the difference in restorative outcomes by gender, with females reporting greater restorative outcomes when compared to males. The data analysis found visitors perceived high restorative outcomes from visiting Pinery but that the type of environment (i.e., beach, forest) was not a determining factor. Visitor's preferences were also found to be associated with greater perceived outcomes. The data analysis revealed visitors who reported a preference for their environment or felt visiting natural environments was important, also reporting greater restorative outcomes.

The findings of this study highlight the importance of parks and protected areas as settings which can provide restorative properties for all social and population subgroups to

varying degrees. An important contribution to existing research is the relationship between visitor perceptions of environmental quality with restorative outcomes, especially with respect to ecological integrity. These findings will provide park agencies with valuable information that can be used to assess policy and management options, and their impact on the distribution of the benefits provided. However, more research is still needed to understand the restorative mechanisms that may be unique to parks and protected areas (Lemieux et al., 2016).

## 6.6 Limitations

This study makes an important contribution to the research on nature-based restorative outcomes as few studies have considered this within a protected areas context, nevertheless, it does still have its limitations. The survey was developed with the intention of comparability between previous research by Lemieux et al. (2012, 2015) on human health and well-being outcomes in Canadian parks, along with literature based around restorative outcomes and environment characteristics. This is a strength of the research, however, since few studies have attempted to consider restorative outcomes, environment type, and quality at once, this makes holistic comparisons between existing research difficult.

The study took place over the summer months with exceptionally good weather conditions, and as such, the data may reflect a seasonal effect (Marselle et al., 2019). Although there is strong evidence that spending time in nature does offer restorative outcomes (Korpela et al., 2010; Marselle et al., 2015, 2016; Marselle et al., 2019; Takayama et al., 2014), surveying in other seasons may be beneficial to better understand the effect this has on visitors, especially in a parks and protected areas context where visitor experiences may differ by season.

Another limitation worth noting is the reliance on participant's self-reporting to measure restorative outcomes and environmental quality. Although this has become a popular method of data collection, it is highly subjective and can mean that estimates are inflated (Marselle et al., 2019). Fretwell & Greig (2019) note that bias can be introduced through the choice of scales, the placement of items in the survey, inaccurate recall, or the influence of current mood states. There remains a lack of evidence on the strength of perceptions compared to ecological data and caution should be taken in relying solely on visitor perceptions to inform management decisions. One way to address this is the use of physiological measures to track health outcomes (i.e., heart rate monitor) and environmental quality (i.e., species inventory) (Marselle et al., 2019).

## 6.7 Opportunities for Future Research

More research is needed on the role parks and protected areas play as a resource for health and well-being benefits. To date, most studies have been situated in Australia, the United Kingdom, and parts of Europe (Lovell et al., 2014), with few taking place in North America, even less so, in parks and protected areas. The literature has been found to be inconsistent in the approaches used, rarely considering the dynamic setting parks offer. Few studies have attempted to consider restorative outcomes, environment type, and quality at once and often do not address ecological integrity specifically (Bratman et al., 2019). The current study helps to fill this gap but there is a need for additional research to draw comparisons and confirm these findings.

There are opportunities to replicate a similar methodology in other provincial and national parks which are operational and open to visitors. Future research could apply the same methodological approach, based on the ecosites and visitor experiences specific to the study site to explore whether the findings of this study are consistent in other parks. While the environment and experiences of each park will differ from those at Pinery, it will give park managers a more comprehensive understanding of the value specific protected areas provide to visitors as well as an opportunity to consider improvements for balancing ecological integrity with visitor needs/benefits. Provincially, this can provide insights for developing a framework for Ontario Parks' strategic policy and planning.

Several questions emerged from the research findings, such as: how well do visitors understand concepts of environmental quality (i.e., species richness, ecological integrity)? How do visitor perceptions of the environment compare with actual ecological measurements? These questions could be answered in future studies to further investigate the relationship between the quality of an environment and individual's restorative outcomes. Emphasis is needed on the relationship between ecological integrity and restorative outcomes specifically. It would be valuable to formally compare visitor perceptions with those of park managers as well as conduct a quantifiable status assessment to evaluate environmental quality.

