

The Beaten Track: Visitor Management in BC Parks and Protected Areas

by
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Abstract

Parks and protected areas are a valuable asset for the Province of BC that provide a number of economic, health, and social benefits. Demand for these areas in certain locations, however, has grown over the past number of years to the point where capacity challenges have led to negative externalities in terms of visitor utility and ecological degradation. This project investigates these capacity challenges related to overcrowding and visitor management in the area of Southwestern BC. The project includes an intercept survey of park visitors at three different sites in the study area, as well as a review of the recreation literature and interviews from experts and stakeholders. Three options are proposed that address visitor management challenges and seek to find a sustainable solution. Options are analyzed with a set of criteria to highlight their trade-offs before recommendations are provided.

Keywords: BC Parks, Recreation Ecology, Visitor Management, Southern British Columbia, Negative Externality

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List of Acronyms

| | |
|-------|--|
| ATS | Alternative Transportation System |
| FLNRO | Ministry of Forestry, Lands, and Natural Resource Operations |
| LAC | Limits of Acceptable Change |
| ROS | Recreation Opportunity Spectrum |
| RSTBC | Recreation Sites and Trails BC |

Executive Summary

Parks and protected areas are a valuable asset for the Province of BC that provide a number of important economic, health, and social benefits for both local residents and visitors. Demand for specific areas in the area of southwestern BC, however, has grown significantly over the past number of years with some hiking trails in particular experiencing dramatic use level increases of over the past 10 years. As a result, the policy problem for this study is that too many parks and protected areas in Southwestern BC are experiencing capacity challenges due to increasing demand, leading to negative externalities including environmental degradation and decreased visitor utility.

The methodology for this study consists of both a primary and secondary methodology. The primary methodology is an intercept survey conducted at three different hiking trails in Southwestern BC identified as having capacity challenges with visitor use levels: Joffre Lakes, Quarry Rock trail in Deep Cove, and Garibaldi Lake. The results of the survey are confirmed by the secondary methodology that is a review of similar studies from the literature, and a number of stakeholder and expert interviews were also conducted to provide additional insights on the local context. Survey results show that the perception of crowding did have a negative impact on the quality of experience for visitors, but also that there was a wide variety of preferences for different hiking trail characteristics. The survey indicates limited support for more restrictive approaches to visitor management on the trails, as well as limited willingness to pay to have guaranteed access to the park or to reduce encounters with other users. Important demographic differences are also found between resident and non-resident visitors as well as between visitor income levels.

Three options for addressing these challenges are identified and trade-offs are analyzed based on a number of key evaluation criteria. The first option discussed is a day-use reservation system designed to ration access to the site. While this option provides greater control for managers in reducing the number of visitor encounters with other users, a key weakness is the impact of displacing visitors to surrounding areas that are unmanaged. The second option discussed is an alternative transportation system that would be a shuttle bus system between gateway communities and sites. This option improves ecological impacts to both the site and the surrounding area, however

will not necessarily reduce the experience of crowding on the trail itself for visitors. The third option assessed is increasing the supply of substitute sites through the completion of management plans in under-utilized provincial parks in the region. This option had mixed results for both ecological impacts and the reduction in crowding, as its success depends on the substitutability between different sites.

The results of the analysis find that an alternative transportation system is the strongest option of the three assessed. Specific recommendations, however depend on the unique characteristics of individual sites and are discussed in reference to the three survey sites. A number of additional recommendations are also made regardless of site characteristics including education for visitors on leave no trace principles, monitoring of site management plans, appropriate site hardening, and funding levels for operations that increase alongside spending on marketing.

Chapter 1. Introduction

This study explores visitor management in BC parks and protected areas. More specifically, the study will investigate the challenges with capacity and overcrowding on hiking trails in Southwestern BC and explore policies to promote the long-term sustainability of these areas.

BC parks and protected areas are an essential part of British Columbia's identity, and increased visitor usage of parks and protected areas present a number of opportunities. For example, there is growing evidence of psychological, physical, and social benefits for individuals who spend time in nature (Mantler & Logan, 2015; Puhakka, Pitkänen, & Siikamäki, 2017). When individuals are able to develop an attachment or emotional tie to local parks and protected areas this has also been shown to foster pro-environmental behaviours in other areas of their life (Vaske & Kobrin, 2001). There are also significant economic benefits for parks and protected areas, both in terms of promoting BC's tourism industry and spending as a result of resident's usage.

While there are a number of benefits to increasing visitor numbers at parks and protected areas, there is also an obligation to managing this increasing demand in a way that is sustainable in the long term. In other words, ensuring that these areas are not "loved to death" and that the aspects that make them unique in the first place are preserved. As user levels rise, a number of different negative externalities put the resource at risk. These include both the risks associated with degradation of sensitive ecosystems, as well concerns in terms of visitor experience and negative impacts on both visitors and local communities. As a result, the policy problem for this study is that too many parks and protected areas in Southwestern BC are experiencing capacity challenges due to increasing demand, leading to negative externalities including environmental degradation and decreased visitor utility.

This study explores the trade-offs involved in sustainable visitor management through three sections. The first section describes the challenge of visitor management and crowding in BC as well as existing literature in the areas of environmental degradation, visitor experience, and management goals. The second section uses an intercept survey to explore the preferences of hikers at three parks in Southwestern BC,

and then compares the results to the literature. Finally, the third section conducts a policy analysis on three different options that have been informed by section two. These options include a day-use reservation system, an alternative transportation system, and increasing the supply of substitute sites. The results of the analysis find that an alternative transportation system is the strongest option assessed, however recommendations depend on the unique characteristics of individual sites.

Chapter 2.

Parks and Protected Areas in BC

In order to better understand the challenges with capacity and crowding in BC, it is necessary first to have some understanding of the current policy context. This chapter outlines the different types of parks, protected areas and recreation sites in BC as well as the increase in visitor use levels.

2.1. Parks and Protected Areas in BC

Parks, protected areas, and hiking trails in BC fall under four different categories. These are national parks under the jurisdiction of the federal government, provincial parks and protected areas under the jurisdiction of the provincial government, and district or regional parks under the jurisdiction of municipalities. The final category includes recreation sites and trails on crown land outside of a park or protected area but managed by the provincial government.

National parks are managed by, Parks Canada, through the *National Parks Act*. There are seven National Parks located in British Columbia, including Pacific Rim National Park, Glacier National Park, and Yoho National Park (Parks Canada, 2018). Part of the goal of Parks Canada is to protect areas in particular that are representative of Canada's natural heritage (Parks Canada, 2018a).

BC Parks is the branch of the BC Ministry of Environment and Climate Change Strategy responsible for the administering the provincial system of parks and protected areas. The system includes over 1,033 different areas covering 14 million hectares, representing 14% of provincial lands. Over 6,000 kilometres of hiking trails and 2000 walk-in or backcountry campgrounds are also included (BC Parks, 2018c.). This system of parks and protected areas is comprised of 7 classifications for different wilderness areas which are outlined in Appendix A (BC Parks, 2018d). The central distinction between these classifications is the intensity of recreation activities permitted within the site and whether or not commercial or resource extraction activities are permitted within the park.

A third category of parks and protected areas in the province are regional or district parks. Regional parks are typically closer to urban areas and are managed by municipalities or regional authorities. Examples in the Metro Vancouver Area include the Lynn Valley Canyon and Deep Cove's Panorama Park, which are both managed by the District of North Vancouver (District of North Vancouver, 2018).

A significant number of hiking trails and campsites also exist on provincial crown land outside of the system of parks and protected areas administered by BC Parks. The ministry of Forests, Lands, and Natural Resource Operations (FLNRO) is responsible for a network of recreation sites and trails on crown land known as Recreation Sites and Trails BC (RSTBC). There is an estimate of 30,000 kilometres of trails in BC, with 12,000 kilometres under the responsibility of Recreation Sites and Trails BC, compared to 6,000 kilometres in BC Parks (BC Ministry of FLNRO, 2012)¹.

This study concentrates on parks with hiking trails that are under the jurisdiction of provincial or municipal governments. National Parks in BC are outside of the scope of this study. In addition, this study focuses on the parks within the area of Southwestern BC, shown by the area in Figure 1. This area of focus extends from Vancouver's North Shore through the Sea to Sky Corridor up to Pemberton. The overall findings, however, will support strategies that can be used in similar circumstances throughout the province.

¹ FLNRO has also collaborated with BC Parks in developing a provincial trail strategy, including a trails advisory body with input from community members (BC Ministry of FLNRO, 2012).

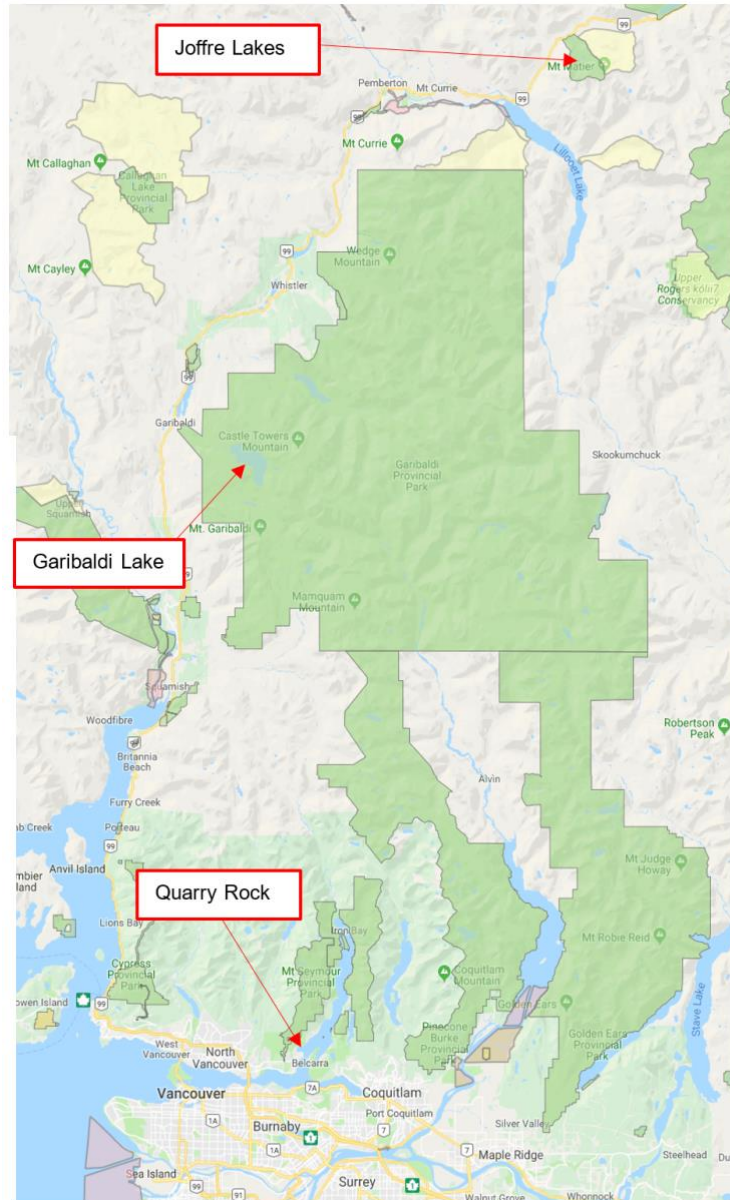


Figure 2.1. Study Area
Map Data Source: © 2019 Google

2.2. BC Parks and it's Financing

As the majority of the parks in this region are provincial parks, this section will give further details into the management and funding of BC parks. The mandate of BC Parks is twofold, representing the balance in park management between conservation and recreation access. First, the conservation aspect of the mandate involves protecting

for future generations “a wide variety of outstanding park lands which represent the best natural features and diverse wilderness environments” (BC Parks, 2018a) Second, the recreation aspect of the mandate includes “Providing province-wide opportunities for a diversity of high quality and safe outdoor recreation” (BC Parks, 2018a). This mandate is supported by three pieces of legislation: the *Park Act*, the *Ecological Reserve Act*, and the *Environment and Land Use Act* (BC Parks, 2018b). These Acts allow for the establishment of new parks, either through an order in council or through additions to the schedule of protected areas.

Management of BC parks is categorized as a ‘public-for profit model’, incorporating both government and for-profit contractors (Eagles et al., 2010). For day-to day operations of parks, BC Parks contracts out the operation and services of their sites at the majority of front country locations (BC Parks, 2016b). The majority of backcountry facilities such as hiking trails and campgrounds are managed directly by BC Parks. These contractors are known as Park Operators and may manage a bundle of parks. For example, in the sea to sky region, Sea to Sky Parks is the operator for sixteen different parks including Mount Seymour and Shannon Falls (Sea to Sky Park Services, 2018)².

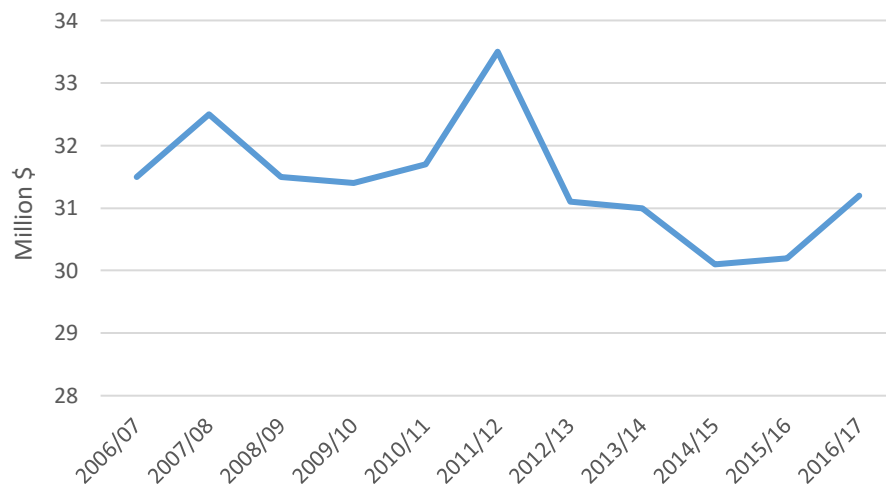


Figure 2.2. BC Parks Operating Budget (Million \$), 2006-2017

² For funding, park operators collect fees for services such as campsites (amounts are set by government) and deficiency payments are made to operators the make up the difference between tourism fees and the costs of providing the service (Eagles et al., 2010).

Securing stable funding for park systems with rising use levels has been a challenge acknowledged in both Canada and the US by recreation literature (Sickle & Eagles, 1998). As displayed in Figure 2, BC Parks operating budget has fluctuated significantly, and a number of cuts occurred after 2001. In 2001, the budget for BC Parks was \$41 million with twenty-seven full time park rangers (CBC, 2016 July 1). In 2016 the operating budget for BC parks was \$30 million, and the number of full-time rangers across the province was reported to be seven (BC Parks 2016c; Labbe, 2016). This funding equates to approximately \$2 per hectare of protected land³. In addition, parking day use fees that were implemented in 2005/06 were eliminated as of May 2011 with the goal of encouraging families to take advantage of the provincial park system (BC Parks, 2012a)⁴.

Beginning in 2017 the funding levels to BC Parks shifted in the opposite direction with the release of a new future strategy for the organization. The province committed to an additional \$35 million of funding over the next three years to put towards the hiring of twenty-five more enforcement officers, and building 1,900 new campsites throughout the province (BC Ministry of Environment, 2017). The operating budget for the 2018/19 Fiscal Year is approximately \$10 million higher than 2016/17 at \$40.7 million⁵ (BC Ministry of Environment and Climate Change Strategy & Environmental Assessment Office, 2018).

The provincial government has acknowledged the challenge with unstable funding for parks and outlined a future strategy of voluntary measures to increase funding for the parks system. The centrepiece of this future strategy is the BC Parks Foundation, a charitable foundation tasked with raising funding through voluntary donations and community awareness for BC Parks (BC Parks, 2016a). Donated funds are incorporated into the Park Enhancement Fund, a separate account for BC Parks that is used to fund different projects and initiatives including enhancing hiking trails and

³ This can be compared to Alberta Provincial Parks, whose operating budget for the 2018/19 fiscal year is \$108 million, equating to funding of \$40/ hectare (Alberta Environment and Parks, 2018).

⁴ In 2009/2010 the revenue collected from day use fees was approximately \$1 million (BC Parks, 2010).

⁵ The operating budget for Sites and Trails BC is significantly smaller at \$7 million/year in 2017 (Provincial Trails Advisory Board, 2016).

supporting volunteer initiatives (BC Parks, 2018f). In addition, the future strategy outlined new donation tools such as sponsorships, a loyalty card, and commemorative licence plates⁶. The strategy proposes that the additional funds be raised through voluntary rather than user-pay initiatives. Another factor connected to funding levels is increasing visitor use levels, which is discussed in the following section.

2.3. Use of Parks and Protected Areas in BC

Overall visitor numbers in BC Parks have been steadily rising over the past number of years. In 2016/17 there was a total of 21.8 million day-use visits to provincial parks, a 28% increase from 17 million visits in 2008/09. This increase has also been encountered in the South Coast region, where day use visits were 8.3 million in 2016/17, a 29% increase compared to 2008/09. Moreover, in specific parks within the sea to sky area of the south coast region this increase has been even more dramatic. For example, at Joffre Lakes Provincial Park there were upwards of 170,000 visitors per year, a 191% increase compared to 58,405 visitors in 2008/09 (more than six times the provincial increase). Although not as dramatic, Garibaldi Provincial Park saw 89,184 visitors in 2015/16, compared to 48,262 in 2008/09, an increase of 85%. (BC Parks, 2018c; BC Parks, 2009; BC Parks, 2016b).

