

How is Climate Change Affecting New Hampshire Communities?

by Chris Keeley

Communities across New Hampshire are already experiencing the impacts of a changing climate to their infrastructure, natural resources, and people. For example, the number and cost of presidentially-declared disasters and emergency declarations in New Hampshire has increased significantly since 2005 (Figure 1). The increase in frequency and severity of storms has also presented communities with rising costs to keep roads clear and repair or replace parts of their infrastructure.

In addition to becoming more extreme, weather is also becoming less predictable. Dangerous snowstorms and heavy rains result in widespread power outages. Businesses forced to close suffer economic losses during these times. Agricultural planting practices and seasonal yields have also changed: the growing season is now two to five weeks longer. Our coastal communities face rising sea levels and greater flooding during storm events.



The City of Dover is one of the many communities that are taking progressive measures to prepare for and adapt to climate change. (Photo: Chris Keeley)

In response, groups at the state and local levels are taking steps to prepare for climate change. In the Upper Valley and on the coast, working groups of planners, businesses, communities, non-profits, and scientists have formed to assist communities (e.g., Upper Valley Adaptation Workgroup, Coastal Adaptation Workgroup). At the state level, the New Hampshire State Legislature established the New Hampshire Coastal Risks & Hazards Commission in 2013 by RSA 483E. Members from the legislature, coastal communities, state agencies, business groups, regional planners, and scientists are working together and using peer-reviewed scientific research to recommend legislation, rules, and other actions. Municipalities across the state are utilizing local planning efforts for stronger, more resilient communities and economies.

Federal Disasters Expenditures in New Hampshire

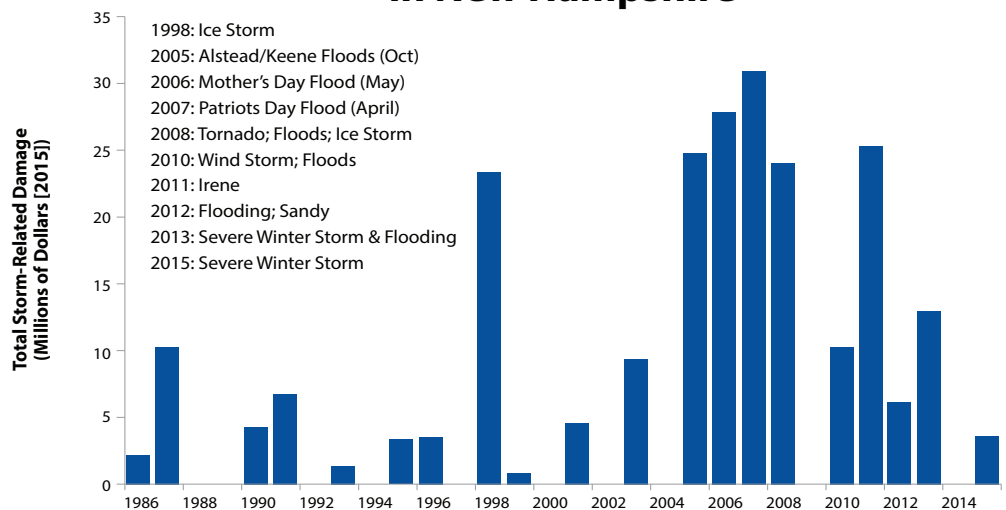


Figure 1. Federal Expenditures on Presidentialy Declared Disasters and Emergency Declarations in New Hampshire. Data from FEMA.

Three Changes Affecting New Hampshire Communities

- 1. Increases in annual precipitation and extreme events.** Annual precipitation has already increased 7 to 20% throughout the state. Precipitation is expected to further increase, mainly in winter and spring, by up to 20% by 2100. While overall precipitation is increasing, rain events are expected to be fewer yet more extreme, with longer periods of drought in between. This translates to challenges like increased demands on stormwater management infrastructure, more polluted runoff, localized flooding, and road closures.
- 2. More extreme heat days.** In southern New Hampshire, the historical average (1980-2009) of days above 95 degrees is about one day per year. Northern and southern New Hampshire communities are likely to see significant increases in the number of days above 95 degrees (Figure 2). People with chronic health problems such as asthma or obesity, or vulnerable populations like youth and the elderly, are often most severely impacted and necessitate greater support from neighbors, health centers, and emergency responders.
- 3. Rising sea level.** Local tide gauge data shows that sea level has risen 0.7 inches per decade since 1900, and the rate has increased to 1.3 inches per decade since 1993. New Hampshire sea levels are expected to rise 0.6–2 feet by 2050 and 1.6–6.6 feet by 2100. While the causes of sea level rise are well understood to be predominantly due to ocean warming or thermal expansion and melt of land-based glaciers, future sea levels are unclear due to the uncertainty of future carbon emissions and warming. We do know that future sea level will not be the same as the past. This uncertainty highlights the importance of scenario planning or considering multiple futures. Communities need to lay plans that work under multiple scenarios and best fits their characteristics.



