



# FACT SHEET

## CLIMATE CHANGE AND THE NORTHERN FOREST

### INTRODUCTION

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A new scientific study<sup>1</sup> shows the Northern Forest of New England and upstate New York to be especially vulnerable to climate change.

- Maine has a higher percentage of its forest and wildlife habitat at risk from global warming than any other state in the continental U.S. Climate models point to the fact that 44% of Maine's existing terrestrial habitats (nearly 15,000 square miles – an area bigger than Maryland) are likely to be transformed into other ecosystem types.
- In the most heavily impacted areas, the rates at which plant and animal species may be required to shift their ranges in response to global warming in the next 100 years may be as much as ten times faster than at the end of the last ice age.
- New Hampshire has 35% of its habitat at risk, making it the 8<sup>th</sup> most vulnerable state in the nation. In New Hampshire and Maine, as well as in Vermont and upstate New York, the northern forests are the most threatened plant communities, particularly at the southern edges of their ranges.
- Unusually high migration rates are likely to affect more than 18,000 square miles of habitats (an area larger than Denmark) in Vermont, Maine, New Hampshire and New York, threatening some species with local extinction.
- High mountain habitats, rare species and fragmented or isolated ecosystems also are highly vulnerable to climate change.

### SHIFTS IN FOREST DISTRIBUTION

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Range changes brought about by global warming and climatic disruption are expected to change the character of the forests of northern New England and upstate New York.

- Climate models predict that in the longer term global warming will eventually transform the conifer forest of northern New England into the type of forest now found farther south – either the deciduous forest of the Mid-Atlantic States, or the mixed forests characteristic of southern New England.

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<sup>1</sup> *Global Warming and Terrestrial Biodiversity Decline*. Jay Malcolm and Adam Markham. World Wildlife Fund. 2000.

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- The conditions that currently support northern hardwood forests will shift up to 300 miles north during the next 100 years, causing the loss of these forests over much of the landscape. The distributions of white spruce, black spruce, red spruce, balsam fir and other species of cool climates will move north and these trees are likely to disappear from most of their current ranges in the Northeastern United States. If disturbances such as fire or storms increase as has been predicted by some scientists, this would hasten the decline.
- Current modeling forecasts predict that maple sugar trees eventually would be completely eliminated as a regionally important species in the northeastern United States. Even where sugar maples are able to persist, changes in the freeze/thaw cycle are expected to reduce the quantity of syrup harvested. Maple syrup production is worth approximately \$20 million annually in New England.

## IMPACTS ON THE FORESTRY INDUSTRY

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More than 300,000 people in New England and New York are employed in the forestry and forest products sector. Climate projections for the Northeast suggest that forests may experience an array of problems, which could seriously affect commercial forestry. Economic losses are likely to particularly affect smaller, non-industrial private landowners in the northeast. More than 250,000 private forest landowners are likely to be affected in New England alone.

- Milder winters are expected to increase the vulnerability of commercial forests to insect pests including eastern spruce budworm, gypsy moth and pine bark beetle. The hemlock wooly adelgid is also likely to be able to move northwards in New York and into Maine, New Hampshire and Vermont.
- The increased frequency or severity of droughts projected by some climate models would adversely affect the health of many forest species. The region's magnificent stands of birch and beech are particularly vulnerable. .
- Higher temperatures and more frequent droughts could be accompanied by an increase in forest fires. As a result, the number of early successional and more cosmopolitan species (such as red maple, gray birch and aspen) may increase in the forests at the expense of climax species. This would also help hasten the northward spread of southern species like oak and hickory.
- Warming temperatures could bring about an increase in the frequency of massive ice storms. In 1998 such a storm damaged more than 17 million acres of forests. Hardwood species are the most vulnerable to ice damage
- Higher summer temperatures will contribute to greater ground-level ozone formation with the likely effect of reducing forest productivity and harming commercial tree species like red spruce and white pine. Ozone impacts are expected to be worst in southern New York and central and southern New England.
- Climate change may act in concert with other environmental stresses, including acid rain, ozone pollution, pests and drought, to reduce the productivity of forests.

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## IMPACTS ON TOURISM AND RECREATION IN FOREST AREAS

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**A** major impact of climate change will be on people who use forestlands recreationally:

- Ski areas in the northeast have experienced exceptionally poor snow conditions in recent winters. Continued warming is expected to result in shorter and less predictable ski seasons in the region.
- Climate change is a significant threat to the forests of the most important public lands in the region, including the Acadia National Park, the Allagash Wilderness Waterway, Baxter State Park, the White Mountains National Forest, and the Mount Washington State Park. The White Mountains are within a day's drive of 77 million people and receive more visitors (7-8 million) every year than Yellowstone and Yosemite national parks combined
- Increased summer temperatures, with 90° F days becoming more common, are likely to increase ozone formation and lead to more smog alerts. As air quality worsens, hikers – particularly those with asthma or other respiratory disorders – will face a heightened health risk.
- Lyme disease is already on the increase in New York and parts of New England. If undetected, the disease can lead to permanent neurological disability. Because it is passed along to humans by ticks, Lyme disease poses a special threat to people who enjoy outdoor pursuits like hiking, birding and fishing. Swedish research on ticks suggests that warmer winters could increase the incidence of the disease and push its potential range further into northern New England.
- According to public health specialists from Harvard Medical School, droughts helped West Nile Virus get established in New York and parts of New England. Continued warming combined with increased extreme weather events is likely to increase mosquito populations and amplify the size of recurrent outbreaks.
- Changing temperature and precipitation patterns could harm the multi-million dollar fall foliage industry by muting autumn colors. Without sugar maple the autumn experience in New England would be very different.
- Populations of cold-water fish species, including brook, brown and rainbow trout, could be dramatically reduced in many of their current stream and lake habitats as a result of warming water temperatures.