⁶ 103,370 license plates were sold from the license plate program inception in January 2017 to June 2018. As a result, \$2,861,262 in revenue was transferred from ICBC to the Park Enhancement Program. (ICBC, 2018)

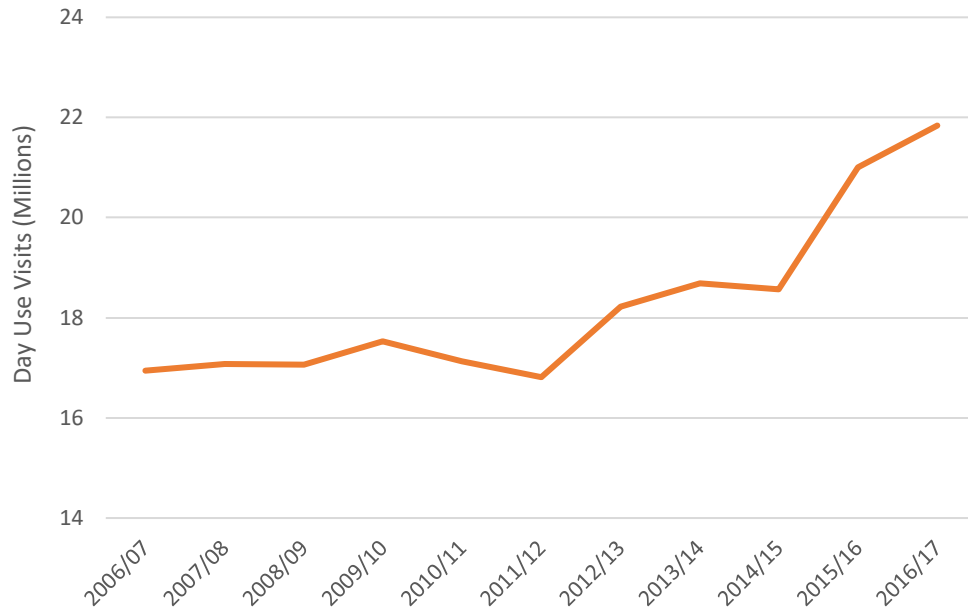


Figure 2.3. BC Parks Visitor Day Use, 2006-2017

Source: BC Parks (2016c); BC Parks (2010)

The economic value of BC's parks in terms of the tourism industry and facilitating spending by BC residents is substantial. According to a study completed by the Canadian Parks Council on the economic impact of National, Territorial, and Provincial Parks in 2009, every dollar invested in BC Parks generates \$8.42 in additional spending by park users (Canadian Parks Council, 2009). BC Parks also reported that approximately one quarter of park users are non-residents, showing significant tourism impacts (BC Parks Annual Report 2016a). In addition, Haider and Kux (2012) estimated that non-motorized outdoor recreation in BC generated \$3.6 billion in trip expenditures during 2012.

Destination BC, the crown corporation responsible for tourism promotion in the province, has relied heavily on parks and protected areas for marketing the province abroad. Destination BC describes their brand as "Super, Natural British Columbia", describing the province as "the sea to sky province of abundant wildlife and cities on the edge of wilderness" and stresses that their target audience has a desire to connect with nature (Destination BC, 2018)⁷. In 2016 Tourism BC reported that the tourism industry

⁷ Destination BC's base operating funding for 2016/17 was \$51.5 million, compared to BC Parks operating funding of \$31.2 million (Destination BC Annual Service Report, 2017; BC Parks Annual Service Report, 2017a).

contributed \$7.9 billion of value added to the province's economy and employed 133,100 people in tourism related business (Destination BC, 2018 March).

Demand for outdoor recreation activities is growing in Southwestern BC, with growth fuelled by a number of different factors. First, the lower mainland population grew by 16% between 2006 and 2016. (Metro Vancouver, 2016). The Metro Vancouver population is also projected to continue to grow from its population of 2.5 million in 2016 to 3.4 million by 2041 (Metro Vancouver, 2016; Metro Vancouver 2011). Second, from 2006-2016 the tourism industry grew by 39% in overall revenue (Destination BC, 2016). The global tourism industry is projected to continue growing and double in size by 2030, and Canada has the goal of increasing international visitation 30% by 2021 (UNWTO, 2011; OECD, 2018). Finally, it has been speculated that the growth in demand for specific locations such as Joffre Lakes has been driven by social media use (Baluja, 2016). Images posted on social media sites such as Instagram and Twitter have been credited with increasing the awareness and popularity of sites that were previously difficult to find or not well advertised (Barry Janyk, personal communication, Dec 19 2018). Studies have shown a correlation between visitor use number and social media use, however there has been no work showing a causal relationship between social media use and visitor use levels (Tenkanen et al., 2017).

In summary, visitor use levels for parks in BC have grown dramatically over the past few years and are expected to continue to rise due the different factors noted above. Planning ahead for future growth will be equally as important as addressing current capacity challenges. Considering these use levels, the following section will discuss ecological and social impacts.

Chapter 3.

Ecological and Social Considerations

As parks have a dual mandate for recreation as well as conservation, both the ecological and social dimensions of park visitation are aspects of determining carrying capacity. A considerable body of research outlines a variety of potential negative impacts of increased recreation use on ecosystems (Manning, 2004). The impact of crowding on the quality of visitor experience has also been documented extensively in the recreation literature (Kohlhardt et al., 2018). This chapter outlines the negative externalities of visitor use in parks and protected areas in both the social and ecological dimensions as it relates to the BC context.

3.1. Negative Ecological Impacts

Identifying the negative impacts from visitors to the very ecosystems that parks were designed to protect in the first place and assessing when these impacts have reached an unacceptable level are two of the most challenging decisions faced by park managers. While there may be no “one-size-fits all” in terms of assessing the impact of recreation use on ecosystems in protected areas, the literature has shown that impacts due to visitor use in parks and protected areas are common in the areas of vegetation, soils and wildlife.

A significant set of research displays the potentially negative impacts that visitors can have on the vegetation and soils in parks⁸ (Ballantyne & Pickering, 2015; Hammitt & Cole, 1998; Marion et al., 2016). One of the most cited impacts from visitor use is trampling which can occur as a result of hiking, camping, or other recreational activities. Trampling in protected areas can lead to soil compaction, increased soil density and penetration resistance, changes in soil structure and stability, losses in litter and humus

⁸ For example, in Australia it is estimated that 42% of critically endangered plants are directly threatened by tourism and recreation, and for some plants tourism and recreation is the primary threat (Rankin et al., 2015).

layers, reduced infiltration rates, greater runoff, and increased erosion (Ballantyne & Pickering, 2015; Hammitt & Cole, 1998).

Vegetation is impacted both through effects to the soil as well as direct damage to vegetation itself. The impact of trampling on vegetation can significantly vary depending on the type of vegetation and its resiliency as well as the level of use (Hammitt & Cole, 1998). Some of the common impacts from medium – high levels of traffic, however, is a reduction in plant cover and biomass and a reduction in the composition of vegetation away from sensitive plants towards more resistant species (Jeffrey L. Marion et al., 2016). In addition, hikers can also serve as a vector for invasive species⁹ (Mount & Pickering 2009). Specifically for hiking trails, there are studies quantifying the significant impacts of trail infrastructure on vegetation and soils¹⁰ (Ballantyne & Pickering, 2015). An important distinction is the difference in ecological damages between informal and official trails. In comparison to formal maintained trails, unregulated informal trails that often “braid” or split can have a substantially greater impact on the ecology in protected areas (Barros, Gonnet, & Pickering, 2013; Pickering & Norman, 2017).

While the impacts discussed above are common, they are also dependent on the type of activity as well as the type of ecosystem. For example, the same level of trips that would reduce vegetation by 40% in an alpine grassy area would decrease vegetation by 97% in a subalpine forest with a fern understory (Marion et al. 2016). Many of hiking trails in Southwestern BC include subalpine and alpine plants as well as krummholz which are easily destroyed by trampling and are may take as long as 500 years to regenerate (Hammitt & Cole, 1998; Kedrowski, 2006). The BC Ministry of Environment has identified 73 species of plants listed as being extirpated, threatened, endangered, or of special concern in the Squamish-Lillooet and Metro Vancouver regional districts alone (BC Ministry of Environment, 2018).

⁹ The spread of invasive species has been recognized as a major issue concern for displacing native BC species, and province recently updated its invasive species strategy for the province for 2018-2022 (Invasive Species Council of BC, 2017; Invasive Species Council of BC, 2018).

¹⁰ Camping areas can also have significant impacts on vegetation and soil. For example, the Boundary Waters Canoe Area in Minnesota has been the subject of a number of studies showing the long-term impacts of camping on soil and vegetation (Eagleston & Marion, 2017; J. L. Marion, 1985)

For wildlife, recreation activities can lead to negative impacts in diversity, composition and structure (Hammitt & Cole, 1998). Studies have found that recreation activities can lead to psychological stress, displacement from preferred environments, and reductions in species diversity (Monz, et al., 2010, Coleman, et al., 2013). Different species, however, will have varying tolerance levels to impacts from recreational visitors (Hammitt & Cole, 1998). Specifically in the BC context, there are 100 animal species listed as threatened, endangered, extirpated, or a species of special concern in the Squamish-Lillooet and Metro Vancouver Regional Districts (BC Ministry of Environment, 2018). There have also been closures of recreation areas specifically as a result of habituation of wildlife to food. Keyhole Falls, a recreation site managed by Sites and Trails BC was closed in 2016 due to aggressive grizzly and black bears that had been attracted by food and garbage¹¹ (CBC News, June 23 2016).

Ecological damage specifically from transportation to and from the protected area are an ecological impact in their own right. Roads and the associated vehicle traffic lead to wildlife-vehicle collisions the likelihood of which increases along with road size and speed limits (Ament, Clevenger, Yu, & Hardy, 2008). According to ICBC there is an average of 9,900 crashes involving wildlife each year in the province (ICBC, 2017). Aside from impacts through collisions, there are also negative impacts of habitat fragmentation¹², air pollution, noise pollution, and increased GHG emission from motor vehicles to be considered (Riley et al., 2006; C. Monz et al., 2016).

3.2. Visitor Use Levels and Ecological Impacts

Despite the wide ranging ecological impacts outlined above, there is no clear linear relationship between the level of visitor use in an area and the level of environmental degradation (Fleming & Manning, 2015). Rather, the ecological impacts from recreation use in protected areas generally tends to be curvilinear, with the most significant impacts occurring in the initial stages of use and becoming less pronounced as visitor levels continue to rise (Monz et al., 2016). This is especially true in the case of

¹¹ Another common challenge in popular parks is food attraction and habituation of wildlife to human food sources (Monz et al., 2010).

¹² Transportation infrastructure has been identified as the main source of habitat fragmentation, causing both wildlife and vegetation to become isolated (Bruschi, Astiaso Garcia, Gugliermetti, & Cumo, 2015)

wilderness camping, where the majority of vegetation damage from recreational use occurs within the first few weeks of usage, after which damage occurs at a lower rate (Hammit & Cole, 1998). Thus, a dispersion of visitors from existing paths that are “hardened” or have been designed to minimize ecological damage, towards informal trails or off trail will result in more significant damages. This is not the case with all types of damages, however, as both Joffre Lakes Provincial Park and Keyhole Falls Recreation Area have experienced an increase in litter damage with higher use levels (Lovgreen, 2017; Schmunk, 2017).

In summary, there are wide ranging impacts from visitor use in BC parks and protected areas which are salient for the visitor management. The field of recreation ecology has documented these impacts in much greater detail than what has been described here. As the popularity of outdoor recreation activities continues to grow, maintaining the ecological integrity of parks and protected areas in BC is increasingly important for future use. The literature has shown that many of the most popular areas in the sea-to-sky corridor are also some of the most sensitive types of ecosystems, and without adequate management visitor use has the potential to cause lasting damage. In addition, a review from the BC Auditor General in 2010 found that the BC Ministry of Environment is currently not meeting its mandate to maintain the ecological integrity of parks and protected areas (Auditor General of British Columbia, 2010)¹³.

3.3. Social Aspects and Visitor Satisfaction

The social aspect of visitor management in parks and protected areas is a second key dimension for consideration. In particular, crowding in parks and protected areas can have a negative influence on visitor satisfaction with the recreation experience (Arnberger & Brandenburg, 2007). For the BC context, Kohlhardt et al. (2018) found that crowding had a relatively large influence on visitor satisfaction during hikes in Garibaldi Provincial Park. The following section discusses the impact of crowding on visitor satisfaction, and the complexities of coping mechanisms and group variation.

¹³ The Auditor General Report cites a number of factors for this findings including a lack of management plans and conservation measures, a failure to uphold conservation policies, a lack of performance indicators, and an overall failure to design the system in a manner that ensures ecological integrity (Auditor General of British Columbia, 2010).

Crowding is one of the most important factors impacting overall visitor satisfaction with recreation experiences and has also been one of the most studied topics in the recreation literature. The early literature on park management has assumed that there is a certain threshold beyond which the visitor use levels will begin to have a negative impact on visitor satisfaction (Manning, 2011). Thus, at low levels of use, additional visitors accessing a park or protected area have no impact on visitor satisfaction. When use levels rise above a certain level, however, the goals of visitors for wilderness experiences may become incompatible with use levels and overall satisfaction is decreased. As the field of recreation studies has progressed, however, the concept of a direct inverse relationship between visitor use levels and visitor satisfaction has been shown to be more complex than initially thought. Overall, existing studies on the relationship between satisfaction and visitor use levels have generally shown significant but weak relationships¹⁴ (Manning, 2011).

Does this mean that visitor use levels and perceived crowding have no impact at all on visitor experience or satisfaction in protected areas? Manning (2011) suggests that this is not the case, but rather that the relationship is more complex due to a number of factors. The first factor is that the concept of “crowding” is a subjective concept. Crowding is typically described as “perceived crowding”, reflecting its nature as a judgement that the density of people in an area is too many (Vaske & Shelby, 2008). Being a subjective value, there have been methodological challenges in defining and quantifying this concept (R. Manning, et al., 2002). Moreover, there are a number of management factors that can influence the perception of crowding aside from actual use levels (Vaske & Shelby, 2008). Additional factors that contribute to the weak relationship between crowding and satisfaction are visitor coping mechanisms and differences in personal characteristics.

Coping mechanisms are responses from users to changing context, and can include displacement to other areas, rationalizing experiences in a positive manner, and shifting expectations (Manning, 2011)¹⁵. This coping behaviour is another reason that

¹⁴ For example, a survey of nine wilderness areas in the US, found low-moderate relationships in 2-4 of the investigated areas, and nonexistent relationships in the other areas (Lucas, 1980). Also, Stewart and Cole (2001), in their survey of backpackers in the Grand Canyon National Park found consistently negative but weak relationships between visitor use levels and visitor satisfaction.

¹⁵ A study of visitors at Acadia National Park in the US found that 94% of survey respondents utilized one or more of these three coping behaviours (Manning & Valliere, 2001).

studies may not be accurately measuring visitor satisfaction (Manning & Valliere, 2001). The level of visitor satisfaction or quality of experience in an area also varies significantly between different groups depending on a number of different personal characteristics. Recreation literature has shown that experience levels, attitudes, cultural aspects, place identity, and expectations can all affect the point at which visitor use levels are interpreted as crowding (Manning, 2011). In the BC context it is important to consider not only how crowding impacts visitor satisfaction, but also how crowding will impact visitor displacement to other sites.

Chapter 4.

Management and Carrying Capacity

There is evidence that the third dimension to consider in visitor management of parks, alongside the social and environmental dimensions, is the mandate or management approach of the park itself (Manning, 2001). As a result, the following two sub-sections focus on the concept of carrying capacity and management plans for identifying this capacity. These concepts are key to understanding the threshold at which the impacts discussed in the previous chapter become unacceptable.

4.1. Carrying Capacity

The concept of carrying capacity has long been used in the area of recreation and protected areas, but has been borrowed from other natural resource contexts. For example, in terms of wildlife carrying capacity it refers to the maximum population level an area can support due to environmental limits such as natural food sources (R. E. Manning, 2007). In the context of recreation and parks, carrying capacity represents the tension between a site's conservation and recreation goals, and could be defined as the maximum number of visitors an area could support without incurring negative social and environmental damages¹⁶ (Lawson & Manning, 2001). This concept is also similar to that of "public goods" in economics literature, where at low levels of use the good is both non-rivalrous and non-excludable. As more and more people use the resource, however, negative externalities occur with each new user as the resource itself becomes degraded and the quality of other visitors' experiences is impacted. This scenario is similar to other "tragedy of the commons" situations where goods are non-excludable but rivalrous (Manning, 2007).

The application of the carrying capacity concept to outdoor recreation settings has been criticized by a number of authors as being too simplistic (Manning, 2011). A main criticism is that, unlike natural resource settings, a wide range of factors including the management approaches to an area influences the carrying capacity of parks. In

¹⁶ Some authors have also delineated social and ecological carrying capacities in order to discuss each separately (Papageorgiou & Brotherton, 1999; Salerno et al., 2013)

addition, specifying a single carrying capacity may ignore what could be done in terms of policies to limit the negative impacts of increased usage (McCool & Lime, 2001). Despite these challenges, the concept of carrying capacity has continued throughout the recreation literature.

4.2. Indicators and Management Plans

Moving beyond the simplistic concept of “carrying capacity”, a number of decision-making frameworks have been developed to assist park managers in determining when changes resulting from visitor usage have extended beyond acceptable levels (Manning, 2009). As outlined by Manning (2009), two of the most commonly used frameworks are Limits of Acceptable Change (LAC) and Visitor Experience and Resource Protection (VERP). The purpose of these frameworks is to clearly define the park conditions to be maintained, to establish objective criteria and indicator variables, monitor conditions and then apply management practices once impacts have gone beyond the specified criteria (Manning, 2007).

Visitor management strategies in parks can also be influenced by the park mandate, regardless of objective resource impacts or visitor experience. For example, if part of the mandate of the park is to allow for solitude, then limiting visitor use levels in order to achieve this goal may be an acceptable strategy (R. E. Manning, 2003). Literature on park management states that values influencing management decisions need to be clearly articulated and transparently communicated to stakeholders (Gende, Hendrix, & Schmidt, 2018). A framework that structures the diversity of goals across different areas is the Recreation Opportunity Spectrum (ROS) (Manning, 2011). This spectrum can assist in ensuring that there is a diversity of different recreation opportunities in an area, ranging from primitive areas with opportunity for isolation, to highly developed settings (Manning, 2011).