## 6.8 Recommendations for Park Planning and Management

Recommendations are provided here for management and visitor experience initiatives that integrate human health promotion in parks and other forms of protected areas. Recommendations have been developed based on the results of the study, existing guidelines for the planning and management of parks, and consultations with Pinery Provincial Park staff

where appropriate. The research findings strongly indicate that there is a relationship between restorative outcomes and the quality of the environment experienced. It is important for park managers to consider how they will actively provide these beneficial outcomes to visitors in a way that effectively balances the park mandate to provide exceptional visitor experiences while maintaining ecological integrity. This is especially important for a park with many provincially significant features like Pinery, which also exhibits a high rate of visitation. While the following section is aimed towards Pinery Provincial Park, many of the recommendations can be applied to Ontario Parks at large. Table 25 summarizes the below discussion and provides further recommendations to be considered by Pinery, Ontario Parks, and similar park agencies.

### 6.8.1 Strategic Planning and Site Management

The last major update to Pinery's management plan was in 1986, which shifted focus towards science-based research and policy, focused on addressing natural heritage issues, and paying little attention to visitor management and tourism (Eagles, 2010). The shift from recreation quality to ecological value (Eagles, 2010) remains an important direction in present planning and management initiatives but a balance is needed in considering ecological integrity alongside visitor-use management. Following the recommendations of Lemieux et al. (2015), Pinery park managers should consider a benefits-based management (BBM) approach, also known as outcomes-focused management (OFM). BBM recognizes benefits (outcomes) as a function of the setting and activity the visitor is experiencing. The BBM framework makes explicit links between inputs and outcomes, allowing managers and policy makers to better understand how their actions and decisions affect people (Weber & Anderson, 2010). Park managers can specify the outcomes they wish to provide, design services and select appropriate settings around outcomes, and measure the extent outcomes are received (Moyle et al., 2014). This approach can help to create improved visitor experiences, foster a greater appreciation of the social significance of protected areas, develop competitive marketing strategies, and more (Weber & Anderson, 2010).

Planning and management decisions need to incorporate considerations to maintain environmental quality and provide opportunities for restorative outcomes. Pinery should consider adopting a health checklist for developing and delivering a health promoting park system, similar to the one outlined by the EUROPARC Federation in the 2018 *EUROPARC Toolkit: Health & Well-being Benefits from Parks & Protected Areas*. This approach calls for a more holistic

perspective which incorporates the local health sector into all levels of park management from strategic policy to site monitoring, staff training, and communications (Europarc Federation, 2018). An example of the health checklist is provided in Appendix C. Additionally, Pinery should consider directly incorporating health promotion into an updated park management plan to address developing a health promoting park system and support existing park objectives. The Ottawa Charter (1986) recognizes that education and a stable ecosystem are among the fundamental conditions and resources for health. Pinery can offer both of these health prerequisites, supporting individual's ability to identify and satisfy needs (World Health Organization, 1986), while considering environmental quality. In order to bring these recommendations forward, public health and park managers, along with educators, and the broader research community, will need to work collaboratively to better understand the relationship between people and parks, and effectively communicate these findings to the public.

### 6.8.2 Visitor Education and Marketing

Creating marketing and outreach campaigns aimed to enhance people's knowledge and understanding of the natural environment and the benefits it offers, is the first step. Nisbet and Zelenski (2013) found people who relate more to nature, show greater concern for living things, community and future generations, and behave more environmentally. There needs to be public buy-in, in order to attract people to want to visit parks. Building on existing initiatives such as the *30x30 Challenge* (Ontario Parks, 2017b)*, or *Nature Coach* (Nature Conservancy of Canada, 2019), is a good place to start. The *30x30 Challenge* provides a tangible goal for individuals to achieve, while creating awareness of nature's benefits. Whereas *Nature Coach* provides similar value but attempts to personalize outreach and recommendations using a nature score based on Nisbet and Zelenski's (2013) nature relatedness scale. The shortcoming of these initiatives is that they focus primarily on what nature can provide to people and less on what people can do for nature.

*Healthy Parks, Healthy People* (HPHP) (Ontario Parks, 2017b) provides a more complete perspective, focusing on the relationship between people and parks. In addition to an ongoing social media campaign, Ontario Parks designates a *Healthy Parks, Healthy People Day* once a year, offering free day-use in all provincial parks. While this creates awareness and opportunity, especially for those who may not have the means to visit a park otherwise, one day a year is not enough. It is recommended that Ontario Parks expand on the *Healthy Parks, Healthy People*

initiative, adopting a year-round operational plan which promotes public health in park environments for all seasons, ages, and abilities (e.g., including accessibility). Additionally, more emphasis should be given to the importance of park environments and their quality (i.e., ecological integrity), as a key component in providing beneficial outcomes.

