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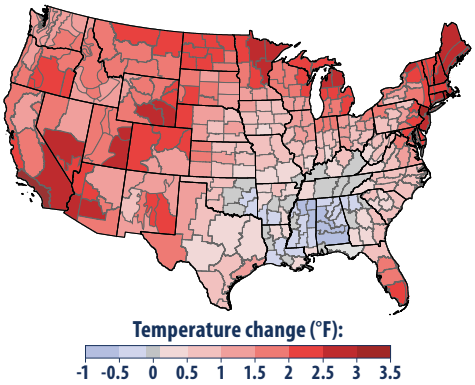
What Climate Change Means for Vermont

Vermont's climate is changing. The state has warmed by more than two degrees (F) in the last century. Throughout the northeastern United States, spring is arriving earlier and bringing more precipitation, heavy rainstorms are more frequent, and summers are hotter and drier. Severe storms increasingly cause floods that damage property and infrastructure. In the coming decades, changing climate is likely to harm ecosystems, disrupt agriculture and winter recreation, and increase some risks to human health.

Climate is changing because the earth is warming. People have increased the amount of carbon dioxide in the air by 40 percent since the late 1700s. Other heat-trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet about one degree during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places—but contributes to drought in others.

Greenhouse gases are also changing the world's oceans and ice cover. Carbon dioxide reacts with water to form carbonic acid, so the oceans are becoming more acidic. The surface of the ocean has warmed about one degree during the last 80 years. Warming is causing snow to melt earlier in spring, causing river floods to occur earlier in the year.



Rising temperatures in the last century. Vermont has warmed almost twice as much as the rest of the contiguous 48 states. Source: EPA, Climate Change Indicators in the United States.

Increasing Temperature and Changing Precipitation Patterns

Rising temperatures and shifting rainfall patterns are likely to increase the intensity of both floods and droughts. Average annual precipitation in the Northeast increased 10 percent from 1895 to 2011, and precipitation from extremely heavy storms has increased 70 percent since 1958. During the next century, average annual precipitation and the frequency of heavy downpours are likely to keep rising. Average precipitation is likely to increase during winter and spring, but not change significantly during summer and fall. Rising temperatures will melt snow earlier in spring and increase evaporation, and thereby dry the soil during summer and fall. So flooding is likely to be worse during winter and spring, and droughts worse during summer and fall.

In 2011, Hurricane Irene caused major flooding and damaged infrastructure across Vermont, including this section of Route 107 in Stockbridge. Heavy storms are becoming more common as a result of climate change. Credit: Vermont Agency of Transportation.

Ecosystems

Changing climate threatens ecosystems by disrupting relationships between species. Wildflowers and woody perennials are blooming—and migratory birds are arriving—sooner in spring. Not all species adjust in the same way, however, so the food that one species needs may no longer be available when that species arrives on its migration. Warmer temperatures allow deer populations to increase, leading to a loss of forest underbrush, which makes some animals more vulnerable to predators.

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Climate change can allow invasive species to expand their ranges. For example, the hemlock woolly adelgid has infested hemlock trees in southern Vermont. Infestation eventually kills almost all hemlock trees, which are replaced by black oaks, black birch, and other hardwoods. Warmer temperatures are likely to enable the woolly adelgid to expand northward. The loss of hemlock trees would remove the primary habitat for the blue-headed vireo and Blackburnian warbler. It could also change stream temperatures and cause streams to run dry more often, harming brook trout and brown trout.

Agriculture

Changing climate may reduce the output of Vermont's $700-million dairy industry, which provides 70 percent of the state's farm revenue. Higher temperatures cause cows to eat less and produce less milk. Climate change may also pose challenges for field crops: Some farms may be harmed if more hot days and droughts reduce crop yields, or if more flooding and wetter springs delay their planting dates. Other farms may benefit from a longer growing season and the fertilizing effect of carbon dioxide.

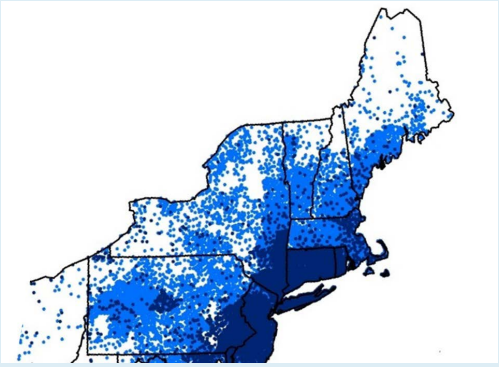
Warmer temperatures are likely to shift the suitable habitat for sugar maples farther north into Canada. Scientists do not know whether warming will reduce maple syrup production in Vermont over the next few decades: although Vermont is the nation's leading maple syrup producer, maple syrup is also produced in warmer places in Pennsylvania and southern New York.

Human Health

Climate change is likely to amplify some of the existing threats to health in Vermont. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor.

Warmer weather could increase the incidence of some diseases carried by insects and some respiratory conditions. The ticks that transmit Lyme disease are active when temperatures are above 45°F, so warmer winters could lengthen the season during which ticks can become infected or people can be exposed to the ticks.

Rising temperatures may also increase the length and severity of the pollen season for plants such as ragweed, which has already been observed in other regions.



Increase in Lyme disease between 1996 and 2013. Each dark dot shows one case reported in 1996; light dots show 2013. The increased range shown here has been attributed to factors other than climate change. Nevertheless, additional warming will lengthen the season during which people are exposed to Lyme disease and may allow the disease to spread to colder areas. Source: CDC.

Winter Recreation

Warmer winters may bring more rain and less snow to Vermont. A decline in snowfall would shorten the season during which the ground is covered with snow, which could harm recreational industries like skiing, snowboarding, and snowmobiling, and local economies that depend on them.

During the warm winter of 2015–2016, ski areas had less snow and fewer visitors than during a normal season, which forced several resorts to close early. This photo shows Mad River Glen's final day of skiing in mid-March. Credit: Eric Friedman, Mad River Glen.

The sources of information about climate and the impacts of climate change in this publication are: the national climate assessments by the U.S. Global Change Research Program, synthesis and assessment products by the U.S. Climate Change Science Program, assessment reports by the Intergovernmental Panel on Climate Change, and EPA's C*limate Change Indicators in the United States*. Mention of a particular season, location, species, or any other aspect of an impact does not imply anything about the likelihood or importance of aspects that are not mentioned. Depiction of trade names does not constitute endorsement of the product. For more information about climate change science, impacts, responses, and what you can do, visit EPA's Climate Change website at www.epa.gov/climatechange.

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