



CLIMATE CHANGE & Nature-Based Tourism

Implications for Park Visitation in Canada

Table of Contents

Background	1
Research methods.....	5
CLIMATE CHANGE IMPACTS	
National Park visitation.....	9
Provincial Park visitation	
A case study of Ontario's park system.....	15
Conclusions	19

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Background

Nature-based tourism, which encompasses activities undertaken in natural settings where the individual activity (e.g., hiking, skiing, sightseeing) or the quality of the visitor experience depends on and/or is enhanced by the natural environment^(1,2), is a major component of Canada's tourism industry. The country's national and provincial parks represent a significant resource for nature-based tourism.

A principal determinant of nature-based tourism in Canada is the climate. Many studies document the importance of climate for nature-based tourism⁽³⁻⁸⁾, and tourism and recreation more broadly⁽⁹⁻¹²⁾. Climate influences tourism in two main ways:

Directly: by influencing

- length and quality of tourism and recreation seasons;
- visitor participation/demand; and
- participants' satisfaction with the experience (e.g., hiking in warm, sunny conditions vs. cold rain or extreme heat).

Indirectly: by impacting the physical resources (e.g., snow cover, biodiversity, water levels) on which nature-based tourism depends.

The vulnerability of nature-based tourism in Canada's park systems, or any park system worldwide for that matter, to climate variability and future climate change has not been adequately assessed^(3,4,7,13,14). Any changes in the length and quality of nature-based tourism seasons induced by global climate change could have considerable implications for park visitation and visitor-related management issues. Furthermore, given the diverse natural landscapes among Canada's national and provincial parks, any changes in the natural characteristics of park environments could negatively affect tourism by reducing their perceived attractiveness among local, national and even international visitors.

Impact of Current Climate Variability on Tourism in Canadian Parks

Over the last decade, aspects of Canada's nature-based tourism industry have been impacted by adverse climatic conditions. This section highlights some of the more prominent examples.

1999 to 2002

Water levels on the Great Lakes were below their long-term average between 1999 and 2002. The low water levels created problems for shoreline-based provincial parks in Ontario, especially those with marinas. Marina operators experienced a range of complications due to the low water levels, including difficulty accessing docks (i.e., dock too high out of the water) and boat launch ramps (i.e., ramps no longer extended to the waterline)⁽¹⁵⁾. In response to the negative impacts that low water levels were having for tourism operators, the Canadian Government funded a \$15 million Great Lakes Water Level Emergency Response Programme to aid marina operators with emergency dredging⁽¹⁶⁾.

2003

A hot, dry summer in Alberta and British Columbia contributed to one of the worst forest fire seasons in decades. The forest fires resulted in access restrictions to many national and provincial parks, and in some cases, even park closures. Visitation was even affected in national parks that did not experience any fires. For example, widespread media coverage of the forest fires in nearby Canadian (e.g., Jasper and Kootenay national parks) and US (e.g., Glacier National Park) mountain national parks contributed to an 8% decline in total person visits to Waterton Lakes National Park in 2003 (over 2002); the most significant monthly reductions occurred in July (-7%), August (-17%) and September (-15%)⁽¹⁷⁾. Okanagan Mountain Provincial Park, a popular camping, hiking and boating park for locals and visitors to Kelowna

(British Columbia), was closed shortly after forest fires broke out in the park. Most of the park's 10,000 hectares were burned and recreation facilities in the park were only reopened to the public as of June 2005⁽¹⁸⁾.

Hurricane Juan made landfall in Halifax in September causing significant environmental and structural damage in at least 11 of Nova Scotia's provincial parks⁽¹⁹⁾, resulting in some temporary park closures. At least two provincial parks damaged by Hurricane Juan remained closed eight months after the storm⁽²⁰⁾.

Interestingly, while parks in parts of western and eastern Canada were experiencing the negative impact of climate variability, visitation in provincial parks in Saskatchewan were booming. Between June and September, provincial parks (those that record visitors) in Saskatchewan recorded 2.5 million visits, which was an 8% increase over the year before and the second highest visitation level in 11 years⁽²¹⁾. The Government of Saskatchewan attributed the increase to 'excellent' summer weather⁽²¹⁾.

2005

In January 2005, daytime temperatures near -40°C forced the closure of some popular ski hills in Banff National Park for several days because hill operators considered it too cold to ski⁽²²⁾. Local tourism officials indicated that the short-term closure, although a disappointment and inconvenience to visitors who came to Banff to ski, would likely not hurt overall ski revenues for the 2004/05 season⁽²²⁾.

Above average June rainfall in Alberta resulted in widespread flooding in the Bow, Red Deer and North Saskatchewan river basins. The flooding inundated many campgrounds, golf courses and boat launches and caused substantial damage to parking lots, access roads and visitor facilities in some of the Province's provincial parks. Willow Creek Provincial Park experienced extensive flood damage and was closed for the 2005 camping season⁽²³⁾. It was expected to remain closed for the 2006 camping season until necessary repairs could be made.

In the Great Lakes region, the summer was heralded as one of the warmest in almost half a century⁽²⁴⁾. As of early August, the Greater Toronto and Montreal areas had recorded 39 and 22 days with temperatures above 30°C, respectively, which is nearly three times higher than the long-term summer average for both cities⁽²⁴⁾. At the time this report was completed, data was not yet available to determine what effect (positive or negative) the extended heat wave had on park tourism in these regions.

Is Canada's Climate Changing?

Climate is the long-term average of weather for a specific place and time period, and includes temperature, precipitation, wind, humidity and a range of other weather characteristics. A location's climate is normally defined by climatologists using at least 30 years of observed weather data⁽²⁵⁾. Trends in long-term data (i.e., > 30 years) allow us to determine if a location's climate is changing.

Trends in climate data from across Canada suggest that the country's climate is changing, although there are regional differences in the magnitude of change⁽²⁶⁾. The mean annual temperature across Canada has increased 1.1°C since the late 1940s; six of the 10 warmest years have occurred since 1993 (1998, 1999, 2000, 2001, 2003 and 2005)⁽¹⁵⁾. Average mean temperatures have increased 2.0°C in the Arctic, 1.3°C in the Prairies and 0.4°C in the Great Lakes region since the 1940s, while Atlantic Canada has experienced a general cooling. Winters (December, January, February) in Canada are also warmer now than they were 70 years ago. On average, winters are 1.9°C warmer now than they were in the 1940s. The winter of 2003/04, for example, was 2.2°C warmer than Canada's long-term average; the warmest winter since the 1940s (2005/06) was 3.9°C above the long-term average.

Canada has experienced above normal annual precipitation since the 1970s⁽²⁶⁾. The wettest year since the 1940s was 2005 (13.4% above normal) and among the driest was 2001 (4.3% below normal). On average, annual precipitation has increased in the Great Lakes region (+1.2%), Atlantic Canada (+0.4%) and the Arctic (+0.3%) and declined in the Prairies (-1.4%) and on the West Coast (-1.0%) over the last 70 years.

In addition to climate station data, a growing body of evidence from other biophysical systems exists to suggest that the climate in Canada is changing^(27,28). Just to illustrate with a few examples, the duration of ice cover on many of Canada's lakes and rivers has diminished over the last century. Assembly of data for Lake Simcoe, the only known lake in Ontario with records dating back more than 100 years, indicates a trend towards later winter freeze-up and earlier spring break-up. It is estimated that Lake Simcoe currently freezes 13 days later than it did 140 years ago. Similarly, the annual spring break up is occurring, on average, four days earlier⁽²⁷⁾. Glacier coverage in the southern Canadian Rocky Mountains is estimated to have decreased 25% in the 20th century^(29,30). The terminus of the Athabasca Glacier for example, the main attraction at the Columbia Icefields, has retreated 1,200 metres since 1900⁽³¹⁾. Evidence of plant phenology also suggests that the timing of different stages of

plant development in many areas of Canada has changed. The average date when lilacs bud in southern Canada is six days earlier than it was in the 1960s, and the Boreal Forest is budding several days earlier and losing its leaves several days later than it did two decades ago⁽²⁷⁾.

Table 1. Projected changes in Canada's climate⁽³²⁾

		Annual	Winter	Spring	Summer	Fall
Temperature change (°C)	2020s	+1.7 to +2.3	+2.1 to +2.5	+1.7 to +2.5	+0.8 to +1.6	+1.6 to +2.6
	2050s	+2.3 to +7.0	+3.3 to +8.2	+2.2 to +6.2	+1.3 to +4.2	+2.2 to +6.5
	2080s	+3.1 to +9.5	+4.9 to +13.2	+3.0 to +8.9	+1.6 to +6.3	+2.9 to +9.6
Precipitation change (%)	2020s	+5 to +6	+6 to +8	+6 to +11	+3 to +4	+5 to +5
	2050s	+7 to +15	+9 to +17	+9 to +23	+4 to +11	+8 to +13
	2080s	+11 to +23	+15 to +29	+15 to +31	+5 to +18	+11 to +20

nationally, winter and spring are projected to experience the largest increases in precipitation.