## CLIMATE THREATS TO FOREST WILDLIFE

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**T**he effects of global warming and climate disruptions are expected to be negative overall. For New England's animals and plants, those effects could prove to be disastrous.

- Many species characteristic of the northern forest will be forced to find new habitat as climate changes. Species already living at the southern edges of their ranges – like martens, fishers and snowshoe hares – will be among the most affected.

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- The bird species that live in northern spruce and spruce/fir forests, including the gray jay, boreal chickadee and spruce grouse, are particularly vulnerable to diminished habitat in New England.
- According to the American Bird Conservancy, several species of wood warbler that visit the north woods in summer to breed are expected to extend their ranges northwards, perhaps by hundreds of miles, while disappearing at the southern edges of their current ranges. The data so far indicate that these changes already have started. Northern breeding species such as bay-breasted warbler, Cape May warbler and Tennessee warbler are particularly vulnerable.
- Recent research in the White Mountains by scientists from Dartmouth College has demonstrated that survival and breeding success of black-throated blue warblers declines during El Nino events. There are strong indications that El Ninos may be getting more frequent and intense as a result of global warming.
- Climate change especially threatens rare and endangered species, and those living in isolated or fragmented habitat. For example, Bicknell's thrush could disappear from several sites in the mountains of Maine and New Hampshire, as the subalpine spruce and fir habitat on which it relies falls victim to climate disruption.
- Global warming will tend to favor opportunistic, fast-moving and adaptable species. It is likely to prove to be a boon for many pests and invasive species that threaten regional biodiversity. Purple loosestrife, garlic mustard, Tartarian honeysuckle and Morrow honeysuckle are some of the troublesome non-native species that may benefit as others decline or disappear.

## FURTHER READING

- Speed Kills: Rates of Climate Change are Threatening Biodiversity.* Adam Markham and Jay Malcolm. World Wildlife Fund/Clean Air-Cool Planet. 2000.
- Seasons of Change: Global Warming and New England's White Mountains.* Janine Bloomfield and Steven Hamburg. Environmental Defense Fund. 1997.
- Tropic of Maine.* Special edition of *Habitat*. Maine Audubon Society. 1999.
- Climate Change Impacts on Forests.* Miko Kirschbaum and Andreas Fishlin in *Climate Change 1995 - Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses* (Eds. R.T. Watson, M.C. Zinyowera and R.H. Moss). Cambridge University Press. 1996.
- Death by Degrees: The Emerging Health Crisis of Climate Change in New Hampshire.* Physicians for Social Responsibility. 2000.
- New England Regional Climate Impacts Workshop: Workshop Summary Report.* Institute for the Study of Earth, Oceans, and Space, University of New Hampshire. 1998.
- Is Global Warming Harmful to Health?* Paul R. Epstein. *Scientific American*: 283 (2). August 2000.

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## QUICK FACTS ABOUT CLIMATE CHANGE

- The 20<sup>th</sup> Century was the warmest in 1000 years. 1998 was the warmest year since records began being kept in 1860, and the six warmest years all were recorded in the 1990s.
- The earth's surface temperature has increased by more than 1° F during the past century.
- Temperatures in coastal New England have increased by as much 4°F during the last 100 years. Drought has increased in northern New England, annual precipitation has dropped by more than 20% and snow seasons are shorter than they were 50 years ago.
- Scientists believe the main culprit is carbon dioxide (CO<sub>2</sub>) released to the atmosphere as a result of burning fossil fuels like coal and oil. Most of this pollution results from the energy used to power factories, heat and light homes and businesses, and run cars and trucks.
- Levels of carbon dioxide in the atmosphere have increased by nearly a third since the beginning of the industrial revolution.
- If current pollution trends continue, scientists expect the earth's temperature to be warmer in the 21<sup>st</sup> Century than at any time in the last 400,000 years. The rate of warming the globe will experience in our children's' lifetimes is likely to be faster than at any time since the beginning of human civilization.
- Solutions to climate change do exist. Individuals, businesses and institutions can take action to increase energy efficiency, utilize renewable sources of power like the wind and the sun, and develop new technologies such as fuel cells and microturbines.
- In addition to slowing global warming, cuts in greenhouse gas emissions will have other benefits, including helping to improve air quality and reduce acid rain.

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*Clean Air-Cool Planet is an alliance of individuals, institutions and leaders of civil society working to achieve real reductions in greenhouse gases throughout the Northeast. Rooted in values of community and self-reliance we catalyze actions to reduce the threat of global warming and create a healthy and sustainable future.*