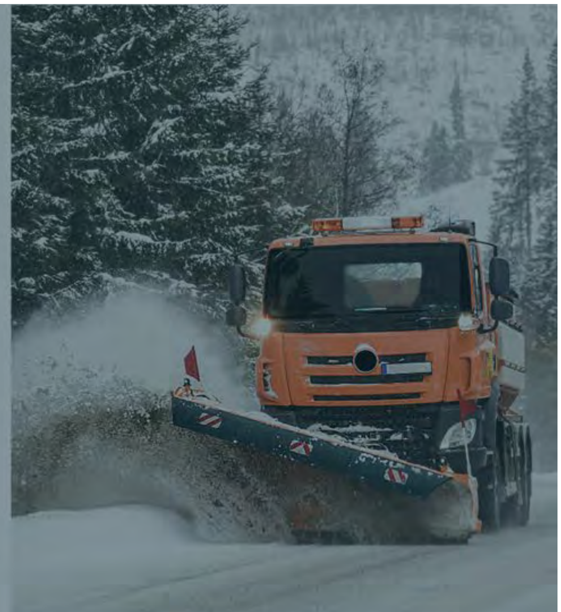
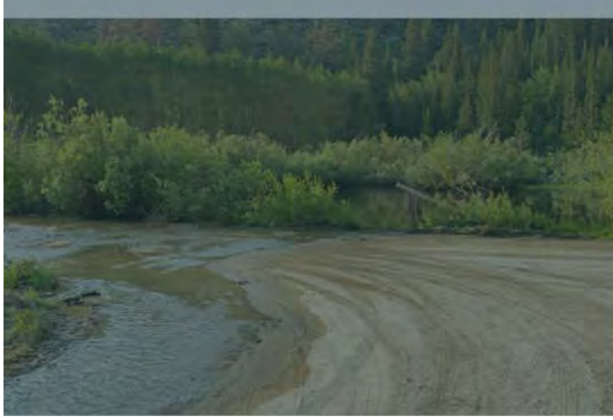


TOWN OF HANCOCK
DRAFT HAZARD MITIGATION AND CLIMATE ADAPTATION PLAN

5/29/2025



ACKNOWLEDGEMENTS

The development of this Hazard Mitigation and Climate Adaptation Plan has been made possible with financial support from the Hazard Mitigation Grant Program, issued by the Federal Emergency Management Agency and administered by the Massachusetts Emergency Management Agency (MEMA). Additional public participation, climate adaptation, and preparedness have been made possible through a Municipal Vulnerability Preparedness (MVP) planning grant provided by the Massachusetts Executive Office of Energy & Environmental Affairs (EOEEA). The Town would like to thank the unerring support and guidance provided by MEMA's hazard mitigation staff and EOEEA's MVP staff throughout this planning process.

The Town of Hancock would like to thank the members of the Hancock Hazard Mitigation & Municipal Vulnerability Preparedness Committee, which served as the advisory committee for this planning effort. The Berkshire Regional Planning Commission provided technical assistance to the Town and the Planning Committee throughout the planning and approval processes.

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Chapter 1 : Introduction

Hazard mitigation planning reduces or eliminates the need to respond to hazardous conditions that threaten human life and property. As noted in the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP, 2018):

> *Natural Hazards are natural events that threaten lives, property, and other assets. Often, natural hazards can be predicted and tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.*

Hazard Mitigation is a term that describes an action taken to reduce the harm that natural disasters have on people and property – it is the up-front work to mitigate or reduce the impacts of a disaster when it strikes. In short, it addresses where and how things are built to reduce the risk of disaster's worst impacts. Mitigation is pro-active rather than reactive and is taken to solve a problem on a permanent, long-term basis. Climate Adaptation is an adjustment in natural or human systems that respond to actual or expected climatic stimuli or their effects (SHMCAP, 2018). In man-made systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment. Resilience is the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event or a changing climate in a timely and efficient manner - the ability to "bounce back" where mitigation may not work.

The Town of Hancock Hazard Mitigation and Climate Adaptation Plan (HMCAP) was prepared to meet the requirements of the Code of Federal Regulations, Title 44 CFR § 201.6, pertaining to local hazard mitigation plans. Title 44 CFR § 201.6(a)(1) states that "a local government must have a mitigation plan approved pursuant to this section in order to receive hazard mitigation project grants. A local government must have a mitigation plan approved pursuant to this section in order to apply for and receive mitigation project grants under all other mitigation grant programs."

Purpose

This plan was also prepared to meet the requirements of the Massachusetts Executive Office of Energy and Environmental Affairs' (EEA) Municipal Vulnerability Preparedness (MVP) Planning Grant, which enabled Hancock to complete this plan and to integrate local effects of climate change into their hazard mitigation action plan. By completing the Community Resilience Building (CRB) process, Hancock will be an MVP community eligible for MVP Action Grants to adapt to the impacts of climate change on the community.

The defined mission for the Town of Hancock Hazard Mitigation and Climate Adaptation Plan is to "reduce risks from natural hazards through practical, locally achievable strategies that protect people, infrastructure, and natural resources, while preserving the Town's rural character and strengthening community resilience." In accordance with Title 44 CFR § 201.6, the local mitigation plan is the representation of the Town's commitment to reducing risks from natural hazards, serving as a guide for decision-makers as they commit resources to reduce the effects of natural hazards. Additionally, the HMCAP is meant to serve as the basis for the Commonwealth of Massachusetts to provide technical assistance and prioritize project funding. This plan must be updated at least once every five years to remain eligible for FEMA hazard mitigation project grants and must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval.

Plan Structure

Below is a summary of the Town of Hancock's Hazard Mitigation Plan chapters. The planning process closely adhered to FEMA guidelines and their intent.

Chapter 2: Planning Process: This chapter outlines the methodology and approach used in the hazard mitigation planning process. It summarizes the Hazard Mitigation Planning Committee (HMPC) meetings and public outreach efforts, including public meetings. This section guides the reader through the process of creating this plan and highlights its open and inclusive public involvement.

Chapter 3: Risk Assessment: This chapter provides an overview of the Town of Hancock, including its history, population, economy, natural assets, and infrastructure. It also offers an in-depth risk analysis, profiling each hazard with the potential to impact the Town of Hancock. Each hazard assessment includes the following components:

- Hazard Profile: An overview of the hazard's characteristics and behavior.
- Probability: An evaluation of the likelihood of the hazard occurring.
- Severity: An analysis of the potential impacts and magnitude of the hazard.
- Historic Data: A review of past occurrences and patterns related to the hazard.
- Vulnerability Assessment: A an examination of how the town may be affected, focusing on:
    - Specific locations within the town at higher risk.
    - Populations that may be more vulnerable due to age, mobility, or other factors.
    - Critical infrastructure, buildings, and utilities at risk.
    - Potential impacts on ecosystems and natural resources.
    - Economic vulnerabilities and potential disruptions.
    - Consideration of factors such as climate change, population changes, and development trends that may alter risk profiles over time.

Chapter 4: Capability Assessment: This chapter evaluates the Town of Hancock's current capabilities to mitigate hazards, including existing policies, programs, and resources.

Chapter 5: Mitigation Strategy: This chapter details the town's mitigation goals, objectives, and proposed actions to reduce risks and enhance resilience to hazards.

Chapter 6: Plan Implementation and Maintenance: The final chapter outlines how the plan will be implemented, monitored, and maintained over time to ensure its effectiveness and relevance.

Background

The Town of Hancock covers an area of 35.7 square miles and is the longest and narrowest town in Berkshire County. It is nestled on the far western edge of Massachusetts, bordering the state of New York. Based on 2020 American Community Survey Data (ACS), the Town's population is 757, giving a density of approximately 21 people per square mile.[i] There are 296 households, resulting in a household size of approximately 2.5 people per. Housing primarily comprises single-family homes (59%), slightly lower than the average of 76% statewide and 88% for Rural Town-type municipalities. Additionally, 20% of all units are in two- to four-family buildings and 20.3% are in multi-family buildings.[ii] In winter, the Town experiences a surge in population, largely attributed to the popularity of Jiminy Peak Ski Resort, the Town's primary winter attraction. Hancock shares its boundaries with several neighboring Massachusetts towns: Williamstown to the north, New Ashford to the northeast, Lanesborough and Pittsfield on its eastern border, while Richmond borders the short southern edge. The Town is approximately 150 miles from Boston and 200 miles to NYC.

Figure 1.1 Location of Hancock within Massachusetts

Hancock is located within the scenic Taconic Valley and features a landscape distinguished by mountainous terrain and steep slopes. The Taconic Range dominates the northwestern part of the town, while another slope in the east defines the boundaries with the towns of New Ashford and Lanesborough. Much of southern Hancock is part of the Pittsfield State Forest.

The major route in town is Route 43, which serves as the primary north-south route linking Hancock to Williamstown. U.S. Rte. 20 passes through the very southern part of Hancock, and some residential and commercial areas are associated with this highway in the far southeastern corner of the town, near its joint boundary with Richmond and Pittsfield. The Taconic Mountain range acts as a natural that impacts the town's direct north-to-south travel. To journey from south to north Hancock, travelers must cross into New York State and re-enter Massachusetts. The town's commercial and industrial development is comparatively limited compared to more densely populated regions. See Error! Reference source not found.

According to MassGIS, the predominant land uses in town are forest (88%), agriculture (5.29%), open and (2.49%), open water and wetland (2.08%) and residential (0.48%).[iii] See Figure 1.3 Land Use Map - Town of Hancock. Existing development in Hancock is primarily concentrated in the northern valley (Route 43). It includes the village of Hancock, Jiminy Peak Ski Area, and several residential and agricultural zones scattered throughout the valley. The town's primary allure lies in its outdoor recreational offerings. Jiminy Peak, a year-round recreational resort and residential condominium complex, is the principal economic driver and cultural attraction. The region boasts an abundance of hiking and ATV trails. Additionally, Route 20 passes through the very southern part of Hancock, which has some residential and commercial areas associated with this highway, namely the historic Hancock Shaker Village, which stands as another significant tourist attraction.

The limited number of municipal buildings in Hancock is predominantly concentrated on Route 43 (Hancock Rd), including the Elementary School, Highway Garage, Hancock Volunteer Fire Department and the Town Hall, which also accommodates the Council of Aging and Police Department. The Massachusetts State Police and the Hancock Volunteer Fire Department primarily address emergency services. Notably, the Town lacks an ambulance service within its jurisdiction, with services split between the northern region managed by Northern Berkshire EMS, responsible for the northern part and Route 43, and the southern portion relying on Pittsfield's private ambulance companies. The Town of Hancock does not have municipal water or sewer; therefore, residents rely on well water and septic tanks. Jiminy Peak's Utility Department operates a public water system and a wastewater treatment facility based on six groundwater supply sources.

The Town has an elementary school that services Pre-K through Grade 6. The 2022 student enrollment was 59 students.[iv] The Town has an agreement with the Mt. Greylock Regional School District to send its students to Mt. Greylock High School. Students can also opt to attend McCann Technical School in North Adams or New Lebanon High School just over the New York border.

Key cultural and civic assets include Town Hall, Hancock Elementary School, Hancock Shaker Village, Hancock Baptist Church, Ioka Farm, the Veterans Memorial, and the town green, which hosts events like flea markets, picnics, and COA lunches. These spaces, along with the town's trail networks and open landscapes, contribute to the quality of life, identity, and social cohesion.

Mitigation Planning History

The Town of Hancock was included in a regional hazard mitigation plan with 22 other Berkshire County municipalities. This original hazard mitigation planning, which covered 19 municipalities, was approved by FEMA Region 1 in 2012. A follow-up addendum, which included Hancock as well as three other towns, was adopted by the Town on August 21st, 2015. This plan is an update of the Berkshire County Hazard Mitigation Plan, dated November 5, 2012, and subsequent Berkshire County Hazard Mitigation Plan Addendum, dated September 15, 2015. This HMCAP is a single jurisdictional plan.