Canada's Future Climate

Projections about future climatic changes still remain uncertain because of complexity in the global climate system and the human systems that are influencing it (i.e., greenhouse gas emissions, land use change). Inter-annual climate variability will continue to occur and so projections of future changes refer to changes in climate conditions in 30-year periods — the 2020s, the 2050s and the 2080s. The '2020s' (defined by 2010 to 2039) reflect **average** changes that are projected to occur 20 years from now. The '2050s' (defined by 2040 to 2069) reflect **average** changes projected for the middle of the 21st century (~50 years from now), while **average** changes at the end of the century (~80 to 100 years from now) are reflected by the '2080s' (defined by 2070 to 2099). Each period reflects changes with respect to a baseline period (1961–90).

Climate change projections for Canada are provided in Table 1 for the three aforementioned time periods — the 2020s, 2050s and 2080s. Canada's climate is generally projected to become warmer under climate change⁽³²⁾. Global climate models project that relative to the 1961–90 baseline period, Canada's mean annual temperature will increase between 1.7°C and 2.3°C in the 2020s, between 2.3°C and 7.0°C by the middle of this century (~2050s) and between 3.1°C and 9.5°C by the end of the century (~2080s). The largest increases in seasonal temperatures are projected to occur in winter (Table 1).

Canada's climate is also projected to experience more precipitation under climate change (Table 1)⁽³²⁾. In the 2020s, annual precipitation is projected to experience a 5% to 6% increase relative to the 1961–90 baseline period. By the middle of the century (2050s), annual precipitation is projected to increase between 7% and 15% and between 11% and 23% by the end of the century (2080s). On average

Climate Change Implications for Tourism in Canada

The scientific community acknowledges that climate change could have a range of impacts (positive and negative) on Canada's tourism industry. Some examples that illustrate this range are provided here.

- Climate change could reduce Canada's tourism trade deficit, as an extended warm-weather tourism season is projected to increase the number of visitors arriving in Canada by at least one third by the middle of the century^(11,33).
- Warm-weather outdoor recreation activities (e.g., golfing, camping and public use of beaches) are projected to benefit from climate change (i.e., longer operating seasons^(5,34,35)), but winter recreation (e.g., downhill skiing, cross-country skiing, snowmobiling, ice fishing) and related tourism events (e.g., winter festivals) would be negatively impacted^(8,14,36–38).
- Temperature-induced habitat loss and range shifts are expected as lakes and rivers warm under climate change. Such changes are projected to contribute to losses in recreationally valued fish populations, especially cold- and cool-water fish species^(39,40).
- Marina operators and recreational boaters could be negatively impacted by projected reductions in water levels on the Great Lakes, as existing boat ramps would need to be lengthened, weight restrictions may need to be placed on boats and dredging may become common⁽⁴⁰⁾.
- Low-elevation glaciers in the Rocky Mountains, particularly those less than 100 metres thick, are projected to disappear in the next 30 years as warmer springs and autumns extend the melting season^(13,41). If such glacial retreat occurs, the Columbia Icefields could lose much of its accessible tourist resource.

Research Objectives

For more than a decade, park professionals in Canada have recognized that projected changes in the climate could have important implications for conservation policy and planning^(3,4,13,42–44). In a recent assessment of the projected impacts of climate change on Canada's national parks⁽¹³⁾, it was recommended that a more detailed analysis was needed to understand the potential impacts of climate change on park tourism and the subsequent implications for park management.

This executive summary presents the key results of a study conducted by the University of Waterloo to assess how climate change may influence nature-based tourism in Canada's parks. It does so through an empirical assessment of climate and visitation at three scales: 1) Canada's national park system, 2) a provincial park system (Ontario), and, 3) individual parks (Banff National Park and Waterton Lakes National Park, Alberta).

This study explored three central questions:

1. How might park visitors respond to future changes in the climate?
2. How might park visitors respond to climate change-induced environmental changes?
3. What are the implications of climate change-related changes in visitation for park management in Canada?

This executive summary provides an overview of the types of impacts that climate change could have on nature-based tourism in Canada's parks systems, including some key regional differences. The direct and indirect impact of climate change on visitation to Canada's national parks is summarized first. This is followed by a summary of the direct impact of climate change on visitation to Ontario's provincial parks. The results of the Banff National Park case study are presented under a separate cover⁽¹⁴⁾, which is also available at the website listed on the inside cover. The broader implications of climate change for nature-based tourism in Canada on park management for Parks Canada and Ontario Parks, including possible climate change adaptation strategies, are discussed in the conclusions.



Research Methods

This climate change impact assessment focused on the direct and indirect impacts of projected changes in the climate on park visitation in Canada, specifically Canada’s national parks and Ontario’s provincial parks. An overview of the methods is provided here and additional details for each specific analysis can be found in peer-reviewed research by the authors^(3-5,7,8,37).

Parks and Visitation Data

A limited number of parks were included in the national park analysis because of data limitations (i.e., no suitable climate station nearby, duplicated visitation records) and low visitor levels in some parks. In total, 15 of Canada’s 39 national parks with reliable visitor and climate data were analyzed (Table 2). These 15 national parks collectively represented 86% of all national park visits in Canada in 2003⁽¹⁷⁾ and different geographic regions and prevailing climates.

Approximately 95% of all person visits to Ontario’s provincial parks occur in parks classified as ‘natural environment’ or ‘recreation’ parks⁽⁴⁵⁾. The reason for this is that these parks offer visitors the widest range of recreational (e.g., camping, hiking, swimming, cross-country skiing) and visitor (e.g., boat launches, public washrooms, staffed beaches) amenities. Visitation levels also vary substantially among these parks. Analyzing all of Ontario’s parks with moderate visitation levels was beyond the scope of this study. Instead, a sample of parks (Table 2) with the highest visitation in each of Ontario Parks’ official regions (Figure 1) was selected to represent the geographic and climatic diversity in Ontario’s park system. The six provincial parks selected to represent each park region collectively represented 27% of all park visits in Ontario in 2003⁽⁴⁵⁾.

Table 2. Parks used in the study

Region	National Park	Province
West	Pacific Rim	British Columbia
	Prince Albert	Alberta
	Waterton Lakes	Alberta
Mountain	Banff	Alberta
	Jasper	Alberta
	Kootenay	British Columbia
	Mt Revelstoke/Glacier	British Columbia
	Yoho	British Columbia
Central	La Mauricie	Québec
	Point Pelee	Ontario
	Pukaskwa	Ontario
East	Prince Edward Island	Prince Edward Island
	Kouchibouguac	New Brunswick
	Cape Breton Highlands	Nova Scotia
	Terra Nova	Newfoundland
Region	Ontario Provincial Park	
Northwest	Kakabeka Falls	
Northeast	Lake Superior	
Central	Killbear	
Algonquin	Algonquin	
Southeast	Sandbanks	
Southwest	Pinery	

Visitation data was obtained from Parks Canada (national parks) and the Ontario Ministry of Natural Resources (provincial parks). The data consisted of the total number of visitors entering each of the 15 national parks per month between January 1996 and December 2003 and each of the six provincial parks between January 1989 and December 2003.

Climate Data and Climate Change Scenarios

This climate change impact assessment required the use of many climate stations. Climate stations used with respect to each national and provincial park contained a complete and quality-controlled historical record (i.e., 1961–90) and were also operational through to 2003 so that recently archived data could be accessed.

In order to capture a full range of potential future climates in Canada and regionally within Ontario, three climate change scenarios and different greenhouse gas emission scenarios (A1, A2 and B2) were used in this study. The scenarios used are from the National Center for Atmospheric Research (NCAR) in the United States, the Center for Climate System Research (CCSR) in Japan and the Max Planck Institute of Meteorology (ECHAM4) in Germany. Climate change scenarios produced by these research centres have participated in Intergovernmental Panel on Climate Change’s (IPCC) model inter-comparisons and are recommended for climate change impact and adaptation assessments by the IPCC’s Task Group for Climate Change Impact Assessments. The specific scenarios utilized are the NCARPCM B21, CCSRNIES A11 and ECHAM4 A21 scenarios. Figure 2 illustrates how these three scenarios (identified by dashed circles) compare with all other climate change scenarios available for Canada.

The NCARPCM B21 scenario generally assumes lower global greenhouse gas emissions and projects a small increase in temperature over the course of this century. In contrast, the CCSRNIES A11 scenario assumes higher global greenhouse emissions and projects a substantial warming this century. In all regions of Canada, the ECHAM4 A21 scenario falls between the other two scenarios in terms of projected warming. As a result of these differences, in this document, NCARPCM B21 is referred to as the ‘least-change’ scenario; CCSRNIES A11 is referred to as the ‘warmest’ scenario, while ECHAM4 A21 is referred to as the ‘middle of the road’ scenario. In this analysis, climatic changes under these three scenarios are relative to the 1961–90 baseline, which is denoted as a black square (■) on most figures in this report.