In the case of BC Parks, the Strategic Management Planning Policy (2013) details that all protected areas in the province must have a management plan approved by BC Parks¹⁷. Each management plan defines what the long-term conservation,

¹⁷ Management Plans are informed by legislation, land-use plans, government to government agreements with First Nations, and higher-level BC Parks policies guidelines and strategies.

recreation, and cultural objectives are for the park, as well as outline strategies to address potential challenges to these objectives (BC Parks, 2013). In addition, management plans include zoning designations to designate the types of activities permitted in different areas within the park. For example, while some areas allow for use levels with high density, others have the goal of “Very low use to provide solitary experiences and a wilderness atmosphere” (BC Parks, 2012b). Using zoning to provide a range of different experiences can be effective for reducing conflict among users.

Chapter 5.

Policy Problem and Stakeholders

The policy problem to be investigated is that too many parks and protected areas in Southwestern BC are experiencing capacity challenges due to increasing demand for parks and recreation areas with no equivalent increase in supply. The challenges have led to negative externalities as a result of overcrowding including environmental degradation, decreased visitor utility, and in some cases safety concerns.

This problem is a current issue as well as an issue that will increase in importance in the future. There are current concerns regarding the ecological impacts from increased visitor use at a number of sites including Semaphore Lakes, Joffre Lakes and Keyhole Falls (Barde, 2018). Safety concerns over use levels and vehicle congestion at Joffre Lakes has prompted a warning letter from the RCMP (Uguen-Csege, 2018). For the Quarry Rock hike in Deep Cove, park rangers are placing limits the number of hikers at the peak to 70 at a time due to safety concerns (District of North Vancouver 2018). For Garibaldi Lake, anecdotal evidence from BC Parks staff suggest that use levels in some areas of the park has increased by up to 300%, raising concerns about both social and environmental impacts (Kohlhardt et al., 2018). The growth of an unofficial market for campground reservations also suggests that demand for accessible experiences in parks and protected areas is far above supply (Laanela, 2016). Furthermore, as discussed in section 2.3, the main drivers behind use level increases are projected to continue in the future.

From the previous chapters it is clear that, visitor management for parks and protected areas is a challenging balancing act for policy makers between the potentially conflicting interests of conservation, recreation access, visitor experience, and management goals. In the province of BC, it is clear that these features are extremely important. Facilitating access to nature is a key aspect of the mandate for BC Parks, yet this needs to be done in a manner that avoids negative externalities. In addition, with increasing visitor numbers come increasing costs of park maintenance.

There are a number of different stakeholders involved in the application of different visitor management strategies in parks and protected areas in BC including

local users and user groups, tourists, residents of local communities, and conservation advocacy groups.

As the most frequent users of the provincial park system, local users and user groups are a key stakeholder. More specifically, a key organization is the Federation of Mountain Clubs of BC (FMBC), which represents the interests of outdoor clubs across BC. The Outdoor Recreation Council of BC is another key user organization in the province, and co-chairs the Provincial Trails Advisory Body (Outdoor Recreation Council, 2018). Support from local users is key to the success of potential policy options.

The issue of crowding and potential visitor management tools have a direct impact on tourists travelling to the parks and protected areas. Changes to visitor management strategies could have direct impacts on the travel decisions made by tourists. As a result, the overall tourism industry also has a stake in the issue. Notable organizations with a stake include the crown corporation tasked with promoting tourism in the province, Destination BC.

Residents of communities adjacent to parks with capacity challenges are also stakeholders impacted by capacity concerns, especially around traffic and parking congestion. Residents of Deep Cove have expressed frustration around being able to access their homes and find parking in the community with the increase in user levels (Johnston, March 16 2018). The communities of Squamish and Pemberton have put forward resolutions at the Union of BC Municipalities calling for measures to help manage capacity challenges in parks and wilderness recreation areas that impact their communities.

In summary the most important stakeholders for consideration are local users and user groups as they are the largest group directly impacted by any policy changes. This is followed by tourist users and surrounding communities.

Chapter 6.

Methodology

In this study two methodologies are used to analyze the policy problem. The primary methodology is the major analysis from an intercept survey of users at popular hikes in Southwestern BC. The secondary methodology is a literature review of jurisdictions outside of BC with similar visitor management challenges to confirm the results of the analysis. The description of this secondary methodology is given after the survey findings in Chapter 10. The following chapter describes the methodology used to conduct the intercept survey of users at hiking trails in Southwestern BC.

6.1. Survey Sites

In order to ground this study in sites currently experiencing crowding and capacity challenges, three different locations in BC were selected as sites for research. As visitor management challenges and tools vary depending on the context, three different examples in Southwestern BC were selected in order to be able to gain a broader understanding of crowding challenges in across parks with different characteristics, rather than a single location. All three sites (Joffre Lakes, Garibaldi Lake, and Deep Cove-Quarry Rock) are in Southwestern BC and have been identified either through the literature or through media articles as having challenges with crowding and capacity. Their key aspects are described in Table 1, and with further details found in Appendix B.

Table 6.1. Summary of Survey Sites

| Park | Park Size | Distance from Vancouver | Hike Length | Elevation | Backcountry Camping | Dog Ban | Recent Visitor Management Measures |
|----------------|-----------------------|-------------------------|-------------|-----------|--|---------|--|
| Joffre Lakes | Class A 1460 ha | 182km | 10km | 400m | Yes – 26 sites (\$5 online reservation year round) | Yes | 2017: Dogs banned on trail |
| Garibaldi Lake | Class A 194,000 ha | 98km | 18km | 820m | Yes – 90 sites, (\$10, no reservation) | Yes | 2016: Online reservations for backcountry camping |
| Deep Cove | n/a | 20km | 3.8km | 100m | No | No | 2018: Commercial bus access restricted 2018: 70 person limit at lookout |

6.2. Survey Design

The purpose of the survey was to better understand visitor experience and crowding concerns on popular trails and assess user support for different visitor management options. The primary question being asked was “*What different visitor management options on popular BC trails are hikers most likely to support and how do the characteristics of hikers influence their support for these options?*” Survey questions were developed through reviewing the literature and identifying significant variables. All questions are available in Appendix C.

Data for the intercept survey was collected in person from the three above locations during the weekends of August 25-26 and September 1-2 (Labour Day long weekend) 2018. Hikers were approached at trailheads as they were exiting the trail and asked if they would like to participate in the survey. During times when there were a significant number of hikers exiting the trail, every 5th hiker was approached, and during times when few hikers were exiting every hiker was approached. Hikers were also given the option of completing an online version of the survey through QR code. Three different versions of the survey were distributed with different dollar amounts in a dichotomous choice ‘willingness to pay’ question. The ‘willingness to pay’ question

described a hypothetical situation where pay entry was being managed and asked if users would be willing to pay to have guaranteed access to the trail.

6.3. Limitations

The first major limitation of the willingness to pay question is that due to limited sample sizes, only three different dollar amounts were distributed for the dichotomous choice question. Ideally a contingent valuation survey would include price points in a wider range to be able to fully capture individuals' willingness to pay. Second, there is a methodological issue with protest votes when attempting to value a good that is currently provided for free. This challenge was also observed by other researchers attempting to measure visitors' willingness to pay at parks which do not currently charge a fee (Loomis & Keske 2009). Third, the sample only includes individuals who were able to communicate in English, which biases the survey participants in favor of local residents. The potential for self-selection bias is another limitation of the survey sample. Specifically, visitors who were concerned with their experience may have been more willing to voluntarily participate in a survey about visitor management. Fourth, different weather conditions between the two sites during the times of the survey had an impact on user levels. Specifically, the rainy weather during the survey at Deep Cove likely had an impact on lower levels of crowding. Finally, it should be noted that the survey took place over busy weekends during the summer, and results may differ during other times of the year.

Chapter 7.

Survey Analysis

For analysis of data collected from the survey, cross-tabulations and basic tools for statistical analysis were used. The analysis was completed using Excel and SPSS software. Differences between study sites are analyzed using single-factor ANOVA tests at a .05 level of significance.¹⁸ Cross-tabulations are used to investigate the impact of values and demographics on support for different visitor management tools. Significance for cross-tabulations were tested using chi-squared tests at .05 level of significance.¹⁹ The analysis of the survey is split into the following sections: description of the sample, visitor motivations, crowding experience, and willingness to pay and management options.

7.1. Sample Description

A total of 138 responses were received, with 130 submitted in person through paper copies and 8 submitted online. In total, 40 surveys were collected from Deep Cove, 49 from Garibaldi Lake, 47 from Joffre Lakes, and two online surveys were completed with no specified site. Three surveys were partially completed, and the remaining 135 were fully completed. Within the entire sample, 46% of respondents are male and 53% are female. For the residence of respondents, 76% of respondents are BC-residents and 23.5% are not permanent residents of the province. This is consistent with the finding from BC Parks that approximately 75% of visitors to BC Parks are local residents (BC Parks, 2016b). Almost all BC residents surveyed are from Metro Vancouver, as only 4% of respondents were BC residents living outside Metro Vancouver.

¹⁸ Analysis of Variance (ANOVA) is a test of the null hypothesis for more than two population means. For this case, the null hypothesis is that there are no differences across survey sites. ANOVA tests at whether or not the variability between groups exceeds the variability within groups.

¹⁹ The Two-variable Chi Squared Tests used in cross-tabulations evaluates whether observed frequencies reflect the independence of the variables. If the observed frequencies differ enough from the expected frequencies, the Chi-Squared score will exceed the Chi Critical value, and the null hypothesis that there is no relationship between the two variables is rejected.

The median level of income for respondents is the \$60,000-\$79,000 bracket, which is consistent with the BC median income of \$69,995 in 2015 (Statistics Canada, 2017a). Education levels are higher than the general population, as 72% of respondents hold a degree at bachelor's level or higher, compared with the general population in BC where 25% of those aged 15 and over hold a degree at a bachelor's level or higher. For age, respondents are younger when compared with the general population, with 75% of all respondents between the ages of 14 and 35. In BC, individuals aged 15-35 only make up 29% of those aged 15 or older (Statistics Canada, 2017b)²⁰.

Overall, the survey sample was representative of BC residents in terms of average income and gender. Individuals with higher levels of education, and younger individuals were both over-represented in the survey sample.

7.2. Visitor Motivations and Trail Preferences

The following section explores survey results relating to visitor hiking motivations and preferences for different trail characteristics.

7.2.1. Hiking Motivations:

Questions 6(a) to 6(d) investigate hikers' reasons for going hiking in the park where the surveys were conducted. The purpose of these questions is to understand the motivations behind why visitors utilize hiking trails, and what is important to them about their experience. Overall, a majority of respondents agree with all of the potential reasons for going hiking presented in the survey. As displayed in Figure 4, the reason receiving the strongest support is "to enjoy the sight and smells of nature", as 83% of respondents strongly agree with this statement. The reason receiving the least support is "I go hiking to get away from people and experience solitude", as only 30.7% of respondents strongly agree with this statement.

²⁰ Further details on the characteristics of survey participants can be found in Appendix D.

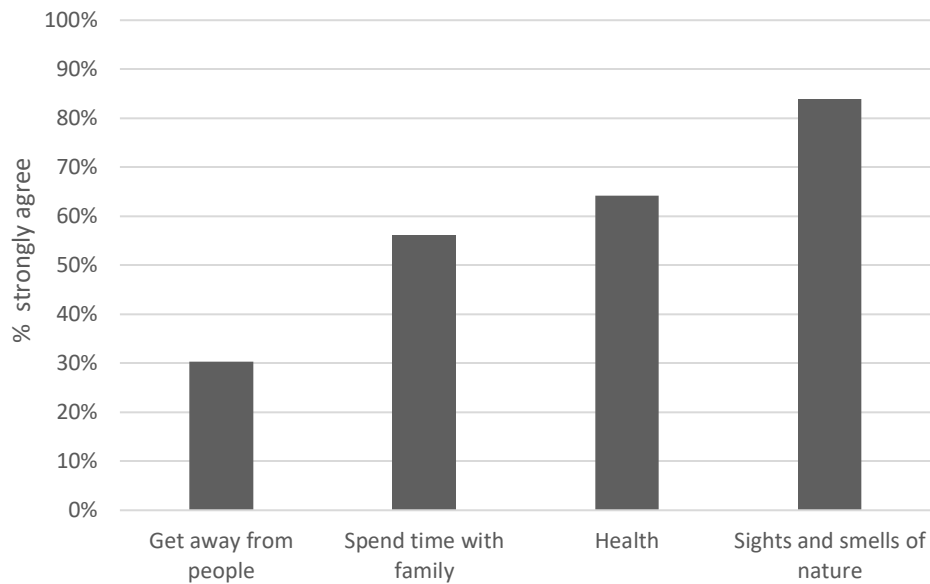


Figure 7.1. Hiking Motivations, All Sites

The differences between sites are only significant for question 6(a) regarding going hiking to experience solitude. Respondents from Deep Cove are the most likely to agree that they go hiking to experience solitude (84%), followed by respondents at Garibaldi (71%) and Joffre Lakes (51%). In other words, between the sites surveyed Deep Cove hikers are the most likely to go hiking in order to seek solitude and Joffre lakes hikers the least likely.

7.2.2. Hiking Trail Preferences

Hikers' preferences for different hiking trail characteristics including rustic single-track trails, wide smooth trails, educational opportunities, and the importance of accessing viewpoints are investigated in questions 7 to 8. Across all sites, there is a slight preference for wide smooth trails as 60% either agree or strongly agree that this type of trail would contribute to their choice of the trail, compared to 55% for rustic single-track trails²¹. Question 7(c) on the presence of educational opportunities on the trail shows similar results, as 51% of respondents agree or strongly agree that educational opportunities signs would contribute to their trail choice. Finally, regarding

²¹ A significant number of respondents for both questions (33% for 7a and 31% for 7b), are neutral about the importance of these attributes.

the importance of the viewpoint, 59% of respondents rank the importance of the viewpoint in accessing a hike as 5 or “extremely important” out of a 5-point scale.

Differences between survey sites are statistically significant on support for wide smooth trails and the importance of the viewpoint. As displayed in Figure 5, 46% of respondents at Joffre Lakes strongly agree that wide smooth trails would contribute to their trail choice, compared to 18% at Deep Cove and 14% at Garibaldi. For the importance of the viewpoint, respondents at Joffre lakes are significantly more likely to rank the importance of accessing a view on the hike as “extremely important”. 74% of respondents from Joffre Lakes rank the view as extremely important, compared to 63% from Garibaldi and 34% from Deep Cove. In addition, respondents from Joffre Lakes also have the highest support for educational opportunities along the trail although this was not statistically significant. To summarize, hikers at Joffre Lakes prefer wide smooth trails, place more importance in the view, and are more open to educational opportunities when compared to hikers from the other two sites.

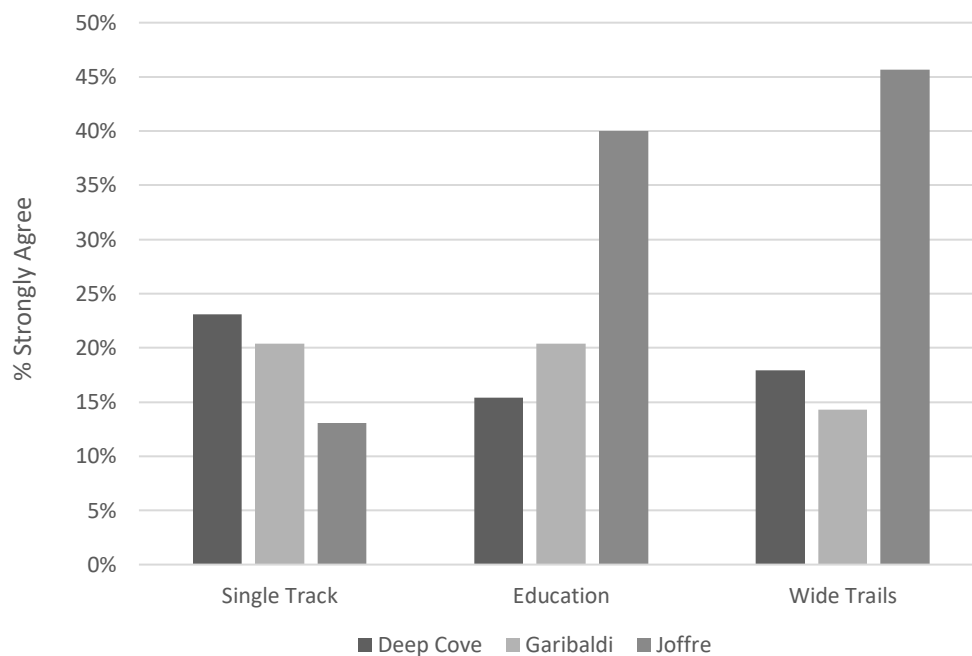


Figure 7.2. Preference for Trail Characteristic, by Site

Respondents’ personal connection to the park where interviewed is investigated by survey Question 4. A total of 39% of respondents agree that they have a personal connection to the park where interviewed, with similar response rates across the three

different sites. Individuals who strongly agreed that they have a personal connection to the park are significantly more likely to be concerned with their ecological impact when planning recreation activities. For example, 63% of respondents who strongly agreed that they have a personal connection to the park also strongly agreed that they are concerned with their ecological impact. By contrast, 33% of individuals who strongly disagreed that they have a personal connection to the park are strongly concerned with their ecological impact.

7.3. Crowding Experience

The following section discusses visitors' experience of crowding at the survey sites as explored with survey questions 10-12. Beginning with question 10, as shown in Figure 6, a total of 64% of respondents from all sites described the hike as either somewhat or very crowded. Differences between sites are statistically significant. Respondents at Joffre Lakes are the most likely to describe the hike as somewhat or very crowded (89%) compared to Garibaldi (49%) and Deep Cove (54%).