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[i] Massachusetts Census Data (malegislature.gov)
[ii] Metropolitan Area Planning Council (http://mapc.org) via Housing MA (http://housing.ma)
[iii] MassGIS 2016
[iv] Enrollment Data (2021-22) - Hancock Elementary (01210005) (mass.edu)

Figure 1.2 Topographic Map - Town of Hancock

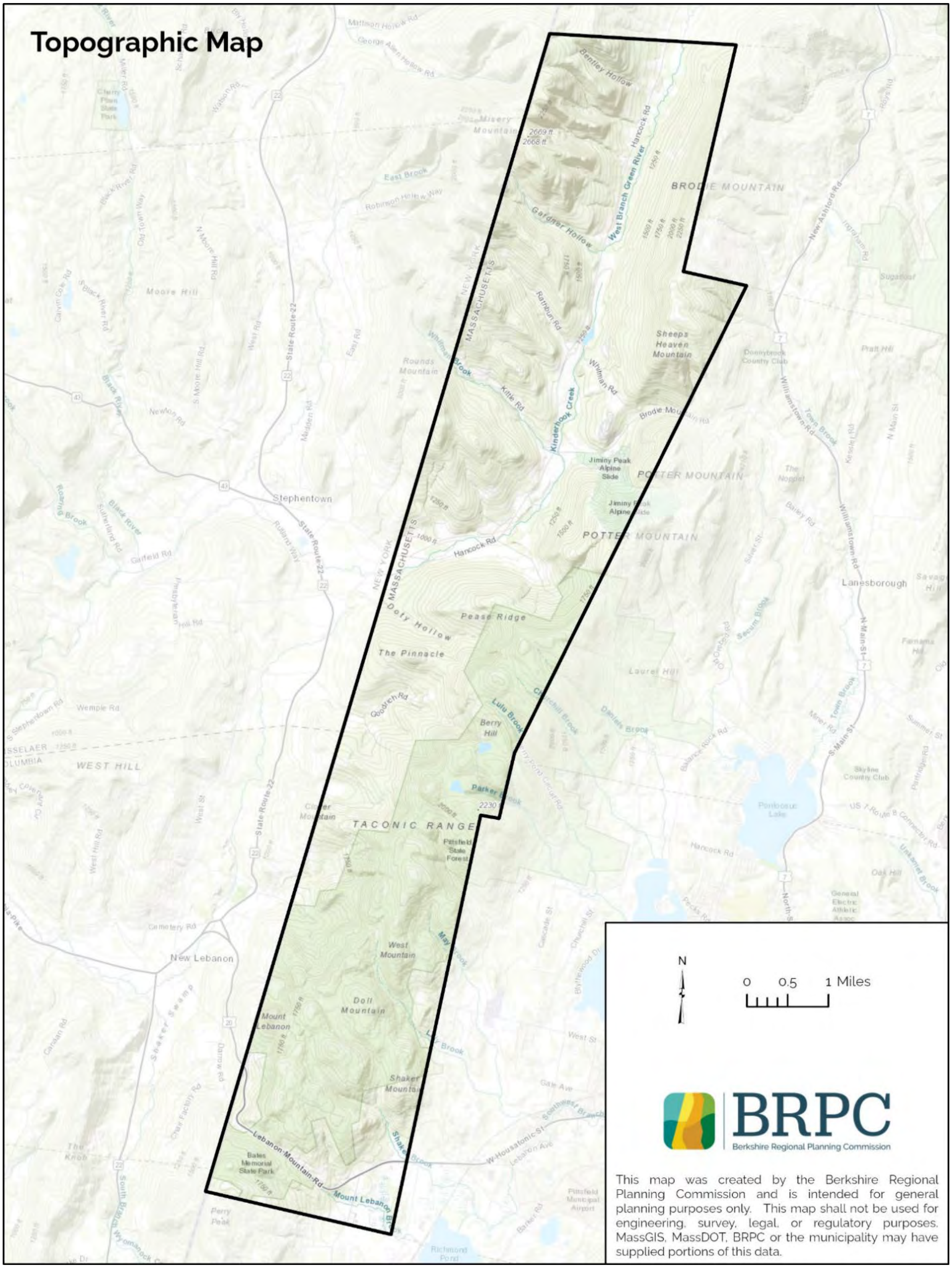
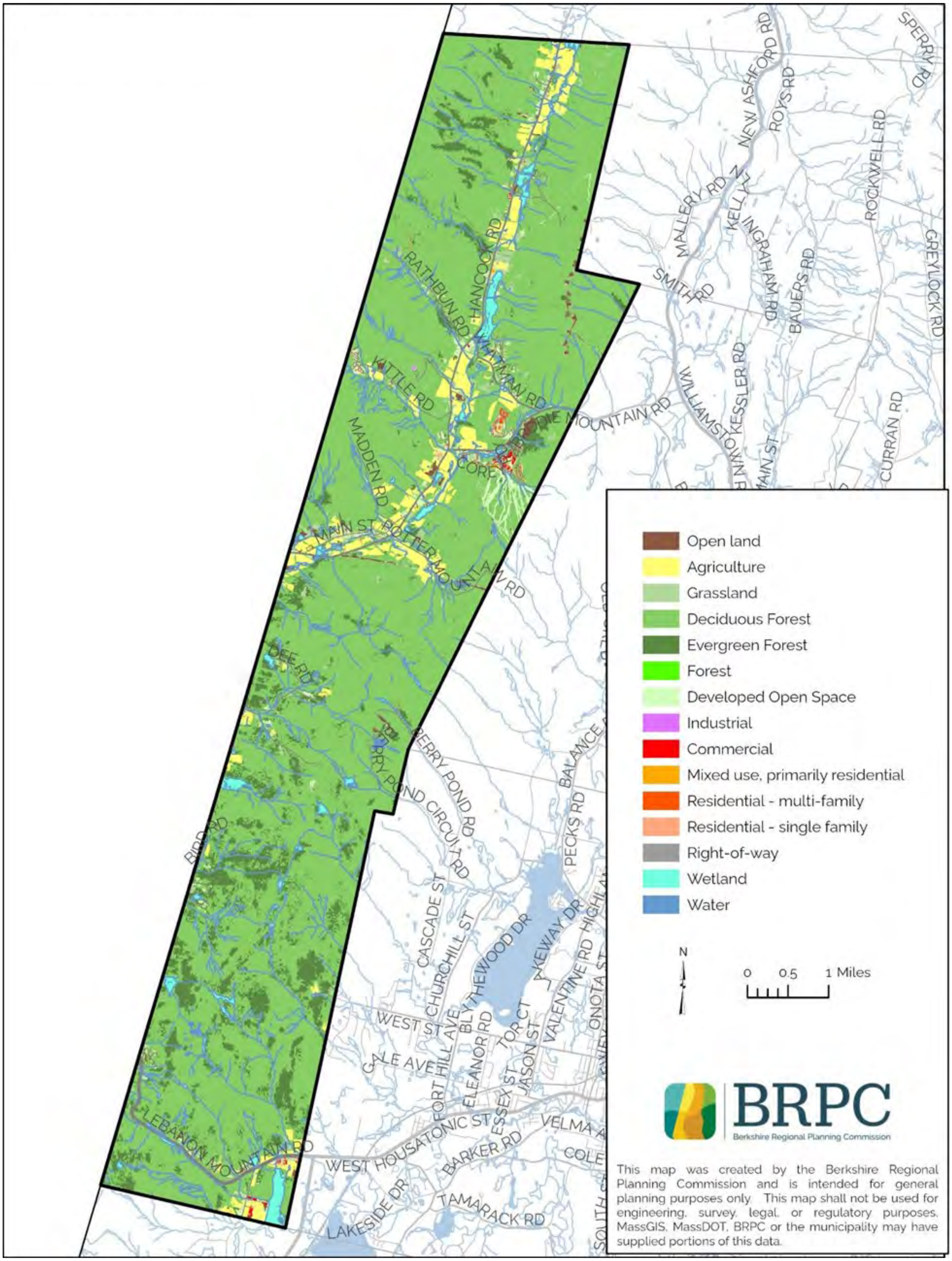


Figure 1.3 Land Use Map - Town of Hancock



Chapter 2 : Planning Process

44 CFR § 201.6(b) & 44 CFR § 201.6(c)(1)

This chapter outlines the development of the Town of Hancock Hazard Mitigation and Climate Adaptation Plan (HMCAP). It identifies who was involved in the process, how they were involved, and the methods of public participation that were employed. An open public involvement process during the drafting stage was essential to the development of the HMCAP. A discussion of how the community will continue public participation in the plan maintenance process (44 CFR § 201.6(c)(4)(iii)) will be discussed in Chapter 6.

The Town retained Berkshire Regional Planning Commission (BRPC) to aid them in developing the HMCAP and the MVP Plan. The Hancock HMCAP is a compilation of data collected by BRPC, information gathered from the Hancock Hazard Mitigation and Municipal Vulnerability Preparedness Committee (HMP/MVP Committee) during meetings, and interviews conducted with key stakeholders outside of working meetings. The Hancock HMCAP reflects comments from participants and the public through the MVP planning process, the Planning Committee, local officials and citizens, neighboring towns, and ultimately MVP, MEMA, and FEMA.

Planning Meetings and Participation

44 CFR § 201.6(c)(1)

During the HMCAP planning process, there was an opportunity for public comment by town residents as well as the neighboring communities of Williamstown, Richmond, Lanesborough, Pittsfield, MA and New Lebanon and Stephentown NY; local and regional agencies; partners involved in hazard mitigation activities; and agencies that have the authority to regulate development. The Hancock Planning Board is the primary town agency responsible for regulating development in the town. Feedback from the Planning Board was ensured through a presentation of this plan to the Planning Board during draft review. Making the document available to the public for review meets requirements of 44 CFR § 201.6(b)(1), and solicitation of comment from neighboring towns meets requirements of 44 CFR § 201.6(b)(2), pertaining to involvement of regional partners in the planning process. See Appendices for documentation.

In 2023, Hancock formed the Hazard Mitigation and Municipal Vulnerability Preparedness Committee (the HMP/MVP Committee) to steer the process. Members of the HMP/MVP Committee include town department heads, Town Boards, and representative residents. The Planning Committee members are listed in Table 2.1.

The HMP/MVP Committee held a series of meetings to assemble data on the Town's infrastructure, identify known hazards to residents, including visitors and seasonal residents, and review existing plans, procedures, bylaws and protections already in place. The Committee met 8 times between January 2024 and October 2023. On November 4th, 2023, the Committee held a full-day workshop. Twenty-two people attended consisting of town officials, residents, community groups, stakeholder organizations, and emergency responders. Hancock utilized the Community Resilience Building Workshop model to collect input from as diverse a group of community members and stakeholders as possible with outreach to climate vulnerable populations such as the elderly.

As noted by its developers, "the Community Resilience Building Workshop" employs a unique community-driven process, rich with information, experience, and dialogue, where the participants identify top hazards, current challenges, and strengths and then develop and prioritize actions to improve their community's resilience to all natural and climate-related hazards today, and in the future. The core directive of the workshop is to foster collaboration with and among community stakeholders that will advance the education, planning and ultimately implementation of priority actions." Invitations were sent to residents and stakeholders through emails, phone calls, flyers, and online postings. Core team members contacted invitees directly to encourage participation and ensure receipt of an invitation. Workshop participants are listed below.

Table 2.1 List of Workshop Attendees

Name	Affiliation
Facilitators	
Courteny Morehouse	Berkshire Regional Planning Commission – Project Coordinator
Britney Danials	Berkshire Regional Planning Commission
Sherdyl Fernandez-Aubert	Berkshire Regional Planning Commission
HMP/MVP Core Team	
Sherman Derby	Select Board Chair, Highway Department
David Rash	Emergency Manager
David Boyer	Chief of Police
Robin Keeney	Hancock Conservation Commission
Michael Williams	Hancock Fire Chief
Workshop Attendees	
Blake Hastie-Etchison	Resident
Cindy Grauman	Resident
Nan Derby	Historical Commission
Judy Whitman	Resident
Art Williams	Resident
Paul Hyde	Resident
Will Dowdy	Resident
Brian Fairbanks	Business Owner, resident
Steve Johnson	Resident
Nadia Jensen	Resident
Art Jensen	Resident
Richard Gillerman	Resident

Public Outreach Methods

Public outreach for the Town of Hancock's Hazard Mitigation and Climate Adaptation Plan included multiple engagement points throughout the planning process. A resident survey was conducted in April 2023 to gather input on hazard experiences, concerns, and community priorities. An information session was held on May 17, 2023, at the Hancock Fire Department, providing an overview of the planning process and inviting public feedback. A second listening session is scheduled for June 11, 2025, at Hancock Elementary School to present the draft plan, share the proposed mitigation actions, and collect final input from the community prior to adoption. Documentation of outreach efforts and participation will be included in the plan appendices.

Public Comment on the Draft MVP Plan and HMCAP

to be inserted once the public comment period closes

Environmental Justice Populations

According to information provided by the Executive Office of Energy and Environmental Affairs (EEA), in Massachusetts an environmental justice population is a neighborhood where one or more of the following criteria are true:

- the annual median household income is 65 percent or less of the statewide annual median household income;
- minorities make up 40 percent or more of the population;
- 25 percent or more of households identify as speaking English less than "very well";
- minorities make up 25 percent or more of the population, and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income.[i]

According to EEA and using 2020 U.S. Census data (as of autumn 2023), there are no environmental justice populations located within the Town of Hancock using the state's criteria. There are no public housing projects or developments in the Town, and therefore any residents meeting any of the EJ criteria will be scattered throughout the Town. Seniors on fixed incomes are likely the largest population segment being cost-burdened.

