

# Climate Change and Recreation in Ontario Parks

Dan Mulrooney

Ontario Parks, Ontario Ministry of Natural Resources

## Abstract

*There is increasing consensus among the scientific community that human induced climate change is a reality and now well underway. Climate change is expected to have extensive impacts on ecosystems and the people who live within them. Each year Ontario Parks provides millions of visitors with the opportunity to pursue a range of recreational opportunities. This presentation and supporting paper examines various climate change scenarios and the potential impacts on the park environment and some of the most popular recreational activities at Presqu'ile Provincial Park.*

## Introduction

On March 4, 2004, as part of the *Coastal Zone Climate Change and Adaptation Workshop* held at the Quinte Conservation, Belleville, Mr. Paul Gray (OMNR) and the author developed an electronic presentation regarding 'Recreation in Provincial Parks'. The focus of this work was on the potential impacts of climate change on recreation at a coastal provincial park: Presqu'ile. The findings presented in this paper are a continuation of the Presqu'ile Provincial Park case study. Bio-climate data for Trenton are used in conjunction with climate change scenarios to help identify impacts on the environment and recreation. Information is presented about climate change, provincial parks, visitation, climate change scenarios and the need for further research.

## Climate Change

Changes in temperature, precipitation patterns, and sea-level rise have been observed at local, regional and global scales. The various levels of change that are projected to occur will have wide-ranging and potentially destructive

impacts on natural environments, and the human societies that depend on them (IPCC, 2001).

Many aspects of the natural environment and humanity are impacted by climate change. The oceans, coastal areas, forests, freshwater resources, species and human health are all subject to the projected changes in our climate. Generally, for every small degree of global warming, there is a host of negative and positive impacts. The level of negative impact to natural environments and human societies is most pronounced at the higher projected temperature increases (Union of Concerned Scientists, 2004; UNFCCC, 2004).

Scientists around the world have made estimates of the potential direct impacts on our world and on societies. However, understanding the complex interactions between the mix of positive and negative impacts and among the various natural and human sectors involved is a great challenge for the scientific community. Our understanding of the full consequences of climate change is still evolving as new data and information become available (Union of Concerned Scientists, 2004).

An outcome of the worldwide scientific debate over whether global warming can be attributed to human activities, such as the burning of fossil fuels, was the formation of the Intergovernmental Panel on Climate Change (IPCC). In addition, the *United Nations Framework Convention on Climate Change* was created as an international policy framework to address the issue of climate change (Union of Concerned Scientists, 2004).

## **The Great Lakes and Provincial Parks**

In 2003, there were 314 provincial parks in Ontario protecting over 7.5 million ha (OMNR, 2003a). Approximately 20% of all provincial parks are connected to the shores of the Great Lakes. In terms of area, Great Lakes provincial parks comprise only 5% of the area of all provincial parks. However, Great Lakes provincial parks account for 53% of the total visitation (OMNR, 2004b). Some of the reasons for this high level of visitation include close proximity to large urban centres, outstanding beaches and scenic vistas. Parks visitation continues to increase. A large percentage of operating parks show increases in visitation (OMNR, 2003b).

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## Presqu'ile Provincial Park and Climate Change Assessment

Presqu'ile Provincial Park is an ecologically diverse area located in the south-east of the province, forming part of the coastal area of Lake Ontario. The park is classed as a 'natural environment' park and preserves 937 ha. The predominant landform is a tombolo that supplies wetland habitat and beach recreation (OMNR, 2000a). Each year the park attracts over 200,000 visitors (OMNR, 2003a).

To assess the impact of climate change on recreation at Presqu'ile Provincial Park, the author used data and models publicly available through the *Canadian Climate Impacts Scenario Project*. The Project is designed as a non-technical introduction to climate change and is a collaborative venture of the *Canadian Climate Change Action Fund*, the Canadian Institute for Climate Studies and Environment Canada (CICS, 2004).

Climate change scenarios are constructed from the results of general circulation models (GCMs) (CICS, 2004). The author used the most recent Canadian Centre for Climate Modelling and Analysis (CCC) model CGCM1 that included the moderating effect of sulphate aerosols (GA1).

A bio-climate profile was not available for Presqu'ile; however, a small nearby community, Trenton, was selected as being representative of Presqu'ile's climate. Bio-climate profile data for Trenton and climate change scenarios (CGCM1-GA1) were used for three periods: 2020, 2050, and 2080.

One major challenge of applying GCM projections to regional impacts is the coarse spatial resolution. Presently, climate variables are bound to a network of grid cells with the distance between cell centroids typically reaching between 200 to 1000 km (CICS, 2004).

A short summary of the Trenton/Presqu'ile results from the CGCM1-GA1 assessment from 2020 to 2080 is provided below:

- annual average temp rise from -5.2°C to 3.3°C, a total rise of 8.5°C;
- average April to October rise from 14.2°C to 19.2°C, a total rise of 5°C;

- average November to December temperature rise from  $-0.9^{\circ}\text{C}$  to  $3.2^{\circ}\text{C}$ , a total rise of  $4.1^{\circ}\text{C}$ ; and,
- average January to March temperature rise from  $-5.2^{\circ}\text{C}$  to  $3.3^{\circ}\text{C}$ , a total rise of  $8.5^{\circ}\text{C}$ .