Figure 1. Ontario Parks’ park regions

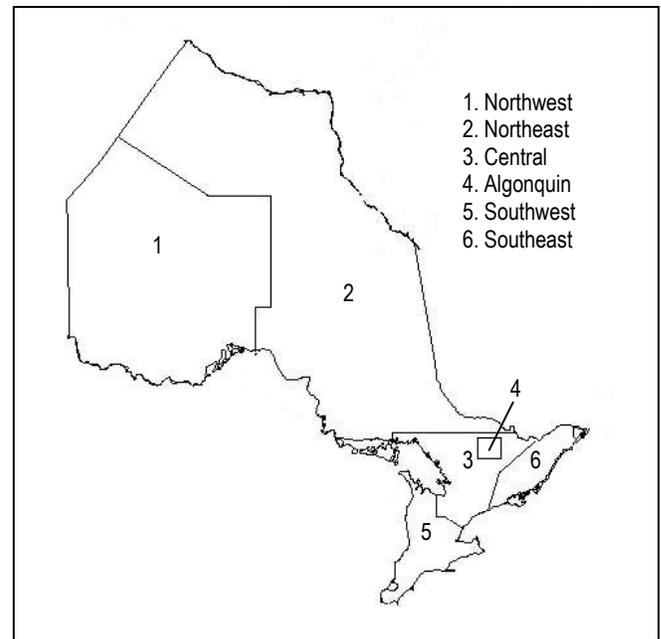
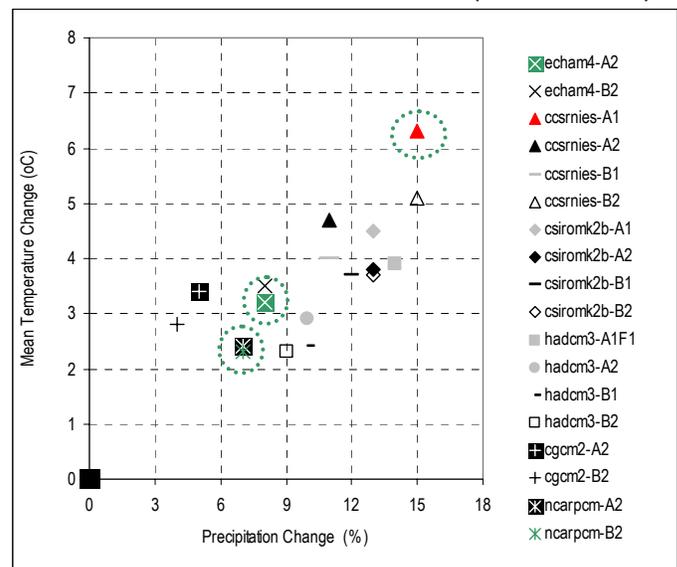


Figure 2. Climate change scenarios for Canada (annual — 2050s)



Direct Impacts of Climate Change on Nature-Based Tourism

An empirical assessment of park visitation was undertaken to determine how visitation patterns to Canada’s national parks and Ontario’s provincial parks may be altered by projected changes in the climate. The assessment of park visitation also considered the potential impacts of demographic change through to the mid-2020s, and the possible synergistic impacts of climatic and demographic change.

To assess the direct impact of climate change on visitation, statistical regression analysis was used to develop a model of the current relationship between climate and monthly person visits to each national and provincial park during its peak and shoulder tourism seasons^(3,4,7). An example of this type of analysis is provided for two parks in Figure 3. The resulting regression models were then used to model visitation for a climatologically average year during the 1961–90 baseline period. The models were then run with the three climate change scenarios to project changes in the seasonality and number of people visiting each national and provincial park in the 2020s, 2050s and 2080s.

Since one provincial park was used to represent each Ontario park region (Figure 1), an additional methodological step was undertaken to determine how climate change could affect visitation system wide. The proportional increase in visits for the park representing each region was applied to all other parks in the region. The total estimated increase in visitation from the six regions was then summed to estimate system-wide changes in visitation levels.

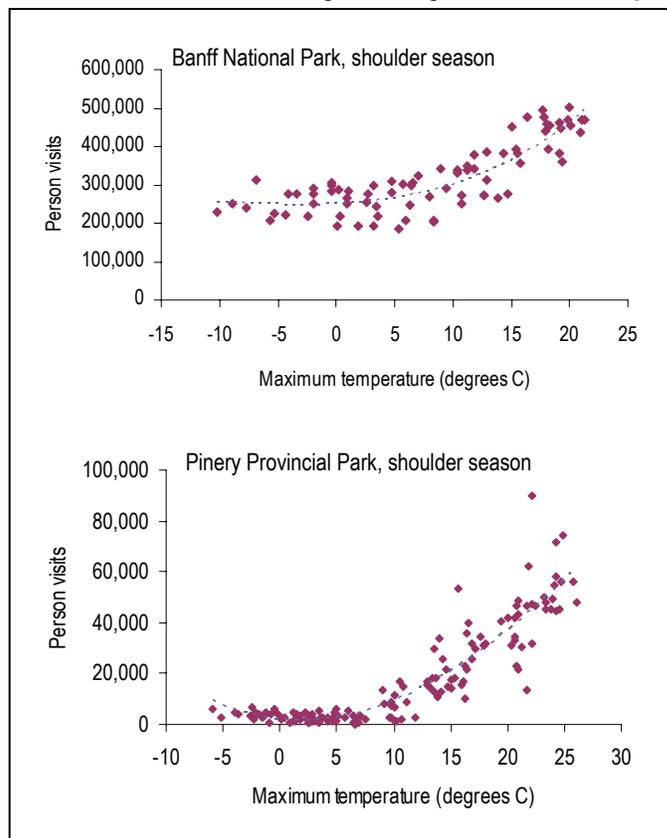
It is important to recognize that without data that correlates outdoor recreation activities with visitors, the climate change projections presented in this executive summary provide insight into the expansion of suitable climatic conditions for warm-weather nature-based tourism and do not estimate any potential visitation losses related to diminished winter recreation opportunities.

Demographic change

The proportion of people of Canadian and international origin visiting Canada’s parks varies by geographic region, park system and individual park. With respect to national parks, Parks Canada estimates that system wide approximately 70% of visitors to its national parks are from Canada, while the remainder are international, with most coming from the United States⁽⁴⁶⁾. At the provincial level, the Ontario Ministry of Natural Resources estimates that system wide most visitors to Ontario’s provincial parks are from the Province of Ontario (~80%), 10% originate from elsewhere in Canada, and international visitors (mainly Americans from the Great Lakes region) account for the remainder⁽⁴⁵⁾.

Population growth and demographic changes in Canada and the United States (and internationally) over the next two decades could interact synergistically with climate change to influence future visitation levels. The ‘soft outdoor adventure’ tourism market encompasses many of the recreational activities pursued by visitors to Canada’s national and provincial parks (e.g., hiking, canoeing, biking). According to the Canadian Tourism Commission, this tourism

Figure 3. Regression relationships



market is projected to increase 9% in Canada and 25% in the United States by 2025⁽⁴⁷⁾. At the provincial level, the Ontario Ministry of Tourism and Recreation estimates that this same tourism market is projected to increase 13% in Ontario and decline 6% in the US states that border the Great Lakes⁽⁴⁸⁾. The decline in the US market is associated with the projected continued out-migration of people from the US northeast and midwest to more southern states.

Using visitor ratios for both parks (national parks — 70% Canadian, 30% US/international; Ontario parks — 90% Canadian, 10% US/international) and the projections for the soft outdoor adventure market, the projected impact of demographic change on visitation to the mid-2020s was estimated for both park systems.

Indirect Impacts of Climate Change on Nature-Based Tourism

Any projected changes in visitation from extended warm-weather seasons will not occur in isolation, as visitation to Canada’s parks will also be indirectly influenced by climate change-induced impacts on park landscapes. For example, in Canada’s national parks, glaciers are projected to disappear from Banff National Park, polar bear populations are projected to decline in Wapusk National Park, the beaches of

Prince Edward Island National Park are projected to erode and be inundated by sea level rise and Point Pelee National Park could be negatively impacted by climate change-induced changes in bird migration routes⁽¹³⁾. No research has yet been conducted to examine how these climate-induced environmental changes could impact park visitation and tourism spending. Research examining the potential impact that climate-induced environmental changes could have on park visitation is very limited.

To explore how environmental changes could influence future levels of visitation, a visitor survey was administered in two of Canada's Rocky Mountain national parks — Waterton Lakes National Park (summer of 2004) and Banff National Park (summer of 2005) — as Rocky Mountain parks are the most visited of Canada's national parks. The survey was distributed at a variety of locations (e.g., town sites, campgrounds, scenic rest stops, backcountry hiking areas and visitor parking lots) in order to engage visitors in a range of tourism and recreation activities.

Visitors to these two national parks were presented with three environmental change scenarios that were developed with region-specific scientific literatures^(13,41,49-62). The scenarios provided plausible stories about how climate change could affect the ecosystems and natural environment in the southern Canadian Rocky Mountains over the next century (Figures 4 and 5). The time period for each scenario was not provided to participants in order to avoid biasing responses (e.g., I will not be alive in 2080, so these changes are not relevant to me). However, scenario 1 was designed to reflect early potential environmental changes (i.e., 2020s), while scenarios 2 and 3 reflected more extensive environmental changes projected for later in the 21st century (i.e., 2050s and 2080s).

Participants were asked to reflect on each scenario as a holistic package of environmental changes and consider whether they would still visit the national park (i.e., Waterton Lakes or Banff) if the changes occurred. Willing participants took the survey with them and returned it by mail. A total of 800 surveys were distributed in Waterton Lakes National Park and 720 were distributed in Banff National Park. In total, 425 (Waterton Lakes) and 382 (Banff) surveys were completed and returned, for a response rate of 53% from each park.