Municipal Vulnerability Preparedness (MVP) Workshop

The central objective of the workshop was to review regional weather events from the past and climate change data and projections, then collect local data from attendees to help:

1. Define top local natural and climate-related hazards of concern;
2. Identify existing and future strengths and vulnerabilities;
3. Develop prioritized actions for the community;
4. Identify immediate opportunities to advance actions to increase resilience collaboratively

Categories of Concerns and Challenges

- Flooding of Roads, Homes, and Infrastructure
- Disrupted Emergency Response or Access
- Property Damage from Wind, Ice, Fire, or Falling Trees
- Health and Safety Threats to Vulnerable Residents

Incorporation of Existing Information

44 CFR § 201.6(b)(3)

No plan should be created in a silo, particularly a hazard mitigation plan, because of its applicability to land use, municipal and emergency services, and vulnerable people. This is especially important for small towns like Hancock, who work and rely closely with their neighbors to address issues on a larger, regional scale. This HMCAP update incorporates relevant data and information from existing plans, plans in development, studies, reports, and technical information. Main data sources and local plans include:

- Berkshire County Hazard Mitigation Plan, 2012
- Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), 2018
- Massachusetts State Climate Assessment Report, 2022

This plan should be used in conjunction with other local and regional plans, specifically transportation and capital improvement programs, Comprehensive/Master Plan, and emergency preparedness planning. At the time of this writing, the Town of Hancock does not have any formal municipal planning documents. However, this plan is a foundational step in integrating hazard mitigation into future decision-making processes.

The flood hazard assessment for the Town of Hancock relies on data and findings from the 1982 Flood Insurance Study (FIS) conducted by FEMA. The FIS provides detailed hydrologic and hydraulic analyses, including historical flood events, base flood elevations (BFEs), and flood zone delineations. This technical data supports the Flood Insurance Rate Map (FIRM), which visually represents flood risks and floodplain boundaries, serving as a critical tool for local planning and flood management. The FIRM, derived from the FIS, identifies flood-prone areas and establishes regulatory requirements for development and flood insurance. data illustrates the flood vulnerabilities identified in Hancock, focusing on the Kinderhook Creek, West Branch of the Green River and their tributaries, and nearby critical facilities. Together, the FIS and FIRM provide a comprehensive framework for assessing and mitigating flood risks.

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i https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

Chapter 3 : Risk Assessment

44 CFR § 201.6(c)(2)

FEMA Requirements

In accordance with 44 CFR § 201.6 (c)(2), this risk assessment provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. The risk assessment analyzes the hazards and risks facing the Town of Hancock and contains hazard profiles and loss estimates to serve as the scientific and technical basis for mitigation actions. This chapter also describes the decision-making and prioritization processes to demonstrate that the information analyzed in the risk assessment enabled the Town to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. This section also provides information on previous occurrences of hazard events and on the probability of future hazard events with consideration to climate change (44 CFR § 201.6(c)(2)(i).

This plan also includes a section on Invasive Species and Vector-borne illnesses because these growing threats could disable critical facilities and the essential services they provide to the community.

Town Profile

People

Hancock's total population declined steadily from 2016 to 2019, reaching a 20-year low of 599 people. Population numbers rose to 749 in 2021, which is also the highest population recorded in a 20-year period. [i] Like other rural towns in the county, Hancock has had a gradual increase in an aging population, with the 65 to 74 age group having a 13% growth in a 6-year period and representing the largest age group out of its total population (22% of its total population).[ii] Children and adolescents also comprise a significant portion of residents, representing 23% of Hancock's total population. Of this group, children under age 5 account for two-thirds. Also, during the last 6 years, children under age 5 have had a 21% increase, indicating that more families are settling in Hancock. While Hancock has no formal mapped environmental justice community, groups over the age of 65 and children under the age of 5 represent the town's most abundant age groups and most vulnerable to natural disasters.

Currently, Hancock has a population density of approximately 21 people per square mile with 296 households, resulting in a household size of approximately 2.5 people per household. [iii] The American Community Survey reports a median age of 50.5, exceeding Berkshire County by 1.10 years and Massachusetts by 10.9 years. The median household income for Hancock residents is $74, 167 marginally lower than Berkshire County's $74,170, and is approximately 61% of the median household income for Massachusetts ($120,626). The poverty rate stands at 2.57 %, which is lower than Berkshire County's overall rate of 11.9%. [iv]

Hancock's housing inventory encompasses owner-occupied, rental, and seasonal. As of 2021, owner-occupied homes constituted 75%, and renter-occupied 25% of the housing stock for full-time residents. Over the past decade, there has been an increase in the overall number of housing units (from 255 to 296), with owner-occupied units remaining the majority. The median year of construction for the housing stock is 1982, which is relatively young compared to its neighboring towns. Seasonal homes make up 58.2% of vacant units, which is one of the highest percentages of second homeowners in Berkshire County. The current median value of owner-occupied housing units is $299,600, which is 1.3 times the amount in Berkshire County ($232,900). It's about two-thirds of the amount in Massachusetts ($424,700). This upward trajectory is the highest for Hancock, whose median house value was $249,000 just five years prior.[v]

Hancock is a bedroom community where most residents commute to Williamstown, North Adams, and Pittsfield employment centers. Northern Hancock residents have convenient access to Williamstown via Route 43 North. However, traveling from Northern Hancock to the southern end of the town and into central Berkshire, including Pittsfield, is less straightforward. It requires crossing into New York and then re-entering Massachusetts via Route 20 due to the natural barrier of the Taconic Range.

Notably, there is no public transportation available, and approximately 90% of working residents commute within Berkshire County, with an additional 11% working in nearby Connecticut or New York. The average travel time to work for Hancock residents is approximately 26.6 minutes.

Economy

The Town's total FY22 revenue was $2.07 million. The majority of the revenue is from taxes, which make up 79% of the budget, while 17 % consists of state revenue, licenses, and permits and less than 4% are a small mix of service charges, miscellaneous, or transfers. [vi]

Given its size, obtaining relevant economic data for Hancock presents a challenge. In large part, job classifications for industries remain unspecified. Notably, the area's top employers are affiliated with the tourism sector, including Club Wyndham Bentley Brook, Fairbank Group LLC (Jiminy Peak Ski Resort), Patriot Resorts Corp, and Vacation Village, and Hancock Shaker Village. Each of these employers typically has a workforce of 20-49 employees.[vii] It's important to note that these figures do not account for seasonal employees who join during the summer and winter, possibly sustaining a workforce comprising hundreds of full-time, part-time, and seasonal employees. Hancock hosts a total of 82 businesses, with a significant portion consisting of sole proprietors, reflecting the entrepreneurial spirit within the community.

Hancock's economic vitality revolves around tourism, with a diverse array of attractions collectively drawing approximately 75,000 visitors annually. Among these destinations, Jiminy Peak stands out as a year-round recreational resort and residential condominium complex, acting as a pivotal cultural and economic focal point. In the southern region, Hancock Shaker Village, a museum and historic cultural attraction, not only employs over 20 individuals but also engages in educational workshops with schools. Brodie Mountain Rd features a strategically located restaurant minutes away from the ski resort, complemented by nearby attractions such as Ramblewild, an outdoor adventure park, and Ioka Valley Farm, a sugar maple production facility, and Bloom Meadows- an event/wedding venue. The influx of visitors also highlights the broader impact a natural disaster could have, affecting not only local residents but also potentially leading to a more significant loss of life given the substantial number of tourists in the area.

Natural Environment

The natural environment is a valuable community asset, offering a multitude of benefits, many of which defy quantification. These ecosystem services encompass clean air, carbon sequestration, clean water, wildlife habitat, water retention, wind and heat mitigation, increased property values, and improved mental well-being. While it's crucial to recognize that disasters like floods, wildfires, and storms can harm the natural environment, it's equally vital to appreciate that they can also serve as agents of rejuvenation, facilitating growth and renewal within ecosystems. In contrast, the built environment often proves more susceptible to the destructive impacts of natural disasters. Maintaining a harmonious balance between the human-made and natural realms is indispensable for ensuring the safety and sustainability of the community.

Hancock is predominantly characterized by its forested landscape, encompassing 88% of its total acres, with 52.4% (11,982 acres) designated as open space protected in perpetuity. The Taconic Mountain range forms a significant part of the Town's western edge, while the eastern edge is bordered by the Berkshire Mountain Range, featuring notable peaks like Potter Mountain and Brodie Mountain. A substantial portion of southern Hancock is integrated into Pittsfield State Forest. The town lies within two watersheds, the Hudson and Housatonic, and hosts numerous creeks, brooks, and rivers that contribute to these watersheds.

Situated in the northern half of the town are the headwaters of the West Branch Green River and Kinderhook Creek. The West Branch Green River flows north, joining the Hoosic River and, eventually, the Hudson River. Simultaneously, Kinderhook Creek flows south and then west to join the Hudson River. The western slopes of Pittsfield State Forest drain into Kinderhook Creek, while on the east side of the mountains, several headwater streams flow east into the Southwest branch of the Housatonic River.

The northern half is predominantly covered by deciduous forest, showcasing a blend of hardwood trees such as oak, maple, and birch. Several working farms cultivate crops like corn, hay, and various vegetables. Overall, Hancock’s natural landscape supports various ecologically significant species and natural communities, comprising 574 acres in the aquatic core, 13,284 acres of forest core, 142 acres of wetland cores, 85 acres of vernal pool cores, and 7 acres of priority natural community. These areas provide habitats for northern hardwoods, including sugar maples, as well as state-listed species such as the Jefferson salamander, longnose suckers, and the Least Bittern. Hancock and neighboring towns of western Pittsfield and Lanesborough collectively form part of a regional, extensive, relatively undisturbed forest habitat.[viii]

Built Environment

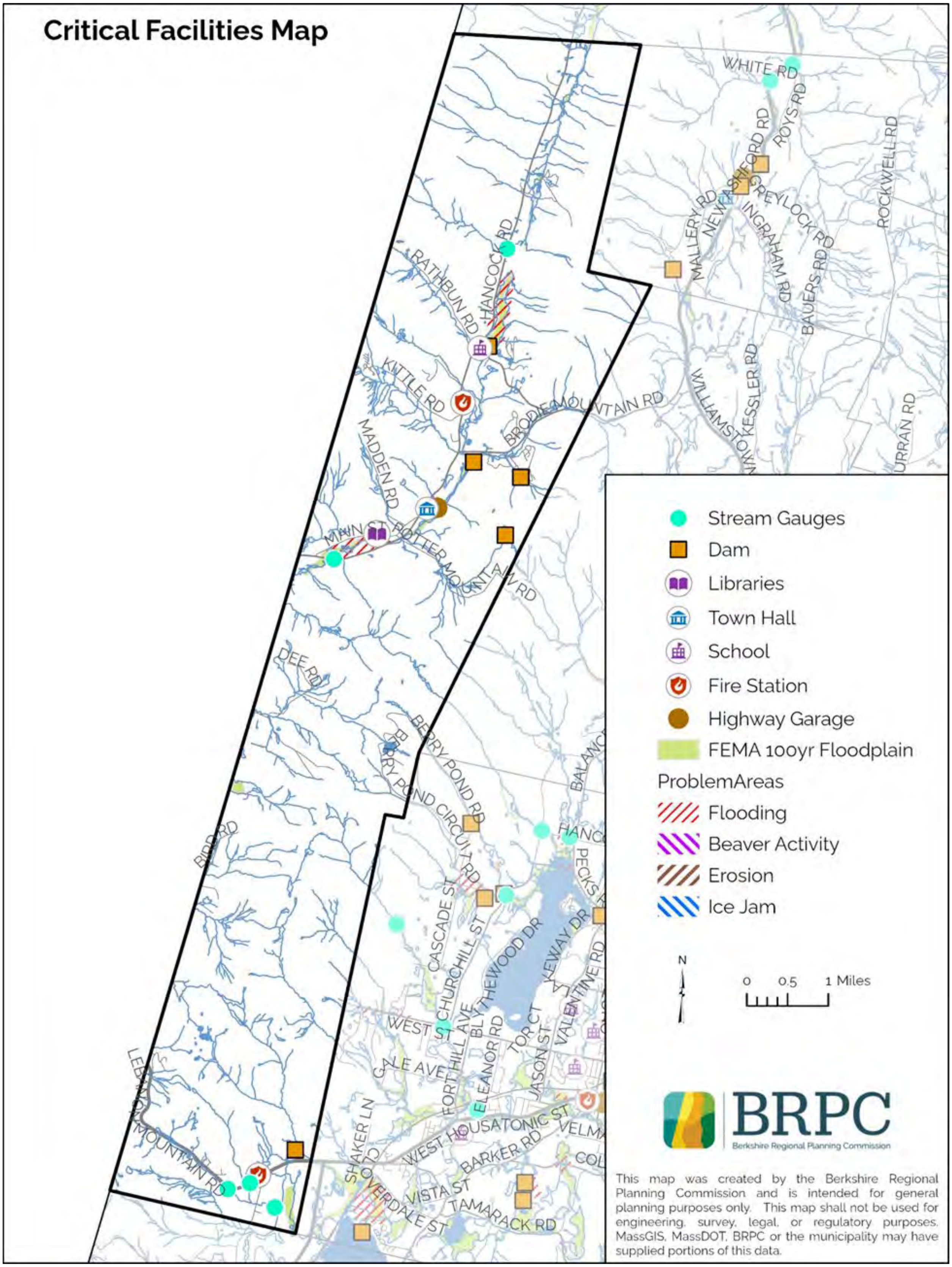
The built environment of the town of Hancock is a critical focal point in comprehensive Hazard Mitigation planning. Understanding the intricacies of the built environment is essential to crafting effective mitigation strategies that will safeguard the town and its residents in the face of various threats. 44 CFR § 201.6 (c)(2)(ii)(C) asks that vulnerability in the risk assessment be addressed in terms of land uses and development trends within the community so that mitigation options can be considered in future land use decisions. For the Town of Hancock, future investments include expanding the Fire Department's fleet apparatus by purchasing a new tanker and installing solar panels at the elementary school. Given these new developments, proactive hazard resilience planning is urgent to ensure people and assets are not placed in harm's way and opportunities to integrate projects. Critical facilities are the buildings and infrastructure hubs that are necessary for continued operation during a hazardous event. Table 3.1 shows Hancock's Critical Facilities, and Figure 3.1 provides a map of the critical facilities and areas of concern. These facilities were digitized into GIS and used to determine their vulnerability to various hazards.

