

## The Potential Impacts of Climate Change on Recreation in Vermont

Gwen Dunnington, May 2011

### Introduction

The projected rise in annual temperatures, shortening of the winter season, and changes in precipitation events pose some significant changes to Vermont's well-known suite of outdoor recreation activities. The winter season, which generates over \$1 billion of revenue for the state annually, stands to see the most changes, with substantial decreases anticipated in the length of the ice fishing, skiing, snowboarding, and snowmobiling seasons and much less reliable snowpack and snowfall conditions (Wake, Burakowski and Goss, 2006; Frumhoff et al., 2007). In the summer, rising temperatures pose health concerns related to heat waves, decreasing air quality, and more pest species such as blue-green algae, ticks, and mosquitos. Careful adaptation planning will be needed in order for Vermont to weather these changes gracefully.



### Impacts

#### *Winter*

By the end of the century, the average number of reliable snow-covered days in the Northeast is expected to decrease to as few as 13-25 days, which will have a significant impact to outdoor winter activities (Frumhoff et al. 2007). Winter sports generate an average annual revenue of \$7.6 billion for the northeast, with snowmobiling alone accounting for \$3 billion annually (Frumhoff et al., 2007). Sports such as snowmobiling, cross-country skiing, snowshoeing, ice fishing and sledding, which rely on natural snow and ice cover, are the most vulnerable to these changes (Wake, Burakowski and Goss, 2006). Vermont, along with Pennsylvania, New York, New Hampshire, Maine, and Massachusetts, contain over 40,000 miles of snowmobile trails, but as snowfall, snowpack, ice cover, and ice thickness decrease and become less predictable, only the very northern and higher-altitude areas are expected to retain a snowmobile season of two months or longer. Lake Champlain has failed to freeze over a dozen times since 1970, and ice-

out dates are arriving an average of nine days earlier in the northern region of the Northeast (Frumhoff et al., 2007; Betts, 2010).

The alpine ski industry is able to offset some of the decrease in snowfall by making artificial snow, but this is expensive, and still reliant upon cold conditions. A particular economic concern is the decreased viability of downhill skiing during the holiday season. The end of the year–New Year’s holiday season can generate as much as one third of a ski resort’s annual revenue. Snow conditions at the beginning of the winter season are quickly becoming less reliable, and overall, more precipitation is expected to fall as rain and less as snow in future decades (Frumhoff et al., 2007; Wake, Burakowski, and Goss, 2006). Even if ski resorts are able to maintain season length by making artificial snow, natural precipitation in the form of rain or freezing rain, rather than snow, during the holiday season may cut substantially into Vermont’s annual revenue.

### *Summer*

Average temperatures are expected to increase by about 10°F by the end of the century, if emissions stay high (Frumhoff et al., 2007; Betts, 2010). Rising temperatures threaten to increase the frequency of severe heat waves, which pose daunting challenges to summer recreation in a state widely appreciated for its mild summer temperatures. In six out of the ten years between 1993 and 2003, heat was the



leading weather-related killer in the United States (Frumhoff et al., 2007). Since the number of days above 90°F is expected to triple or quadruple over the upcoming decades, increased preparedness (e.g. warning systems, education, preparedness, etc.) will be essential to lessen the impact of extreme heat on vulnerable people (Frumhoff et al., 2007).

Increasing temperatures will also encourage the expansion of pest species such as ticks and mosquitoes, which pose new and increasing threats such as West Nile Virus and Lyme disease to human health (Frumhoff et al., 2007). Other undesirable species such as poison ivy and blue-green algae also thrive in warmer temperatures. Warm, shallow aquatic environments such as Missisquoi Bay are particularly susceptible to large-scale blue-green algae blooms, which make the water unswimmable and potentially hazardous for human consumption (LCC, 2010). The rare, delicate alpine environments that can be enjoyed only at the tops of Camel’s Hump and Mount Mansfield are also among the habitats most vulnerable to temperature increases.

Additional effects on recreation may include:

- Severe/unpredictable weather, which may pose elevated safety risks for outdoor recreationists and increase weather-related damage to trails;

- Rising lake levels may limit access to some beaches and shoreline recreation centers;
- Shrinking populations of cold water fishes, such as trout, as warmer-water species thrive (Stager and Thill, 2010). Warmer water can also hold less dissolved oxygen than colder water, which may cause undesirable algae blooms in environments such as Missisquoi Bay; and,
- Decreasing air quality due to rising temperatures, which allow for more ozone-causing chemical reactions. Ozone damages lung tissue and is especially unhealthy to people with asthma or other respiratory diseases. Warm temperatures are also expected to increase pollen production and lengthen the pollination season, simultaneously lengthening the allergy season and increasing the risk of asthma attacks (Frumhoff et al., 2007).

### What are we already doing?

A number of programs already exist that will help Vermont's recreation sector adapt to the challenges posed by climate change:

- *The Recreation Trails Program* develops and maintains trail systems across Vermont, expanding trails whenever money is available. Half of the funding in this program goes to state programs, while half is distributed in the form of community grants for local partners to construct and maintain trails. This program also seeks to develop universally-accessible trails for all Vermonters to enjoy. Improving the interconnectedness of trails across the state may be an effective way to avoid transportation costs and emissions, and to foster stewardship and appreciation for Vermont's natural landscape.
- *Many Vermont state parks* offer educational talks and programs at campgrounds and ranger stations. Since hundreds of thousands of people (almost 840 thousand in 2010 alone) visit Vermont state parks every year, these programs are perfectly positioned to advance climate education and awareness to a huge number of people. Climate change and its impacts on Vermont could become a common issue presented to park visitors.
- *Social networking tools* such as Facebook and Twitter are also already used by the Department of Forests, Parks, and Recreation to engage a broad audience and keep them up-to-date on activities impacting Vermont's parks. Vermont-lovers from all over the country can subscribe to the FPR's blog and newsletter, which may be used to convey information about the impacts of climate change in Vermont all year round.



### Next Steps

Much of Vermont's economic and cultural value is derived from its natural beauty, and effective management practices will help preserve those qualities for the health of the environment, the health of the residents, and the financial stability of the state. Some projects to adapt to the changing climate may include:

- The completion of a vulnerability assessment to help identify outdoor destination areas that are most vulnerable to climate change impacts;
- The expansion and potentially relocation of camping facilities, particularly near lake and river shores, to avoid costly annual repair fees and to preserve particularly vulnerable environments;
- Expansion of summer recreation activities to help offset the lost revenue from winter sport;
- Promotion of low-impact development;
- Improved interconnectedness of trails;
- Increased public transportation to parks and beaches; and,
- Increased climate education programs at Vermont campgrounds, ranger stations, and visitor centers.

**References**

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