Figure 4. Environmental change scenarios — Waterton Lakes National Park survey

TYPES OF ENVIRONMENTAL CHANGE	Scenario 1	Scenario 2	Scenario 3
Total number of mammal species found in the park (currently = 60)	75	100	90
Mammal species lost from the park	0	6	12
Population of grizzly bears, moose and big horn sheep 	no change	small decline	moderate decline
Number of glaciers in the park (currently = 30) 	30	10	0
Vegetation composition in the Park	(% of park)	(% of park)	(% of park)
Alpine Meadows & Tundra 	15%	10%	1%
Forest 	70%	65%	55%
Grassland 	15%	25%	44%
Number of rare plant species lost from the park	0	5	10
Occurrence of forest fires	no change	moderate increase	large increase
Chance of a campfire ban during your visit 	10%	33%	75%
Average fishing catch rate 	10% increase	15% increase	20% decrease
Lake water temperature	2°C warmer	4°C warmer	7°C warmer

Figure 5. Environmental change scenarios — Banff National Park survey

TYPES OF ENVIRONMENTAL CHANGE	Scenario 1	Scenario 2	Scenario 3
Number of <u>existing</u> mammal species lost from the park (currently = 60)	0	6	12
Number of <u>new</u> mammal species found in the park	0	10	15
Population of grizzly bears, moose and big horn sheep 	no change	small decline	moderate decline
Number and size of glaciers in the park 	Continue to shrink, but none lost	Many small glaciers disappear and only the highest remain	All glaciers have completely disappeared
Vegetation composition in the Park	(% of park)	(% of park)	(% of park)
Alpine Meadows & Tundra 	40%	25%	10%
Forest 	55%	65%	75%
Grassland 	5%	10%	15%
Number of rare plant species lost from the park	0	5	10
Occurrence of forest fires	no change	moderate increase	large increase
Chance of a campfire ban during your visit 	10%	33%	75%



National Park Visitation

National parks are an important tourism resource in Canada, and the 15 parks analyzed in this study attract approximately 12.8 million people annually⁽¹⁷⁾. The national parks located in the Canadian Rocky Mountains are among the most popular tourism destinations within the national park system. Banff National Park, a world-class and internationally recognized tourism destination, is the most visited national park in Canada with approximately 4 million visitors annually⁽¹⁷⁾.

Seasonality in Current Park Visitation

There is a well-defined seasonality in visitation across Canada's national park system. At present, approximately 50% of annual park visits system wide occur between June 1 and August 31, with nearly 70% of all person visits occurring during the warm-weather months between May 1 and September 30⁽¹⁷⁾. Visitation tends to be highest during the summer months of July and August at most parks, which corresponds to when most Canadians have school or work-related holidays. Visitation is lowest during the winter months and approaches zero in some parks (Figure 6, A–D). The one notable exception to this pattern is Point Pelee National Park (central region), where visitation is highest in the month of May. This peak in visitation occurs when hundreds of thousands of birds use the park as a stopover on their northward spring migration.

The seasonal pattern to visitation is more pronounced in some parks analyzed in this study. For example, 74% of annual visits to Pukaskwa National Park (central region) and 61% of annual visits to Cape Breton Highlands National Park (eastern region) occur between July 1 and August 31, clearly demonstrating the importance of the summer tourism season to these parks. Approximately one-half of annual visits occur during July and August at four other national parks (Prince Albert — 51%; La Mauricie — 50%; Prince Edward Island — 49%; Waterton Lakes — 48%). Conversely, the summer peak tourism season is much less dominant in other national

parks. National parks such as Banff (31%), Point Pelee (26%), Yoho (25%) and Terra Nova (25%) receive less than one-third of their annual visitors during July and August.

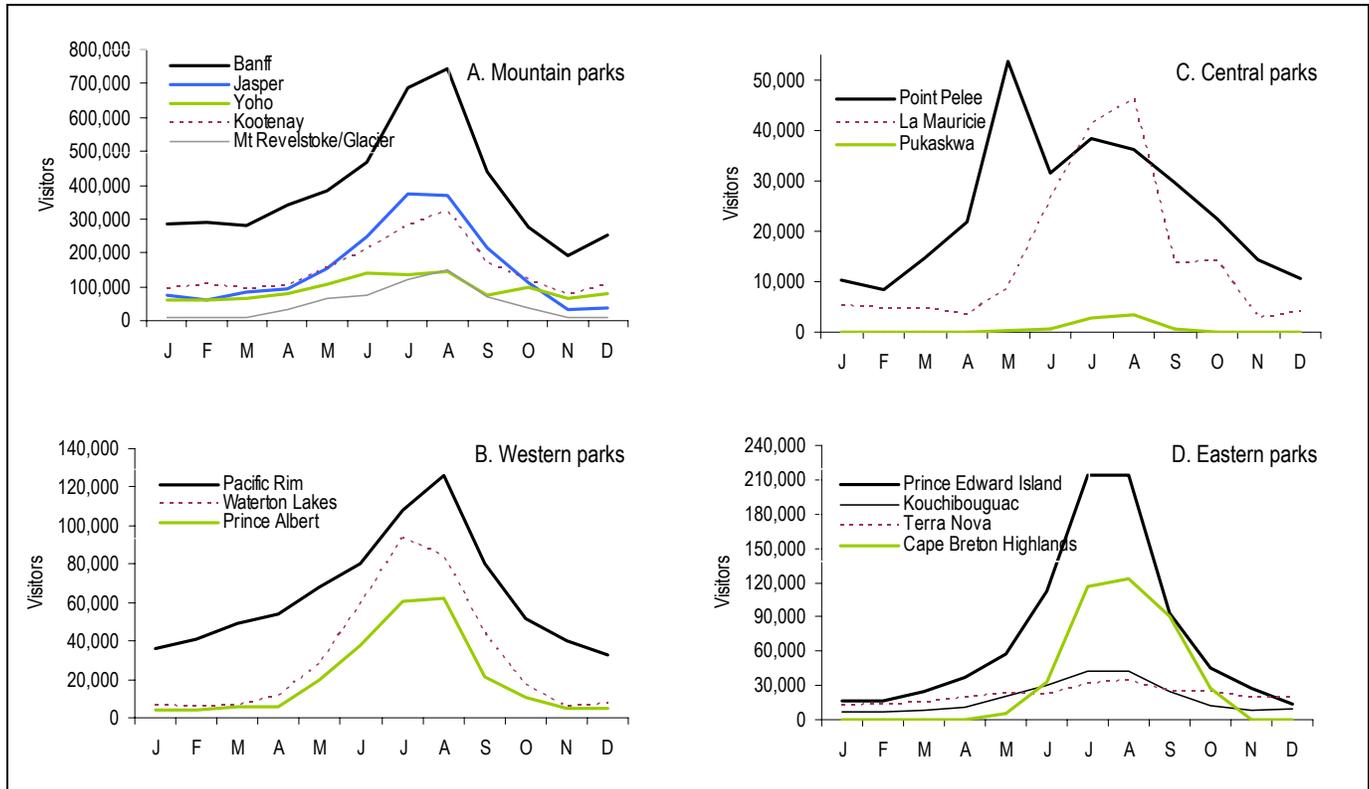
Direct Impact of Climate Change on Visitation

Annual visitors

Under a warmer climate, Canada's national parks are projected to become more popular as tourism destinations. With the period for warm-weather tourism projected to be extended under climate change and assuming visitor demand patterns remain unchanged, total annual visits to the 15 national parks analyzed are projected to increase between 6% (to 13.5 million) and 8% (to 14.1 million) in the 2020s (Table 3). A number of individual parks are projected to experience higher increases in visitation. Annual visits under the 2050s scenarios are projected to increase between 9% (to 13.7 million) and 29% (to 16.1 million) relative to baseline conditions. With further warming by the end of the century (2080s), the number of people visiting the 15 national parks analyzed is projected to increase 10% (to 14.1 million) under the least-change climate change scenario and increase 41% (to 18.0 million) under the warmest climate change scenario. Under the warmest climate change scenario for the 2080s, visitation was projected to more than double in eight of the 15 national parks analyzed.

Although visitation to Canada's national parks is projected to increase at all 15 national parks under climate change, there are regional differences in the projected magnitude of increase. Currently, mountain parks are the highest-visited national parks in Canada, with nearly two-thirds of all national park visits annually⁽¹⁷⁾. With the exception of Mount Revelstoke/Glacier National Park, mountain parks in this study are generally projected to experience the smallest increases in visitation in the 2020s, 2050s and 2080s under all three climate change scenarios (Table 3). Comparatively,

Figure 6. Regional variability in monthly visitation to national parks, 2003



national parks in eastern Canada are projected to experience the largest increases. Prince Edward Island and Cape Breton Highlands national parks, for example, are projected to experience at least a doubling of visitor levels by the 2080s under the warmest climate change scenario. At present, visitation to national parks in eastern Canada is highly seasonal with less than 10% of annual visitation occurring outside the warm-weather months⁽¹⁷⁾. Any future improvement in the climatic conditions during the warm-weather months would benefit tourism in these parks.