An extreme high tide event at Seabrook Beach demonstrates current vulnerability to coastal flooding. Photo: Ron Sher

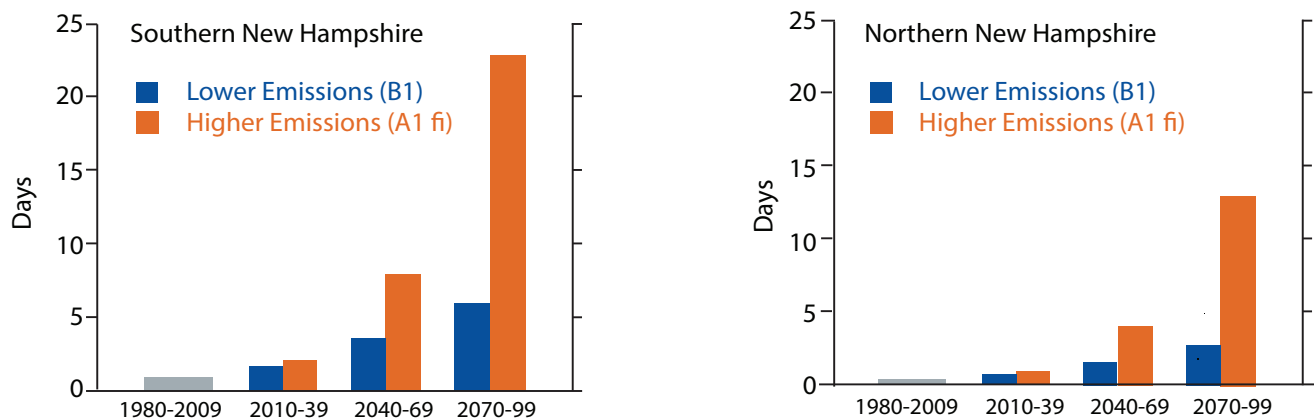


Figure 2. Average number of days per year above 95°F, historical (grey) and projected lower emissions (blue) and higher emissions (red), shown as 30-year averages for northern NH (top) and southern NH (bottom). Projected values represent the average of four AOGCM simulations. Source: Climate Change and Human Health in New Hampshire, 2014

One key for protecting infrastructure with a long life expectancy is to design for higher standards. The New Hampshire Coastal Risks & Hazards Commission recommends investments in infrastructure and buildings in at-risk coastal areas be designed to meet the 100-year flood levels, as this will also prepare them for the projected sea-level rise heights in the near term. Critical facilities in these areas should be designed to withstand 500-year flood levels.

Planning for valuable infrastructure to be safe under projected conditions makes sense as an enhanced protection strategy to both current and future coastal hazards.

Ready to Get Started? Here are FIVE things Your Community Can Do

- 1. Contact UNH Cooperative Extension.** Specialized assistance programs are available to help convene community members, explore information, and assist in developing actionable steps. UNH Cooperative Extension serves communities across the state.
- 2. Protect Natural Areas** by limiting development in floodplains and flood-prone areas using existing tools such as conservation easements, zoning ordinances, and floodplain overlays. These areas are key for buffering against flooding.
- 3. Enhance Stormwater Management Regulations.** Communities can use their stormwater management regulations or ordinances to control development and ensure adequate stormwater management capacity, while also reducing the amount of polluted runoff that reaches water bodies. These regulations are particularly relevant for communities that experience flash flooding during extreme rains.
- 4. Update the Hazard Mitigation Plan.** A hazard mitigation plan is a planning tool to identify policies and practices that reduce risk and future losses from natural hazards and to plan for recovery. It is also a tool for securing post-disaster recovery funds from the Federal Emergency Management Agency. While there are basic requirements for what to include, nearby communities in Massachusetts and around the country have gone above minimum requirements to include threats like sea level rise and changes in extreme heat. The Town of Durham adopted a Climate Change Adaptation chapter as a subset to their existing hazard mitigation plan (see Case Study).
- 5. Enroll Your Community in FEMA's Community Rating System.** The system rewards participating communities with reduced premiums for National Flood Insurance Program policyholders by up to 50%, depending on the number of innovative approaches and regulations enacted beyond minimum requirements.

What have New Hampshire communities done? Here are three examples.

