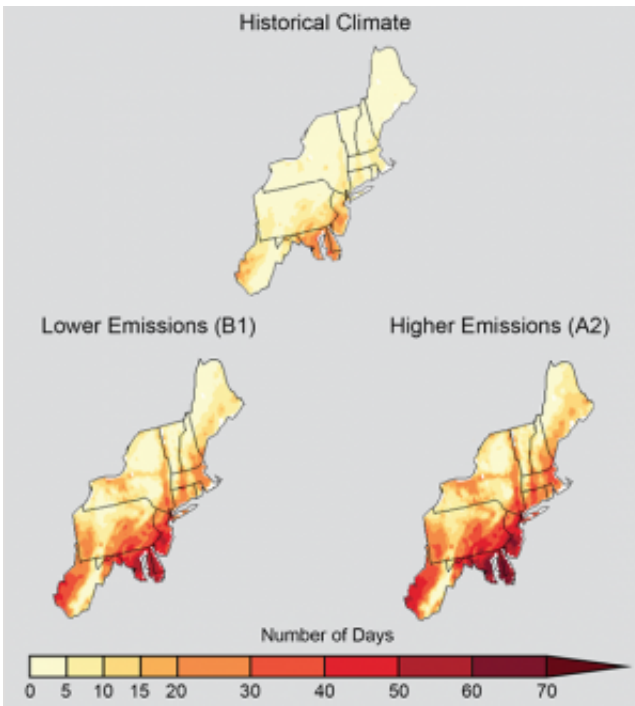


# Northeast already hit by climate change, says draft of major US report

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Projected increase in number of days per year in the US Northeast with maximum temperatures above 90 degrees F, 2041-2070, compared with 1971-2000, under lower or higher greenhouse-gas emissions. Credit: NOAA NCDC / CICS-NC

A draft of the U.S. government's [latest official report on climate change](#), to be released this week, says northeastern states are already seeing dangerous effects of warming climate, including the nation's largest increase in extreme downpours, sea-level rise above the global average,

and crop-unfriendly weather. The new National Climate Assessment, the first in five years, also makes newly specific future regional projections. It maps out flood-vulnerable areas, potential deaths from heat waves, and challenges to land and marine ecosystems. There is some good news: The region's rainfall will probably go up, so it may not suffer the droughts projected for other areas; and most of the 12 Northeast states and many municipalities are already laying plans to cut greenhouse-gas emissions and adapt.

The federal government is required by a 1990 law to periodically produce the National Climate Assessment (NCA), covering climate-change impacts and projections across the United States. Previous versions were published in 2000 and 2009. The new one, a collaboration of 13 federal science agencies, and some 300 authors and advisors, breaks the nation into eight regions. It makes the strongest case yet that changes are already taking place, and contains projections more drastic and certain than in the previous reports. A draft of the report, expected to be released by the White House after it is finalized at meeting in Washington tomorrow morning, was posted for public comment last year.

"The overall message is that climate change is happening right now—we can't think of this as an issue for future generations," said Radley Horton, the convening lead author for the assessment's Northeast chapter. "We know that the effects on ecosystems, infrastructure, economics and public health are going to grow," said Horton, a climate scientist at the Columbia University Earth Institute's Center for Climate Systems Research, and the affiliated NASA Goddard Institute for Space Studies. "But there are things we can do today to guide investments to protect the people and things that we value."

The report says that between 1895 and 2011, average Northeast temperatures increased by almost 2 degrees F, and annual precipitation

increased by 5 inches, or 10 percent. Coastal flooding increased due mainly to a 1-foot rise in sea level since 1900—50 percent above the global average rise of 8 inches. The outsize rise came mainly because much of the northeast coast is slowly sinking, but there is some evidence also that recent changes in Atlantic Ocean circulation may play a role. Perhaps most striking, the Northeast saw the nation's greatest increase in extreme precipitation events—between 1958 and 2010, some 70 percent. Such events are widely predicted as an outcome of more heat in the atmosphere, but have not been as readily observed elsewhere.

The report cites the toll that extreme weather has already taken. This includes 2011's Hurricane Irene, which wiped out houses and bridges in upstate New York that had been there since the early 19th century, and took out 500 miles of roadways in Vermont. Hurricane Sandy, the following year, hit urban New York and New Jersey, doing some \$80 billion in damage, with 650,000 homes damaged or destroyed.