Seasonal pattern of visitation (2050s)

Most of the national parks in this study are projected to experience the largest increases in visitation during the spring (April to June) and fall (September to November) months, with minimal increase during the traditional peak months of July and August (Figure 7—A). Banff National Park, for instance, is projected to experience average spring increases in visitation of 19% and average fall increases of 16% under the warmest climate change scenario compared to an average increase of only 5% during July and August. This seasonal change in visitation suggests that conditions become more climatically suitable for warm-weather outdoor recreation and tourism during the shoulder seasons at many of Canada's national parks.

In some parks, visitor increases are projected to be higher during the summer months of July and August than during other times of the year (Figure 7—B). For example, Cape Breton Highlands National Park is projected to experience an 80% increase in summer visitor levels under the warmest climate change scenario compared to an average increase of 57% and 60% in the spring and fall shoulder months in the 2050s, respectively. Any increase in visitors during the peak tourism period would place extra strain on park resources that can be operating near capacity during July and August.

It is also possible that some parks may experience a reduction in visitation during the summer months (e.g., Pukaskwa) (Figure 7—C). This pattern is partially explained by the fact that the relationship between visitation and temperature during the park's peak season was negative in the regression analysis. Thus, further increases in average temperature under climate change would contribute to projected reductions in summer visitation.

Changes in the seasonal timing of increases in visitation will influence a range of management issues, including user-fee collection, environmental operations and staffing needs.

Synergistic Effect of Climate and Demographic Change on Visitation

Climate change-induced impacts on visitation to Canada's national parks will not occur in isolation. Other factors such as population growth, an ageing society and even travel costs could affect future visitation patterns. Some of these factors could act synergistically with climate change to affect visitation.

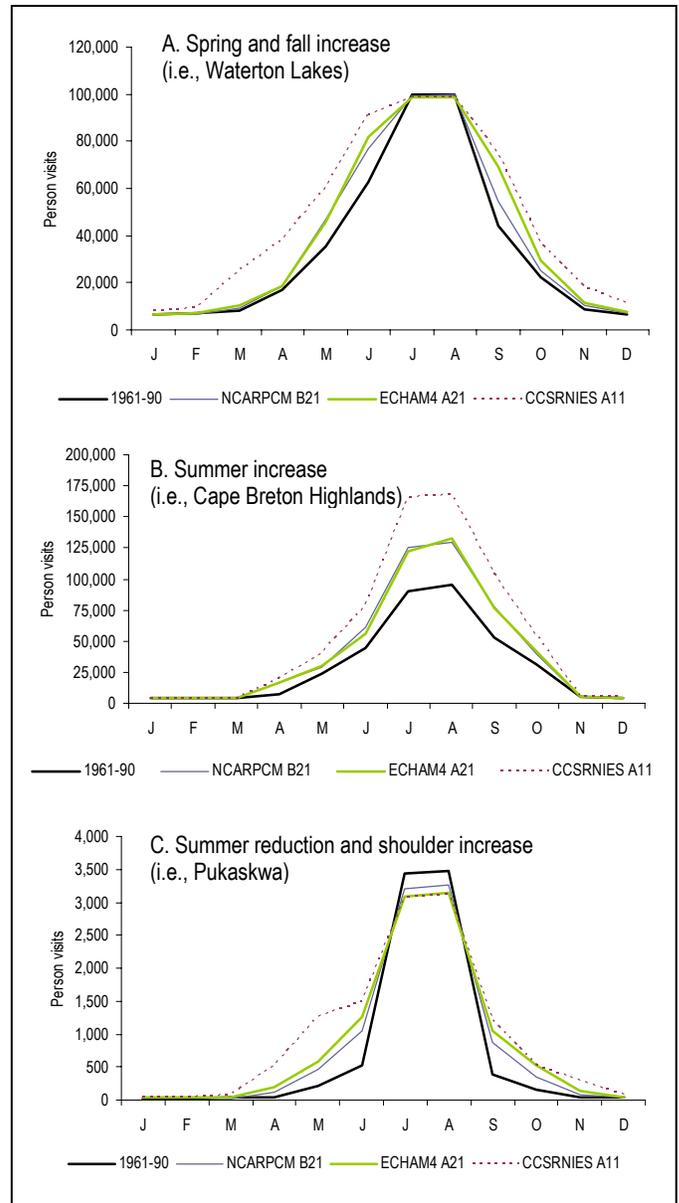
One important factor that will act synergistically with climate change to affect visitation to Canada's national parks over the next 20 to 30 years is demographic change. Using Parks Canada's ratio of visitor origins (70% Canadian, 30% US/international), the impact of demographic change on visitation in the mid-2020s is projected to be two to three times greater (+14%) than climate change alone (+5% to 8%) (Table 4). The combined impact of demographic change and climate change is projected to increase visitor levels between 20% and 23%, which translates into an additional 2.5 to 2.9 million people visiting Canada's national parks annually by the mid-2020s.

Economic Implications

National parks are an important component of Canada's nature-based tourism industry because they generate millions of dollars in tourism revenues. Based on the most recent economic data available, national parks contribute approximately \$1 billion to Canada's gross domestic product annually⁽⁴⁶⁾. Thus, any projected increases in visitation would translate into additional revenues for Parks Canada.

Although there is regional variation in visitor spending (e.g., due to park amenities, distance travelled), it is estimated that on average park visitors spend between \$103 and \$162 (US\$90 to \$141)⁽⁶³⁾ per day during their visit to a national park. Using this expenditure range as a proxy for all 15 parks, Parks Canada could generate between \$263 million and \$413 million in additional revenue in the mid-2020s under the least-change climate change scenario from the combined impact of climate and demographic change. Higher visitation levels under the warmest climate change scenario could generate Parks Canada between \$301 million and \$474 million in additional revenue.

Figure 7. Projected changes in the seasonal pattern of national park visitation (2050s)^a



^a Parks projected to experience each pattern:

- A: spring/fall increase (Banff, Jasper, Kouchibouguac, La Mauricie, Mt. Revelstoke/Glacier, Point Pelee, Prince Albert and Waterton Lakes);
- B: summer increase (Cape Breton Highlands, Kootenay, Pacific Rim, Prince Edward Island, Terra Nova and Yoho);
- C: summer reduction (Pukaskwa)

Table 3. Projected changes in national park visitation

National park	Modelled annual visits ^a (1961–90)	NCARPCM B21			ECHAM4 A21			CCSRNIES A11		
		2020s	2050s	2080s	2020s	2050s	2080s	2020s	2050s	2080s
Pacific Rim Reserve	537,282	+9.8%	+13.2%	+15.6%	+7.9%	+15.5%	+29.6%	+7.6%	+37.2%	+49.4%
Waterton Lakes	418,358	+6.1%	+10.1%	+14.4%	+7.7%	+16.0%	+32.2%	+10.2%	+36.3%	+60.0%
Prince Albert	203,376	+6.7%	+10.4%	+11.7%	+13.6%	+22.7%	+39.5%	+14.6%	+35.7%	+55.1%
Mt Revelstoke/ Glacier	462,448	+8.8%	+14.8%	+17.1%	+29.0%	+43.3%	+64.6%	+26.1%	+56.0%	+78.7%
Kootenay	1,628,373	+5.7%	+9.8%	+11.6%	+10.4%	+21.0%	+39.1%	+8.1%	+31.5%	+52.4%
Yoho	1,066,544	+3.5%	+5.5%	+6.7%	+5.6%	+10.7%	+19.5%	+5.1%	+19.1%	+29.9%
Banff	4,413,741	+2.5%	+4.0%	+4.7%	+3.4%	+6.7%	+12.2%	+3.0%	+11.9%	+19.8%
Jasper	1,879,078	+3.5%	+6.1%	+7.1%	+3.7%	+7.8%	+15.8%	+3.9%	+18.5%	+31.0%
Point Pelee	331,932	+4.8%	+6.5%	+9.1%	+7.7%	+14.7%	+20.7%	+13.0%	+28.6%	+39.4%
Pukaskwa	8,367	+12.2%	+14.2%	+16.4%	+12.9%	+21.0%	+30.5%	+22.6%	+40.2%	+58.8%
La Mauricie	171,710	+5.5%	+8.8%	+10.9%	+6.3%	+16.8%	+29.2%	+15.7%	+35.2%	+54.3%
Prince Edward Island	845,850	+14.1%	+21.2%	+23.8%	+10.5%	+24.6%	+38.2%	+22.4%	+50.6%	+73.6%
Kouchibouguac	229,055	+5.1%	+7.9%	+9.8%	+4.6%	+11.1%	+19.2%	+5.2%	+22.4%	+33.3%
Cape Breton Highlands	366,307	+22.9%	+36.6%	+40.3%	+15.3%	+36.3%	+59.6%	+30.0%	+78.2%	+126.2%
Terra Nova	239,736	+3.4%	+5.8%	+7.0%	+5.7%	+9.3%	+11.5%	+3.9%	+9.3%	+12.7%
Total visits	12,802,157	13,500,332	13,905,030	14,107,002	13,693,863	14,564,314	16,098,445	13,850,828	16,094,033	18,049,845
% change in visitation		+5.5%	+8.6%	+10.2%	+7.0%	+13.8%	+25.7%	+8.2%	+28.7%	+41.0%

^a Modelled visits were within +/-25% of observed visits in 2003 at all 15 parks (11 parks were within +/-10%; six parks were within +/-5%)