It is also recommended that Pinery consider updating existing education, interpretation, and outreach (EIO) resources, in addition to creating new programs which provide individuals with the knowledge and opportunity to engage with the park and receive restorative outcomes. Updates should be made to interpretive signage at the trail heads, visitor centre, Information Guide, and *Explore Pinery App*, which highlights benefits to visitors. Pinery's Outdoor Education Program, offered at the park or in the classroom (The Friends of Pinery Park, 2017), should also be updated to include curriculum-linked programming for kindergarten to grade 12, related to *Healthy Parks, Healthy People* which emphasizes the value of parks, the importance of maintaining ecological integrity (including student's roles), and the benefits of spending time in nature. A strong program will include cross-curricular, experiential learning components with actionable opportunities to critically examine real-world interactions (Favaloro et al., 2019).

Finally, targeted marketing is needed to communicate the value and benefit of parks to key visitor demographics such as females. Identifying visitor groups with similar perceptions and behaviours will help inform visitor marketing initiatives. Insights into behavioural patterns of visitors should also help park development so that tourism can genuinely support conservation (Cochrane, 2006). The visitor profiles identified from this study will be beneficial in focusing marketing initiatives to various population subgroups. Ontario Parks is already doing this to some extent through social media campaigns but tends to be more generalized around benefits of nature contact and less specific to the value of parks and protected areas (see Figure 11 for examples).

*Figure 11: Examples of Ontario Parks Twitter feed, highlighting social media campaign on health benefits of nature (Ontario Parks, 2019c).*

*Table 25: Summary of recommendations for park planning and management based on research findings.*

| Recommendations for Park Planning and Management |
|---|
| **Strategic Policy and Planning** |
| 1. **Encourage and support the repositioning of parks** as a holistic, ecological approach to health (Cecily Maller et al., 2010). <br> 2. **Consider developing a strategic and corporate benefits-based management policy** (Lemieux et al., 2015), inclusive of health and well-being outcomes, and environmental quality. <br> 3. **Create partnerships with public health agencies and the education sector** early and often in all planning and outreach initiatives aimed at promoting health and well-being in parks. <br> 4. **Consider adopting a health checklist for developing and delivering a health promoting park system** (Europarc Federation, 2018)**.** |
| **Management Direction** |
| 1. **Update the Pinery Provincial Park management plan** to reflect an emphasis on actively providing opportunities for visitors to derive benefits, alongside maintaining ecological integrity. <br> 2. **Consider incorporating dynamic visitor-use management policies** which specify visitor capacity, allowable activities, and actionable measures for managers to support human health and well-being through ecological changes and pressures from visitation. |
| **Research, Monitoring, and Reporting** |
| 1. **Foster interdisciplinary research** into the benefits individuals gain from time in parks to inform policy and management. <br> 2. **Consider a visitor monitoring system** which gathers ongoing assessment of restorative outcomes reported by visitor's (OMNR, 2017) and their perceptions of the environment to evaluate the ecological quality of the park and visitor experience. <br> 3. **Develop a cost-effective ecological integrity monitoring and reporting program**, which includes impacts from recreation (OMNR, 2017). |
| **Corporate Culture and Function** |
| 1. **Provide training and education sessions on health and well-being to all levels of park staff** that can be applied to their daily duties. <br> 2. **Consider developing an updated implementation strategy** to provide staff with direction and guidance on related planning and management initiatives. |
| **Operations and Development** |
| 1. **Consider the unique roles played by each park in providing health and well-being benefits** (Lemieux et al., 2015). <br> 2. **Consider active management and restoration in development and infrastructure projects** (i.e., prescribed burns, restoration of rare wet meadow in Burley Campground, reducing or alternating access to trails). |
| **Education, Interpretation, and Outreach** |
| 1. **Consider updating existing education, interpretation, and outreach resources and create new programs** to engage people of all ages: <br> • Expand Healthy Parks, Healthy People initiatives. <br> • Update interpretive signage and materials to educate visitors about benefits and ecological quality. <br> • Leverage existing Naturalist Program to provide short educational offerings on HPHP to visitors regularly during the summer months. <br> • Update the Pinery Outdoor Education Program offerings to include themes around HPHP and EI. <br> • Develop curriculum-linked resources, available for download on The Friends of Pinery Park website. |

| Recommendations for Park Planning and Management Continued |
|---|
| **Marketing** |
| 1. **Consider targeted marketing initiatives** which communicate the value and benefits of parks to key visitor demographics (i.e., females).<br>2. **Maintain year-round marketing and outreach campaigns** to enhance knowledge and understanding of the natural environment and the benefits it offers (i.e., social media, HPHP, 30x30 Challenge). |

