Climate Judiciary Project

Climate Science Overview – Vermont[1]

Contents

Climate change and its impacts in Vermont

- **Vermont Climate Assessment (uvm.edu)**
  - Vermont Climate Assessment, prepared by Galford et al. (2021) of the University of Vermont. This is a comprehensive report that outlines the ways in which climate has changed in Vermont since 1900, and the multiple impacts that this change has already had, and will continue to have, on Vermont's society. Some key takeaways include:
    - Climate change has already affected temperature and precipitation trends in the state.
    - Extreme weather events, such as floods and droughts, are expected to increase with climate change. Flooding is the most likely natural disaster to occur in Vermont.
    - Climate change is having multifaceted impacts on Vermont's forests via shifting growing conditions; exacerbating threats from invasive species, insects, and diseases; and contributing to irregular precipitation patterns. Moreover, urban trees are more sensitive to climate impacts, which provide several societal services such as urban cooling and protection from stormwater runoff and extreme precipitation.
    - Climate change is driving extreme variations in the water cycle, prolonging drought and reducing water availability during certain periods. At the same time, increasing overall precipitation and extreme precipitation in Vermont may contribute to reduced water quality, increased streamflow, increased stormwater runoff, and increased flood risk.
    - Climate change is expected to have detrimental impacts on fish and wildlife: 92 bird species are expected to disappear from Vermont over the next 25 years; an increase in white-tailed deer populations and decrease in moose populations is expected; decreased health

[1] These notes were prepared for Judge Thomas S. Durkin by the Climate Judiciary Project for a presentation to Vermont judges on March 31, 2023.

of lake and river ecosystems due to, among other phenomena, increased harmful algal blooms is expected.
        - Climate change may have both positive and negative impacts on Vermont's agriculture. Longer growing periods facilitate the potential for growing new crops. However, changes in precipitation and increased impact of extreme weather events will lead to some agricultural setbacks. In addition, apple trees and the maple syrup industry are likely to suffer from changes in temperature variations.
        - Climate change both exacerbates existing health issues and contributes to new ones. Warmer and wetter conditions will likely create more habitat for disease-carrying ticks and mosquitos. In addition, changes in food and water quality could contribute to increased food- and water-borne illnesses. Generally, elderly people, people of low socioeconomic status, Indigenous people, and people with underlying health conditions are most susceptible to climate-related health issues.
        - Climate change is affecting tourism in Vermont. Increasing winter temperatures are reducing the season for most snow sports. Vermont may see an increase in "seasonal climate refugees" during summer, from those looking to escape much hotter conditions elsewhere. Fall and spring are becoming more popular tourism seasons, although negative impacts on apple trees and the maple syrup industry could affect this.
    - There is a lot more to say on each of these topics. See the Executive Summary for more, if needed.

- **Vermont - State Climate Summaries 2022 (ncics.org)**
    - A brief 2022 report by the National Oceanic and Atmospheric Administration (NOAA) about climate change and its impacts in Vermont, with three key messages:
        - Message 1: Temperatures in Vermont have risen by about 3 °F since the beginning of the 20th century. The last 11-year period (2010-2020) was the warmest 11-year period on record. Under a higher emissions pathway, historically unprecedented warming is projected to continue through this century. The intensity of extreme winter cold is projected to decrease.
        - Message 2: Annual average precipitation has increased nearly 6 inches since the 1960s (a decade marked by prolonged, multiyear droughts and cold temperatures), with the largest increases occurring in mountainous regions of the state. Winter and spring precipitation is projected to increase throughout this century, and warming will increase the proportion of that precipitation that will fall as rain.
        - Message 3: Extreme weather events, particularly floods and severe storms, are having a stronger impact on Vermont. At the same time, multiyear meteorological and hydrological droughts continue

to pose challenges for water-dependent sectors. Extreme rainfall events are projected to become more frequent and intense in the future.

- **Home | Climate Change in Vermont**
  - Vermont's Agency of Natural Resources website on climate change, which includes some content on the state's greenhouse gas emissions by sector and commitments to emission reductions in accordance with the Global Warming Solutions Act (requiring a halving of carbon and methane emissions by 2030).
  - The website also includes Vermont's 2021 Climate Action Plan, which is updated every four years: Read the Plan | Climate Change in Vermont

Climate data

- **NRCC Home Page (cornell.edu)**
  - The Northeast Regional Climate Center (NRCC) provides temperature, precipitation and snowfall data, and their analyses, at the state- and regional level. Datasets of interest from their weather stations can be defined and accessed here: CLIMOD 2 (cornell.edu).

- **Global Monitoring Laboratory - Carbon Cycle Greenhouse Gases (noaa.gov)**
  - The "Keeling curve" is the longest record of atmospheric carbon dioxide measurements. This record is derived from Mauna Loa Observatory, Hawaii and was started in 1958 by C. David Keeling of the Scripps Institute of Oceanography.
  - This video provides excellent historical and geological context to the scale of our emissions.

A global perspective

- **AR6 Synthesis Report: Climate Change 2023 — IPCC**
  - "Assessment reports" from the U.N. Intergovernmental Panel on Climate Change (IPCC) are the most scientifically comprehensive and authoritative sources of climate change information. These assessment reports are updated every 6-7 years, and a "synthesis report" that summarized the latest conclusions of the IPCC (Assessment Report 6) was recently released.
  - Each scientific report is accompanied by a "Summary for Policymakers." While this information is certainly pertinent for all decisionmakers, the language of this document is negotiated between the 195 member-countries of the IPCC and the hundreds of scientists who produce the report. By the nature of the need for consensus, the Summary for Policymakers tends to be conservative in its language.

A regional climate scientist*

trained in judicial education by the Environmental Law Institute's Climate Judiciary Project:

- **Professor Justin Mankin**
  - Professor Justin Mankin of Dartmouth College recently completed a training in judicial education for climate scientists organized by the Environmental Law Institute's Climate Judiciary Project. Professor Mankin is an accomplished climate scientist with expertise in climate impacts on ecosystems and human systems. He has agreed to speak at possible future engagements for the Vermont Judiciary, and the Climate Judiciary Project will be happy to assist with any such programming.