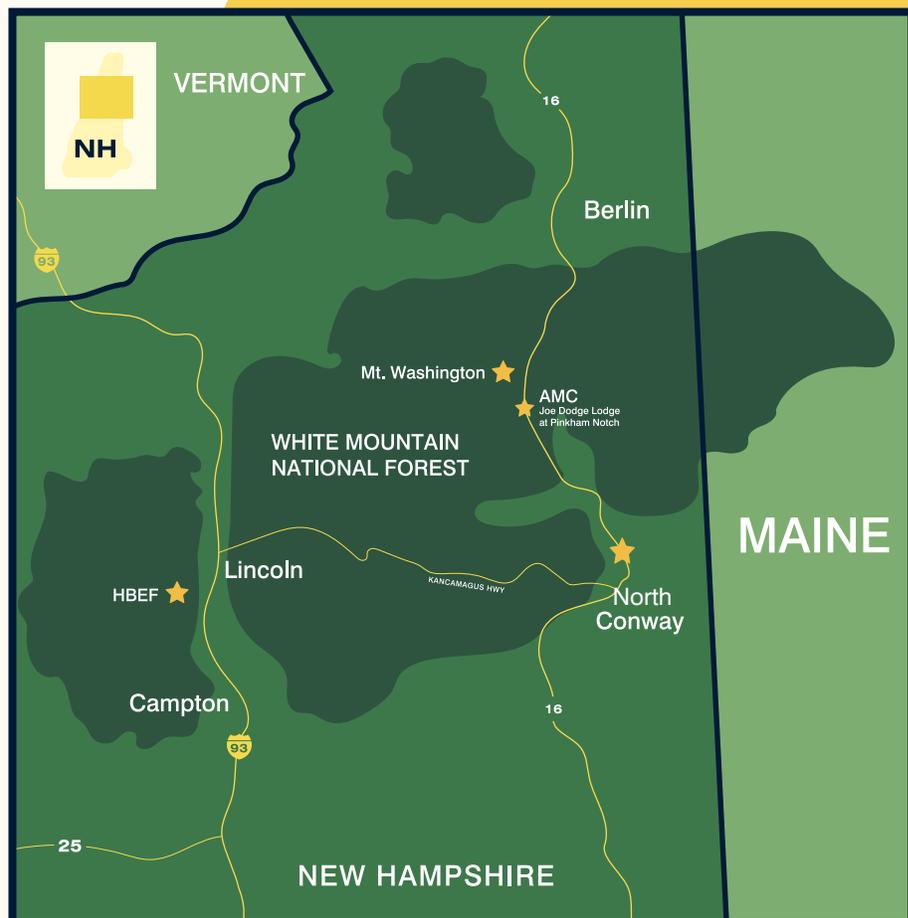


# Climate Change in the White Mountains: Warmer and Wetter

Long-term records from four sites across the White Mountains of New Hampshire (see map) indicate that the climate has been shifting over time. These shifts in climate include increases in air temperature, rainfall, as well as decreases in snow cover. The records reported here are from observations made daily by local researchers and partners since the 1930s who live and work in the White Mountains, a region defined by the character of its four distinct seasons. Long-term records and climate models together suggest that rainier, warmer days will continue, which shifts seasonal runoff and increases erosion and risk of flooding. These changes affect the local ecology, natural resources, recreation, and tourism.



## The Air is Getting Warmer

Average annual air temperatures across four sites in the White Mountains have varied over the past 64 years. Despite year-to-year variation, winter air temperature has warmed by 5°F and annual air temperature by 3.2°F. Records from other locations in New Hampshire show the same trend, with average minimum air temperatures increasing by 2°F and maximum air temperatures by 6°F over the past century.<sup>1</sup> This increase in air temperature is consistent with observed trends worldwide, which show greater warming at higher latitudes.

## Our Summers are Getting Wetter

The summer of 2023 (June, July, August) was one of the wettest on record across all four White Mountain region sites. While one summer could be an anomaly—a perfect storm of storms—these same locations have been tracked for at least 64 years and have seen summer rainfall increase significantly, with sites receiving 2.6 to 5.8 more inches of rain on average over that period. While

### Total Summer Rainfall (inches)

Site	2023	1991 - 2020 avg.
Hubbard Brook	<b>23.9</b>	15.9
Mt. Washington	<b>48.4</b>	25.2
N. Conway	23.3	13.6
Pinkham Notch	<b>30.8</b>	16.3

All Time Greatest Rainfall in Bold

precipitation (e.g. rain, snow, and ice) is not increasing uniformly across the year, it is consistently increasing in the summer across all sites.

## Heavy Precipitation is Increasing

Heavy precipitation events—defined as days with more than one inch of precipitation—are increasing at all four sites. Since 1959 the average number of days in the year with heavy precipitation has increased by 3.8 to 7.7 days across three sites, with only the Mt. Washington Summit having no significant change in heavy precipitation events between 1959 and 2022. However, using the full record available at Mt. Washington, we see that heavy precipitation events have increased by 10.6 days since 1935. The increase in intense precipitation seen at each site is consistent with observations from other locations across the Northeast that show a 60% increase in “extreme precipitation” since the 1950s, as reported in the 2023 National Climate Assessment.<sup>2</sup> (Here “extreme precipitation” is defined as events with the top 1% of daily precipitation totals in the region.)

## We’re Losing Snow

Since 1959 maximum annual snow depth has declined by 9.6 inches at Hubbard Brook and 20.5 inches at Pinkham Notch. No significant change was seen at the other sites. Other studies across the northeastern United States also document loss of snow.<sup>3</sup>

<sup>1</sup> <https://scholars.unh.edu/cgi/viewcontent.cgi?article=1071&context=sustainability>

<sup>2</sup> <https://nca2023.globalchange.gov/chapter/21/>

<sup>3</sup> <https://esajournals.onlinelibrary.wiley.com/doi/10.1002/eap.1974>

Our organizations are working together to study weather and climate in the White Mountains, with a focus on educating residents and visitors about the regional impacts of climate change. Visit our organizations’ websites to learn more about our work.



The Appalachian Mountain Club is the nation’s oldest conservation and recreation organization, committed to fostering the protection, enjoyment, and understanding of the outdoors. Since 1876, AMC has encouraged generations to deepen their passions for the outdoors and helped protect some of the most precious natural environments in the Northeast and Mid-Atlantic regions. Learn more at [www.outdoors.org](http://www.outdoors.org).



Mount Washington Observatory is a private, non-profit, member-supported institution dating back to 1932 with a mission to advance understanding of the natural systems that create Earth’s weather and climate. It serves this mission by maintaining a weather station on the summit of Mount Washington, performing weather and climate research, conducting innovative science education programs, and interpreting the heritage of the Mount Washington region. Learn more at [mountwashington.org](http://mountwashington.org).



The Hubbard Brook Experimental Forest is one of the longest running and most comprehensive ecosystem study sites in the world. Operated and maintained by the U.S. Department of Agriculture, Forest Service since 1955, this 7,800-acre research site is located just north of Plymouth, NH, in the White Mountains. Long-term ecological research at Hubbard Brook is supported by the National Science Foundation, along with other agencies and partners. The Hubbard Brook Research Foundation leads outreach and education programs to strengthen connections between science and society. Learn more at <https://research.fs.usda.gov/nrs>.