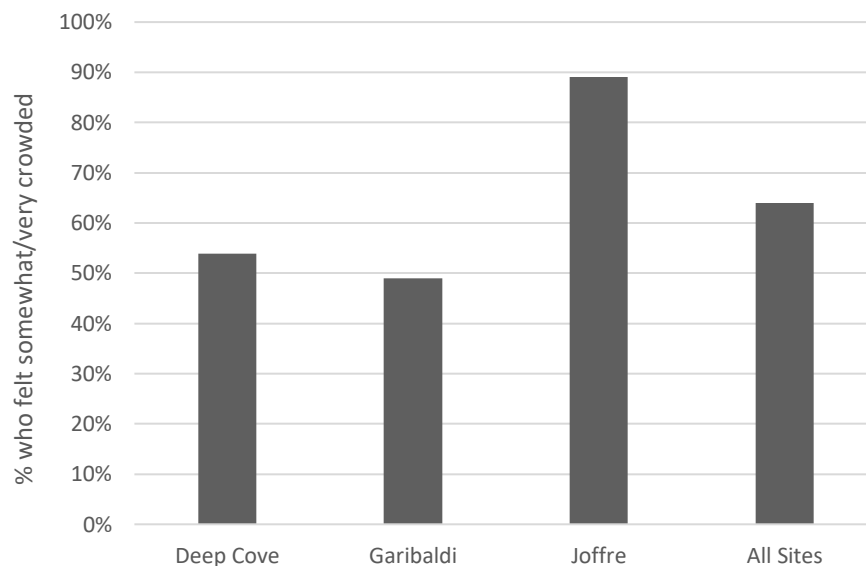


Figure 7.3. Crowding Experience, by Site

The specific area of the park that felt the most crowded to users is also investigated in question 11. Results of the survey show that the most common area for respondents to feel crowding is at the viewpoint, with 48% of respondents choosing it as

feeling the most crowded compared to 23% of respondents choosing the trail itself as feeling the most crowded²². Differences between sites for the area of the hike that feels the most crowded were consistent across sites.

It is also important to consider not only if visitors felt that the hike was crowded, but if this has a negative impact on their hiking experience. Question 12 asks respondents whether the number of other people on the hike had a positive or negative impact on their hiking experience that day. As displayed in Figure 7, 39% of total respondents across all sites were negatively impacted by the number of other people on the trail, while only 18% were positively impacted (the remainder are neutral). Differences between sites are statistically significant for this question, with respondents from Joffre Lakes the most likely to be negatively impacted by the number of people at the hike (53%), followed by Garibaldi (35%) and Deep Cove (26%).

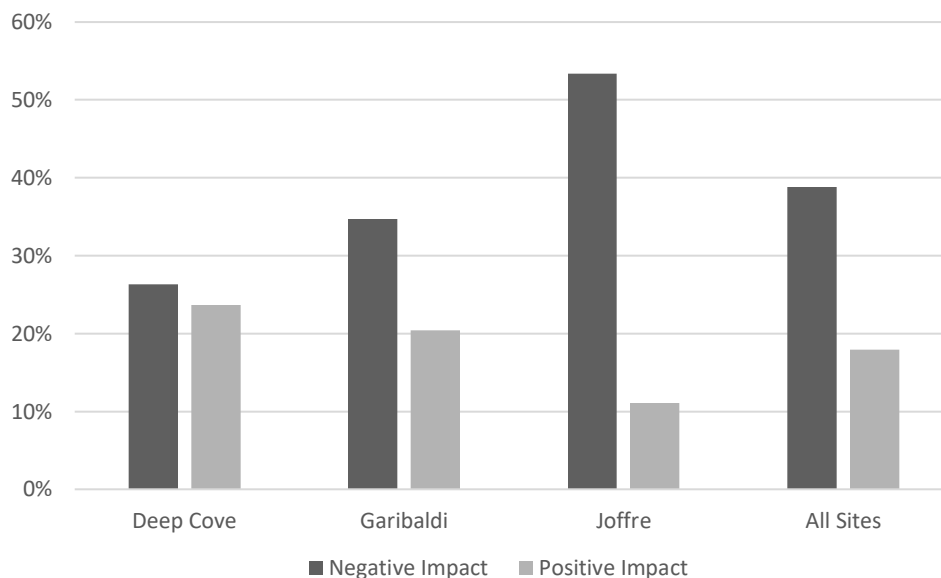


Figure 7.4. Impact of Visitor Numbers on User Experience, by Site

A strong correlation (.57) exists between respondents who feel that the hike was crowded, and respondents who found that crowding had a negative impact on their experience. This result was also found to be statistically significant.²³ This finding

²² A number of respondents (11%) also chose multiple locations as feeling the most crowded rather than choosing a single area as requested in the survey

²³ Chi Squared Value 31.394, p-value 0.5236E-7

suggests that while not all respondents found the hike to be crowded, crowding had a negative impact on the satisfaction of those that considered the hike crowded.

7.4. Willingness to Pay and Management Options

This section discusses survey results relating to respondent's willingness to pay and support for different visitor management options.

7.4.1. Willingness to Pay

Visitors' willingness to pay in order to access the park and to reduce crowding are investigated by questions 9(a-b). The question describes a scenario where the park is being controlled to manage visitor numbers, and respondents are asked whether or not they are willing to pay a specified amount to have guaranteed access to the trail. Three versions of the survey with \$5, \$10, and \$15 dichotomous questions were handed out. Not considering the different fee amounts, 45% of total respondents responded that they were willing to pay the fee presented to access the trail. As shown in Figure 8 the trend observed across sites is that a higher percentage of respondents are willing to pay an entrance fee with lower fee amounts. Across all sites, 63% of respondents presented with a \$5 fee are willing to pay, 41% presented with a \$10 fee are willing to pay, and 32% presented with a \$15 fee are willing to pay²⁴.

Statistically significant differences in willingness to pay are observed across survey sites. Deep Cove respondents are the least likely to be willing to pay to access the trail, while respondents from Joffre Lakes are the most likely. Respondents at Joffre Lakes are significantly more likely to be willing to pay the higher \$10 and \$15 amounts. For example, 69% of those who received the \$15 question at Joffre Lakes responded "yes", compared to only 7% at Deep Cove. Respondents from Garibaldi are between the other two sites for the \$10 and \$15 samples, however of those who received the \$5 question 91% responded "yes", higher than both Deep Cove and Joffre Lakes.

²⁴ The only exception to this finding is at Joffre Lakes where a higher percentage of respondents that received the \$15 question responded "yes" (69%) than those who received the \$5 version (61%). This result may be due to small sample sizes.

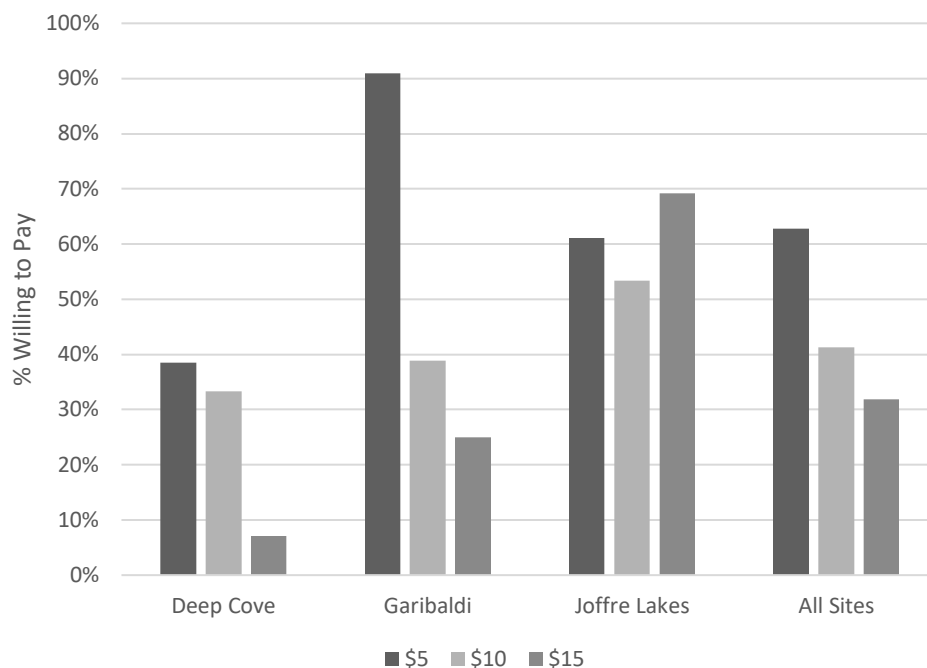


Figure 7.5. Willingness to Pay Entrance Fee, by Site

A follow-up willingness to pay question was asked about willingness to pay for a reduction in the number of other hikers on the trail. This question was also asked as a dichotomous choice format and specifies that there would be “half as many encounters with other hikers on the trail”. In comparison to the initial question, fewer respondents are willing to pay. As displayed in Figure 9, regardless of price 39% of respondents are willing to pay specifically to reduce crowding compared to 45% who are willing to pay to have guaranteed access. This suggests that while some visitors are willing to pay to access the trail if required, fewer are willing to pay specifically for the purpose of reducing interactions with other users.

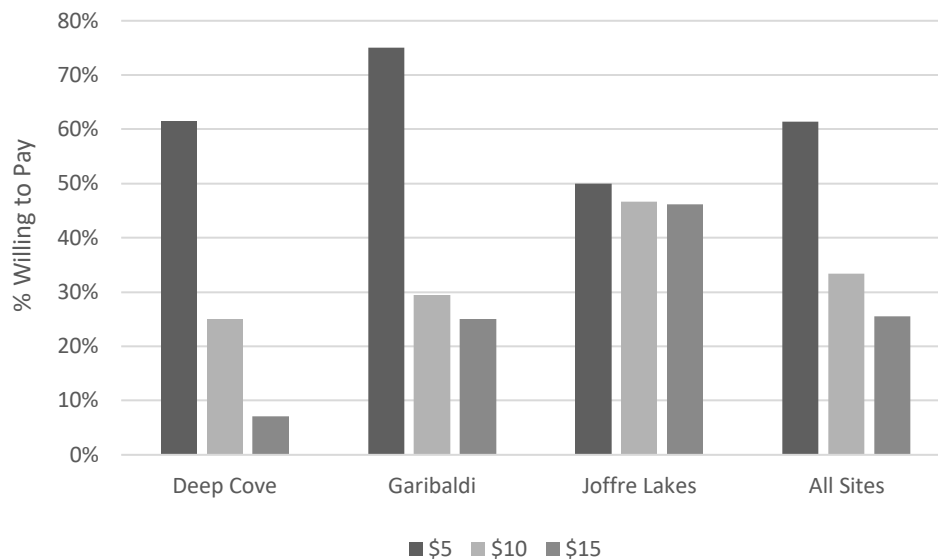


Figure 7.6. Willingness to Pay to Avoid Crowding

7.4.2. Management Options

Respondents support for different visitor management options are explored in the following section. Question 16 asks respondents to choose between having a 50% chance of accessing the trail and encountering very few individuals or having guaranteed access to the trail and encountering a large number of individuals. The purpose of this question is to assess the trade-off between access and solitude. As displayed in the total column of Figure 10, across all sites 29% of respondents prefer having a limited chance of access but fewer people on the trail. Respondents from Joffre Lakes are the most likely to choose limited access (36%), and respondents from Deep Cove the least likely (20%), however these differences were not statistically significant.

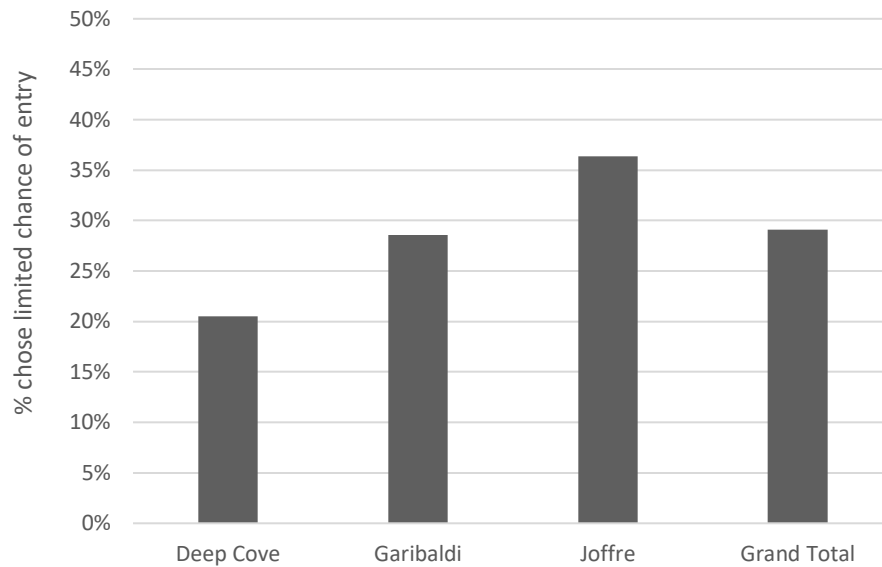


Figure 7.7. Support for Limited vs. Unlimited Access, by Site

Survey questions 17 (a-d) investigate respondents support for additional management policies in the park. These options include a first-come first serve cap on the number of hikers, an online reservation system, an access fee during peak hours, and rezoning to allow for the expansion of hiking trails. The policy with the highest overall support (somewhat or strongly supported) across all sites is rezoning to allow for the construction of additional hiking trails, as 60% of respondents support this policy. The policy with the least overall support across all sites is a first-come first serve cap on the number of visitors, as only 36% of respondents support this policy.

As displayed in Figure 11, the differences between sites suggest that respondents from Joffre Lakes are the most likely to support all of the policies discussed in the survey. Support for a reservation system is particularly high at Joffre Lakes, as 68% of respondents support this option. Respondents from Deep Cove are the least likely to support any of the policies with the exception of a first-come first serve cap. Differences between sites are only statistically significant for a reservation system.

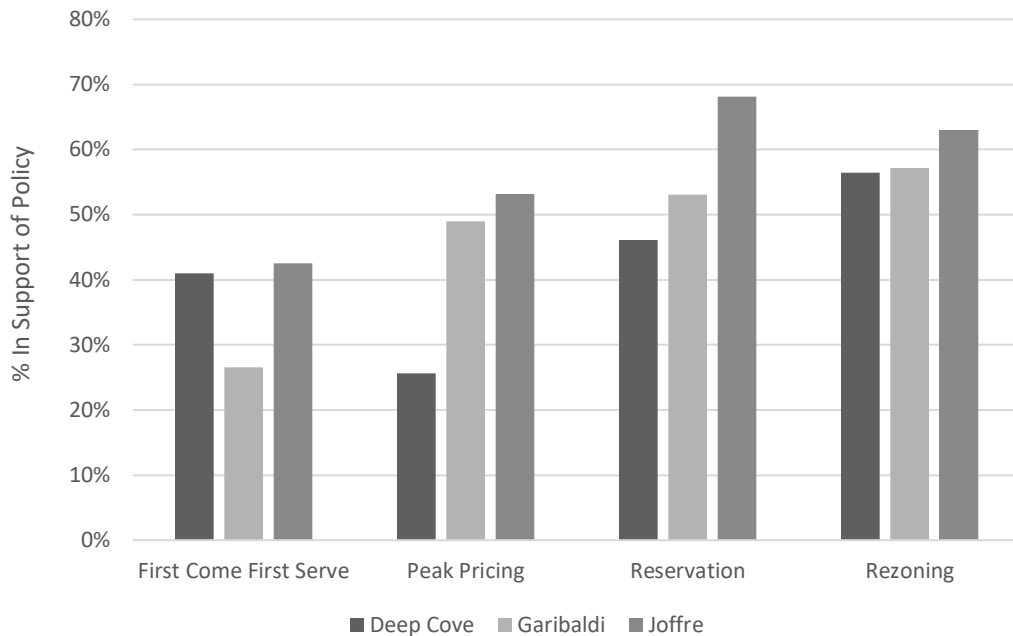


Figure 7.8. Support for Management Policies

7.4.3. Differences between Groups

Differences in support for management options are also explored by respondent characteristics, and support based on perceptions of crowding, planning ahead, residence, and income are discussed below.

Respondents who felt that the number of people on the hike negatively impacted their experience are more likely to support a number of policies that limit entry. As displayed in Figure 12, these respondents are more likely to support a reservation system (73% compared to 42% of individuals who were positively impacted). These respondents are significantly more likely to choose having a limited chance of access to the trail with fewer people, as 51% chose limited chance of access compared to 13% of those who were positively impacted by the number of people. In terms of willingness to pay, there are no significant differences in willingness to pay to access the park (question 17a), however respondents who felt crowded are more likely to pay to have fewer encounters with other hikers on the trail (question 17b). In summary, the results suggest that hikers who experience a negative impact from the number of other people on the trail are more likely to support policies that limit entry when compared with hikers who are not negatively impacted.

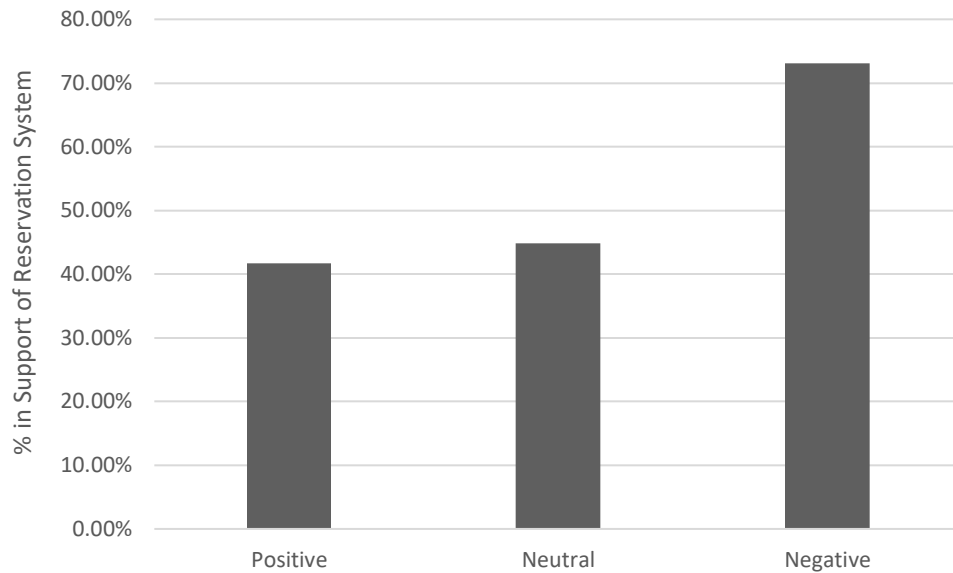


Figure 7.9. Support for Reservation by Impact of Number of Other Hikers

Differences in support of proposed management options are also observed for individuals who plan ahead based on expected crowding. Overall across sites, 58% of respondents agree that they plan ahead for their hike based on expected crowding. Individuals who plan ahead for crowding are significantly more likely to support a reservation system, a peak price system, as well as rezoning. For example, 66% of individuals who plan ahead for crowding support a reservation system compared to 39% of those who do not²⁵. Individuals who plan ahead are also more likely to be willing to pay to access the park (particularly at the \$5 and \$10 levels), however this result was not statistically significant.