Table 3.1 Critical Facilities in Hancock

Facility and Function	Address
Town Hall: Town Offices, Public Meeting Space, Council of Aging, and Police Department	3650 Main St.
Hancock Volunteer Fire Department: Emergency services & rescue equipment, Emergency Operations Center	3276 Hancock Rd and Clark Rd.
Hancock Highway Garage: Road Services, Salt Shed	Clark Rd
Hancock Elementary School: Public Meeting Space, vulnerable population center	3080 Hancock Rd
Hancock Baptist Church: Council of Aging programs	124 Main St

Hancock's road network spans approximately 28.41 miles, with the Town maintaining 14.94 miles and the Massachusetts Department of Transportation (MassDOT) overseeing 13.21 miles, including Route 43 and Route 20.[ix] Route 43 is the primary entry point for travelers from Williamstown in the north or those entering Hancock from the east via New York. Additionally, Route 20 comprises a small segment in southern Hancock, crucial for those re-entering Hancock through New York or heading into Pittsfield. Residents can access Route 7 to travel north and south of the county, with the only access point in Hancock being Brodie Mountain Road.

Figure 3.1 Critical Facilities and Areas of Concern in Hancock



Hazard Identification and Risk Assessment Processes

In order to identify potential hazards that can affect the Town of Hancock, a number of interviews of local Town staff and stakeholders were held. Surveys were conducted Town wide, and hazards described in neighboring town Hazard Mitigation Plans were included. Hazards were characterized further through a workshop of major stakeholders and research that included archival newspapers going as far back as 1930s. The hazards identified through these sources were Flooding, Dam Failure, Wildfire, Snow, High Wind, and Other Natural hazards (i.e. severe storms and tornadoes). To build on this list, the 2018 *Massachusetts State Hazard Mitigation and Climate Adaptation Plan* (SHMCAP) for the Commonwealth of Massachusetts was consulted. Accounting for the location, natural and built environments, history, and scientific studies of the area, it was determined that the Town of Hancock must plan for the following hazards:

- Flooding (including Dams, Ice Jam, Beaver Activity)
- Severe Winter Event (Ice Storm, Blizzard, Nor'easter)
- Severe Storms (High Wind, Thunderstorms)
- Drought
- Annual / Extreme Temperatures
- Invasive Species
- Tornado
- Hurricane & Tropical Storms
- Wildfire
- Landslide
- Earthquake
- Vector-borne Diseases

The Core Team reviewed and omitted the following natural hazards:

- Coastal hazards
- Coastal erosion
- Sea level rise
- Tsunamis
- Cybersecurity Threats

Coastal-related hazards were left out because Hancock is too far inland to be impacted directly by such hazards. Cybersecurity threats were intentionally omitted from the plan due to the town's small, rural, and technologically limited landscape, where minimal online presence reduces susceptibility to such risks.

Prioritization and Hazard Profiles

Table 3.2 illustrates the first step in prioritizing hazard mitigation actions in addition to profiling local impacts during the risk assessment. The method of prioritization meets the requirements of 44 CFR § 201.6(c)(3)(iii). In addition to reviewing existing data, the Town decided to consider changing weather patterns expected due to climate change through a Massachusetts Municipal Vulnerability

Preparedness grant. Prioritization also considered public input that residents provided to the Committee through a town-wide survey. Hazards other than flooding are difficult to prioritize without this or a similar ranking system.

Table 3.2 Hazards that have the greatest potential to impact Hancock

Hazard	Area of Impact Rate	Frequency of Occurrence Rate	Magnitude / Severity Rate	Hazard Ranking
	1=small 2=medium 3=large	0 = Very low frequency 1 = Low 2 = Medium 3 = High Frequency	1=limited 2=significant 3=critical 4=catastrophic	
Severe Winter Event (Ice Storm, Blizzard, Nor'easter)	3	3	1	7
Severe Storms (High Wind, Thunderstorms, Hail)	3	3	1	7
Change in Average/Extreme Temperature	3	3	1	7
Pests/Vector-borne Diseases	3	3	1	7
Hurricane & Tropical Storms	3	2	1	6
Urban & Wildfire	2	3	1	6
Invasive Species	2	3	1	6
Flooding (include Washouts & Beaver Activity)	2	2.5	1	5.5
Drought	2	2	1	5
Earthquake	3	1	1	5
Tornadoes, High Winds and Thunderstorms	1	1	2.5	4.5
Landslide	1	1	1	3
Dam Failure	1	0	1	2

Area of Impact	
1=small	isolated to a specific area of town during one event
2=medium	occurring in multiple areas across town during one event

3=large	affecting a significant portion of town during one event
Frequency of Occurrence	
0=Very low frequency	events that have not occurred in the recorded history of the town or that occur less than once in 1,000 years (less than 0.1% per year)
1=Low frequency	events that occur from once in 100 years to once in 1,000 years (0.1% to 1% per year)
2=Medium frequency	events that occur from once in 10 years to once in 100 years (1% to 10% per year)
3=High frequency	events that occur more frequently than once in 10 years (greater than 10% per year)
Magnitude/Severity	
1=limited	injuries and/or illnesses are treatable with first aid; minor" quality or life" loss; shutdown of critical facilities and services for 24 hours or less; property severely damaged < 10%
2=significant	injuries and/or illnesses do not result in permanent disability; shutdown of several critical facilities and services for more than one week; property severely damaged < 25% and > 10%
3=critical	injuries and/or illnesses result in permanent disability; complete shutdown of critical facilities for at least two weeks; property severely damaged < 50% and > 25%
4=catastrophic	multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged> 50%

[i] US. Census Bureau American Community Survey 5-year estimates. Retrieved from Tables ACS 5-Year Estimates Data Profiles, Table DP05, 2016-2021.
[ii] US. Census Bureau American Community Survey 5-year estimates. Retrieved from Tables ACS 5-Year Estimates Data Profiles, Table DP05, 2016-2021.
[iii] Massachusetts Census Data (malegislature.gov)
[iv] U.S. Census Bureau (2021). American Community Survey 5-year estimates. Retrieved from Census Reporter Profile page for Hancock, Berkshire County, MA
[v] U.S. Census Bureau (2021). American Community Survey 5-year estimates. Retrieved from Census Reporter Profile page for Hancock, Berkshire County, MA Table S2506
[vi] Department of Revenue, Division of Local Services. Accessed on 10/18/23. Data retrieved from https://dlsgateway.dor.state.ma.us/reports/rdPage.aspx?rdReport=ScheduleA.GenFund_MAIN
[vii] https://lmi.dua.eol.mass.gov/lmi/EmploymentAndWages
[viii] NHESP and Mass DFW Biomap2, Hancock Report, 2011, https://www.mass.gov/doc/hancock/download
[ix] https://www.mass.gov/doc/2022-road-inventory-year-end-report/download

Severe Winter Storms (Ice Storms, Nor'easters, Blizzards)

Hazard Profile

Severe Winter Storms (Ice Storms, Nor'easters, Blizzards) Hazard Profile Snow and other winter precipitation occur frequently across the entire Commonwealth. Severe winter storms in Hancock typically include heavy snow, blizzards, Nor'easters, and ice storms. Due to elevation changes, the town can vary slightly in terms of which areas receive more snow. For instance, higher elevations outside the Town center typically have icier roads and slightly more snow. A winter storm warning is issued when 6" of snow or more in a 12-hour period (or 8" of snow or more in a 24-hour period) is expected within the next 12 to 36 hours. [i]

A blizzard is a winter snowstorm with sustained or frequent wind gusts to 35 mph or more, accompanied by falling or blowing snow reducing visibility to or below a quarter mile. These conditions must be the predominant condition over a three-hour period. Extremely cold temperatures are often associated with blizzard conditions but are not a formal part of this definition. However, the hazard created by the combination of snow, wind, and low visibility increases significantly with temperatures below 20°F. A severe blizzard is categorized as having temperatures near or below 10°F, winds exceeding 45 mph, and visibility reduced by snow to near zero.[ii]

A Nor'easter is typically a large counterclockwise wind circulation around a low-pressure center, often resulting in heavy snow, high winds, and rain. Strong areas of low pressure often form off the southern east coast of the U.S., moving northward with heavy moisture and colliding with cooler winter inland temperatures. Sustained wind speeds of 20-40 mph are common during a nor'easter, with short-term wind speeds gusting up to 50-60 mph or even to hurricane-force winds.[iii]

Ice storm conditions are defined by liquid rain falling and freezing on contact with cold objects, creating ice build-ups of ¼ inch or more that can cause severe damage. An ice storm warning is now included in the criteria for a winter storm warning. This warning is issued when ½ -inch or more of accretion of freezing rain is expected. This type of storm may lead to dangerous walking or driving conditions along with power lines and trees pulling down.[19] Ice storms may also accompany freezing rain or sleet. Freezing rain occurs when rain falls into areas that are below freezing. For this to occur, ground-level temperatures must be colder than air temperatures. Freezing rain can also occur when the air temperature is slightly above freezing but the surface that the rain lands upon is still below freezing from prior cold air temperatures. Sleet is made up of drops of rain that freeze into ice as they fall. They are usually smaller than 0.30 inch in diameter. [iv] A sleet storm involves significant accumulations of solid pellets, which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces, posing a hazard to pedestrians and motorists.

Likely Severity

A storm will occur periodically, which is a true disaster and necessitates intense, large-scale emergency response. The main impacts of severe winter storms in the Berkshires are deep snow depths, heavy ice accumulations, high winds, and reduced visibility, potentially resulting in the closing of schools, businesses, some governmental operations, and public gatherings. Loss of electric power and possible closure of roads can occur during the more severe storms events. The magnitude or severity of a severe winter storm depends on several factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, times of occurrence during the day (e.g., weekday versus weekend), and time of season.

NOAA's National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms impacting the eastern two-thirds of the U.S. The RSI ranks snowstorm impacts on a scale from one to five. RSI is based on the spatial extent of the storm, the amount of snowfall, and the combination of the extent and snowfall totals with population. Data beginning in 1900 is used to give a historical perspective.

Table 3.3 Regional Snowfall Index Ranking Categories

Category	Description	RSI-Value
1	Notable	1-3
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18+

Source: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan

Of the 12 recent winter storm disaster declarations that included Berkshire County, only two events were ranked as Extreme (EM-3103 in 1993 and DR-1090 in 1996), one was ranked Crippling (IM-3175 in 2003) and two were ranked as Major (EM-3191 in 2003 and DR-4110 in 2013). It should be noted that because population is used as a criteria, the storms that rank higher will be those that impact densely populated areas and regions such as Boston and other large cities and, as such, might not necessarily reflect the storms that impact less populated areas like the Berkshires. For example, one of the most famous storms in the Commonwealth in modern history was the Blizzard of '78, which dropped over two feet of snow in the Boston area during 65 mph winds that created enormous drifts and stranded hundreds of people on local highways. The storm hit the snow-weary city that was still digging out of a similar two-foot snowstorm 17 days earlier. On the Berkshires, things were not that severe, with 11-19 inches of snow falling in the county over the course of the 33-hour storm. Winds of up to 50 mph and dropped visibility to zero. Berkshire County was not listed in the disaster declaration.

The Northeast States Consortium has been tracking one- and three-day record snowfall totals. According to their data, 99% of the one-day record snowfall events in the region typically yield snow depths in the range of 12"-24", while the majority of three-day record snowfall events yield snow depths of 24"-36" (Table 3.4). One of the most serious storms to impact communities in the Berkshires was the Ice Storm of December 11, 2008. The storm created widespread downed trees and power outages across New York State, Massachusetts and New Hampshire. Over one million customers were without electricity, with 800,000 without power three days later and some without power weeks later. This storm severely impacted the hill towns in central and northern Berkshire County, including Hancock. While severe winter weather declarations became more prominent starting in the 1990s, it is not believed that this reflects more severe weather conditions than the Berkshires experienced in the 40+ years prior to the 1990s. Respected elders prior to the 1990s were consistently deeper than what currently occurs in the 2010- 2020s.