The CGCM1-GA1 was also used to produce a water surplus and deficit profile for Trenton. At the extreme, annual precipitation may increase from 849 mm to 900 mm in the year 2080. Generally, the model assessments indicate more precipitation in the shoulder seasons. Most striking is the more intense period of water deficit, rising from the current 75 mm to near 100 mm in July of 2080.

A change in the water cycle also influences the conditions for forest fire. Much of the province, including Presqu'île, may have a higher forest fire severity rating as a result of the predicted increases in the frequency and intensity of drought (McAlpine, 1998). Fire can help to renew the environment; however, park natural features as well as human life and property may be at higher risk.

Climate change may increase the frequency and intensity of extreme weather events (UNFCCC, 2004). The temperature profile chart for Trenton 2050 indicates extreme high temperatures of close to  $40^{\circ}\text{C}$  may be reached between April and October.

## **Climate Change Impacts on Recreation at Presqu'île**

What recreational activities do visitors engage in at Presqu'île? The top three most popular activities are hiking, swimming, and viewing/photographing nature (OMNR, 2000b). These activities are most typical of Great Lakes parks and protected areas and may be impacted by changes in climate.

Some general impacts of climate change on recreation are thought to include longer seasons and increased visitation (IPCC, 2001). Ontario Parks has responded to the visitor demand for longer seasons with more electrical sites and interpretative programs in the non-peak season (OMNR, 2004a). For many southern Great Lakes parks, there has been a decline in cross-country skiing. Some parks, such as Presqu'île, no longer groom trails as a result

of a shorter season of reliable snow cover and falling participation (OMNR, 2004a). Finally, human health concerns such as the increased risk of Lyme Disease, West Nile virus, Malaria, Hantavirus and Dengue fever may deter participation and visitation to protected areas (Kling *et al.*, 2003; Environment Canada, 2004).

Discomfort from higher temperatures and humidity may deter participation in some popular recreational activities (Kling *et al.*, 2003). As mentioned previously, more severe weather events may also be an outcome of climate change (Kling *et al.*, 2003). The threat of severe weather conditions may also deter some from outdoor recreation participation.

Potential visitors may also be deterred by a perceived loss or reduction in the quality of the recreation/tourism product. Loss of tree cover from high winds or poor beach conditions may also affect visitation and participation. The economic gains from higher participation and visitation may be offset by losses to the natural environment and infrastructure. The multi-billion dollar nature-based tourism industry may see a mix of gains and losses (IPCC, 2001). Recent severe weather events at Presqu'ile, Rondeau and Halfway Lake have had devastating effects on the park environment, visitation and perhaps on local economies.

There are also specific impacts on individual recreational activities. Hiking may have extended seasons and more people may participate as the temperatures increase. However, there may be greater risks associated with dehydration and heat stroke (Kling *et al.*, 2003). Climate change may also result in more smog or poor air quality days. Will hikers go anyway or stay at home indoors and wait for better air quality? More people concentrated into a more comfortable temperature range, as might be expected in the shoulder seasons, may give rise to greater trail impacts and erosion. This 'constrained comfort season' might also lead to more trail encounters and a potential loss of enjoyment for some visitors.

Swimming may benefit from warmer waters, a longer season and more beach area (International Institute for Sustainable Development, 1997). This may be offset by higher beach temperatures and discomfort, poorer water quality, more blowing sand and loss of sand beach. Waterborne infectious disease may become more prevalent. The incidence of diseases such as cryptosporidiosis or giardiasis may be increased by more frequent rainstorms (Kling *et al.*,

2003). More frequent rainstorms and the associated health risks may result in more beach closures at parks.

Viewing and photography may also benefit from a longer season. This could increase participation and visitation. The increase in visitation might also lead to more crowded viewing areas. However, lower lake levels are predicted for Lake Ontario (Kling *et al.*, 2003). The loss of habitat and/or food sources for migratory songbirds, shorebirds and waterfowl may reduce overall viewing opportunities at costal parks such as Presqu'ile.

Southern Ontario's climate may become more like present-day northern Virginia. By 2080, summers in southern Ontario will feel more like the hot and humid summers of the southern U.S. (Kling *et al.*, 2003). Some three-season activities may move to year-round activities while other activities such as cross-country skiing may greatly decline.

## **Further Research Needs**

Relatively little research has been done on the impact of climate change on recreation. Generally, there is a need for more comprehensive tourism and recreation studies at various scales (Wall, in press). The following questions may be considered as potential research topics:

- What are the costs and benefits associated with extended seasons for Ontario Parks?
- How can we help park visitors mitigate and adapt to climate change?
- Are park users already adapting to climate change? If so, what are their new behaviors and the implications for visitor management?
- Will demand shift to 'cooler' parks?

## **Summary**

Bio-climate profile data for Trenton and climate change scenarios (CGCM1-GA1) were used for three periods (2020, 2050, and 2080) to assess impacts at Presqu'ile. Climate changes for Trenton include increased temperatures, more total precipitation and a more intense period of water shortage. As a Great Lakes coastal park situated in highly urbanized southern Ontario, the park receives substantial visitation. The top three recreational activities include hik-

ing, swimming and viewing/photographing nature. A range of negative and positive impacts of climate change on park environments and recreational activities were presented. Climate change may bring a mix of benefits and risks to both the environment and recreation at Presqu'ile Provincial Park. Finally, more research is needed on the impact of climate change on parks and protected areas, and on visitors and their associated recreational activities.

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