Another important consideration between groups is the difference between BC residents and non-residents. As displayed in Figure 13, non-residents are more likely to support all policies presented in the survey apart from rezoning. For example, 64% of non-residents support a peak-pricing system compared to 39% of BC residents. Due to limited sample sizes, however, differences are only statistically significant for peak pricing. Non-residents are more to be willing to pay to access the park (58% for non-residents, 43% for residents), although this difference was also not statistically significant.

²⁵Statistically significant, Chi Squared Value 14.273, p-value .006

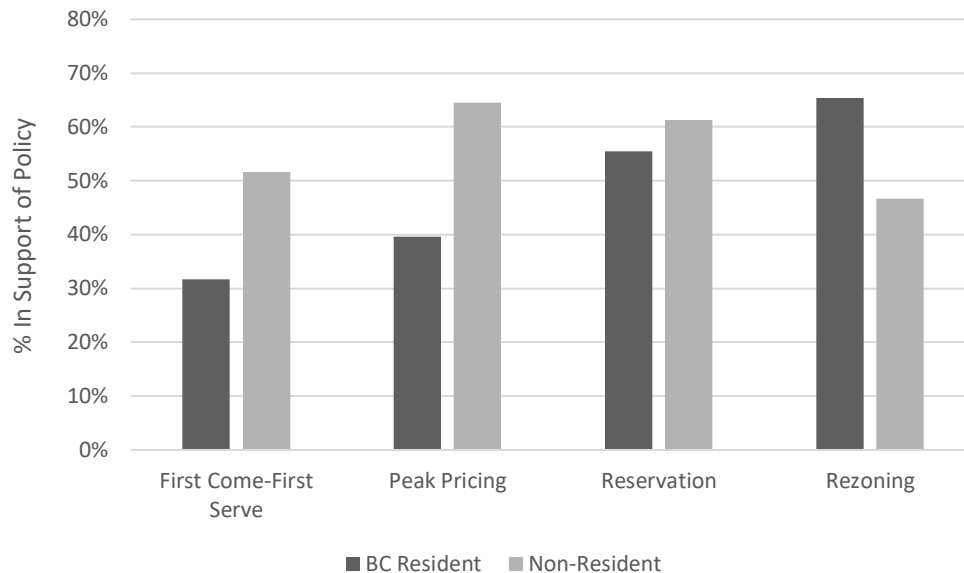


Figure 7.10. Support for Options, by Residence

For additional demographic factors, important trends are viewed in the results however despite the findings not being statistically significant. Individuals in the top household income brackets are found to be more likely to pay to access the trails at the \$10 and \$15 levels. For example, 41% of those in the \$100,000+ income bracket are willing to pay \$15 compared to only 27% of those earning below \$40,000/year. In terms of support for additional management options, individuals in lower income brackets are slightly more likely to support a first come first serve cap or a peak pricing system, while those in higher income brackets are more likely to support a reservation system. For example, 65.9% of those in the \$100,000/year income bracket support a reservation system compared to 54% of those with incomes below \$40,000/year²⁶.

7.5. Summary of Findings

A number of key insights can be drawn from the survey results, which are listed in five main points below.

First, the survey found that a significant number of respondents interpreted the trails as crowded on the weekends that the survey took place. Moreover, for

²⁶ The limited number of respondents with low income in the sample limited the ability to test the statistical significance of this effect.

respondents who perceived the hiking trail as crowded, the number of people on the trail had a negative impact on the quality of their experience.

Second, the survey found significant differences between the motivations and trail preferences of respondents between survey sites. In general, enjoying nature is the most important motivation to respondents to go hiking, followed by improving health and spending time with family and friends. Seeking solitude is the least important of the motivations presented to respondents, and this is particularly true for respondents at Joffre Lakes. In terms of trail preferences between sites, those at Joffre Lakes strongly prefer smooth wide paths and educational opportunities, while wide trails are least popular at Garibaldi. Accessing a viewpoint is important for all respondents but is particularly important at Joffre Lakes.

Third, overall there was limited support for paying a fee to access the trail as well as the different management options presented. Demand also appeared to be relatively inelastic, as across all sites there was a 31-percentage point drop in the number of people willing to pay a \$5 fee versus those willing to pay a \$15 fee. Respondents at Joffre Lakes were the most likely to be willing to pay followed by Garibaldi and Deep Cove whose respondents were the least willing to pay. The preferred management option across all sites was the one that did not limit access (rezoning to allow for more trails). The least popular policy overall was a first-come first serve cap, followed by a peak pricing system. Respondents at Joffre Lakes were the most supportive of all management options presented in the survey.

Fourth, the results show that a number of different variables contribute to the likelihood that respondents will support restrictive management options or an entry fee. First, individuals who found the trail to be crowded were more supportive of a number of restrictive management options such as a reservation system. Second, individuals who plan ahead for crowding were also more supportive of a number of management options including a reservation system.

Fifth, for demographics there were important differences between residents and non-residents, as well as different income groups. Non-residents were more supportive of a number of measures, particularly a peak pricing system. The results also suggest that non-residents would be more likely to pay to access the park, however this finding is

not significant. Finally, some limited evidence showed an income-effect with individuals with higher incomes being more likely to be willing to pay to access the trail.

Chapter 8.

Secondary Methodology: Literature Review

The secondary methodology to confirm the results of the primary methodology is a review of the literature. A number of studies in the field of recreation studies have specifically investigated challenges with crowding through survey analysis. Due to the limited number of studies completed specifically in Southwestern BC, surveys from parks in other jurisdictions that have experienced similar concerns with visitor use levels are utilized for comparison.

8.1. Negative impact of crowding

This survey's findings that crowding has a negative impact on the quality of visitor experience is supported by other studies in the same jurisdiction. A recent choice experiment survey in Garibaldi Provincial Park (same location as one of this study's sites) also found that crowding had a significant negative impact on the quality of visitor experience Kohlhardt et al. (2018). In addition, both this survey and the survey from Kohlhardt et al. (2018) found that crowding was felt most significantly at the viewpoint on the trail.

Although this survey found that crowding had a negative impact, the survey also found that visitors were less willing to pay specifically to lower the number of encounters with other hikers than to enter the park. A possible reason for this finding which is supported by the recreation literature is that while there is often support for visitor management tools that place limits for purely ecological purposes, there is less support for limits to reduce the experience of crowding (Manning, 2011). The Australian survey from Fleming and Manning (2015) supports this finding that respondents are less willing to pay specifically to reduce crowding when compared to ecological purposes.

The finding that there is a diversity of preferences for trail characteristics across the different survey sites is also supported by examples from the literature. The Kohlhardt et al. (2018) study classified respondents into three different categories based on their motivations and preferences: outdoor tourist, casual recreationist, and experienced freedom seeking outdoor person. The majority of respondents from Joffre Lakes fit the

description for the “outdoor tourist” category of hikers²⁷, while respondents from Garibaldi and Deep Cove both fit between the “casual recreationist” and “experienced freedom seeking outdoor person” categories²⁸.

8.2. Willingness to Pay and Management Options

The percentage of respondents that were willing to pay to access the site can also be compared to examples from the literature. In the study by Kohlhardt et al. (2018), day use fees were supported by 36% of residents, similar to the 45% of respondents at Garibaldi in this survey who were willing to pay²⁹. Other studies have shown that there are mixed results in how significantly a fee will impact visitation, with results depending on demand elasticity and available substitutes (Manning, 2011). For example, at Zion National Park in the US declines in use due to fees were estimated to be 22% (Schwartz & Lin, 2006)³⁰.

Although a trade-off between solitude and access is apparent in the survey, respondents value access higher than solitude when compared to other cases. In the study from Lawson and Manning (2001) at Delicate Arch National Park in the US, a majority of visitors would be willing to accept a 40-80% chance of accessing the park if a low number of people are encountered. This can be compared to findings from this survey, where only 29% of respondents are willing to accept a 50% chance of access the trail with half as many other encounters.

A conclusion from the recreation literature is that indirect management options are typically preferred to those that limit access (Manning, 2011). This supports findings from this survey, as the most popular management option (rezoning) was one that expands supply and does not limit access. Similar to the findings from this survey, Fleming and Manning (2015) also found that peak pricing methods received low levels of

²⁷ That is, supportive of access fees, prefer wide smooth trails, and place the highest importance in the viewpoint.

²⁸ That is, the majority of respondents at both sites are opposed to fees, are less supportive of wide trails, and place less importance in the viewpoint.

²⁹ The Kohlhardt et al. (2018) survey asked questions with dollar amounts similar to those in this survey (\$5, \$10, \$18).

³⁰ Another similar user survey in Colorado found that 62% of respondents were willing to pay a fee of less than \$20 to access the site (Keske & Mayer, 2014).

support from respondents when compared to other options. The recreation literature also supports this survey's finding that concerns with crowding strongly influences support for management options (Manning, 2011). For example, surveys by Watson and Niccolucci (1995) in Oregon found that for day hikers the strongest predictor of support for use limits in the area was a perception of crowding.

Another variable from the literature found to influence support for visitor management methods is place attachment to the survey area (Manning, 2011). Results from this survey did not find a statistically significant relationship between place attachment and willingness to pay, however a positive trend was observed. Other surveys studying willingness to pay have also failed to find statistically significant results for this variable such as the Korean study from Lee et al. (2011). In addition, the survey finding that a strong place attachment is associated with higher concern about ecological impacts is consistent with similar surveys on the topic (Vaske & Kobrin, 2001).

8.3. Demographic Differences

The survey's finding that non-resident hikers are more likely to support restrictive visitor management options when compared to resident hikers is supported by a number of Canadian studies. First, a study of the hiking trail network in Jasper National Park, a park on the border between BC and Alberta, also found differences between resident and tourist trail use (Anderson, 2005). The study found that when compared to tourists, residents are less supportive of any management actions that would infringe on their own use. Second, a study of Whistler residents found that residents place a higher value on recreational access to wilderness areas as opposed to conservation when compared with users from outside the area (Saremba & Gill, 1991)³¹.

The finding from Arnberger and Brandenburg (2007) that local residents are more likely to perceive the park as crowded is not supported by this survey's findings. Differences in both the perceived level of crowding and the impact visitor numbers at the hike on user satisfaction were not statistically significant between BC residents and non-residents. Although not statistically significant, these findings oppose Arnberger and

³¹ Examples from studies outside Canada in areas such as New Zealand and Norway also show that residents oppose attempts to limit free access when compared with tourists (Gundersen, Mehmetoglu, Inge Vistad, & Andersen, 2015; R. E. Manning, 2011; Mason, 2005).

Brandenburg's (2007) findings, suggesting that non-residents are more likely to describe the hike as crowded and be negatively impacted by the number of people on the trail when compared with residents³².

Although the findings in the survey on the relationship between willingness to pay and income were not statistically significant, overall findings still suggested that lower income respondents were less willing to pay to access the park. There is a significant body of literature investigating this effect, as the equity of fees to access parks with regard to low income visitors has been one of the most debated issues in the recreation literature (Manning, 2011; Lamborn, Smith, & Burr, 2017)³³.

In summary, both the primary and secondary methodologies suggest a number of key points for future policies. First, the perception of crowding has a negative impact on the quality of visitor experience. Second there is variation among visitors for different trail characteristics such as the services available and how rustic the trail is. Third, overall there is opposition towards restrictive visitor management options, and this opposition is more pronounced among local users. Of the options for restricting access presented, a reservation system received the greatest support from users across different sites. In addition, willingness to pay is relatively inelastic, with 31 percentage point gap between those willing to pay \$5 and \$15. Fourth, there are potential equity concerns as lower-income groups are less likely to be willing to pay to access the park. These findings inform the policy options and evaluation criteria in the following section.

³² This may be due to the fact that the vast majority of BC resident respondents were from Metro Vancouver, and in the case of Joffre Lakes had to drive three hours to access the hike.

³³ For example, a study by Lamborn et al. (2017) based in Utah found behavioral evidence that low-income users are displaced by fees and will travel further to visit a site without fees.

Chapter 9.

Policy Options and Evaluation Criteria

This chapter presents the three options considered for analysis as well as evaluation criteria and measures.

9.1. Policy Options

There are a wide range of tools available to park managers which have been categorized in a number of different formats by researchers in the field. Manning (2011) categorizes these options into four different categories: increase in supply, increase in durability of resource, change in visitor behaviour, and limit use. There are a significant number of potential options available to park managers to manage visitors within each of these categories, but only three policy options are assessed in this report. These policies include examples from the categories of limiting access, increasing supply, and developing facilities³⁴.

9.1.1. Option 1: Day-Use Reservation System

The first option is an online day-use parking reservation system for visitors accessing the site to fit the management category of limiting use. For this option, park managers will need to assess the site's goals in terms of ecological and social impacts to be able to evaluate the number of available parking spaces. Thus, the reservation system must support the overall site goals as it relates to visitor use levels. As in the survey the sites have had significant challenges with crowding, this reservation system will result in a decrease in the overall number of people accessing the site. Existing constraints on parking availability will also be considered in setting the total number of spaces available for reservation. The system will only be in place during the busiest visitor use season, for example from June to September, with the option of expanding the time further.

³⁴ Additional measures in the other categories that could contribute to more effective implementation of the policies analyzed are discussed in Appendix F.

For BC Parks, this system will be combined with the existing online reservation system in place for backcountry permits and front-country campground spaces. In order to avoid re-sale of reservation spaces, reservations will be on a rolling basis rather than a fixed date when all reservations become available³⁵. A fee of \$5-\$10 will be charged to reserve a space, and the revenue from the fees is required to be reinvested at the site where it is received. Park staff on-site will check that visitors have a reservation and that their ID matches it. The online booking website will show when the parking lot is fully booked, with no longer access to the site. This option will be long-term but reviewed on an annual basis to ensure that park goals are met.

9.1.2. Option 2: Alternative Transportation System

The second option is to develop an alternative transportation system (ATS) for accessing park sites as a component of increasing the durability of the resource through developing facilities. This system will involve setting up parking areas in nearby gateway communities or other close locations and operating a shuttle bus service to the park in question. This shuttle bus will be operated by on a schedule communicated to the public online, with times to and from the site spread throughout the day. Designated parking for visitor vehicles at the site will still be available, and ridership on the ATS will be voluntary. An additional aspect will be increased enforcement of illegal parking by park users through fines and towing. When the fixed parking lot is full, visitors will be informed that to access the site they can park in the designated ATS lots in gateway communities and access the site through the shuttle system. For example, at Garibaldi Lake, the shuttle will operate between Whistler or Pemberton and the trailhead at Rubble Creek. This service will be in collaboration with Park Bus, the existing shuttle bus service which operates longer distances to parks from Vancouver.

The number of busses for access to a site will be set by the park managers based on demand levels, as well as the goals of the management plan. In cases where demand for the site is higher than the number of available parking places, the shuttle bus will facilitate increased access. Access to the site will be allocated on a first come

³⁵ Re-sale of camping reservations was previously a problem in BC Parks, and prompted the shift to a rolling reservation window rather than a single date when all reservations for the season become available (Laanela, 2016).

first serve basis limited by the number of shuttle busses in operation. This option will be long-term but reviewed on an annual basis to ensure that park goals are met.

9.1.3. Option 3: Increase Supply of Substitute Sites

The third policy option is to increase the number of accessible recreation opportunities in the area as a component of increasing supply. These opportunities will occupy similar spaces on the Recreation Opportunity Spectrum as sites that are currently experiencing capacity challenges. The new supply of trail infrastructure will be located within existing parks in the surrounding region. Capacity challenges have not been evenly spread across all parks and hiking trails in the area, but rather focused on sites that are easily accessible (S. Jones, personal communication, Dec 12, 2018). This option will increase the supply of recreation sites or hiking trails with similar activities and difficulty levels. Currently, many of the hikes in the sea to sky region are only accessible by vehicles with 4-wheel drive (M. Bittel, personal communication, January 18, 2019).

This option will develop existing provincial parks in the region that do not have completed management plans and are considered to be underutilized, such as Pinecone Burke and Callahan Lake Provincial Parks. The management plans for these parks will be developed to include the addition of new hiking trails and visitor facilities to the existing trail network. The management plans for these new areas will include plans for monitoring limits of acceptable change for both social and ecological indicators. Appropriate hardening of the new sites due to the increase in use levels including maintained trails with proper drainage will also be a component of this policy. The new facilities will be reviewed in 3 years to determine if additional actions are necessary to achieve social and ecological goals. This policy does not entail increasing supply indefinitely, and thus is short-term.

9.2. Evaluation Criteria

Table 3 displays a number of objectives and criteria for evaluating the given policy options. The goal of the evaluating the options with these measures is to display the trade-offs and rank their strengths. The weights of the different objectives are considered equal for the ranking of the policy options, and as such the objectives with

two criteria will be divided by two to arrive at a ranking out of three. The timeframe for evaluation of the criteria is short-term annual basis.