## 7. Conclusions

Parks and protected areas are fundamental to protecting representative ecosystems, ensuring ecological integrity and biodiversity is maintained, and providing visitor experiences which foster opportunities for knowledge enhancement and appreciation of natural and cultural heritage. Park managers are faced with often competing tasks of maintaining ecological integrity, while balancing high rates of visitation. However, as long-term health problems from growing disconnect and sedentary lifestyles show no signs of slowing down, it is more important than ever that parks and protected areas be recognized for their significant contribution to human health and well-being by providing ideal resources to connect people with nature and derive benefits.

The results of this research strongly suggest that the restorative outcomes housed within Pinery Provincial Park are substantial. In an attempt to better understand how visitor experiences provided by diverse environments in Pinery affective subjective health and well-being, it is clear visitors perceive high restorative outcomes regardless of the type of park environment. Furthermore, this study reveals a strong relationship between environmental quality and reports of greater restorative outcomes, perceived by visitors. The results support the importance of protected areas as a place for people to derive restorative outcomes regardless of socio-demographic variables, physical and mental health, and quality of life. This is good news for Pinery Provincial Park and managers should take advantage of this opportunity to market the value of this provincially significant landscape as a mechanism for health promotion.

The findings from this research represent an important contribution to what is known about the relationship between visitor perceptions of environmental quality and restorative outcomes, especially with respect to ecological integrity. This has important implications for resource management and visitor experiences as park managers work to increase well-being benefits to meet visitor needs accordingly with conservation initiatives. There is still a need for further research to draw comparisons and confirm these findings. Few studies have attempted to consider restorative outcomes, environment type, and quality at once, and have neglected the ecological integrity as a measure of quality. It is recommended that future studies build on this work to understand the restorative mechanisms that may be unique to parks and protected areas.

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**Perceived Human Health and Well-being Benefits of Diverse Natural Environments in Pinery Provincial Park**

**Survey Design July 2016**

Your participation in this study is voluntary; you may decline to participate without penalty. You may skip any question(s)/procedure(s) you do not wish to answer.

*Agree to consent form
*Enter participant code

**PART 1: In-Situ Questions**

1. Where are you at this moment?
   - ☐ Sassafras (Lookout) Trail
   - ☐ Riverside Trail
   - ☐ Hickory Trail
   - ☐ Bittersweet Trail
   - ☐ Wilderness Trail
   - ☐ Day Use Beach
   - ☐ Heritage Trail
   - ☐ Pine Trail
   - ☐ Dunes Beach Area
   - ☐ Burley Beach Area
   - ☐ Visitor Centre
   - ☐ Cedar Trail
   - ☐ Cedar Trail Huron Lookout
   - ☐ Dunes Campground
   - ☐ Burley Campground
   - ☐ Riverside Campground
   - ☐ Carolinian Trail
   - ☐ Nipissing Trail
   - ☐ Other

2. Who are you with at this moment? Please check all that apply.
   - ☐ No one
   - ☐ Spouse, partner or significant other
   - ☐ Infant children (aged 0-2)
   - ☐ Young children (aged 3-10)
   - ☐ Older children (aged 11-17)
   - ☐ Adult children (aged 18+)
   - ☐ Other family
   - ☐ Friends

☐ Co-workers
☐ Other

3. How would you rate the naturalness of this environment?
☐ Purely artificial
☐ Mostly artificial
☐ Mix of natural & artificial
☐ Mostly natural
☐ Purely natural

4. Please rate the ecological integrity (quality) of this environment.

Ontario Parks recognizes *Ecological Integrity* as: "Ecosystems that have integrity when they have their mixture of living and non-living parts and the interactions between these parts are not disturbed."
☐ Very low ecological integrity
☐ Low ecological integrity
☐ Moderate ecological integrity
☐ High ecological integrity
☐ Very high ecological integrity

Please rate your agreement with the following statements, comparing how you feel in this environment versus other areas of the park.