Table 4. Projected combined impact of climate and demographic change on national park visitation in the mid-2020s

National park	Modelled annual visits (1961–90)	Climate change only (2020s) ^a			Demographic change only (to 2025) ^b	Combined climate and demographic change (2020s)		
		NCARPCM B11	ECHAM4 A21	CCSRNIES A11		NCARPCM B11	ECHAM4 A21	CCSRNIES A11
Pacific Rim Reserve	537,282	581,400	579,727	589,420	611,427	671,347	659,730	657,895
Waterton Lakes	418,358	440,000	450,572	460,983	476,091	505,133	512,750	524,653
Prince Albert	203,376	216,906	231,035	226,989	231,442	246,948	262,918	265,232
Mt Revelstoke/ Glacier	462,448	503,233	596,558	583,276	526,266	572,577	541,528	663,726
Kootenay	1,628,373	1,720,586	1,797,724	1,759,677	1,853,088	1,958,715	2,045,810	2,003,189
Yoho	1,066,544	1,103,631	1,126,270	1,121,147	1,213,727	1,256,208	1,281,696	1,275,991
Banff	4,413,741	4,526,076	4,563,808	4,547,070	5,022,837	5,148,408	5,193,614	5,173,522
Jasper	1,879,078	1,944,993	1,948,604	1,953,207	2,138,391	2,213,234	2,217,511	2,221,788
Point Pelee	331,932	347,849	357,491	375,225	377,739	395,870	406,824	426,845
Pukaskwa	8,367	9,386	9,446	10,259	9,522	10,683	10,750	11,674
La Mauricie	171,710	202,315	182,528	221,858	195,406	206,153	207,717	226,085
Prince Edward Island	845,850	965,289	934,664	1,035,407	962,577	1,098,301	1,063,648	1,178,195
Kouchibouguac	229,055	240,658	239,683	240,964	260,665	273,958	272,759	274,219
Cape Breton Highlands	366,307	450,152	422,352	476,309	416,857	512,318	480,637	541,915
Terra Nova	239,736	247,858	253,401	249,037	272,820	282,095	288,370	283,460
Total visits	12,802,157	13,500,332	13,693,863	13,850,825	14,568,855	15,351,949	15,446,261	15,728,388
% change in visitation		+5.5%	+7.0%	+8.2%	+13.8%	+19.9%	+20.7%	+22.9%

^a Based on change values (%) in Table 3

^b Based on a 9% increase in the soft adventure outdoor tourism market for Canadian visitors and a 25% increase for US/international visitors⁽⁴⁷⁾

Indirect Impact of Environmental Changes on Park Visitation

The quality of the natural environment in Canada's national parks is critical to their success as tourism destinations. A recent visitor survey conducted by Parks Canada in the Rocky Mountain national parks found that the natural environment was the number one factor motivating people to visit these parks⁽⁶⁴⁾. The natural environment in parks will be altered by climate change. Although the type and magnitude of change will vary depending on the region and natural resources present, any climate-induced changes in the quality of natural landscapes could have negative implications for tourism.

Based on the scientific literature, scenarios of environmental change were developed for Waterton Lakes and Banff national parks and visitors were then surveyed to ascertain if and how these environmental change scenarios would affect their intention to visit each park.

The results of the visitor survey, which were similar in both national parks, suggest that long-term environmental changes could have the most meaningful impact on future visitation and related tourism (Table 5). After considering the environmental changes outlined in scenario 1 (~2020s), all visitors (100%) to Banff and Waterton Lakes national parks indicated that they would still visit and approximately 10% of all respondents in both samples indicated that they would visit more often. Slightly fewer respondents in Waterton Lakes (97%) and Banff (94%) national parks stated that they would visit if the environmental changes in scenario 2 (~2050s) were realized. Approximately 14% and 22% of total respondents in Waterton Lakes and Banff, respectively, indicated that they would visit less often.

For many current visitors to Waterton Lakes and Banff national parks, the environmental changes in scenario 3 (~2080s) surpassed their threshold of an acceptable level of change. If the environmental changes in scenario 3 (~2080s) were realized, 38% of respondents in the Waterton Lakes survey indicated they would visit less often and approximately one-fifth (19%) indicated that they would no longer visit. By comparison, approximately one-third (31%) of respondents in the Banff survey indicated that they would no longer visit the park. With most people indicating that they would not visit or would visit less often, it is possible that the considerable environmental changes projected to occur later this century may contribute to reduced annual visitation to Waterton Lakes and Banff national parks.

Visitors to Banff National Park were also asked about the future status of Banff as a world-class destination. Most respondents (64%) felt that Banff would continue to be a world-class tourism destination regardless of the nature and magnitude of climate change-induced environmental changes projected for later this century. This is approximately an equal proportion (69%) to those that indicated they would visit Banff National Park under the high-impact environmental change scenario (scenario 3) (Table 5), thus providing increased confidence in these findings.

Nonetheless, the visitor segments most likely to be affected by potential climate-induced environmental change are those that travel a long distance to see these parks and first-time visitors. In a recent Parks Canada survey of visitors to Canada's mountain national parks⁽⁶⁴⁾, nearly all respondents indicated that they were very satisfied with their natural environment experiences in Banff, Jasper, Yoho and Kootenay. The visitor surveys developed for this climate change study suggest that environmental changes may adversely affect these experiences in the future.

Table 5. Visitor survey results — visitor intentions under environmental change scenarios

	Waterton Lakes National Park (N = 425)		
	2020s	2050s	2080s
Visit more often	10%	5%	
Visit the same amount	89%	78%	43%
Visit less often	2%	14%	38%
Will not visit		3%	19%
Total	100%	100%	100%
	Banff National Park (N = 382)		
	2020s	2050s	2080s
Visit more often	9%		
Visit the same amount	87%	72%	33%
Visit less often	4%	22%	36%
Will not visit		6%	31%
Total	100%	100%	100%



Provincial Park Visitation – Ontario Case Study

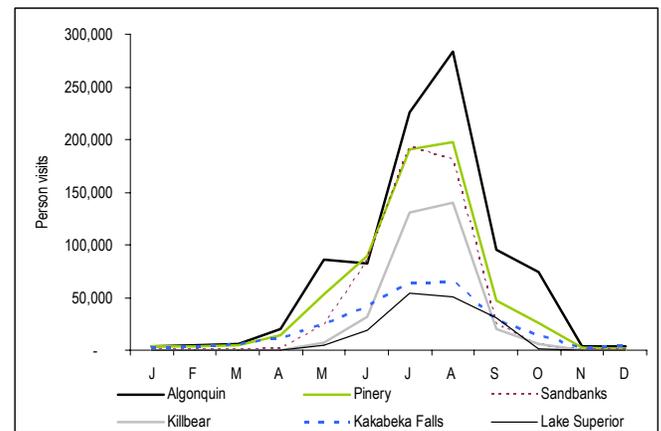
In addition to Canada’s system of national parks, there is a system of provincial parks in each Province and Territory. The provincial park systems are an even more important resource for nature-based tourism in Canada, at least in terms of visitation numbers. Based on recent data, it is estimated that approximately 19 million people visit British Columbia’s provincial parks and recreation areas annually⁽⁶⁵⁾, while approximately 8 million and 3 million people visited Alberta’s and Saskatchewan’s provincial parks annually, respectively^(66,67).

In the Province of Ontario, the range of natural and recreational amenities offered in its 300-plus provincial parks attract approximately 10 million people annually⁽⁴⁵⁾. Wasaga Beach Provincial Park and Algonquin Provincial Park each receive more than 1 million visitors annually, making them the most visited parks in Ontario⁽⁴⁵⁾.

Seasonality in Current Park Visitation

Visitation to Ontario’s provincial parks is highly seasonal, more so than visitation to Canada’s national parks. Figure 8 illustrates the seasonality in visitation at the six provincial parks analyzed in this study⁽⁶⁸⁾. Visitation tends to be highest during the summer months of July and August, with nearly two-thirds of annual visits to these parks occurring during this period; 70% of park visits occur between June 1 and August 31. The summer peak in visitation corresponds to when most Canadians have school or work-related holidays. Visitation to these provincial parks tends to be lowest during the winter months (December, January and February) (~10% of total annual visits) because many popular recreation amenities (e.g., campgrounds, public beaches) are closed to the public or the parks themselves are closed. Similar patterns to these are seen in other parks in Ontario’s park system.

Figure 8. Monthly provincial park visitation, 2003



Direct Impact of Climate Change on Visitation

Annual visitors

Ontario’s provincial parks are projected to experience a trend toward higher visitation under climate change (Table 6). Assuming tourist demand patterns remain unchanged, as the period for warm-weather recreation is extended under climate change, total annual visits to Ontario’s entire system of provincial parks are projected to increase between 11% (to 11.2 million) and 19% (to 12.1 million) in the 2020s from a current baseline of approximately 10 million visitors. In the 2050s, annual visits system-wide are projected to increase between 16% (to 11.8 million) and 48% (to 13.5 million). In the 2080s, the number of people visiting Ontario’s provincial parks is projected to increase 27% to 15.1 million under the least change climate change scenario and 82% to 18.5 million under the warmest climate change scenario.