Table 9.1. Assessment Criteria

| Objective | Criteria | Measure | Index |
|---------------------------|--|---|---|
| Ecological Sustainability | Ecological Impact at Site in Question | Projected impact of policy on damage to soil, vegetation, air quality and wildlife as a result of visitor use at site | 1- Negative Impact or No Impact 2- Potential for positive impacts 3- Guaranteed positive impact |
| | Ecological Impact in surrounding region | Projected impact of policy on damage to soil, vegetation, air quality and wildlife as a result of visitor use in surrounding region | 1- Negative Impact or No Impact 2- Potential for positive impacts 3- Guaranteed positive impact |
| | | | Total/3 |
| Effectiveness | Quality of visitor experience | Reduction in number of visitor encounters with other users on the trail | 1- Increase in # of encounters, or no change 2- Potential decrease in # of encounters 3- Guaranteed decrease in # of encounters |
| Equity | Distributive Equity | Disproportionate impact of policy on specific groups ability to recreate | 1- Significant negative impact 2- Limited negative impact 3- No negative impact |
| Administrative Complexity | Ease of implementation | Required changes to existing management practices | 1- Low complexity (no changes) 2- Medium complexity (some changes) 3- High complexity (significant changes) |
| Cost | Impact on budget | Capital and yearly operating costs, less incremental revenue. Average yearly cost over first 3 years per site. | 1- \$100,000 or less 2- \$100,000-\$500,000 3- \$500,000 + |
| Stakeholder Acceptability | Acceptability to local users and user groups | Support for policy from local users and user groups | 1- Low support 2- Neutral support 3- High support |
| | Acceptability to non-resident users | Support for policy from non-resident users | 1- Low support 2- Neutral support 3- High support |
| | | | Total/3 |

9.2.1. Ecological Sustainability

The first factor is sustainability of the policy in terms of reducing the negative ecological impacts of visitor use. As discussed in chapter 4, there is a range of potential negative impacts from visitor usage including negative impacts to both wildlife and vegetation. There are two criteria considered in this objective: First, the projected impact of option on damage to soil, vegetation, and wildlife as a result of visitor use is considered for the site in question; second, the projected impact of the option on damage to soil, vegetation, wildlife, and species at risk from visitors in other areas in the same region (i.e. sea to sky corridor). There are three rankings for these criteria: negative Impact or no impact, potential for positive impacts, and guaranteed positive impact. The “potential for positive impacts” ranking is applied when a policy has the potential to improve ecological impacts, but this is limited by the characteristics of the site.

9.2.2. Effectiveness

For effectiveness, the social dimension and quality of visitor experience is considered. Although there is a large number of potential factors that influence the quality of experience, the criterion considered is the impact of policy on the experience of crowding at the site. Survey data showed that the most common area for visitors to experience crowding is either on the trail or at the viewpoint. As such, the measure for this criterion is the impact of the policy on the number of visitor encounters with other users on the trail. There are three rankings for this criterion: Increase in number of encounters or no change, potential decrease in number of encounters, and guaranteed decrease in number of encounters. The “potential for reduced encounters” ranking is applied when a policy may reduce encounters, but this is dependent on characteristics of the site.

9.2.3. Equity

Given that parks and protected areas are public resources, equity is one of the most important considerations, particularly for any policies that restrict visitor access. A number of studies in the recreation literature have investigated different dimensions of equity, providing a taxonomy of different aspects of equity (Manning, 2011). The primary

aspect of equity considered here is compensatory equity, or any disproportionate impact of the policy on the ability of specific groups to access the park. For example, any potential regressive impacts of the policy will be considered here.

9.2.4. Administrative Complexity

The administrative complexity, or how challenging the policy is for park managers to implement is also an important criterion to be considered for the options. With rising visitor use numbers and limited funding, park managers may have limited time and resources available to dedicate to implementing new policies³⁶. The specific measure considered for administrative complexity is the ease of implementation, measured by changes that would be required to the existing management framework. This could require no changes to the current framework, some changes to the current framework, or significant changes.

9.2.5. Cost

As discussed in Chapter 2, given the challenges with maintaining consistent funding often faced by park systems including BC Parks the cost of any proposed policy is an important consideration. The up-front capital cost of implementation, the ongoing cost per year of operating the policy, and any additional revenues raised as a result of the policy are considered. Cost will be calculated on a single site basis where appropriate, with Joffre Lakes serving as the example site to estimate cost. The measure is average yearly cost over the first three years, including all incremental costs and revenues.

9.2.6. Stakeholder Acceptability

The acceptability of the policy to stakeholders is key to achieving the park's mandate of providing recreation opportunities to the public. The acceptability of the policy is key to its overall success, as a policy with low acceptability may not be perceived as legitimate by users and be unsuccessful. The groups for whom acceptability is assessed are local users and user groups, and non-resident users. As

³⁶ B. Janyk, personal communication, December 19, 2018

explored in the survey results, there are important differences between these non-residents and local users in terms of support for different visitor management policies. Results from the survey, stakeholder interviews, and available literature will be used to assess overall acceptance for these two groups.

Chapter 10.

Analysis of Policy Options

This chapter covers the analysis of the three policy options with evaluation of the criteria. Results of the analysis are presented at the end of the chapter in Table 3.

10.1. Analysis of Policy Option 1: Day-Use Reservation System

In ecological sustainability for the site in question, a reservation system has the potential for positive impacts to the quality of the ecosystem. Ecologically sensitive areas such as alpine meadows are negatively impacted by high user levels, and would benefit from control in the number of visitors accessing the site (Hammitt & Cole, 1998; Keske & Mayer, 2014). For this policy, the number of individuals accessing the site is not dependent on demand, but rather is assessed and controlled by the park management. In addition, if the number of visitors is within the limits of acceptable change for the site, a reservation system offers a mechanism for monitoring to ensure that use levels remain within those limits. The recreation literature has, however, shown that in the majority of cases the ecological impacts from visitors who are hiking or camping are curvilinear in nature (Hammitt & Cole, 1998). As a result, for some areas that already have high user levels restricting access would not have significant ecological benefits unless user levels are drastically reduced (Newsome, et al., 2013)³⁷. For ecological impacts in the surrounding area, the impact of the policy is projected to have a negative impact. The recreation literature has identified that policies which restrict visitor access can push visitor impacts into surrounding areas (McCool, 2001). Trails that are informal or user made have a higher likelihood of negative impacts such as erosion (Pickering & Norman, 2017). Particularly in the sea-to-sky corridor where there are a limited number of hikes with maintained trails, limiting access alters visitors use patterns spatially towards at sites that are not maintained or designed for high-volume use levels (H. Harshaw,

³⁷ Studies have found that reducing the number of users at a site does not necessarily result in fewer people hiking off trail (D'Antonio & Monz, 2016).

personal communication, January 9, 2019). Thus, the total ranking for sustainability is 1.5/3.

For effectiveness, by limiting the number of people accessing the trail at one time more opportunities are provided for solitude (Manning, 2003). In addition, providing information online about when the park is the busiest and when reservations are full may contribute to individuals changing their travel plans to days or areas that are less busy. Individuals travelling to the site from a significant distance would be able to have guaranteed access to the site, meaning that they would not arrive after investing travel costs and not be able to access the site. As a result, the policy will have a guaranteed reduction in the number of encounters on the trail, ranking 3/3.

Regarding equity, there are significant concerns with a reservation system and the accompanying fee disproportionately impacting low income users. As discussed in the survey results and secondary analysis, lower-income individuals have a lower willingness to pay and are displaced by user fees³⁸. There are also equity concerns with a reservation system disproportionately impacting individuals who have flexible work schedules or are not able to plan their trips in advance for a variety of reasons (Manning, 2001). More specifically, the 13% of survey respondents who disagree with the statement that they plan hiking trips in advance based on how crowded they expect the trail to be are disproportionately impacted. In addition, users will not be able to easily change their recreation in the case of unexpected weather changes³⁹. This has potential safety implications if it results in individuals recreating in conditions that put their safety at risk. As a result, the ranking for equity is low or 1/3.

Regarding administrative complexity, studies from the recreation literature have described this option as high complexity (Manning, 2009). The policy requires setting up and testing a new system designed specifically for day-users⁴⁰. Although reservations systems for camping and backpacking have been in place for a number of years, reservations for day-use access are significantly more challenging due monitoring and enforcing the high number of reservations per day that would be required. In addition,

³⁸ An additional concern is the local users “paying twice” for park usage through taxes and user fees, while non-residents pay the user fee but not taxes.

³⁹ (M. Bittel. Personal communication, January 18 2019)

⁴⁰ In Provincial Parks, changes to the *Parks Act* would also be required to facilitate enforcement

the policy requires a high degree of enforcement in order to be successfully implemented. Previous information on the effectiveness of mandatory parking fees suggest that compliance rates were as low as 25% (BC Business, 2013). As a result, the administrative complexity is assessed to be high for a ranking of 1/3.

For costs, of the options considered a mandatory reservation system and fee is the most likely to have a net positive impact on operating budgets and has been ranked as low cost overall. Initial capital costs include setting up an addition to online reservation system for day use, and ongoing yearly costs include additional administration staff to manage the system as well as a significant number of enforcement staff to ensure compliance. While there are significant additional staffing costs for this system, the additional revenue collected as a result of the reservation system is likely to more than account for additional costs⁴¹. As a result, the anticipated cost is less than \$100,000, ranking 3/3.

For stakeholder acceptance, there are significant concerns from local users. The survey results found that 55% of local residents support an online reservation system, however only 43% of residents were willing to pay to have guaranteed access and 38% were willing to pay to have fewer encounters with other users. The secondary methodology also found that local users in BC as well as in other jurisdictions are less supportive of restrictive management tools when compared to tourists. Local user groups also expressed mixed support for a reservation system and associated fee, suggesting that it would be difficult to administer in a day-use format and that it should be a last case option far down the list of preferred actions (B. Janyk, personal communication, December 19, 2018). As a result, support from local users is assessed as low. For non-residents, both the survey results and examples from other jurisdictions in the secondary methodology show higher support for restrictive management options than local residents. For example, 61% of non-residents support a reservation system, 58% are willing to pay to have guaranteed access to the site, and 48% are willing to pay to have reduced encounters with other users. As a result, support from non-residents has been assessed as neutral, and overall acceptance for both groups is 1.5/3.

⁴¹ Further details on costs found in Appendix F

10.2. Analysis of Policy Option 2: Alternative Transportation System

For ecological sustainability, there is potential for an alternative transportation system to have positive impacts at the site in question. Shuttle systems can result in fewer vehicles on roads in or surrounding the park in question, as well as fewer vehicles idling while waiting for parking spaces. Shuttle systems can result in reduced air pollution, noise pollution, and lower the potential for vehicle and wildlife collisions through a reduction in personal motor vehicles (S. Lawson et al., 2011; S. R. Lawson, Newman, & Monz, 2017; Taff et al., 2013). In addition, there is a reduction in vegetation damage from inappropriate parking (Dunning, 2005). These impacts, however, are dependent on voluntary usage of the shuttle system and successful enforcement of illegal parking. Through facilitating access to the site, the number of users is projected to either remain the same or increase in number. For example, some areas of Rocky Mountain National Park in the US had twice as many visitors with an ATS compared to when the area was only accessible through private vehicle (S. Lawson et al., 2011). Although the impacts of use are curvilinear, there is still potential for increased visitor levels to have negative impacts in sensitive alpine ecosystems. Through facilitating access to the site in question, however, there are no concerns with inadvertently pushing users elsewhere into areas that are not managed. Due to this fact, the impact on the surrounding area is assessed as positive due to being concentrated at sites with existing high use levels. Overall, the total ranking for sustainability is 2.5/3.

Regarding effectiveness, there are a number of conflicting impacts for an ATS. On one hand, shuttle systems do have the potential to decrease traffic congestion entering the park and improve visitor safety due to decreased vehicle usage. (S. Lawson et al., 2011). A shuttle system also provides park managers with some degree of control over the timing of visitor access for those on the shuttle (S. R. Lawson & Manning, 2001). Spreading out the same number of visitors temporally could reduce the number of encounters. Unless there are also additional restrictions limiting the number of users, however, a shuttle system that facilitates easier access has the potential to further exacerbate crowding on the trail. National parks in the US that have had shuttle systems in place for a number of years continue to have issues with capacity challenges and overcrowding when shuttle systems have been added to existing parking (Lawson et al.,

2017). Due to these conflicting impacts, the option has been assessed as 1/3, having no change in the number of encounters.

For equity, there are no disproportionate impacts on the ability of any groups to access the site or recreate, particularly given that this policy is voluntary. In addition, instituting a shuttle system allows for more equitable access for individuals in gateway communities who do not own private motor vehicles. Other surveys have found transportation to be a barrier for ethnic minorities in accessing parks (Perry et al. 2015). More specifically, the 15% of Squamish residents, 17% of Pemberton residents, and 43% of Whistler residents for whom a vehicle is not their primary mode of transportation will now have access to the sites without use of a private vehicle (Statistics Canada, 2017c). As a result, the ranking for equity is 3/3.

For administrative complexity, this option fits relatively easily into existing management practices and there are a number of local examples to learn from. More specifically, a shuttle system has been implemented successfully at other parks in the area such as Mount Seymour Provincial Park, and the longer distance Park Bus system has also been operating for a number of years. Ensuring that the system is successful at the site is question would, however, ideally involve some traffic modelling at the site in question. New “park and ride” locations would also need to be set up in gateway communities, which would require consultation with the municipality in question such as Pemberton⁴². As a result, the ranking is 1/3.

For costs, there are a number of ongoing costs for an ATS system. Rather than developing an ATS system in house, the system would be developed through a contract with Park Bus, who currently operates shuttle systems to a number of different national and provincial parks. Taking Joffre Lakes as an example, the approximate round-trip cost of a shuttle service is \$5 per passenger⁴³. As a result, the ranking is medium or 2/3 with costs between \$200,000 - \$500,000/year depending on site specifics.

Overall stakeholder acceptance for this policy is expected to be high for both local users and non-residents. No specific question in the survey addressed this directly, however, question 16 in the survey did ask visitors whether they would prefer

⁴² Point raised by Pemberton Mayor (M. Richman, personal communication, January 16, 2019)

⁴³ Based on estimates provided by Park Bus, further details provided in Appendix F.

guaranteed access to the site and more crowding or limited access and less crowding. Overall, 71% of respondents preferred maintaining guaranteed access to the site even if it meant that the site was more crowded (63% for non-residents and 72% for BC residents). Other studies on user acceptance of alternative transportation systems that have been instituted in parks and protected areas such as Yosemite and Rocky Mountain National Park have also found that visitors are supportive of voluntary shuttle systems (Taff et al., 2013). In particular, a voluntary system may result in less perceived loss of freedom when compared with a mandatory system. As a result, the overall ranking for acceptance across both groups is 3/3.

10.3. Analysis of Policy Option 3: Increase Supply of Substitute Sites

For ecological sustainability the impact at sites in question to develop new trails and recreation areas is projected to be negative. The construction of new trails and increasing the number of visitors in areas without high levels of visitation will create additional impacts to soils, vegetation, and wildlife. The extent of these impacts depends on the ecological characteristics of the site, however if usage in the area where the trail is being constructed has previously been low there will be negative impacts resulting from the curvilinear impacts from visitor usage (Marion et al., 2016). Some of these impacts can be managed by ensuring that trails are properly constructed with hardened surfaces and drainage to prevent soil erosion (Hammitt & Cole, 1998). For ecological impact on surrounding region, there is a potential ecological benefit by providing an increased number of sites that are adequately maintained and monitored, with fewer visitors on informal trail systems (T. Ball, personal communication, January 25, 2019). As a result, the overall ranking for sustainability is 1.5/3.

Regarding effectiveness, there is potential that expanding the supply of sites that offer similar experiences will take some of the use pressure off of sites experiencing the highest use levels. In particular, developing recreation opportunities in Pinecone Burke Provincial Park and Callahan Lake Provincial park has the potential to provide alternate recreation sites for the growing lower mainland population. This impact, however, is dependent on the substitutability between the new sites and the sites experiencing crowding. The substitutability of a site depends on a number of factors including transportation time, motivations, and place attachment. Regression analysis of similar

studies on campers and place attachment has shown that there is a negative relationship between place attachment and willingness to substitute sites (Wynveen, et al., 2008). As a result, the 39% of survey respondents who indicated that they have a personal connection to the park where they were surveyed may be less likely to relocate their activities to another site. Overall, this potential for reduction in the number of encounters is given a ranking of 2/3.

For equity, similar to the shuttle system, increasing the number of accessible sites may also improve equity from the status quo. For example, increasing the number of accessible sites in the area will allow visitors without access to four-wheel drive vehicles increased opportunity to recreate. Moreover, to the extent that current capacity challenges limit access, increasing supply distributes the personal health benefits of being in nature to a wider range of individuals. As a result, there are no significant concerns or disproportionate distributional impacts associated with this policy, ranking 3/3.

For administrative complexity, on one hand, building trails and updating management plans is not a new approach for BC Parks or the managers of municipal park systems. In some regards, this approach is expanding the existing work being done by managers and is not an overall change of direction that is untested. On the other hand, this approach is wider in scope than the other options considered and involves looking at the broader network of trails trail infrastructure in the region. This requires coordination across different parks, discussion between FLNRO, BC Parks, and particularly Ministry of Transportation in order to improve accessibility. In addition, the Sea to Sky Corridor Recreation Trail Strategy which includes zoning designations for different user activities may need to be re-negotiated depending on the extent of the changes (Ministry of Tourism Sport and the Arts, 2008). Thus, this option's ease of implementation is projected to be medium or 2/3.

Regarding costs, expanding the infrastructure of accessible hiking trails is projected to be the highest of the three options reviewed projected. The capital cost for this option include the trail construction and construction of visitor facilities. Ongoing costs include trail maintenance, additional enforcement staff for the new region, and additional planning staff to develop the management plans. In addition, there is the potential for

significant capital costs for road upgrades and parking⁴⁴. As a result, costs for this option are ranked as above \$500,000 or a ranking of 1/3.

For stakeholder acceptance, results from the survey show that this policy had the most consistent support of the options offered in the survey⁴⁵. For local users, 65% of respondents supported expanding supply. Support for increased trail infrastructure was also expressed by the BC Federation of Mountain Clubs as well as the Canadian Parks and Wilderness Society, who noted that there has been no investment in the overall trail infrastructure to keep up with demand. There is, however, potential push back to this option from crowd-averse local users who are currently recreating in the area where new recreation sites would be established. More specifically, the sea to sky corridor has a number of different user groups including mountain bikers and motorized recreation vehicle users. Rezoning or changing management plans in order to allow for increased access to particular areas will potentially be opposed by other types of users in the area. As a result, overall acceptance for residents was ranked as neutral. For non-residents, support for this option has also been assessed as neutral as although there are not the same concerns with displacing local users, support in the survey was lower at 45%. A potential reason for this is that non-residents may be more motivated to visit well known “must see” locations. As a result, overall acceptance for both groups is assessed as neutral or 2/3.

⁴⁴ Further details on cost found in Appendix F.