Farmers have seen less dramatic but costly problems. In 2003 and 2004, grape growers in New York's Finger Lakes region suffered heavy losses when unusual midwinter thaws de-hardened vines, which then froze when cold weather returned. In 2007 and 2012, extended spring thaws followed by freezes caused many trees and vines to prematurely leaf or bloom, destroying much of the Northeast's crops of apples, grapes, cherries and other fruits. Northeast maple-syrup producers—the world's main source, behind Canada—are seeing erratic yields due to rapid spring warming. The Northeast currently has 180,000 farms with \$17 billion in annual sales.

Projections of future trends vary, but all show substantial changes. Depending on whether greenhouse gases continue to grow and other factors, temperatures are predicted to keep ascending 3 to 10 degrees F by 2100. Sea-level rise will remain above the global average, now estimated at 1 to 4 feet by the end of this century. Scientists are less

certain of rainfall, but some models suggest it will go up 5 to 20 percent. Unfortunately, much of that may come as sudden, heavy downpours, which will exacerbate flooding. It is projected that even without any changes in the intensity of storms, two feet of [sea-level rise](#) will more than triple the frequency of dangerous coastal flooding. In one projection, two feet of rise will flood 212 miles of roads, 77 miles of rails and 3,647 acres of airport facilities. Rising waters are likely to cause other problems, such as intrusion of salt into aquifers.

As for public health, the report cites one recent study projecting a 50 to 91 percent increase in deaths in Manhattan alone, due to summer and fall heat waves. Changing seasonal distributions of temperature and rainfall could also boost the timing and potency of airborne plant allergens; scientists have already observed an increase in ragweed pollen in the northern part of the region. The distribution of Lyme disease-carrying ticks and West Nile virus-carrying mosquitoes are also projected to increase.

Natural ecosystems and the products they supply will probably also be affected. Marine studies predict that warming of ocean waters will shift the ranges of important food species northward, bringing significant declines to the cod and lobster fisheries below Massachusetts' Cape Cod. On land, one 2008 study shows that the boundary between northern hardwood trees and evergreen boreal forest in parts of Vermont's Green Mountains has already shifted upward in elevation by 299 to 390 feet. If such rapid shifts spread and continue, it would change the makeup of forests, which cover much of the region, with unpredictable effects.

The report says that some effects can be dampened by investments in [public health](#), agricultural technology and infrastructure. But one big challenge: many of the Northeast's buildings, mass transit facilities and other structures are far older than in the rest of the country. Gary Yohe, an economist at Connecticut's Wesleyan University, and the other

convening lead author of the chapter, said, "A lot of stuff in Boston and New York—it's been there for 100, 150 years. It's easily damaged, and harder to upgrade. From now on, [climate change](#) has to be on the table any time there is a public building project." But Yohe said that the authors specifically avoided making overall economic projections of climate-related damage, because there are too many unknowns. These include havoc left by gigantic but sporadic events such as Hurricane Sandy, and hard-to-quantify factors such as the value of clean water, timber and other services provided by ecosystems.

Many governments in the region are already responding, especially in the wake of damaging storms that have already hit. Ten of the 12 Northeast states have released, or plan to release, statewide climate-adaptation plans. New York City has been formulating a climate strategy for years via its PlaNYC. In New England, bodies such as the Cape Cod Commission are helping communities incorporate climate projections into zoning and other decisions. Connecticut is looking into helping coastal homeowners get loans to raise their houses above projected flood levels, and thus reduce their insurance premiums. Maine has started a statewide initiative simply to increase the size of road culverts, to handle heavy rains—a huge undertaking, since the state alone manages 97,000 culverts, and towns and private property owners probably manage far more than that.

The report points out that most such plans are still only in formative stages. "As a society, we tend to underestimate how vulnerable we are," said Horton. "Now we're beginning to take halting steps, but at least we are taking steps. If we're going to adapt, the first step is assessing what it is we are facing."

**More information:** [ncadac.globalchange.gov/](http://ncadac.globalchange.gov/)

Provided by Columbia University

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