Probability

Residents and municipal staff in the Berkshires perceive blizzards and ice storms as routine challenges, anticipating several snowstorms and a few Nor'easters each winter. The Northeast generally experiences at least one or two major winter storms each year with varying degrees of severity. These major storms can make roads impassible, close airports, halt the delivery of goods and services, and leave thousands without power for days. In the Berkshires, snowfall amounts vary due to orographic effects, upslope flow enhances precipitation on windward slopes, and downslope flow creates a shadow effect. The region's unique landscape, intersecting with valleys and mountains, magnifies these impacts. Higher elevations generally experience colder temperatures, influencing the persistence of moderate snowfall.

From 2000 to 2023, the NOAA-NCDC storm database recorded 91 winter storm events in the Berkshires, including 13 FEMA-declared winter storm disasters and 59 "notable" winter storms in the Northeast Urban corridor. v Massachusetts has received over $30 million in federal funding for post-disaster winter/ice storm events since 1991 (EOEEA ResilientMA Plan, 2023). Positioned in Western New England, Hancock faces a heightened risk of winter storms, accentuated by severe weather patterns and slightly elevated terrain relative to neighboring counties.

Drawing insights from historical data, it is estimated that Hancock will be at risk for approximately 4.14 severe winter storms annually, with 2.5- 4.4 days of 5 inches of snow or more (EOEEA ResilientMA Plan, 2023, Tables 4–7). However, the influence of climate change is expected to amplify winter precipitation and storm frequency. Rising temperatures enhance the atmosphere's water-holding capacity, intensifying rain events and impacting winter weather. The Massachusetts Climate Assessment indicates a correlation between climate change and more severe winter storms, marked by colder temperatures, even with a potentially shortened winter season. This shift results in increased instances of extreme winter weather, including ice storms, nor'easters, heavy snow, and blowing snow, particularly in January, with significant risk extending from December through March.

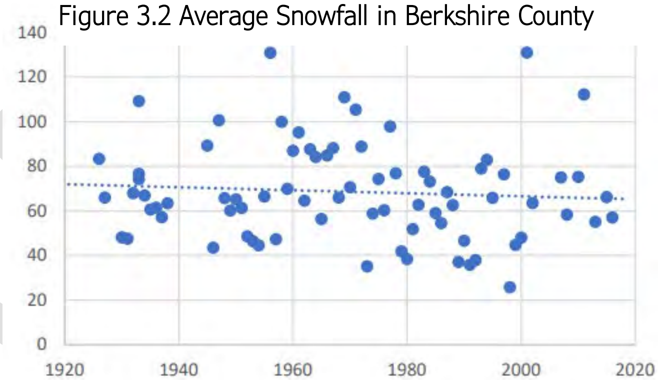
While the county may not consistently experience high snowfall amounts, as exemplified by the 2010-11 winter with over 100 inches, warmer temperatures in future winters may lead to a greater number and severity of storms featuring heavy, wet snow or ice. This dynamic poses concerns for road travel, human safety, and the risk of roof failures.

Historic Data

Although the entire community is at risk from severe winter storms, the higher terrains in the county tend to receive higher snowfall amounts, and these same areas may receive snow when the lower elevations receive mixed snow/rain or just rain. Snow and other winter precipitation occur very frequently across the entire region. Snowfall in the region can vary between 26 and 131 inches a year. However, it averages around 65 inches a year, down from around 75 inches a year in 1920. Figure 3.2 illustrates historic snowfall totals received in the county, indicating the average snowfall levels are trending downward.

The National Climatic Data Center, a division of NOAA, reports statistics on severe winter storms from 1993 through 2017. During this 24-year span, Berkshire County experienced 151 severe winter storms, an average of six per winter. This number varies each winter, ranging from one during 2006 to 18 during 2008. In 2011, a barn situated on Route 43, operated by the Quimby and Blair families, unfortunately collapsed from heavy snow compelling the family to send 40 head of cattle to Egremont for auction. This barn, located on a 180-acre farm that has been in the family for generations, faced significant loss.[vi] Remarkably, in the same year, Berkshire County established its snowfall record. Specifically, on October 30, 2011, the county experienced an unprecedented snowfall of 25.9 inches within a 24-hour period, marking a significant event in the region's weather history. In 2017, The Hancock Shaker Village restored its wooden silos after experiencing winter storm damage. Built for storage in 1908, the silos, incurred significant damage, with restoration cost estimated at around $92,000.[vii]

Figure 3.2 Average Snowfall in Berkshire County



Source: Massachusetts EEOA 'Precipitation Database 2019

Since 2000, two severe ice storm events have occurred in the region. The storms within that period occurred in December and January, but ice storms of lesser magnitudes may impact the region from October to April and on at least an annual basis. Based on all sources researched, known winter weather events that have affected Massachusetts and were declared a FEMA disaster are identified in the table below. Of the 18 federally declared winter storm-related disaster declarations in Massachusetts between 1954 to 2022, Berkshire County has been included in 13 of those disasters. None have been declared in for the county since 2015, although routine severe storms continue to impact Hancock.

Table 3.4: Memorable Severe Winter Weather including Declared Disasters Berkshire County

Year	Description of Event
March 1888	"The Great White Hurricane" A three-day blizzard leaves 42 inches of snow in the Berkshires. Fifteen-foot drifts are reported on North Street in Pittsfield. Farmers reportedly spend days in their barns because they cannot reach their houses. (Berkshire Eagle Archives 2016)
June 1905	Melting blizzard snow turned into flash flooding
Dec 1915	Berkshires experience the worst snowstorm since the Blizzard of 1888. Nearly three feet of snow falls, stalling trains, and crippling wire communications. Heavy snow accumulation in Hancock affects trade routes into Pittsfield.
March 1916	A two-day storm brought 20 inches of snow, the county would receive an additional 44 inches by the end of the month. Snowdrifts reaching upward of 20 feet became common, making roads impassable (Berkshire Eagle Online, 2022).
March 1919	A snowstorm with high snow drifts shut down the road between Hancock and Williamstown and took three days to clear.
March 1932	Rural towns in Northern Berkshire were isolated for 24 hours due to winter storm and heavy snow fall (Berkshire Eagle Archives]
March 1947	A snowstorm that lasts for 16 days drops more than 45 inches on the Berkshires. The greatest one-day snowfall occurs on March 3, when 16 inches fall. (Berkshire Eagle Archives 2016
Jan 1962	Snowstorm with high winds damages Hancock worth $2,000 in damages. (Berkshire Eagle Archives]
Feb 1969	Snow blizzard dumps 18 inches of snow in less than 24 hours forcing the town to shut down Hancock and cripples most of Berkshire County. (Berkshire Eagle Archives]
Dec 1969	A two-day storm that begins on Christmas Day leaves 23 inches of snow in Berkshire County. State police on snowshoes wade through 5- to 6-foot snow drifts to reach a woman with severe frostbite who is stranded off Route 116 in Cheshire. (Berkshire Eagle 2016)
Nov 1971	2 day snowstorm brought 22.5 inches on Thanksgiving stranding many travelers. This storm was the greatest November snowstorm on record at the time (Berkshire Eagle Online 2022).

May 1973	Storm uproots 6 trees. A silo on a nearby farm is blown over. Several homes went without power for 12 hours.
Feb 1976	Rainy conditions switched to flash freezing during a 30-degree drop in the few hours. Rain changed to snow and winds increased to 50 MPH with gusts to 67 MPH to produce blizzard conditions. (Berkshire Eagle Online 2022)
Jan 1979	Storm knocks out power for 100 customers along Route 43 for four hours for residents in Hancock
Aoril 1982	Considered the worst April snowstorm in local history. The snowstorm was accompanied by heavy snowfall, high winds, blizzard conditions, and most notably; extensive thunderstorm activity. Most areas saw one to two feet of snow. Gusts of 70 to 80 MPH were observed (Berkshire Eagle Online 2022).
Oct 1987	An early snowstorm brings 18 inches across the county, causing power outages and hazardous driving. It cancels the Northern Berkshire Fall Foliage Parade, the only time in its history.
March 1993	Melting snow and heavy rains impacted dirt roads, with several vehicles stuck in the mud. Berkshire County flood watch remained in effect for 2 days. (EM-3103)
Dec 1992	Nor'easter with snow 4'+ in higher elevations of Berkshires, with 48" reported in Becket & Peru; snow drifts of 12'+; 135,000 without power across MA. Declaration number: DR-975
Nov 1995	Winter snowstorm brings 60mph, knocking out power for more than 100 customers for 2 days.
Jan 1996	Blizzard of 30+" in Berkshires, with strong to gale-force northeast winds; MEMA reported claims of approx. $32 million from 350 communities for snow removal. (DR-1090)
March 1997	On March 31 and April 1, a classic late season nor'easter produced rain across Berkshire County during the morning hours. The rain changed to heavy wet snow by early afternoon. Snowfall amounts were highly elevation dependent with up to 30 inches in the highest peaks of the Berkshires. Some specific snowfall totals included: 8 inches at Great Barrington, 12 inches at North Adams, 23 inches at Dalton, 21 inches at Monterey and 20 inches at Lenoxdale. The wet snow brought down many trees and power lines causing widespread power outages and road closures. Some areas remained without power for several days. Estimated damage was $1 million. (NOAA Storm Database).
March 2001	Heavy snow across eastern Berkshires to Worcester County; several roof collapses reported; $21 million from FEMA. (EM-3165)

Dec 2002–Jan 2003	Unprecedented back-to-back snowstorms buried parts of the Northeast during the Christmas and New Year 2002-2003 holiday season. Both storms produced over 20 inches of snow. The first storm on Christmas Day was the biggest snowstorm since the "Superstorm" of 1993. 6-16 inches in western New England and considerable blowing and drifting. The second storm produced 20.8 inches of snow. It was the first time since 1887-88 that two storms of more than 20 inches were recorded. The second storm combined with ice left on trees from an ice storm that occurred January 1-2 to bring down numerous trees and bring many power outages.
Feb 2003	"President's Day" Winter storm with snow of 12-24", with higher totals in eastern Berkshires to northern Worcester County; $28+ million from FEMA. (EM-3175)
March 2003	A nor'easter dumps 22 inches of snow in 24 hours. The storm packs winds of up to 70 mph, which help create 10-foot snowdrifts. State of Emergency Declared (EM-3103).
Dec 2003	A "classic nor'easter' resulted in the first major snowstorm of the early winter season across the Berkshires. Nine to 18 inches fell across the Berkshires with Dalton receiving 17 inches. (EM - 3191)
Jan 2005	A powerful Nor'easter brought up to 30 inches of snow, hurricane-force winds, and blizzard conditions to parts of Massachusetts. While the coast bore the brunt of the impact with widespread power outages, significant coastal flooding, and paralyzed transportation, Berkshire County experienced an average snowfall of approximately 9 inches. (EM-3201 & DR-1614)
April 2005	A strong cold front moved across the Berkshires. Ample moisture was supplied by the warm air mass over eastern New England. Enough cold air was both advected into the region as well as transported downward by heavy precipitation to change the rain over to snow and produce an unusually late season snowstorm. Snow, falling at the rate of more than an inch per hour was common during the height of the storm. Gusty winds approaching 35 mph produced near blizzard conditions at times, including both blowing and drifting of the snow. Five to 10 inches of snow covered northwestern Massachusetts with locally higher amounts. Some business were closed or delayed in opening. Estimated damage was $25,000. (NOAA Storm Database).
April 2007	Severe Storm and Flooding; wet snow, sleet and rain added to snowmelt to cause flooding; higher elevations received heavy snow and ice; $8 million from FEMA. (DR-1701)
Dec 2007	A winter storm with mixed precipitation and high winds brought down several trees and caused spotty power outages through Berkshire County. A 50ft tree uprooted on Main St. in Hancock, crashed onto the car and through a nearby second-story roof.
Dec 2008	Major ice storm across eastern Berkshires & Worcester hills; at least ½" of ice accreted on exposed surfaces, downing trees, branches and power lines; 300,000+ customers without power in state, some for up to 3 wks.; $49+ million from FEMA. (DR 1813)

Dec 2009	Two day ice storm damages maple trees impacting 5% of maple sugar industry in the Berkshires (Berkshire Eagle Archives
Jan 2011	Nor'easter with up to 2' within 24 hrs.; $25+ million received from FEMA; Savoy received 40.5" and N. Adams received 33" (DR-1959)
Oct 2011	"Snowtober" Severe storm and Nor'easter with 1'-2' common; at peak 665,000 residents state-wide without power; 2,000 people in shelters statewide; $70+ million from FEMA statewide; Peru received 32" and Pittsfield received 18" (DR-4051 & EM-3343)
Feb 2013	Severe Winter Snowstorm and Flooding; $65+ million from FEMA statewide; Boston received almost 15" of snow. (DR 4110)
March 2017	Nor'easter, Pi Day Blizzard, was a significant storm that dumped 1 to 3 feet of snow. Across the Berkshires, winds gusted as high as 74 mph. The winds brought considerable blowing and drifting of snow. State of Emergency was declared. (NWS, 2017)
March 2018	Massachusetts was hit by a "bomb cyclone," a meteorological expression referring to a rapidly intensifying low-pressure system. The storm resulted in 10 to 18 inches of snowfall across the region. The most notable aspect of the storm was the intense winds it brought to Massachusetts (Boston Globe 2018).
Jan 2022	Higher elevation locations in the Catskills, Adirondacks, the southern Greens and northern Berkshires came in with 10"-14" on average
March 2023	A nor'easter brings the heaviest snow to Berkshire County in 12 years, where Hancock received over 27 inches of snow in 2 days - the second-highest record in the county.