5. I feel calmer here.
☐ Disagree strongly
☐ Disagree a little
☐ Neither agree or disagree
☐ Agree a little
☐ Agree strongly

6. I feel restored and relaxed here.
☐ Disagree strongly
☐ Disagree a little
☐ Neither agree or disagree
☐ Agree a little
☐ Agree strongly

7. I feel enthusiastic and energetic here.
☐ Disagree strongly
☐ Disagree a little
☐ Neither agree or disagree
☐ Agree a little
☐ Agree strongly

8. My concentration and alertness clearly increase here.
- ☐ Disagree strongly
- ☐ Disagree a little
- ☐ Neither agree or disagree
- ☐ Agree a little
- ☐ Agree strongly

9. I forget everyday worries here.
- ☐ Disagree strongly
- ☐ Disagree a little
- ☐ Neither agree or disagree
- ☐ Agree a little
- ☐ Agree strongly

10. My thoughts are clearer and clarified here.
- ☐ Disagree strongly
- ☐ Disagree a little
- ☐ Neither agree or disagree
- ☐ Agree a little
- ☐ Agree strongly

11. I prefer this environment over others in the park.
- ☐ Disagree strongly
- ☐ Disagree a little
- ☐ Neither agree or disagree
- ☐ Agree a little
- ☐ Agree strongly

12. There are more plant and animal species here compared to other areas of the park.
- ☐ Disagree strongly
- ☐ Disagree a little
- ☐ Neither agree or disagree
- ☐ Agree a little
- ☐ Agree strongly

**PART 2: Background Survey**

1. How many days will you spend in the park on this visit?
    _____(numeric)

2. Is this your first visit to the Pinery?
   ☐ Yes
   ☐ No

Condition for Q3: Display if answer to Question 2 is "No".
3. About how many days have you visited this park in the last 12 months?
    _____(numeric)

4. How many days would you estimate you spend in Provincial, National, or other similar parks per year? (Exclude city parks and gardens)
    _____(numeric)

5. Who is accompanying you on this visit?
   ☐ No one
   ☐ Spouse, partner or significant other
   ☐ Infant children (aged 0-2)
   ☐ Young children (aged 3-10)
   ☐ Older children (aged 11-17)
   ☐ Adult children (aged 18+)
   ☐ Other family
   ☐ Friends
   ☐ Co-workers
   ☐ Other

6. What is the size of your group? (Including you)
    _____ (numeric)

7. What year were you born? (e.g., 1968)
    _____(numeric)

8. Are you a Canadian citizen?
   ☐ Yes
   ☐ No

Condition: If answer to question 8 is "Yes".
9. How many years have you been a Canadian citizen?
    _____(numeric)

10. What is your gender?
   ☐ Male

☐ Female
☐ Other

11. Where do you live?
☐ Ontario
☐ Other Canadian province/territory
☐ USA
☐ Other

12. What are the first three digits of your postal (or zip) code?

_____

13. What is the highest degree, certificate or diploma you have obtained?
☐ No certificate, diploma or degree
☐ Secondary (high) school diploma or certificate
☐ Registered apprenticeship or trades certificate or diploma
☐ College, CEGEP or other non-university certificate or diploma
☐ University certificate or diploma below the bachelor's level
☐ University certificate or diploma or degree at the bachelor's level
☐ University certificate or diploma or degree above the bachelor's level

14. What is your current employment status?
☐ Employed (work for pay or self-employed)
☐ Unemployed (without paid work or without self-employment work, and available for work)
☐ Not in the labour force (students, homemakers, retired workers, seasonal workers in an off season, long term illness or disability)

15. What is your total household income from all sources before taxes?
☐ Less than $25,000
☐ $25,000-$49,999
☐ $50,000-$74,999
☐ $75,000-$99,999
☐ $100,000-$124,999
☐ $125,000-$149,999
☐ $150,000 or more

16. In general, how would you rate your mental health?
☐ Poor
☐ Fair
☐ Good
☐ Very Good
☐ Excellent
☐ Don't Know

17. In general, how would you rate your physical health?
- ☐ Poor
- ☐ Fair
- ☐ Good
- ☐ Very Good
- ☐ Excellent
- ☐ Don't Know

18. Thinking about the amount of stress in your life over the 7 days prior to your visit, would you say that most days were:
- ☐ Not at all Stressful
- ☐ Not very Stressful
- ☐ A bit Stressful
- ☐ Quite a bit Stressful
- ☐ Extremely Stressful
- ☐ Can't Recall