⁴⁵ While this survey specifically asked about rezoning areas that had been previously zoned for conservation, the proposed option does not include reducing the size of conservation areas. As a result, user support for expanding access to areas that are underutilized due to the lack of management plans would likely be higher than indicated by the survey results.

Table 10.1. Analysis Results

| Criteria | Reservation System | Alternative Transportation System | Increase Supply of Substitute Sites |
|---------------------------------------|---|---|--|
| Ecological Impact at Site in Question | Potential for positive ecological impacts (2) | Potential for positive ecological impacts (2) | Negative ecological impacts (1) |
| Ecological Impact in surrounding area | Negative spillover impacts (1) | Positive ecological impacts (3) | Potential for positive ecological impacts (2) |
| Sustainability Total | 1.5 | 2.5 | 1.5 |
| Reduction number of encounters | Guaranteed decrease in number of encounters (3) | No change (1) | Potential to decrease number of encounters (2) |
| Equity | Significant negative impact (1) | No negative impacts (3) | No negative impacts (3) |
| Administrative Complexity | High Complexity (1) | Low complexity (3) | Medium Complexity (2) |
| Impact of policy on budget | <\$100,000 (3) | \$200-500,000 (2) | \$500,000+ (1) |
| Local User Acceptance | Low (1) | High (3) | Neutral (2) |
| Non-resident Acceptance | Neutral (2) | High (3) | Neutral (2) |
| Acceptance Total | 1.5 | 3 | 2 |
| Total/18 | 11 | 14.5 | 11.5 |

10.4. Recommendations

Analysis of the three options as displayed in Table 3 indicates that overall an ATS has a greater number of advantages when compared with the other two options. An ATS excels in its user acceptance, equity, and is relatively low complexity. An ATS is also unique when compared with the other options in that it allows for potential positive ecological impacts without negative spillover effects to surrounding areas. Overall, facilitating usage at existing sites without restricting access but altering usage in a manner that decreases ecological impacts is an ideal strategy. A key weakness of this policy, however, is that while there may be improvements to traffic congestion there may be no improvement to the experience of crowding on the trail. This analysis also

highlights that in for some options there is a trade-off between ecological goals, where at high levels of use concentrating users in the preferred approach, and social goals which benefit from spreading users across different sites to reduce the number of encounters on the trail.

Despite this finding, there is no single solution that can address all of the challenges associated with park visitor management or be applied at all sites regardless of context⁴⁶. Rather, the choice of management tool depends on the goals for the specific site in question as established by tools such as LAC and ROS. As such, the establishment and monitoring of LAC is essential across all sites to determine the appropriate response. Recommendations for the options above are also discussed below in relation to the three survey sites.

For Garibaldi Lake and Joffre Lakes, both expanding supply in the surrounding area and an ATS are recommended options to address capacity challenges. In the short-term, a shuttle system can provide relief for current parking challenges if accompanied by enforcement staff. Implementation of this system should be in collaboration with Park Bus rather than developing the system in-house from the ground up. Implementation will also require coordination with gateway communities Squamish, Pemberton, and Whistler on potential parking areas. In the medium term, expanding supply in the region through completing the management plans of Pinecone Burke and Callaghan Lake provincial parks is an option that requires more significant investment and consultation and will take longer to be implemented. Development of the management plans for additional trail infrastructure should take place alongside engagement sessions with user groups to determine appropriate locations for development.

A reservation system for day-use hikers beyond the backcountry camping service already in place is not currently recommended, as the risk in pushing users to alternative areas that are not managed is currently too high. In the long term, a reservation system limiting access is only recommended as a last option in circumstances where limiting access is necessary to protect particularly fragile ecosystems or for safety purposes. Limiting access on the basis of perceived crowding alone is not recommended or

⁴⁶ Additional implementation recommendations found in Appendix G

supported by the majority of users. Specifically for Joffre Lakes where support for a day-use reservation system is highest, it is recommended that this option be re-evaluated only after alternative sites and an ATS have been established.

For Deep Cove, an ATS is not recommended due to existing service from municipal transit services. In addition, the district has recently banned tour busses to the community during summer months, and a shuttle system would contradict this approach. Given the hike's short length and its proximity to an urban centre, a day-use reservation system is also not recommended as users do not have to invest the same travel time or costs. The current approach where a quota is enforced only when necessary for safety purposes is recommended in the short term. In the medium-term, expanding alternative trail infrastructure in the surrounding area is recommended, however the proximity to the urban environment places limits on this expansion.

Chapter 11.

Conclusion

As the analysis has shown, park managers face difficult trade-offs between multiple objectives including visitor experience, access, equity, and ecological sustainability. Facilitating access to nature is key to the continued support for parks and protected areas in the future, but the aspects that make these areas unique must also be preserved for future users. Regardless which of the options discussed are implemented, the parks system in the province will require increased resources for maintenance, enforcement, monitoring, and education as demand continues to grow⁴⁷.

Rather than looking at sites only on an individual basis, considering recreation opportunities within the entire area of southwestern BC provides an opportunity for strategic planning. As the survey has shown, there is considerable diversity in visitor preferences and motivations for recreation. As such, providing a range of different opportunities along the recreation opportunity spectrum within the region is an effective approach. This process requires coordination between BC Parks, FLNRO, local municipalities, as well as the participation of user groups who possess valuable on the ground experience. While a big picture approach requires greater coordination, the benefits are a system that minimizes conflict, and maximizes both social and ecological objectives for future users.

⁴⁷ See appendix G for additional implementation recommendations including funding mechanisms

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Appendix A.

BC Parks Classification Table

Table A.1. BC Parks Classification Table

Source: BC Parks (2018d)

| Designation | Area (ha) | Establishing Legislation | Purpose | Permitted Activities |
|---------------------|------------|---|---|--|
| Ecological Reserves | 160,289 | Order in Council under <i>Ecological Reserve Act</i> or inclusion in schedule of <i>Protected Areas of BC Act</i> | Ecological purposes including science, preservation of representative ecosystems | No extractive activities permitted, open to public but not established for outdoor recreation |
| Class A Parks | 10,516,435 | Order in Council under <i>Park Act</i> or inclusion in Schedule of <i>Protected Areas of BC Act</i> | Preservation of environment and enjoyment of public | Development limited to what is necessary for recreation, commercial logging, mining hydroelectric not permitted |
| Class B Parks | 3,778 | Order in Council under <i>Park Act</i> | Preservation of environment and enjoyment of public | Same as class A, but may permit a broader range of uses that are not detrimental to recreation values |
| Class C Parks | 484 | Order in Council under <i>Park Act</i> | Preservation of environment and enjoyment of public | Same as Class A, but must be managed by a local board |
| Conservancies | 2,999,899 | <i>Park Act</i> or <i>Protected Areas of BC Act</i> | Preservation of biological diversity, preservation of First Nations social, ceremonial and cultural uses, protection of recreation values | Wider range of low-impact activities permitted, commercial logging, mining hydroelectric not permitted |
| Protected Areas | 383,892 | Order in Council under <i>Environment and Land Use Act</i> | To ensure aspects of preservation are considered in land use and resource development | Have one or more activities (i.e pipeline, road) that are not allowed in parks, activities are determined by provisions specific to area |

| Designation | Area (ha) | Establishing Legislation | Purpose | Permitted Activities |
|------------------|-----------|--|---|---|
| Recreation Areas | 5,929 | Order in Council under <i>Environment and Land Use Act</i> | Areas set aside for public recreational use (all currently under review be fully protected) | Mineral resource evaluation permitted under time-limited tenure |

Appendix B.

Survey Sites

Joffre Lakes

Joffre Lakes is a 1460-hectare Class A provincial park located 35 kilometres from Pemberton BC and 182 kilometres from Metro Vancouver. The park features a 5-kilometre hike past Lower, Middle, and Upper Joffre Lake, which sit below the Matier Glacier and the 2,721-meter Joffre Peak. Lower Joffre Lake is immediately accessible as a 5-minute walk from the parking lot. The park also features 26 backcountry campsites at the upper lake (BC Parks, 2018e). There is currently a \$5 permit for overnight backcountry camping, which can be purchased online but does not reserve a site. As previously mentioned, visitor attendance has increased as much as 191% since 2008/09. Recent measures taken by park staff include prohibiting dogs on the trail as of May 2018. In addition, BC parks reported that they would be towing cars illegally parked along highway 99 that have overflowed from the parking lot (Pawson, 2018, Aug. 31). Illegally parked vehicles have presented a safety challenge with visitors walking along highway 99 in order to access the park. Joffre Lakes also recently underwent trail construction to improve the durability and accessibility of the hike (S. Jones, personal communication, December 10, 2018).

Garibaldi Lake

Garibaldi Provincial Park is a 194,000-hectare Class A provincial park, with the trailhead to Garibaldi Lake located 98 kilometres from Metro Vancouver. Visitor attendance has also risen in recent years at this park, though not as dramatically as at Joffre Lakes, rising 85% since 2008/09. Based on anecdotal evidence from BC Parks staff reported by Kohlhardt et al. (2018), in some areas of the park use has increased by up to 300%. Garibaldi Lake is one of the most popular areas within Garibaldi Provincial Park. The hike to the lake from the Rubble Creek trailhead is 9 kilometres in length, with 50 backcountry sites at the lake and 40 located 7.5 kilometres along the trail at Taylor Meadows. Garibaldi is one of only three provincial parks in BC that now requires online reservation year-round for backcountry camping as of 2016 (CBC News, June 22 2016). The reservation fee is \$10 per person, and dogs are also banned in the park. Winter use

in the park has also dramatically increased with the popularity of backcountry ski touring, particularly in the Spearhead area, which had its management plan updated in 2014 (BC Parks, 2014).

Deep Cove

Third, the Quarry Rock hike is located in Deep Cove BC and is a short 3.8 kilometre round trip hike which leaves from the community of Deep Cove and follows the Baden Powell trail (Vancouver Trails, 2018). The trailhead for the hike is located approximately 20 kilometres from downtown Vancouver and is accessible by public transit. The site is managed through the District of North Vancouver, who instituted a number of new starting in summer 2018 after to capacity concerns were raised. These changes include parking restrictions, commercial bus restrictions, and the ability for park rangers to limit the number of hikers at the peak to 70 at a time (District of North Vancouver 2018; Baker, 2018). While this location differs significantly from the BC Parks sites as a peri-urban park, or a park in the urban/rural fringe (Arnberger & Brandenburg, 2007), it has been included as a comparison due to the significant challenges with crowding and measures that have already been taken by the district.

Appendix C.

Survey Statistics

Table C.1. ANOVA Survey Results

| ANOVA Test – Site differences (Joffre, Garibaldi, Deep Cove) by Question | | | |
|--|-------------|-------------|--------------|
| | F-Statistic | F- Critical | P-Value |
| Q6a. Hiking Motivation Solitude | 4.837** | 3.066 | 0.009** |
| Q6b. Hiking Motivation Family | 0.537 | 3.065 | 0.585 |
| Q6c. Hiking Motivation Nature | 1.081 | 3.065 | 0.342 |
| Q6d. Hiking Motivation Health | 0.191 | 3.065 | 0.826 |
| Q7a. Wide Paved Trails | 3.290** | 3.065 | 0.028** |
| Q7b. Narrow Single Track | 2.424 | 3.065 | 0.093* |
| Q7c. Educational Opportunities | 1.674 | 3.065 | 0.191 |
| Q8. View Importance | 7.095** | 3.065 | 0.001** |
| Q9. WTP to enter (\$5) | 3.872** | 3.248 | 0.029** |
| Q9. WTP to enter (\$10) | 0.590 | 3.220 | 0.558 |
| Q9. WTP to enter (\$15) | 4.342** | 3.200 | 0.018** |
| Q10. Feeling of Crowding | 13.816** | 3.065 | 3.596 E-06** |
| Q12. +/- Impact of Use Levels | 3.784** | 3.066 | 0.025** |
| Q15a. Plan Ahead | 1.504 | 3.065 | 0.226 |
| Q15b. Ecological Impact Concern | 0.610 | 3.065 | 0.545 |
| Q16. Limited Access yes/no | 1.263 | 3.066 | 0.286 |
| Q17a. First Come First Serve | 2.306 | 3.065 | 0.104 |
| Q17b. Reservation System | 3.677** | 3.065 | 0.028** |
| Q17c. Peak Access Fee | 0.064 | 3.065 | 0.064* |
| Q17d. Rezoning/ New Trails | 0.442 | 3.065 | 0.643 |

** p<0.05 , *p<0.1

Table C.2. Chi-Squared Survey Results

| Chi-Squared Test, Question Cross tabulations | | | |
|---|----------------------|------------------|-------------|
| | Pearson Chi Squared | Likelihood Ratio | P-Value |
| Q4 personal connection* 15b environment concern | Assumptions Violated | 12.463** | .014** |
| Q10 Crowding Experience* Q12 Crowding impact | 31.394** | | 1.5236E-7** |
| Q15a) Planahead * Q17d) Rezoning | Assumptions Violated | 14.273 | .006** |
| Q15a)Planahead*Q17c)Peakprice | Assumptions Violated | 15.363 | .004** |
| Q15a)Planahead*Q17a)cap | 7.716 | | .103 |
| Q15a)Planahead*Q17b)reservation | Assumption Violated | 9.345 | .053 * |
| Q12 Satisfaction*Q17b)reservation | 14.787 | | .005** |
| Q12 Satisfaction*17a)cap | 3.158 | | .532 |
| Q12 Satisfaction*17c)peakprice | 15.230 | | .004** |
| Q12 Satisfaction*17d)rezoning | 3.159 | | .532 |
| Q12 Satisfaction*Q9 totalwtp | 4.843 | | .089* |
| Q12 Satisfaction*Q16 limited access | 20.056 | | .000** |
| | | | |
| Q22 BCresident*Reservation | .462 | | .794 |
| Q22 BC resident*cap | 4.493 | | .106 |
| Q22 BC resident*peak price | 6.090 | | .048** |
| Q22 BC resident*rezoning | 3.833 | | .147 |
| Q12 Satisfaction * Q9 \$5 | 3.378 | | .185 |
| Q12 Satisfaction * Q9 \$10 | Assumptions Violated | 2.043 | .360 |
| Q12 Satisfaction * Q9 \$15 | 1.632 | | .442 |

Appendix D.

Survey

You are being invited to participate in a research study to explore hikers' experiences on popular BC trails. This study is being conducted by principal investigator Clayton Neufeldt, a Masters Candidate in the School of Public Policy at Simon Fraser University. The purpose of this research study is to inform different options for visitor management and crowding on hiking trails in Southwestern British Columbia.

Your participation in this survey is completely voluntary, and you are free to stop the survey at any point. No identifying information will be requested. Once submitted, responses cannot be withdrawn as surveys will not contain any identifying information. Your responses will remain confidential and will only be used for the purposes of research to inform a graduate project. Your privacy will be ensured by storing all printed results in a locked cabinet and storing all data on a secure SFU server to which only the principle investigator will have access. The results of this survey will be reported in a graduate capstone project, which will be uploaded to SFU's research depository upon completion. The survey should take you no longer than 10 minutes to complete.

1. What activity did you visit the park for today?
 - ☐ Hiking
 - ☐ Overnight Backpacking
 - ☐ Other, please specify _____
2. During the average hiking season, how often do you go hiking on trails in the region?
 - ☐ Maybe once a month
 - ☐ Once every other week
 - ☐ Once a week
 - ☐ Twice a week
 - ☐ More than twice a week
3. How many times have you visited this particular hike in the past year (including today)?
 - ☐ 1
 - ☐ 2
 - ☐ 3
 - ☐ 4+
4. Indicate whether you agree or disagree with the following statement:
I have a personal connection to this trail or park.
 - ☐ Strongly agree
 - ☐ Somewhat agree
 - ☐ Neither agree nor disagree
 - ☐ Somewhat disagree
 - ☐ Strongly disagree
5. How long did you spend traveling to access this trail?
 - ☐ Less than 1 hour
 - ☐ 1 hour - less than 2 hours
 - ☐ 2 hours - less than 3 hours
 - ☐ 3 hours - less than 4 hours
 - ☐ 4 hours or more
6. Indicate whether you agree or disagree with the following statements:
 - a. I go hiking to get away from people and experience solitude.
 - ☐ Strongly agree
 - ☐ Somewhat agree
 - ☐ Neither agree nor disagree
 - ☐ Somewhat disagree
 - ☐ Strongly disagree
 - b. I go hiking to spend time with friends or family.
 - ☐ Strongly agree
 - ☐ Somewhat agree
 - ☐ Neither agree nor disagree
 - ☐ Somewhat disagree
 - ☐ Strongly disagree
 - c. I go hiking to enjoy the sights and smells of nature.
 - ☐ Strongly agree
 - ☐ Somewhat agree
 - ☐ Neither agree nor disagree
 - ☐ Somewhat disagree
 - ☐ Strongly disagree
 - d. I go hiking to get a good workout and improve my health.
 - ☐ Strongly agree
 - ☐ Somewhat agree
 - ☐ Neither agree nor disagree
 - ☐ Somewhat disagree
 - ☐ Strongly disagree
7. When choosing between different trails ahead of time, to what extent do the following characteristics add to or detract from choosing that trail?

a. Wide, smooth, and well-maintained trails with clear signs

- ☐ Strongly attract
- ☐ Somewhat attract
- ☐ Neutral
- ☐ Somewhat deter
- ☐ Strongly deter

b. Rustic, single track trails

- ☐ Strongly attract
- ☐ Somewhat attract
- ☐ Neutral
- ☐ Somewhat deter
- ☐ Strongly deter

c. Educational opportunities such as interpretive signs about the area's plants, wildlife, and history along the trail

- ☐ Strongly attract
- ☐ Somewhat attract
- ☐ Neutral
- ☐ Somewhat deter
- ☐ Strongly deter

8. On a scale of 1-5 with 1 being not important at all and 5 being extremely important, how important is it to you to access a scenic view on your hike?

- ☐ 5 - Extremely important
- ☐ 4
- ☐ 3
- ☐ 2
- ☐ 1 - Not at all important

9. Suppose that the trail you are hiking is being managed to control the number of visitors accessing the trail. Please answer the

following two questions with this scenario in mind.

a. Would you be willing to pay a day-use fee of (\$___)⁴⁸ in order to have guaranteed access to this trail?