Source: FEMA, MEMA 2023 unless otherwise noted.

Vulnerability Assessment

Geographic Areas Likely Impacted

Winter storms are the most common and familiar of Massachusetts hazards, which affect large geographical areas. Rural areas are most at risk of losing power and becoming isolated during a winter storm. Snow clearing and power restoration efforts take much more time in rural areas than along highways and in urban areas. Severe winter storm events generally occur across the entire area of Hancock, although higher elevations have slightly higher snow depths.

People

Many long-term residents of Hancock pride themselves on being independent and self-sufficient during severe winter events. Emergency personnel tell stories in which they will go to check on residents who may need assistance only to find they are well prepared with wood stoves and water on hand. There is some concern, however, especially among more vulnerable populations. During a public survey, winter storms ranked third most worrying out of 13 hazards. The highest reason for concern was the loss of electricity and isolation during blizzards and high winds.

According to the NOAA National Severe Storms Laboratory, every year, winter weather indirectly and deceptively kills hundreds of people in the U.S., primarily from automobile accidents, overexertion, and exposure. People who travel in winter storms are at the most risk. 70% of winter storm-related deaths occur in cars, more than the number of people caught out in the storm. Winter storms often accompany strong winds creating blizzard conditions, blinding wind-driven snow, drifting snow, and extreme cold temperatures with dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. Injuries and deaths may occur due to traffic accidents on icy roads, heart attacks while shoveling snow, hypothermia from prolonged exposure to cold, or fires or carbon monoxide poisoning from generator use or faulty heating methods after a storm causes a power outage.[viii] [ix]

Vulnerable populations during winter storms encompass those living alone, especially the elderly, who face heightened risks of injury and fatality due to falls, overexertion, and hypothermia from snow and ice clearance attempts or power failures. Individuals aged 65 and above, people with disabilities, and those with mobility limitations or lacking transportation are at increased risk, as they may require medical attention that could be hindered by storm-related isolation. People over 60 years of age account for half of all exposure-related deaths.[x] In Hancock, the senior population is particularly vulnerable, and survey responses highlighted concerns about isolation and limited access to emergency services during winter events. Compounding this, Hancock lacks a formal emergency shelter, relying solely on a volunteer fire department for emergencies, which may be hampered by heavy snowfall, icy roads, and fallen trees, impacting emergency response. The absence of a designated emergency shelter raises the potential for displacement or the need for temporary-to-long-term sheltering during extreme storms. Furthermore, hazards such as fallen trees, damaged buildings, and debris carried by high winds increase the risk of injury or loss of life. Winter conditions in Hancock pose particular dangers on roads, especially in higher elevation areas like Kittle Rd, Rathbun Rd., and Good Rich Hollow, where roads climb and wind around hills. Private, dirt, or non-state managed roads around town may be particularly hazardous, especially for vehicles ill-equipped to handle snowy and icy conditions.

Built Environment

Severe winter storms can damage the built environment by collapsing roofs under the weight of snow, making roads impassable due to snow or ice, damaging roads by freezing or unintended damage due to snowplows, freezing and bursting pipes, downing trees and power lines, and the flooding damages that result from melting snow. Utility power line systems are especially vulnerable due to heavy snow and high winds that can accompany severe winter storms. In Hancock, maintaining safe travel along Route 43 and Route 20 is critical to connecting residents to key services (shops, fuel, doctors and hospitals, schools, etc.).

Natural Environment

Winter storms are a natural part of the Massachusetts climate, and native ecosystems and species adapt well to these events. However, changes in the frequency or severity of winter storms could increase their environmental impacts. Environmental impacts of severe winter storms can include direct mortality of individual plants and animals and felling of trees, the latter of which can alter the physical structure of the ecosystem. These impacts can include direct damage to species and ecosystems, habitat destruction, and the distribution of contaminants and hazardous materials throughout the environment.[xi]

Economy

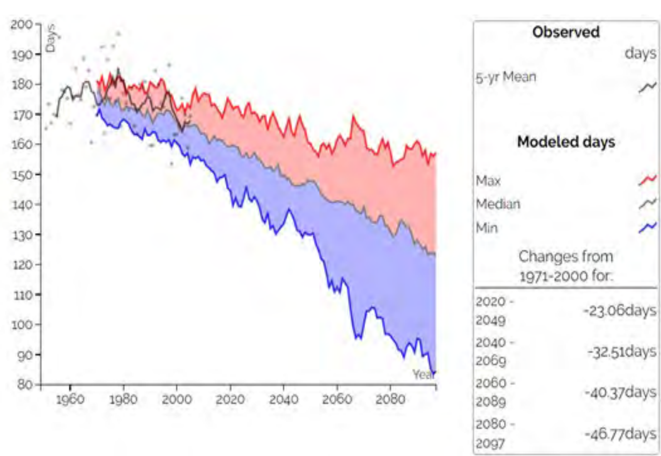
The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain municipal and state financial resources due to the cost of staff overtime, snow removal, and wear on equipment. Heavy ice accumulation can bring down trees, electrical wires, telephone poles and lines, and communication towers, making travel more difficult. Loss of utilities, business function, and income, along with interruption of transportation corridors, all impact the local economy, especially on those self-employed or on winter recreation and tourism, a major commerce for Hancock.

Severe winter weather can lead to flooding in low-lying areas. Ice that accumulates on branches in orchards and forests can cause branches to break, while the combination of ice and wind can cause trees to fall. This damage can stress trees and reduce their quality in forests that are being managed for timber, Christmas tree harvest, or sugar maple production.

Future Conditions

In Berkshire, winters are poised to experience the most pronounced impacts from climate change compared to other seasons. According to the Northeast Climate Center, the region is projected to lose nearly 47 days below freezing annually by the century's end. This shift is expected to bring about more frequent freeze-thaw cycles, with winter precipitation likely taking the form of heavy, wet snow, ice, or rain rather

Figure 3.3 Predicted Annual Days with Minimum Temperature



Source: resilientma.org

than the fluffier snow that has been more typical for the region. See Figure 3.3. These changes in winter conditions will have broad implications for infrastructure, public safety, and the environment.

Projected temperature increases associated with climate change are expected to modify the dynamics of winter thaw. As temperatures rise, the traditional deep winter thaw is likely to be reduced, affecting the insulation provided by snow cover to the ground. This alteration in the depth of winter thaw could significantly affect the region's vulnerability to flooding events.

The consequences of these altered freeze-thaw cycles are twofold in Hancock, with the impact on paved roads and infrastructure. The alternating expansion and contraction of moisture within road surfaces can lead to the formation of potholes, cracks, and frost heaves. These cycles can also cause cracks in pavements and even lead to collapsing foundations, posing a threat to the safety and durability of structures. Some mitigation tactics are improving drainage, increasing pavement thickness, and stabilizing subgrade soils.[xii]

Recent and planned developments in Hancock, including the paving of three dirt roads, the construction of new housing and commercial properties, and the rise in Airbnb rentals, signal a shift in the town's land use patterns. While these developments enhance accessibility and economic growth, they also introduce new challenges concerning winter storm resilience.

The increase in impervious surfaces due to road paving and new construction raises the potential for increased runoff and localized flooding during snowmelt. Future development projects must be carefully planned to mitigate these risks, emphasizing sustainable land use practices and resilient infrastructure design. This may involve revising zoning laws, implementing stricter building codes, and enhancing floodplain management to ensure that new developments can handle the changing winter conditions, such as adequate insulation, heating systems, and emergency preparedness measures.

Additionally, changes in winter precipitation will impact the maintenance of roads and utility line infrastructure. The increased occurrence of wetter snow and ice may necessitate enhanced weight-loading designs for buildings and infrastructure, potentially increasing the risk of frozen pipes. Moreover, reduced snowpack can lead to diminished groundwater recharge, drier springs, and decreased spring river flows for aquatic ecosystems.

With no public transportation available, Hancock's residents rely heavily on private vehicles for commuting, often over long distances to nearby employment centers like Williamstown, North Adams, and Pittsfield. Winter storms could disrupt commuting patterns, increasing travel times, causing potential road closures, and creating hazardous driving conditions. The town's remote and mountainous geography and the need to traverse New York to access central Berkshire further complicates emergency response and road maintenance during winter events. The Town must consider these factors when planning for emergency services and public safety measures, particularly for those who may be isolated or unable to travel during severe winter conditions.

Hancock's population has experienced a notable increase, particularly among families with young children and the elderly, two groups highly vulnerable to winter storm impacts. The growing number of children under age five and the elderly population means that more residents could be at risk during severe winter weather, especially if power outages or prolonged cold snaps occur. The significant percentage of seasonal homes in Hancock presents unique challenges during winter storms. Seasonal residents may not be as prepared for winter conditions as full-time residents, leading to potential issues with unoccupied homes, such as frozen pipes or snow damage. The town will need to ensure that these vulnerable groups have access to adequate heating, shelter, and emergency services during winter storms. Additionally, if the population increase trend is to continue, increasing population density may strain existing limited resources, requiring more targeted outreach and support during severe weather events.

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[i] Massachusetts Emergency Management Agency (MEMA) https://www.mass.gov/info-details/winter-storm
[ii] National Snow and Ice Data Center, 2023
[iii] National Weather Service 2019
[iv] https://nsidc.org/learn/parts-cryosphere/snow
[v] FEMA.gov
[vi] iberkshires.com "*County Roofs Buckle Under Pressure*" Feb.2011
[vii] WAMC Northeast Public Radio "*Hancock Shaker Village Repairs Damaged Silos*" 2017
[viii] NOAA National Severe Storms Laboratory (2023)
[ix] Northeast State Emergency Consortium
[x] Centers for Disease Control and Prevention (CDC). (1984, January 20). Hypothermia-related deaths—United States, 1979–1981. Morbidity and Mortality Weekly Report, 33(2), 17–19. Retrieved from https://www.cdc.gov/mmwr/preview/mmwrhtml/00001319.html
[xi] Massachusetts Climate Adaptation Partnership. 2015. Massachusetts Wildlife Climate Action Tool.
[xii] FEMA Hurricane and Flood Mitigation Handbook for Public Facilities March 2022. https://www.fema.gov/sites/default/files/documents/fema_p-2181-fact-sheet-1-1-road-surfaces.pdf

Tornadoes, High Winds and Thunderstorms

Hazard Profile

Tornadoes, high winds, and thunderstorms are significant meteorological phenomena that pose substantial risks to life, property, and infrastructure. They are closely related hazards, often occurring within the same weather systems and amplifying the risks they pose. Thunderstorms are the common thread, as they create the conditions that lead to high winds and tornadoes. Supercells are the storms most commonly producing tornadoes: severe, long-lived thunderstorms. Approximately 20 percent of supercells produce tornadoes (EOEEA ResilientMA Plan, 2023).

Thunderstorms develop when warm, moist air rises and cools, forming clouds and generating strong updrafts. As these storms grow in intensity, they can produce high winds, often resulting from downbursts, intense downward flows of air that hit the ground and spread out rapidly, causing damage across wide areas. These high winds can lead to power outages, tree damage, and structural impacts (NOAA, n.d.)

Tornadoes, violent rotating columns of air extending from a thunderstorm to the ground, often emerge from the most severe thunderstorms. They form when wind patterns within the storm create rotation, which intensifies as it is stretched vertically by the storm's updraft. While not all thunderstorms produce tornadoes, those that do can cause devastating damage, with wind speeds exceeding 200 mph in the most extreme cases (NOAA, n.d.)

The common factors in tornado formation are very strong winds in the middle and upper levels of the atmosphere Clockwise turning of the wind with height (i.e., from southeast at the surface to west aloft) Increasing wind speed in the lowest 10,000 feet of the atmosphere (i.e., 20 mph at the surface and 50 mph at 7,000 feet) Very warm, moist air near the ground, with unusually cooler air aloft A forcing mechanism such as a cold front or leftover weather boundary from previous shower or thunderstorm activity.

These phenomena are of significant concern because they have the potential to cause widespread destruction in a short time. A single thunderstorm can trigger high winds that spread damage over a large area and sometimes spawn a tornado that causes even more focused and severe impacts.