Table 6. Projected changes in visitation to Ontario's provincial parks

Park region	Total visitors in 2003	NCARPCM B21			ECHAM4 A21			CCSRNIES A11		
		2020s	2050s	2080s	2020s	2050s	2080s	2020s	2050s	2080s
Northwest	777,477	+8.3%	+12.3%	+16.3%	+15.2%	+30.1%	+45.3%	+24.4%	+51.7%	+73.3%
Northeast	816,572	+22.2%	+30.7%	+37.4%	+32.3%	+56.5%	+58.8%	+57.4%	+97.0%	+103.1%
Central	3,485,606	+8.3%	+11.9%	+14.5%	+13.5%	+28.4%	+42.8%	+20.6%	44.2%	+65.6%
Algonquin	886,617	+2.6%	+4.0%	+5.2%	+4.6%	9.7%	+14.7%	+7.7%	+16.8%	+24.5%
Southeast	1,951,717	+17.2%	+23.1%	+29.7%	+21.4%	+49.8%	+80.1%	+40.1%	+91.8%	+146.3%
Southwest	2,264,129	+8.2%	+10.9%	+14.6%	+13.0%	26.4%	+38.4%	+21.3%	+47.2%	+68.2%
Total visits	10,182,118	11,261,639	11,676,324	12,076,229	11,787,393	13,523,101	15,069,382	12,898,708	15,926,083	18,492,171
% change in visitation		+10.6%	+14.7%	+18.6%	+15.8%	+32.8%	+48.0%	+26.7%	+56.4%	+81.7%

Table 7. Projected impact of climate change and demographic change on visitation to Ontario's provincial parks (mid-2020s)

Park region	Total visitors in 2003	Climate change only (2020s) ^a			Demographic change only (to 2025) ^b	Combined climate and demographic change (2020s)		
		NCARPCM B11	ECHAM4 A21	CCSRNIES A11		NCARPCM B11	ECHAM4 A21	CCSRNIES A11
Northwest	777,477	842,008	895,654	967,181	863,777	935,470	995,071	935,469
Northeast	816,572	997,851	1,080,325	1,285,284	907,211	1,106,798	1,200,241	1,427,951
Central	3,485,606	3,774,911	3,956,163	4,217,583	3,872,508	4,193,926	4,395,297	4,685,735
Algonquin	886,617	909,669	927,401	954,887	985,031	1,010,642	1,030,343	1,060,879
Southeast	1,951,717	2,287,412	2,369,384	2,734,356	2,168,358	2,541,315	2,632,386	3,037,869
Southwest	2,264,129	2,461,108	2,558,466	2,739,596	2,515,447	2,734,291	2,842,455	3,043,691
Total visits	10,182,118	11,272,959	11,787,393	12,898,887	11,312,333	12,522,444	13,095,793	14,191,594
% change in visitation		+10.7%	+15.8%	+26.7%	+11.1%	+23.0%	+28.6%	+39.4%

^a Based on change values (%) in Table 6

^b Based on a 13% increase in the soft adventure outdoor tourism market for Canadian visitors and a 6% decrease for US/international visitors⁽⁴⁸⁾

Changes in visitation to Ontario's provincial parks are projected to vary regionally (Table 6). The northeast and southeast regions are projected to experience higher visitor increases than the other four park regions. By the end of the 21st century, the northeast and southeast park regions are projected to experience more than a doubling in visitors under the warmest climate change scenario. By comparison, Algonquin region was projected to experience the smallest increase in person visits under all three climate change scenarios and in all three time periods (less than 25% growth by the end of the 21st century).

Seasonal pattern to visitation

At the system level, the seasonal pattern of visitation is generally much more pronounced in Ontario's provincial parks than it is in Canada's national parks. As a result, there could be positive implications for tourism and recreation during the non-peak months of July and August as the warm-weather recreation season is extended.

Visitation is projected to increase during the summer months of July and August at all six provincial parks analyzed in this study (Figure 9). Sandbanks Provincial Park is projected to experience the largest increase in visitation during the peak season of July and August (31% to 43%) in the 2050s. By comparison, Algonquin Provincial Park is projected to experience the smallest increase in summer visitation, with average increases between 2% and 6% in July and August over current conditions. A notable exception to the projected visitation increases during the summer is Lake Superior Provincial Park. Under the warmest climate change scenario, this park is projected to experience a reduction in summer visitation*.

Perhaps more important to provincial park managers than projected increases in summer visitation are the increases in visitation projected to occur outside of the summer peak season across all six parks (Figure 9). The most noteworthy increases are projected to occur in Kakabeka Falls, Lake Superior and Sandbanks provincial parks under the warmest climate change scenario. Kakabeka Falls is projected to experience a 371% increase in average visitor levels in the 2050s during the winter months (December to February). Visitation is projected to increase on average 144% during the spring and 171% during the fall months at Lake Superior Provincial Park, while average increases at Sandbanks Provincial Park for the same periods in the 2050s are 368% and 328%, respectively.

* This pattern is partially explained by the regression relationship between temperature and visitation patterns⁽⁴⁾.

Synergistic Effect of Climate and Demographic Change on Park Visitation

Like the national park system, future demographic changes in tourism markets in Ontario and US states that border the Great Lakes region could influence park visitation in Ontario. Using Ontario Parks' ratio of visitor origins (90% Canadian, 10% US/international), the impact of demographic change on visitation was estimated.

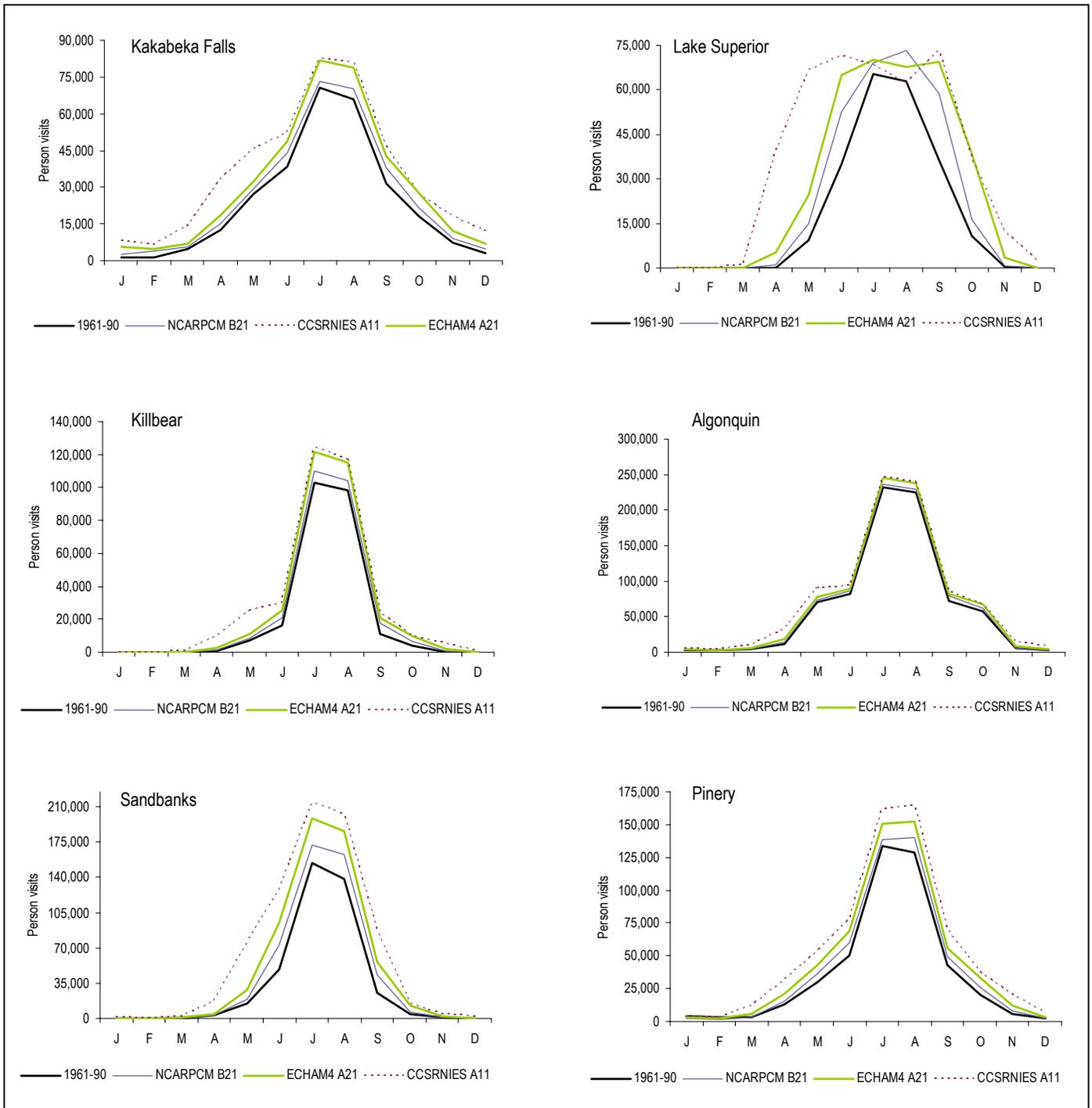
The impact of demographic change alone on park visitation in the mid-2020s is projected to be approximately +11% (Table 7), which is approximately equal to the least-change climate change scenario for the 2020s (Table 6). The combined impact of demographic change and climate change is projected to increase visitor levels system-wide between 23% and 39%, which translates into an additional 2.3 to 4.0 million people visiting Ontario's provincial parks annually by the mid-2020s.