- ☐ Yes
- ☐ No

b. Would you be willing to pay \$(___)⁴⁹ in order to have half as many encounters with other hikers on this trail?

- ☐ Yes
- ☐ No

10. On average, how crowded did it feel on your hike today?

- ☐ Not crowded at all
- ☐ Not too crowded
- ☐ Somewhat crowded
- ☐ Very crowded

11. Where did it feel the most crowded during your visit?

- ☐ While actually hiking on the trail
- ☐ While stopped at a viewpoint
- ☐ While parking or at entrance to the park
- ☐ At a campsite
- ☐ Did not notice crowding

12. Overall, the number of other people on the trail today made my hiking experience:

- ☐ Much better
- ☐ Somewhat better
- ☐ No effect
- ☐ Somewhat worse
- ☐ Much worse

⁴⁸ \$5, \$10, or \$20 depending on version completed

⁴⁹ \$5, \$10, or \$20 depending on version completed

13. Overall, the amount of litter on this trail made my hiking experience:

- ☐ Much better
- ☐ Somewhat better
- ☐ No effect
- ☐ Somewhat worse
- ☐ Much worse

14. Overall, my impression of the trail's maintenance was:

- ☐ Very positive
- ☐ Somewhat positive
- ☐ Neither positive nor negative
- ☐ Somewhat negative
- ☐ Very negative

15. Indicate to what extent you agree or disagree with the following statement.

a. I choose hikes ahead of time based on how busy I expect the trail to be.

- ☐ Strongly agree
- ☐ Somewhat agree
- ☐ Neither agree nor disagree
- ☐ Somewhat disagree
- ☐ Strongly disagree

b. I am concerned with my ecological impact when planning recreation activities.

- ☐ Strongly agree
- ☐ Somewhat agree
- ☐ Neither agree nor disagree
- ☐ Somewhat disagree
- ☐ Strongly disagree

16. If given the option, would you choose (pick only one of the following):

- ☐ Having guaranteed access to the trail, and encountering a large

number other hikers during your hike.

- ☐ Having a 50% chance of accessing the trail due to a quota, and encountering very few other hikers during your hike.

17. Indicate whether you would support or oppose the following visitor management measures:

a. A first come first serve cap on the number of hikers allowed on the trail.

For example, the first 100 hikers to the trail-head would be allowed access while hikers that come later would be required to wait until there are fewer people on the trail.

- ☐ Strongly Support
- ☐ Somewhat Support
- ☐ Neither Support or Oppose
- ☐ Somewhat Oppose
- ☐ Strongly Oppose

b. An online reservation system for accessing this trail.

For example, in order to hike on this trail you would need to reserve a space ahead of time through an online system, similar to other reservation systems for camping.

- ☐ Strongly Support
- ☐ Somewhat Support
- ☐ Neither Support or Oppose
- ☐ Somewhat Oppose
- ☐ Strongly Oppose

- c. An access fee that would apply during peak times.

For example, the fee would be in place during the busiest weeks of the summer, but would be lowered or removed during less busy times.

- ☐ Strongly Support
- ☐ Somewhat Support
- ☐ Neither Support or Oppose
- ☐ Somewhat Oppose
- ☐ Strongly Oppose

- d. Rezoning conservation areas to allow for the construction of more hiking trails.

For example, areas in the park that had previously been closed to trail building to would have new trails constructed in them.

- ☐ Strongly Support
- ☐ Somewhat Support
- ☐ Neither Support or Oppose
- ☐ Somewhat Oppose
- ☐ Strongly Oppose

18. What gender do you identify with?

- ☐ Male
- ☐ Female
- ☐ Other

19. What is your household income level?

- ☐ Less than \$20,000
- ☐ \$20,000 - \$39,999
- ☐ \$40,000 - \$59,999
- ☐ \$60,000 - \$79,999
- ☐ \$80,000 - \$99,999
- ☐ \$100,000 +

20. What is the highest level of education that you have completed?

- ☐ Less than High School
- ☐ High School or equivalent
- ☐ Some Post-Secondary
- ☐ Trade-Certificate / Apprenticeship
- ☐ College Diploma
- ☐ Bachelor's Degree
- ☐ Masters or PhD

21. Please indicate your age range:

- ☐ 14 - 24
- ☐ 25 - 34
- ☐ 35 - 44
- ☐ 45 - 54
- ☐ 55 - 64
- ☐ 65 - 74
- ☐ 75 +

22. If you currently are a BC resident, in what area do you live?

- ☐ Not a BC resident
- ☐ Vancouver and Lower Mainland
- ☐ Vancouver Island and Gulf Islands
- ☐ Whistler, Pemberton, Squamish or other Sea to Sky
- ☐ Thompson Okanagan
- ☐ Northern BC and Haida Gwaii
- ☐ Kootenay Rockies
- ☐ Other, please specify

(End of survey if BC resident)

Appendix E.

Sample Description

Table E.1. Sample Description Statistics

| | All Sites | Deep Cove | Garibaldi | Joffre |
|------------------------------------|-----------|-----------|-----------|--------|
| Gender | | | | |
| Male | 46.27% | 35.14% | 58.33% | 40.43% |
| Female | 52.99% | 62.16% | 41.67% | 59.57% |
| Other | 0.75% | 2.70% | 0 | 0 |
| Age | | | | |
| 14-24 | 25.00% | 30.43% | 20.41% | 28.26% |
| 25-34 | 50.00% | 43.48% | 51.02% | 52.17% |
| 35-44 | 11.67% | 8.70% | 12.24% | 13.04% |
| 45-54 | 8.33% | 8.70% | 10.20% | 4.35% |
| 55+ | 5% | 8.70% | 6.12% | 2.17% |
| Household Income | | | | |
| > \$20,000 | 17.83% | 14.29% | 17.39% | 21.74% |
| \$20,000 - \$39,999 | 12.40% | 20.00% | 10.87% | 8.70% |
| \$40,000 - \$59,999 | 11.63% | 5.71% | 15.22% | 10.87% |
| \$60,000 - \$79,999 | 13.18% | 11.43% | 13.04% | 15.22% |
| \$80,000 - \$99,999 | 13.18% | 20.00% | 10.87% | 8.70% |
| \$100,000 + | 31.78% | 28.57% | 32.61% | 34.78% |
| Residence | | | | |
| BC Resident | 76.52% | 85.29% | 69.39% | 76.60% |
| Non-BC Resident | 23.48% | 14.71% | 30.61% | 23.40% |
| Education | | | | |
| High School or less | 5.97% | 5.26% | 4.17% | 8.70% |
| Some Post-Secondary | 8.96% | 13.16% | 12.50% | 2.17% |
| Trade-Certificate / Apprenticeship | 2.24% | 2.63% | 2.08% | 2.17% |
| College Diploma | 11.19% | 13.16% | 8.33% | 13.04% |
| Bachelor's Degree | 41.79% | 36.84% | 35.42% | 52.17% |
| Masters or PhD | 29.85% | 28.95% | 37.50% | 21.74% |

Appendix F.

Cost Estimates

Where costs estimates were taken from other jurisdictions and years, costs were adjusted to 2019 dollars using the CPI index, then converted to 2019 CAD. Costs for staff are based on the average salary rates from the BC government (British Columbia, 2019).

Table F.1. Cost Estimates Option 1 Day Use Reservation System

| Item | Cost | Quantity | Total, 3 years |
|------------------------|---------------------|--|----------------|
| Costs | | | |
| Park Assistant | \$23,000 (6 months) | 4 * 3 years | \$276,000 |
| Administrative Officer | \$60,000/year | 1 * 3 years | \$180,000 |
| Conservation Officer | \$63,000/year | 1 * 3 years | \$189,000 |
| Online system upgrades | \$10,000 | 1 | \$10,000 |
| Total | | | \$655,000 |
| Total/ 3 | | | \$218,333 |
| Revenues | | | |
| Reservation Fee | \$5 | 120,000 visitors * 68% WTP * 70% compliance rate | \$856,800 |
| Total/3 | | | \$285,600 |
| Suplus/Deficit | | | \$67,267 |

Table F.2. Cost Estimates Option 2 ATS

| Item | Cost | Quantity | Total, 3 years |
|----------------------------|---------------------|----------------------|----------------|
| Round trip shuttle service | \$5.45/ person | 60,000 (120,000 / 2) | \$981000 |
| Park Assistant | \$23,000 (6 months) | 2 | \$138000 |
| Total | | | \$1119000 |
| Total/3 | | | \$373,000 |

Table F.3. Cost Estimates Option 3 Increase Supply

| Item | Cost | Quantity | Total, 3 years |
|--------------------------------|-----------------------------------|-------------|----------------|
| Trail construction | \$26441/mile (Oh & Hammitt, 2010) | 20 miles | \$528,820 |
| Maintenance Cost ⁵⁰ | \$15364/mile | 20 miles | \$95,160 |
| Conservation Officer | \$63,000/year | 1 * 3 years | \$189,000 |
| Land Use Planner | \$80,000/year | 1 * 3 years | \$240,000 |
| Washroom Facilities | \$50,000/washroom | 4 washrooms | \$200,000 |
| Road Upgrades ⁵¹ | \$500,000 | 1 | \$500,000 |
| Total | | | \$1,752,980.00 |
| Total / 3 | | | \$584,326.67 |

⁵⁰ Based on 6% of construction costs/year, as recommended by Alberta Parks (Alberta Community Development, 2001).

⁵¹ Based on costs for previous BC Parks projects in annual reports (BC Parks, 2016b)

Appendix G. Further Implementation Details and Options

The following section provides further implementation details and options including parking enforcement, visitor education and site hardening, and funding mechanisms.

Parking Enforcement

A key aspect in the success of options 1 and 2 is being able to enforce parking violations. This is discussed in further detail below, as a number of aspects exist to addressing this issue.

First, BC Parks does have the jurisdiction to enforce illegal parking inside provincial parks themselves. For areas where the only parking available is within the park itself and roads are contained within the park, ticketing and towing by BC parks enforcement staff is the only necessary enforcement authority. Current mechanisms under the *Parks Act* under Section 4, provision 23 provide park officers with the authority to enforce illegal parking and as well as authority under the *Motor Vehicle Act* (B.C. Reg.180/90). This will require increased staffing capacity for enforcement officers and towing capacity. Fines for parking violations may be a preferred approach in areas without cell service as in some cases towing illegally parked vehicles could leave hikers stranded. Fines must be large enough to provide adequate incentive to park legally. In addition, disseminating information to the public through all available channels (social media, website, signs, etc.) will be key in the lead up to enforcing any new parking measures at sites.

The issue of parking enforcement becomes more complicated when parking is outside the park along a highway as is the case with Joffre Lakes. In this case, coordination is required between BC Parks, the Ministry of Transportation and Infrastructure, and local municipalities as park staff no longer have jurisdiction. In the case of Joffre Lakes, the province and the Squamish-Lillooet Regional District have both claimed that the other has the responsibility to enforce illegal parking (Batchelor, 2019 January 25). More specifically, the province claims that the district must pass a parking bylaw for the area, while the district claims that it has no jurisdiction. Access to

information requests have shown that the RCMP currently can only ticket vehicles if the driver is present (Batchelor, 2019 January 25).

There are a number of potential solutions to these jurisdiction challenges. First, the RCMP could change their policy to allow for parking enforcement when the driver is not present. Second, the municipality could pass a bylaw regarding parking along the highway and provide staff to enforce the bylaw. Third, BC Parks officers could be designated the authority to enforce illegal parking in the area adjacent to the park as well as within it. Rather than being a jurisdiction problem, the bigger issue is a lack of resources regardless of where the responsibility lies. For this reason, funding for enforcement in the area outside parks could potentially be shared between the different ministries as well as the regional district.

Visitor Education and Site Hardening

The options analyzed in chapters 11-12 are in no way an exhaustive list of available approaches. Three additional policies that could be implemented alongside these options to increase their effectiveness are discussed here: visitor education programs, interpretive programs, and trail maintenance and hardening.

First, visitor education programs that educate visitors on leave no trace principles have shown to be an effective way of reducing impact of visitor use (Marion & Reid, 2007). These programs vary in delivery type from passive messaging through brochures and signs to in-person communication. The majority of studies have found education programs to be effective for altering visitor behaviour in the desired direction, with in person communication noted as being particularly effective (Kidd et al., 2015; Jeffrey L. Marion & Reid, 2007). Visitor education program can also extend beyond leave no trace principles to also include the emerging challenge of social media usage in parks. For example, park staff would advise visitors on the implications of geotagging their photos in sensitive or off trail areas, where a significant increase in visitor numbers could have negative ecological impacts.

Similar to visitor education programs on appropriate behaviour, interpretive programs have also been shown to have a positive impact on influencing visitor behaviour both in terms of environmental and social outcomes (Sim, et al., 2018).

Interpretive programs attempt to reveal the meaning and relationships behind parks and protected areas and in doing so foster increased feelings of stewardship for the area (BC Nature, 2010). BC Parks previously funded interpretive programs in provincial parks up until this funding was cut in 2011 (BC Nature, 2012). In addition, data from this survey showed a statistically significant relationship between place attachment and concern for environmental impact, providing further evidence for the effectiveness of interpretation programs.

Finally, sustainable trail construction and maintenance can significantly reduce the impact of visitor use. For example, using boardwalks for sensitive areas, keeping the grade of trails under 10%, and providing designated camping areas are all methods of reducing the impact of use in parks and protected areas (Marion, 2016). “Hardening” or increasing the durability of the site to visitor impacts, however, may have the unintended consequence of increasing usage further (Mason, 2005). As such, limits to site hardening should be considered for areas where extensive site hardening has the potential to increase use levels to the point where there is a decrease in the quality of visitor experience. Using tools such as the ROS to ensure that a range of different opportunities are available is an effective strategy to balance conflicting demands. In addition, as recommended by the Auditor General Report, an essential aspect of maintaining ecological integrity is monitoring and performance indicators (Auditor General of British Columbia, 2010). Updated and monitored management plans allow managers to recognize when impacts are outside of the limits of acceptable change, and whether or not tools such as site hardening will adequately address these impacts.

Funding Mechanisms

As discussed in section 2.2, funding has been an ongoing challenge for many parks and protected areas, and in particular for BC Parks. The recommendations discussed in this section as well as chapter 12 require consistent ongoing funding to be able to achieve their objectives. In addition, interviews highlighted a lack of consistent funding levels as a major factor contributing to the crowding and capacity challenges experienced in Southwestern BC (B. Janyk, personal communication, December 19, 2018; T. Ball, personal communication, January 25, 2019). As such, recommendations are offered below to achieve consistent funding levels.

The first recommendation is that funding levels for BC Parks as well as RSTBC increase at rates commensurate to that of Destination BC, the crown corporation responsible for promoting visitation to parks and protected areas in the province. This promotion has included social media advertising for areas such as Joffre Lakes. Destination BC currently has \$50 million / year in base funding, but also receives performance-based funding of up to 2% / year based on the success of the tourism sector (Destination BC, 2017b). It is recommended that BC Parks have similar base operational funding that is protected for years to come in the range of \$50 million/year. Similar to Destination BC, funding levels would then increase at a rate of up to 2% / year based on the number of visitors in BC Parks. This policy would mean that the operating budgets for BC Parks and RSTBC increase at the equivalent rates, allowing budgets for maintenance and enforcement to increase alongside use levels.

Second, BC Parks should continue to pursue innovative options for voluntary funding including the BC Parks Foundation and the BC Parks license plate program with ICBC. The license plate program alone was able to raise \$2,861,262 between January 2017 – June 2018 (ICBC, 2018). Voluntary funding mechanisms provide the opportunity to provide additional revenue for specific projects such as additional infrastructure or interpretation resources.

Another option that should be discussed is to move further towards a user-funded system, however this approach is not currently recommended for a number of reasons. First, BC Parks currently operates under a public and for-profit combination governance model (Newsome et al., 2013). Under this model, park operators charge and retain all front-country fees, and receive deficiency payments for additional expenses not covered by these fees (P. F. J. Eagles et al., 2013)⁵². In addition, collected revenues are not required to be reinvested in the park but return to general revenues (BC Parks, 2016b). This can be compared to a parastatal model like Ontario where the park system is a government owned corporation and services are provided by in-house government staff. Surveys comparing provincial parks in the two provinces have found that Ontario's

⁵² For example, in 2015/16, recreation user fees generated \$22 million, with \$21.4 million of these funds retained by park operators and \$0.5 million paid to the crown. An additional \$5.6 million was paid by the crown to park operators in the form of deficiency payments (BC Parks, 2016b).

provincial park system ranks higher than BC's in every category of governance investigated by the authors (Newsome et al., 2013).

As it stands, BC parks governance model does not have the perceived legitimacy needed to support the move towards a user-paid system, and restructuring the governance of BC Parks is outside of the scope of this study. For BC Parks to move further towards a user funded model, it would first need to restructure its governance model to increase legitimacy so that funds collected are used to support the park system and not providing profits to for-profit park operators. Research on user fees has shown that requiring the funds collected to be reinvested in the park system, ideally at the same park where they are received, has a significant impact on support for user fees (Manning, 2011). In addition, compliance rates for day-use fees have been as low as 25% in the past suggesting a lack of perceived legitimacy for user fees under the current governance model (BC Business, 2013). There are also significant equity concerns involved in moving towards a user-funded system, as displayed in survey results from this study on willingness to pay.

Appendix H. Information Interviews

Information interviews were conducted with the following list of participants in order to supplement the information from the survey and literature. Participants included both stakeholders from local communities and user groups as well as academics from the field of recreation ecology and visitor management.

Howie Harshaw, PhD: Associate Professor, University of Alberta

Barry Janyk: President, Federation of Mountain Clubs of BC

Harry Nelson: Associate Professor, UBC Faculty of Forestry

Tori Ball: Canadian Parks and Wilderness Society

Steve Jones: Local Parks Activist

Monica Bittel: Co-chair, Southwestern BC Recreation and Conservation Committee,
Federation of Mountain Clubs of BC

Mike Richman: Mayor of Pemberton, BC

Boris Issaev: ParkBus Co-founder