Likely Severity

The severity of these hazards is determined by their potential to inflict damage, ranging from localized, minor impacts to widespread, which are particularly dangerous due to their capacity for extensive destruction. If a major tornado were to strike, the damage could be severe, especially if it impacts residential areas or critical facilities. Such an event could result in the displacement of individuals and families, significant structural damage or total destruction of buildings, prolonged business closures, some potentially permanent, and widespread disruptions to essential services such as electricity and telecommunications. The National Weather Service (NWS) uses the Enhanced Fujita (EF) Scale (**Figure 3.4 Enhance Fujita (EF) Scale Source: NWS**) to rate tornadoes, which measures not wind speed directly but the extent of damage caused. This scale estimates 3-second wind gusts based on observed damage across various structure types, accounting for differences in height and exposure.

Figure 3.4 Enhance Fujita (EF) Scale

EF SCALE	
EF Rating	**3 Second Gust (mph)**
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Source: NWS

High winds and thunderstorms, while not always associated with major storm systems, can still cause significant damage. Hancock and several communities across Berkshire County have experienced numerous thunderstorms and high wind events, including microbursts. High winds can lead to downed trees and power lines, roof and window damage, and other structural impacts. Wind speeds as low as 40 to 45 mph can cause scattered power outages, particularly if the region has experienced prolonged drought or excessive rainfall, weakening root systems, making trees more susceptible to wind. In contrast, winds under 30 mph are generally not considered hazardous.

Thunderstorms are generated within cumulonimbus clouds and are often accompanied by lightning, heavy rainfall, and gusty winds. The severity of a thunderstorm is classified as "severe" when it produces wind gusts exceeding 58 mph, hail at least one inch in diameter, or a tornado. Severe thunderstorms can range from brief, localized events to large-scale storms that cause significant direct damage and lead to widespread flooding. Flooding, in particular, is a common consequence of severe storms and is often the primary reason for disaster declarations. The severity of flooding varies based on both the storm's characteristics and the specific geography of the affected region. Occasionally, lightning within thunderstorms can also pose severe hazards, particularly in cases where it leads to fires or other secondary impacts.

Probability

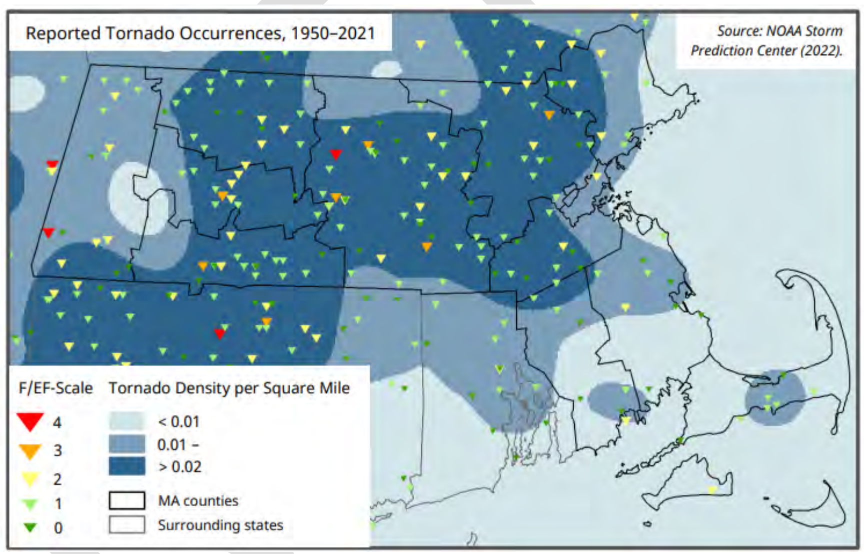
The Northeast experiences tornadoes less frequently compared to other regions of the U.S., such as the Central U.S. and the Great Plains. The varied topography of the Northeast can disrupt the formation and movement of storms capable of producing tornadoes. Additionally, the clash of warm, moist air, the fuel for storms, with cold, dry Canadian air occurs less frequently and with less intensity in the Northeast. While the Northeast does experience severe weather, it is less often subjected to the powerful low-pressure systems that drive the development of supercells, the type of storms most likely to produce tornadoes.

Berkshire County is less at risk for a tornado than Hampden County through Worcester, Middlesex, and part of Essex County (EOEEA ResilientMA Plan, 2023). However, if atmospheric conditions are ideal, the location of tornado impact is unpredictable. Tornadoes occur in Massachusetts usually during June, July, and August, although the county's most devastating was in Great Barrington in May 1995.

From 1951 to 2023, the Commonwealth experienced 198 tornadoes or an average annual occurrence of 2.6 tornado events yearly. In the last 20 years, the average frequency of these events has been 1.7 yearly (NOAA, 2018). Massachusetts experienced an average of 1.4 tornadoes per 10,000 square feet annually between 1991 and 2010, less than half of the national average of 3.5 tornadoes per 10,000 square feet per year (NOAA, n.d. as cited in MEMA & EOEEA, 2018).

According to data from the National Climatic Data Center, Berkshire County has experienced 13 tornadoes since 1950. These tornadoes have either touched down within the county or moved through it as part of their path. Additionally, several tornadoes have occurred in neighboring counties and states within the region (see Figure 3.5 Density of Reported Tornadoes per Square.)

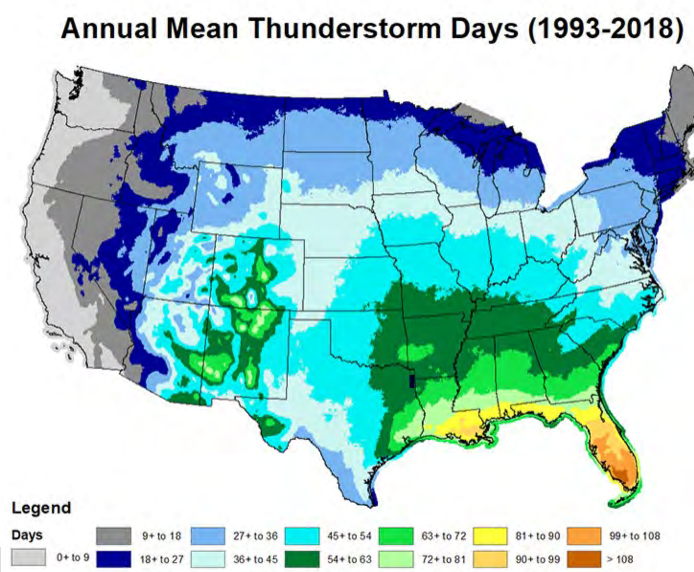
Figure 3.5 Density of Reported Tornadoes per Square



The most recent tornado struck Berkshire County in July 2014, when an EF1 tornado impacted Dalton. While these events average one tornado every five years, only two tornadoes in the region have reached the strength of an EF4, indicating that such severe tornadoes have an estimated recurrence rate of approximately once every 33 years (*NWS Surface Analysis 18z*, 2017).

Between January 1, 2008, and December 31, 2017, Massachusetts experienced 435 high wind events, averaging about 43.5 yearly events. The NWS defines high winds as sustained winds of 40 mph or more for at least an hour or gusts of 58 mph or more at any duration. However, these numbers may overestimate the frequency, as many events were in the same weather system. Climate projections suggest an increased severe weather, which may lead to more frequent high-wind events (*NOAA NWS Storm Prediction Center*, 2018)

Figure 3.6 Annual Mean Thunderstorms (1993- 2018) *Source: ResilientMA*



Thunderstorms require moisture, unstable rising air, and a lifting mechanism, such as topography or the meeting of different air masses. As warm air rises, it cools, causing condensation and cloud formation. Thunderstorms, averaging 15 miles across and lasting around 30 minutes, can grow larger and longer in severe cases. Massachusetts can experience 10–30 days of thunderstorms annually (*Thunderstorm and Lightning*, n.d.), (see Figure 3.6). There have been 33 lightning fatalities recorded in the Commonwealth from 1959 -2016, with 6 fatalities in 2024 (NWS, 2017), (CDC, 2024a). While climate change may increase storm volatility, the risk of lightning-related death or injury remains low.

Historic Data

The National Climatic Data Center reports data on tornado events and does so as far back as 1950. Only two tornadoes in Massachusetts have ever received FEMA disaster declarations, one in 1953 (DR-7-MA)and one in 2011 (DR-1994-MA); however, neither were in Berkshire County. Table 3.5 list the document tornadoes in Berkshire County. In 1964, a Berkshire Eagle article reported on a "twister." This event was accompanied by an electrical storm with hail and 1.25 inches of rain falling in just 30 minutes. One child was injured, a garage was torn apart, and residents on West Mountain Road were without power for two days.

On August 28, 1973, a tornado struck West Stockbridge along a six-mile path. The tornado caused significant destruction, killing four people and injuring 33 others. The Berkshire Truck Plaza was destroyed, and several homes were heavily damaged or obliterated. The tornado also caused severe damage to the Berkshire Farm for Boys in Canaan, NY. Debris from the tornado was carried as far as 55 miles away (Gentile, 2013).

The Great Barrington tornado, an EF4 event, struck the Berkshires on May 29, 1995, causing devastating damage. It resulted in three deaths, 24 injuries, and approximately $25 million in property damage. This tornado is notable as one of only four EF-3 or stronger tornadoes in the National Weather Service Albany County Warning Area over the past 45 years. It is the strongest tornado in Massachusetts since the 1953 Worcester tornado. The tornado originated from a supercell formed in a cluster of severe thunderstorms. After crossing the Hudson River, the system intensified, and an EF2 tornado touched down in Hudson, NY. The storm then moved into Great Barrington, where the EF4 tornado developed, driven by enhanced wind shear in the Housatonic River Valley. The tornado traveled from North Egremont to West Otis, with damage extending over 18 miles. Among the casualties, three people were killed when their car was lifted and dropped into a wooded area. The storm also caused significant structural damage, including the destruction of a nursing home roof, a gas station, and buildings at the local fairgrounds. Debris from the tornado was found over 45 miles away in Belchertown (US Department of Commerce, 2020).

Table 3.5 Historic Tornado Events in Berkshire County

Date	EF Scale	Damage	Injured	Fatalities
07/12/1955	EF2	$0	0	0
09/07/1958	EF0	$2,500	0	0
03/01/1966	EF2	$25,000	0	0
08/11/1966	EF2	$25,000	0	0
10/03/1963	EF1	$2,500	0	0
06/18/1970	EF1	$250,000	0	0
08/28/1973	EF4	$25 million	36	4
07/13/1975	EF2	$25,000	0	0
07/27/1978	EF0	$250	0	0
07/11/1984	EF1	$25,000	0	0
05/29/1995	EF4	$25 million	24	3
07/03/1997	EF1	$3 million	0	0
06/29/2005	EF0	$0	0	0
08/02/2020	EF0	$60,000	0	0
Source: NOAA, SHMCAP				

It is difficult to define the number of other severe weather events Hancock experiences each year. Though not uncommon, high wind events occasionally impact the Town of Hancock and require emergency response. For example, in 2012, the winds that accompanied T.S. Sandy required response from all across the Town. Local officials and private residents worked with chainsaws and heavy equipment to open roads for utility crews and help neighbors open driveways.

Microbursts occur throughout Berkshire County, downing trees and utility lines and sometimes causing property damage. In the Berkshires, microbursts are often accompanied by heavy rainfall that can cause additional damage from flooding. According to news media reports, thunderstorm/microburst events have caused damage in the communities of Williamstown, North

Adams, Cheshire, Lanesborough, Pittsfield, Lee, and Stockbridge in recent years. An event that struck Pittsfield and other central Berkshire communities in July 2011 caused extensive damage and was responsible for the death of a man in Hinsdale who was struck by a falling utility pole. WMECO called in 339 out-of-state work electric crews and 14 out-of-state tree crews to remove trees and repair damaged lines (McKeever, 2011). The same microburst did an estimated $800,000 in damage to the Mass Audubon Wildlife Sanctuary.

In June 2014, Cheshire experienced a "monsoon season" after severe thunderstorms with 60-mile-an-hour winds and flooding caused over $ 1 million in damage to roads and other existing structures. infrastructure. In July 2016, as the Berkshire Eagle newspaper reported, Cheshire was hit with a short but high-intensity microburst – a localized column of sinking air within a thunderstorm that caused extensive damage. The worst of the affected areas were Main Street, East Main Street, Mill Hill Road and Meadowbrook Drive. Initially, power was cut for about 1,300 customers. Trees were knocked down, requiring the cleanup of branches and debris from area roads.

On July 24, 2022, a supercell thunderstorm with gusts reaching hurricane strength (up to 74 mph) struck Lenox, Massachusetts. The storm downed trees and power lines, causing significant damage and resulting in power outages for hundreds of homes and businesses. Utility crews were dispatched to restore power and clear debris, and the National Weather Service confirmed the wind speeds had reached hurricane levels.

Vulnerability Assessment

Geographic areas of concern

All of Hancock is vulnerable to tornadoes, high winds, and thunderstorms that can cause extensive damage.
damage. Microbursts can also occur anywhere associated with thunderstorms.