Economic Implications

Ontario Parks would benefit economically from additional visitors, as it has the authority under the Provincial Parks Act to use park revenues to fund park operations and projects. Studies that document visitor spending in Ontario's provincial parks are very limited. In one of the only known studies, researchers estimated expenditure levels of visitors to Algonquin Provincial Park. Expenditures varied substantially, ranging on average between \$28 per person-night for car campers to \$200 per person-day for day trippers⁽⁶⁹⁾.

Using this expenditure range as a proxy for all parks in Ontario, Ontario Parks could generate between \$66 million and \$468 million in additional revenue in the mid-2020s under the least-change climate change scenario from the combined impact of climate and demographic changes. Higher visitation levels under the warmest climate change scenario could generate Ontario Parks between \$112 million and \$800 million in additional revenue.

Figure 9. Projected changes in the seasonal pattern of provincial park visitation (2050s)





Conclusions

National and provincial parks are a major resource for nature-based tourism in Canada, providing a wealth of outdoor recreation opportunities for visitors to pursue. This executive summary has demonstrated that climate change is important to the future of Canada's nature-based tourism industry, as it will create new opportunities and new management challenges for national and provincial parks over the course of the 21st century.

Summary of Findings

Visitation to Canada's national parks is projected to increase even under the most conservative climate change scenario. Visitor increases of 6% to 8% are projected for the 15 national parks analyzed for the 2020s with increases of 9% to 29% by the 2050s. Most of the increases are projected to occur outside of the traditional peak summer tourism season. Demographic change is projected to have more impact on visitation (+14%) in the next few decades than climate change alone (6% to 8%), even under the warmest climate change scenario. The synergistic effect of climate and demographic changes is projected to increase visitation, with the largest increase occurring in national parks located in eastern Canada.

Canada's national parks will also experience a range of climate-induced environmental changes over the course of this century. These changes may be particularly noticeable in the Rocky Mountain national parks, which are currently among the most visited in the national park system. A visitor survey found that it would take substantial environmental change to potentially impact visitation to these mountain parks. Based on available scientific knowledge, it would require decades of environmental change under the warmest climate change scenario to produce the situation described in scenario 3. Because it is questionable whether we can predict the behaviour of visitors 80 years from now on the responses of contemporary visitors, this negative impact on

visitation remains highly uncertain. Consequently, there is greater confidence in the positive impact of a longer and more climatically suitable warm-weather tourism season on visitation.

The magnitude of change in visitation to Ontario's provincial parks is projected to be even larger than that projected for Canada's national parks, suggesting that visitor management may be a more salient issue at the provincial level in the future. Visitation increases system-wide is projected to range between 11% and 19% in the 2020s and between 16% and 48% in the 2050s, both of which is at least twice the rate of increase projected for national parks during the same periods. The largest portion of the visitor increases will occur outside the traditional peak season of July and August.

The combined influence of climate change and demographic change is projected to increase visitation levels in both park systems over the next 20 to 30 years. In Canada's national parks, visitation is projected to increase between 19% and 23%, while climate and demographic change together is projected to increase visitation between 23% and 39% in Ontario's park system.

Implications of Visitation Changes for Park Management

Higher levels of visitation brought about by an extended warm-weather tourism season (and demographic changes in tourism markets) have several implications for tourism and park management in Canada. Since the implications are similar for both park systems, they are discussed in general together.

Higher annual visitation to Canada's systems of parks would create a number of opportunities. Higher visitation would bring the opportunity of higher tourism revenues. Parks Canada and Ontario Parks both operate under a partial

revenue-retention model, which means that both agencies have authority to use park revenues to fund park operations and projects under their respective jurisdictions. More visitors would result in higher revenues generated from entrance and other tourism-related services for both Parks Canada and Ontario Parks.

Park communities would also benefit from higher visitation if opportunities to increase visitation can be accomplished in a sustainable manner and the integrity of natural environments, on which nature-based tourism depends, can be maintained. Towns located within national parks such as Banff (population ~9,000), Jasper (population ~4,200) and Waterton (population ~150) are dependent on tourism, and higher visitor levels would result in higher revenues (i.e., from tour fees, accommodation, food and beverage and entertainment sectors). Similar benefits would be experienced in gateway communities to national parks such as Terra Nova (Terra Nova National Park, NF), Tobermory (Bruce Peninsula National Park/Fathom Five National Marine Park, ON) and to provincial parks such as Wasaga Beach (Wasaga Beach Provincial Park), Grand Bend (Pinery Provincial Park) and Brighton (PresQu'ile Provincial Park) in southern Ontario and Thunder Bay (Kakabeka Falls Provincial Park) and Wawa (Shoals Provincial Park) in northern Ontario. In Ontario, it is possible that substantial growth in visitation in northern park regions could also benefit backcountry operations and fishing/hunting outfitters that support the economies of many smaller northern communities.

On the other hand, higher visitation and a longer warm-weather tourism season in national and provincial parks could have some negative implications for park management. Significant increases in visitation or changes in seasonal visitation could exacerbate existing visitor pressures in some parks where visitors already pose an ecological stress, and parks that do not currently list visitation as a key ecological stressor, may in the future. Under a changed climate, parks may need to consider more intensive visitor management strategies. Higher visitation would also exacerbate crowding issues at popular park attractions (e.g., Banff town site, Sulphur Mountain and Lake Louise in Banff National Park; Cabot Trail in Cape Breton Highlands National Park; Wasaga Beach at Wasaga Beach Provincial Park) potentially leading to higher occurrences of conflicts among park users. Existing visitor pressures, for example, were largely responsible for Banff National Park ranking of 44th out of 55 North American national parks on National Geographic's⁽⁷⁰⁾ 'stewardship index.' Higher visitation would only exacerbate crowding at popular attractions (e.g., Banff

town site, Cave & Basin Hot Springs, Sulphur Mountain, Chateau Lake Louise and area).

Although Parks Canada and Ontario Parks could earn revenue from increased visitation, there would also be financial costs associated with accommodating additional visitors (i.e., 'climate change opportunity costs'). Higher visitation and extended tourism seasons would result in additional staff costs for visitor and environmental services (e.g., park patrols, by-law enforcement). Much of this future cost would be incurred during the spring and fall shoulder seasons when seasonal staff is usually at a minimum (rather than the summer when full complements of staff are available). The additional stress placed on existing park infrastructure (e.g., roads, trails, campgrounds, water supply, sewage waste management) could also lead to increased annual maintenance costs and may require further infrastructure investment. Although Parks Canada and Ontario Parks operate on a partial cost-recovery system, it is currently uncertain whether the additional revenue that would be generated would be sufficient to offset the additional costs of higher visitation.

Future Research

Climate change represents a multifaceted challenge to nature-based tourism in Canada, including the management of parks at various levels of government jurisdiction. Due to the economic significance of nature-based tourism in Canada, there is an urgent need to reduce the knowledge gaps related to the impacts of climate change in this sector, some of which are anticipated to be meaningful as early as the 2020s.

Climate change is a very complex and rapidly evolving research and policy area. This study has identified a number of additional research areas that require further analysis.

- This study identified a number of implications of higher visitation for parks in Canada. With limited participation of local tourism stakeholders, the potential economic impact of climate change could not be ascertained and remains an important uncertainty.
- Extremely warm summers, severe fire seasons, heavy precipitation events and warm winters with poor snow conditions have an impact on different aspects of the nature-based tourism industry. Analysis of the impact of these events (termed 'climate analogues') on park visitation should be undertaken to improve our understanding of the vulnerability of the industry (regionally and by recreation sector) and the effectiveness of current climate adaptation response strategies.

- The environmental change visitor survey presented in this executive summary was only undertaken in two national parks. Similar surveys are needed that examine how visitors may respond to climate-induced environmental changes in other national parks with different natural landscapes (e.g., Prairie parks, coastal parks – Atlantic coast) in order to understand differential vulnerability within the park system.
- Climate change will not be the only factor that affects park visitation in the decades to come. Additional analysis is needed that examines how climate change may interact with these other factors (e.g., population growth, ageing society, travel costs) to impact visitation.

Final Thoughts

Both the United Nations Intergovernmental Panel⁽⁷¹⁾ on Climate Change and the Government of Canada have indicated that despite efforts to reduce greenhouse gas emissions, some level of human-induced climate change will need to be realized in the 21st century. As a result, climate change adaptation is a necessary policy strategy.

This study has demonstrated that climate is important to nature-based tourism in Canada and that projected climatic changes over the 21st century will create new opportunities and challenges for park management at federal and provincial levels. Parks Canada is in the very early stages of developing a climate change adaptation framework and climate change policy. The primary focus of Parks Canada's climate change adaptation policy and planning to date has been the maintenance of ecological integrity. Ontario Parks has recently completed a scoping level climate change impact assessment⁽⁷²⁾ and commissioned research to develop a climate change adaptation strategy. As both agencies begin to plan for the challenge of climate change, changes in visitor management strategies will need to be a fundamental component of their climate change adaptation frameworks.

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