19. What was your primary motivation for visiting Pinery Provincial Park?

_____

20. In your opinion, how important are visits to natural areas (such as provincial parks) to improving various aspects of your health and well-being?
- ☐ Not important
- ☐ Somewhat not important
- ☐ Neutral
- ☐ Somewhat important
- ☐ Very important

**PART 3: Audio Questions**

1. Tell us how this environment makes you feel.
   *Audio response*

2. Please describe anything that could make this experience better.
   *Audio response*

## Appendix B: Sampling Locations with Ecosite Classifications

**Table 1**

*List of 18 sampling locations in Pinery Provincial Park with corresponding ecosite classifications determined through Ecological Land Classification (ELC) data.*

| Code | Sampling Location | Ecosite Classification |
|---|---|---|
| | **Pinery Provincial Park Sampling Locations** | |
| **Code** | **Sampling Location** | **Ecosite Classification** |
| 01 | Sassafras (Lookout) Trail | Dry-Fresh Oak Mixed Hardwood Deciduous Woodland Ecosite |
| 02 | Riverside Trail | Floating-leaved Shallow Aquatic Ecosite |
| 03 | Hickory Trail | Dry-Fresh Oak Deciduous Woodland Ecosite |
| 04 | Bittersweet Trail | Dry-Fresh White Pine- Hardwood Mixed Forest Ecosite |
| 05 | Wilderness Trail | Dry-Fresh Mixed Regeneration Thicket Ecosite |
| 06 | Beach Day Use | Open Sand Dune Ecosite |
| 07 | Heritage Trail | Prescribed Burn Site |
| 08 | Pine Trail | Treed Sand Dune Ecosite |
| 09 | Dunes Beach Area | Open Sand Dune Ecosite 1 |
| 10 | Burley Beach Area | Open Sand Dune Ecosite 2 |
| 11 | Visitor Centre | Recreational 1 |
| 12 | Cedar Trail | Dry-Fresh Mixed Woodland Ecosite |
| 13 | Cedar Trail 2 Huron Lookout | Dry-Fresh Tallgrass Mixed Savanna Ecosite |
| 14 | Dunes Campground | Recreational 2 |
| 15 | Burley Campground | Recreational 2 |
| 16 | Riverside Campground | Recreational 2 |
| 17 | Carolinian Trail | Dry-Fresh Oak- Maple- Hickory Deciduous Forest Ecosite |
| 18 | Nipissing Trail | Dry-Fresh Deciduous Savanna Ecosite |

# Health Check-list

5

## Are you delivering?

## a health-promoting park / Protected Area?

The Health Check-list below and in the following pages is designed to help you think about:

- how best to plan, manage and promote your sites to a wider range of people to improve their general health and well-being; and
- how to link your sites to the health sector so that people at risk of or experiencing specific illness / health conditions can be supported to make use of your sites.

### Strategic planning - is there:

> A link between the management objectives of your site, and the national / regional / local health and well-being policy framework
> A site management plan that engages with local health stakeholders and responds to health issues and priorities / target groups

### Outreach – does your site have:

> Engagement with health sector, intermediary bodies and target groups to ensure activity programmes and volunteering opportunities cater for their needs
> Outreach programmes aimed at key target groups or communities

### Monitoring & evaluation – does your site have:

> A visitor monitoring system that gathers feedback on health benefits
> Monitoring systems for the health benefits delivered through specific activity programmes / health interventions

### Communications – is there:

> Active engagement with local health professionals, providing information and opportunities to experience the ways your site can support health outcomes
> A communications plan for your site that specifies appropriate messages for health professionals and for the public / target health groups
> Easily accessed information about the site and what it offers to a range of visitors

### Site management – does your site have:

> Easily accessible information on the facilities provided at the site
> A sense of welcome for visitors
> Visitor facilities such as parking for people with disabilities; toilets
> A range of access provision, from easy-going paths for people with health issues / disabilities, to specific equipment / furniture to promote physical activity
> A range activity programmes delivered directly, or through green exercise providers
> Staff who are well trained to support visitors with health issues

### Staff training

> Do site staff have appropriate skills and confidence to work with health groups
> Can you build wider awareness and capacity in your organisation on health

### Other opportunities – are you able to:

> Identify local health sector partnerships and provide a place / activity programme / visual identity for green exercise referrals / sign-posting
> Make access to information easier for health professionals and target groups to find by inputting into / establishing a central information service for a wide range of parks / protected areas