Portsmouth's Coastal Resiliency Initiative. In 2013, the city secured a grant to hire a team of consultants from the University of New Hampshire and Rockingham Planning Commission to assess potential local impacts of climate change. The project resulted in a report outlining potential impacts to critical infrastructure and facilities, roads, trails/paths, recreational properties, municipal properties, public health, and coastal wetlands. The final report includes these impacts as well as a set of flood elevation maps, a vulnerability assessment, and recommendations for planning, regulation, and policies. Learn more at www.planportsmouth.com/cri

Rye's Preparing for Climate Change. In the summer and fall of 2014, the Rye planning and zoning administrator worked with UNH Cooperative Extension, NH Sea Grant, Rockingham Planning Commission, and a group of community members to organize a series of workshops to engage residents in Rye. Workshops were held once a month and covered local climate change past and future, planning and regulatory tools, action planning, and a field visit to a local salt marsh to learn about natural protection strategies. As a result of the workshops, the community developed a comprehensive list of prioritized concerns about climate change. The planning and zoning administrator became a certified floodplain manager and enrolled in FEMA's Community Rating System certification course to help the community get into the program to best utilize existing regulatory tools. Learn more at www.town.rye.nh.us

Durham's Climate Adaptation Chapter. To develop the chapter, a subset of their Hazard Mitigation Plan, a team of community leaders worked with the Strafford Regional Planning Commission to review approaches to sea level rise and storm surge taken by other states, communities, and agencies. They developed a series of maps identifying areas of increased flood risk due to sea level rise specific to Durham; developed strategies that protect areas at risk from flooding due to climate change and sea level rise; and identified various regulatory and non-regulatory options that can be considered by the town. Strategies include an Extended Coastal Flood Hazard Overlay District (with higher standards for buildings) and a prohibition of artificial hardening of estuary and river shorelines. Learn more at www.ci.durham.nh.us

Where Can My Community Get More Information?

Increases in flooding, extreme rain, and runoff are impacts of a changing climate that are affecting our roads and infrastructure, our people and economies, and our natural resources. Local leaders, including town staff, volunteer boards, and commissions, have a responsibility to protect the health and safety of people in their communities. Fortunately, high quality and locally relevant information about past and projected climate change is available. The University of New Hampshire has produced regional reports for coastal, southern, and northern New Hampshire (Figure 3). As with all science, look for research that has undergone a rigorous review by the scientific community (often called “peer-review”). This process enhances the credibility of the resource.

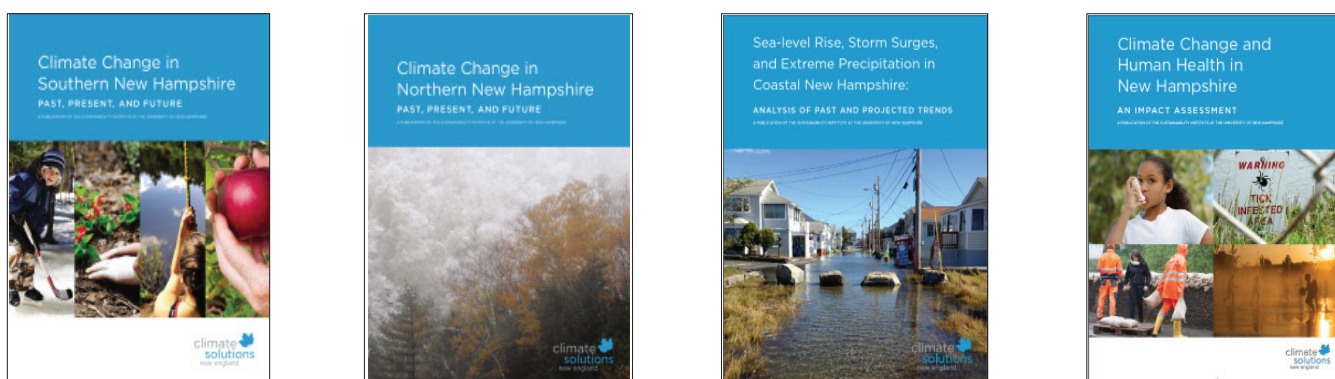


Figure 3. Regional and sector-specific reports are available to support decision-making (from left to right: Climate Change in Southern New Hampshire; Climate Change in Northern New Hampshire; Sea-level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire; Climate Change and Human Health in New Hampshire). Find them online at www.climatesolutionsne.org.

Recommended Resources

- UNH Cooperative Extension, www.extension.unh.edu
- New Hampshire Sea Grant, www.seagrant.unh.edu
- New Hampshire Coastal Adaptation Workgroup, www.nhcaw.org
- Wake, C., J. Bucci, S. Aytur, 2014. Climate Change and Human Health in New Hampshire: An Impact Assessment.
- Science and Technical Advisory Panel, New Hampshire Coastal Risks and Hazards Commission. 2014. Sea Level Rise, Storm Surges, and Extreme Precipitation in New Hampshire: An Analysis of Past and Projected Trends. www.nhcaw.org
- Wake, C., E. Burakowski, P. Wilkinson, K. Hayhoe, A. Stoner, C. Keeley, J. LaBranche. 2014. Climate Change in Northern New Hampshire: Past, Present, and Future. Climate Solutions New England. Durham, New Hampshire. www.climatesolutionsne.org.
- NH CRHC Report and Recommendations (Draft Release 3/2016). www.nhcaw.org

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