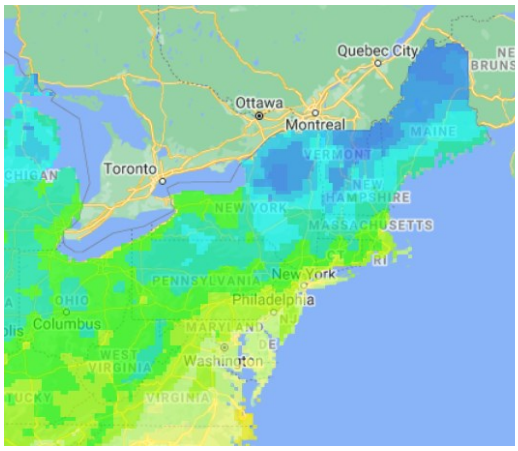
Climate Change Projections for the Northeast United States

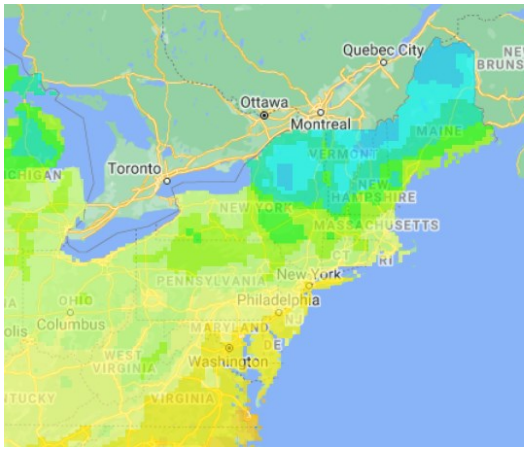
Daniel A. Herms and Scott E. Maco

The Davey Climate Change Fact Sheet Series projects the future impacts of climate change in our industry over the next 30-70 years, with emphasis on changes in temperature, precipitation, storm intensity, tree health, pest pressure, wildfire, and worker stress. Temperatures across the U.S. are expected to increase between 3-11°F by the end of this century, with future patterns of greenhouse gas emissions providing the largest source of uncertainty. The Intergovernmental Panel on Climate Change (IPCC) predicts future climates based on modeling for different emissions scenarios, called "Representative Concentration Pathways (RCP)." This fact sheet focuses on changes expected to occur in the Northeast U.S. based on lower (RCP4.5) and higher (RCP 8.5) emissions scenarios. Currently, global patterns of fossil fuel consumption correspond most closely with the high emission scenario, while the lower emission scenario will require significant mitigation measures yet to be implemented.

Image from Fourth National Climate Assessment



Current winter hardiness zones



Winter hardiness zones projected for end of century under the lower emission scenario

The climate is warming.

The average annual temperature in the Northeast U.S. has warmed from just under 1°F (West Virginia) to about 3°F (New England) since the beginning of the 20th century. This trend is predicted to accelerate in the coming decades depending on future global greenhouse gas emissions.

By 2050, average temperatures in the Northeast are predicted to increase by 4.0°F under the lower emissions scenario and 5.1°F under the higher scenario, with winters becoming milder and spring arriving earlier.

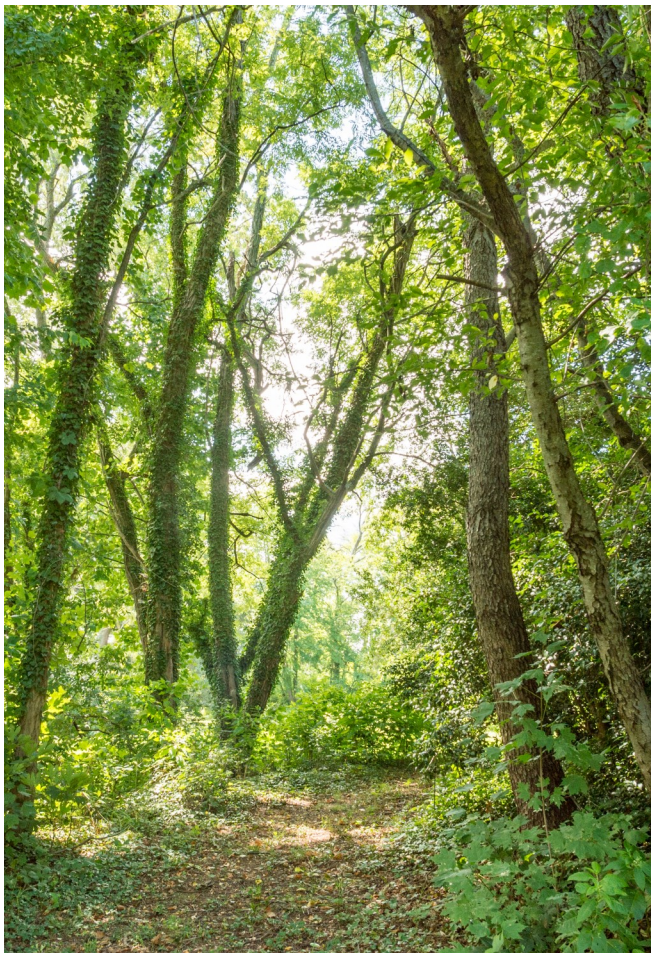
Current USDA plant hardiness zones range from Zone 6 (West Virginia) to Zone 4 (Maine). under the low climate change scenario (RCP4.5), winter hardiness zones are predicted to transition to Zones 7 and 5 by mid-century, and 8 and 7 by end-of -century, for West Virginia and Maine, respectively. Relative to the near present (1975-2005), the growing season (number of frost-free days) is predicted to increase by 2-3 weeks throughout the region by mid-century.

Precipitation is increasing

Average precipitation and rainfall intensity have increased, with further increases expected during the winter and spring and little change in the summer. Consequently, extreme precipitation events and summer drought are both becoming more common. Rainfall intensity has increased more in the Northeast U.S. than any other part of the country. For example, precipitation from extremely heavy storms has increased 70% over much of the region since 1960, which has increased the frequency of flooding throughout much of the region.

Total precipitation, frequency of downpours, and flooding are predicted to continue to increase through the rest of the century, with the magnitude dependent on the degree of future warming. With increasing rainfall intensity, runoff becomes a concern, especially with use of fertilizer and other landscape products.

Earlier springs will increase evaporation and soil drying during summer, which is predicted to intensify episodes of summer drought. The proportion of winter precipitation falling as snow will continue to decrease due to less early winter snowfall and a shorter snow season.



Tree species distribution is changing.

A longer growing season and increased precipitation and atmospheric CO_2 has increased overall forest productivity, and this trend is predicted to continue. With winters warming faster than summers and winter hardiness zones continuing to change, some tree species will benefit at the expense of others.

In central West Virginia, oak and hickory are predicted to increase in dominance, as sugar maple, beech, and gray birch decrease in abundance. In northern Maine, spruce-fir forests will transition to maple-beech-birch forests, which will be replaced by oak-hickory forests in New York.

As hardiness zones change, care of landscape trees and plants will present new challenges and opportunities. With warming temperatures, species selection will limit suitability for some species and expand the options of others. Timing of tree and landscape services will be affected by shifting seasonality.

Pest pressure is increasing

Disease pressure on trees is predicted to increase as a warmer, wetter, and more humid climate favors the growth and spread of pathogens. For example, increased incidence and severity of foliar diseases of white pine in New England already have increased defoliation, resulting in growth reductions and dieback.

Southern pine beetle, a significant pest native to the southeastern U.S. where it has caused widespread mortality of pines, has recently spread to New Jersey, New York, and Massachusetts. By 2050, it is predicted to spread throughout the pitch pine forests of West Virginia and Pennsylvania and the red pine forests of coastal Maine. By 2080, southern pine beetle will be distributed throughout the Northeast region where suitable hosts are found.

Hemlock woolly adelgid is predicted to spread to northern reaches of New York, Vermont, and New Hampshire, and Maine where it is currently limited by cold winter temperatures.

Hemlock Woolly Adelgid

Human health

Rising average temperatures are raising concerns about public health impacts in the Northeast. Heat waves, and occurrences of extreme heat (≥95°F days) are predicted to become more frequent, increasing under the lower warming scenario by 15 days per year in West Virginia to three days in northern Maine.

Higher temperatures will impact human health and worker stress. For example, extreme heat resulted in an estimated 133 premature deaths in New York City in 2013. An additional 650 premature deaths are predicted annually by 2050 under both the lower and high emissions scenarios, and up to 3,300 excess deaths annually by 2090 under the high emissions scenario.

The incidence of Lyme disease is expected to continue increasing in the northern regions of New England as ticks that vector the disease are active earlier in the season and warmer winters increase tick survival.

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