People

The entire population of Hancock is considered to be exposed to tornado, high-wind, and thunderstorm events. Elderly individuals, people with disabilities, and those dependent on electricity-powered medical devices are particularly vulnerable. Power outages caused by high winds can severely impact their ability to access life-sustaining equipment, and limited mobility may prevent quick evacuation during emergency situations. Hancock is a rural community with sparse settlement patterns that can delay critical infrastructure repairs, such as restoring power, and can leave certain areas of town, particularly those without strong communication networks, isolated during disasters. These individuals, especially those with limited communication access, may not receive timely warnings, increasing their risk during fast-developing events like tornadoes. The absence of public transportation exacerbates these issues, as residents, particularly those without reliable vehicles, may struggle to evacuate or access shelter during emergencies.

The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly that little, if any, advanced warning is possible. This short warning time is part of why tornadoes are so dangerous. Tornado watches and the local NWS office issue warnings. A tornado watch is released when tornadoes are possible in an area. A tornado warning means a tornado has been sighted or indicated by weather radar (MEMA & EEOEA SHMCAP, 2018). Power outages may also result in inappropriate use of combustion heaters, cooking appliances, and generators in indoor or poorly ventilated areas, leading to increased risks of carbon monoxide poisoning (MEMA & EEOEA SHMCAP, 2018). Outdoor workers, individuals engaged in outdoor recreation, and first responders are particularly exposed to hazards like lightning strikes or falling debris during high winds and thunderstorms.

Low-income families and people living in substandard housing are also at heightened risk. Homes not built to withstand high winds or flying debris are more susceptible to damage, putting occupants at greater risk of injury or death. Additionally, the town's growing number of seasonal homes adds complexity to disaster preparedness. Many of these properties may be poorly maintained or vacant during the off-season, complicating response efforts and infrastructure damage assessments. Part-time residents may not be fully integrated into local emergency communication systems.

The most common problem associated with severe weather is the loss of utilities. Severe windstorms causing downed trees can seriously impact electricity and aboveground communication lines. Downed power lines can cause blackouts, leaving large areas isolated. Loss of electricity and phone connections would leave certain populations isolated because residents could not call for assistance. Additionally, the loss of power can impact heating or cooling systems and cause loss of electricity to power oxygen and other life-sustaining equipment. Downed wires can create the risk of fire, electrocution, or an explosion.

These severe wind events present potential safety impacts for individuals without access to shelter during these events. Additionally, research has found that thunderstorms may cause the rate of emergency room visits for asthma to increase to 5 to 10 times the normal rate. Much of this phenomenon is attributed to the stress and anxiety that many individuals, particularly children, experience during severe thunderstorms. During thunderstorms, high winds can cause a sudden release of spores and pollen into the air, leading to increased concentrations of allergens. Inhalation of these airborne particles can trigger asthma attacks, a phenomenon known as "thunderstorm asthma" (Al-Rubaish, 2007).

Built Environment

All elements of the built environment are exposed to severe weather events such as tornados, high winds and thunderstorms. The extent of damage to buildings depends on several factors, including wind speed, storm duration, the storm's path, and the construction quality of the buildings. The Massachusetts State Building Code (9th Edition), following national standards provided by the

American Society of Civil Engineers (ASCE 7), defines wind risk zones that account for different levels of wind exposure. These zones help determine how structures should be designed to withstand wind forces in specific areas, and the state is divided into four wind risk categories:

1. Risk Category I (120 mph): Applies to low-hazard buildings like agricultural or temporary structures, with minimal risk to human life.
2. Risk Category II (130 mph): Covers most residential, commercial, and industrial buildings designed for moderate wind loads.
3. Risk Category III (140 mph): Includes high-importance buildings like schools and assembly areas, requiring greater wind resistance.
4. Risk Category IV (150 mph): Reserved for essential facilities (e.g., hospitals, emergency shelters), built to withstand extreme wind forces for disaster response.

Public safety facilities and equipment are particularly vulnerable to high winds, which could cause direct damage. Roads may become impassable due to flash flooding or landslides caused by heavy, prolonged rainfall. These impacts on transportation lifelines can have both immediate consequences, such as hampering evacuation efforts, and long-term effects on daily commuting and emergency services. Water and sewer systems may also fail if power is lost for extended periods.

Secondary hazards such as hail, wind, debris, and flash flooding associated with tornadoes can cause damage to infrastructure (EOEEA ResilientMA Plan, 2023). If a tornado hit a large expanse of Hancock and/or its neighboring towns, electricity could be out for several days, as was the case when the ice storm of 2008 struck the Berkshire Hilltowns. High winds could down power lines and poles adjacent to roads Damage to aboveground transmission infrastructure can result in extended power outages. Incapacity and loss of roads and bridges are the primary transportation failures resulting from tornadoes, and these failures are primarily associated with secondary hazards, such as landslide events. Tornadoes can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating populations, and disrupting ingress and egress. Of particular concern are bridges and roads providing access to isolated areas and older residents

Natural Environment

High wind events, such as tornadoes, can profoundly affect the natural environment. These events defoliate forest canopies, uproot or down trees, and significantly damage large plants, leading to structural changes that destabilize food webs and cause widespread ecosystem disruption. For example, a tornado-impacted neighborhood in Springfield experienced a dramatic reduction in tree cover, dropping from 40 percent to just 1 percent, resulting in observed temperature increases of up to 4°F due to the loss of natural shading (EOEEA ResilientMA Plan, 2023).

The loss of trees and root systems can increase the risk of soil erosion and heighten wildfire threats as decomposing felled trees add dry matter to the ecosystem. These disruptions also affect biodiversity and the composition of forests, providing opportunities for invasive plant species to establish themselves in the disturbed areas, taking advantage of increased sunlight and reduced competition from native species.

In addition to these impacts, high winds can also severely affect wildlife. Habitat destruction can displace animals, disrupt breeding and migration patterns, and lead to population declines, particularly for species that depend on forest canopies or specific ecological niches. The long-term effects of habitat loss can significantly alter local wildlife populations.

Water systems may also be affected as heavy winds and rains lead to soil erosion, causing sedimentation in rivers, streams, and other bodies of water. This sedimentation can degrade water quality and harm aquatic ecosystems, posing challenges to species reliant on clear water for breeding and feeding. Additionally, hazardous materials carried by high winds, such as asbestos-contaminated debris, can contaminate these water bodies, further exacerbating environmental damage.

The long-term recovery of forest ecosystems from tornadoes and high wind events can take decades. During this time, regrowth may be slow, and the composition of the ecosystem could change permanently due to invasive species and the loss of critical species.

Economy

In 2022, tornadoes caused approximately 708 million U.S. dollars in damage across the United States, marking a more than 200 percent increase compared to the previous year. The economic toll from tornadoes in the U.S. reached its peak in 2011, with nearly 9.5 billion U.S. dollars in damages.(Burguen Salas, 2023).

The economic impacts of high wind related events can still be far-reaching, especially in rural communities like Hancock, where agriculture, forestry, and tourism are key economic drivers. Severe weather can inflict significant damage to agricultural crops, forestry species, and vital equipment, disrupting production and leading to costly recovery efforts. Although tornadoes are typically localized, the financial losses within the impacted areas can be substantial. Beyond direct physical damage, businesses may experience secondary impacts such as the cost of relocating operations, wage losses, and prolonged disruptions to day-to-day functions.

While high winds and thunderstorms may cover a broader geographic area, they can still significantly disrupt locally. These events may damage infrastructure, such as water supply systems, and lead to rental losses as properties undergo repairs. Power outages caused by these storms can further disrupt business activities, especially for industries reliant on continuous electricity, and recovery costs can be substantial. Historical data shows that the average economic loss from tornadoes in Massachusetts is approximately $3.9 million annually (MEMA & EEOEA SHMCAP, 2018). [i]

Additionally, lightning strikes, often accompanying thunderstorms, can lead to severe losses. Lightning can cause fires, damage infrastructure, and destroy crops, with damages ranging from minor to millions of dollars in large-scale events. The cascading effects of these hazards often leave communities dealing with extensive financial challenges long after the initial storm has passed.

Outdoor recreation and tourism in Hancock, including Jiminy Peak's ski trails and hiking trails, are highly vulnerable to severe weather. Tornadoes and high winds can damage trails and campgrounds, reducing visitor access and impacting businesses dependent on tourism. Extended closures for repairs can lead to significant revenue losses.

Disruptions to transportation infrastructure further compound these economic challenges. Damaged roads and bridges can sever supply chains, causing delivery delays and increasing operational costs. Such disruptions impact daily economic activity and hinder longer-term recovery efforts.

Future Conditions

Due to the changing climate, Hancock is expected to face an increase in the frequency and severity of thunderstorms and high winds. The Northeast, including Massachusetts, has already experienced a 55% increase in precipitation from the most intense storms since the 1950s, a trend that is projected to continue. Rising temperatures fuel more frequent and intense storms, exacerbated by the increased atmospheric moisture. Thunderstorms could become more severe, leading to greater risks of tornadoes, flash flooding, and high winds. These events will strain Hancock's aging infrastructure, potentially overwhelming stormwater systems and causing long-term disruption. Tornadoes may also occur outside their usual peak summer months as temperatures continue to rise. Warmer weather for longer periods could expand the window for tornado formation, increasing the number of months during which these storms are possible. This shift poses a greater risk to the community, which may not be accustomed to tornadoes occurring outside traditional storm seasons.

With a significant portion over 60, Hancock's population will continue to grow older. This shift presents future challenges as older residents tend to be more vulnerable during severe weather events, particularly if those events lead to prolonged power outages or infrastructure damage. Climate migration may cause Hancock's population to place additional pressure on existing services, including emergency response capacity and preparedness measures. A greater number of residents, particularly those who are elderly or socially vulnerable, may require more extensive services such as shelters, medical aid, and assistance with storm recovery. Educating residents on emergency preparedness and maintaining communication systems during power outages will be crucial, particularly to support the growing elderly population. As Hancock continues to maintain its rural character and low development, future land use decisions will likely prioritize minimizing risks posed by severe weather. Permitting processes may become stricter to ensure that any small-scale or redevelopment projects are resilient to hazards such as flooding and high winds. Additionally, updates to building codes and stormwater management systems will be necessary to protect existing structures and ensure long-term resilience against increasingly intense weather events.

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[i] Data not available after 2018

Change in Average Temperature/Extreme Temperatures

Hazard Profile

Temperature serves as a fundamental metric for understanding climate, encapsulating the prevailing weather patterns in a given region. These patterns not only dictate the distribution of plant and animal species but also shape the landscape and ecosystems. However, alterations in climate, particularly changes in average temperature and the occurrence of extreme temperature events, signal significant shifts in climate dynamics at both regional and global scales. Temperature variations occur due to several atmospheric phenomena. Increased greenhouse gas emissions from human activities are contributing to an increase in the earth's surface temperature, causing more extreme temperatures. Shifts in temperatures are evident in gradual increases in overall temperature averages over time, alongside the emergence of extreme weather phenomena such as heatwaves and cold snaps, which deviate significantly from historical norms.

Changes in temperature patterns serve as vital indicators of broader climate trends, reflecting the intricate interplay of various environmental factors. For example, the interconnectedness of atmospheric conditions and oceanic currents plays a crucial role, with warmer ocean waters acting as a "heat sink" that influences air temperatures and contributes to the intensification of storms, impacting inland areas such as the Town of Hancock. Understanding these changes is essential for grasping the multifaceted risks they pose to public health, economic stability, and infrastructure resilience. In the Northeastern region, projections suggest a trend towards more frequent and intense precipitation, prolonged fall and spring seasons, and warmer winters accompanied by heavier snowfall. Adaptation strategies must address these evolving climate dynamics to effectively mitigate their impacts and safeguard both human and environmental systems.

Likely Severity

Hancock benefits from natural safeguards against extreme heat due to its higher elevation and dense forest cover. However, most roads and residences are situated in lower elevations, typically ranging between 1,400 to 1,700 feet, making them more susceptible to temperature fluctuations. The community and its inhabitants have adapted to cooler climates; however, it remains susceptible to fluctuations in temperature, especially amidst a changing climate. Traditional home constructions prioritize heating systems and modest insulation to retain warmth, with central air conditioning systems being less common.

NOAA relies on a combination of land-based weather station data and satellite measurements to gauge average temperatures. In regions like the Berkshires, characterized by moderate climates, temperature variations can have significant repercussions particularly affecting environmental integrity, seasonal economy and vulnerable demographics such as the elderly, individuals with preexisting health conditions, and those with limited financial resources.

Environmental integrity is jeopardized as temperature fluctuations disrupt delicate ecosystems, leading to shifts in biodiversity and potentially threatening native species. For example, warmer temperatures may alter migration patterns or habitat availability for certain wildlife species, impacting ecosystem stability.[i]

The seasonal economy of towns like Hancock relies heavily on industries such as tourism, agriculture, and outdoor recreation, which are sensitive to changes in temperature. Warmer temperatures can lead to shortened ski seasons, reduced snowfall, and altered foliage patterns, affecting tourism revenue and agricultural productivity. This, in turn, can have ripple effects on local businesses and employment opportunities.

Vulnerable demographics, including the elderly and individuals with preexisting health conditions, face increased risks during extreme temperature events. Heat waves can exacerbate health issues such as heat-related illnesses and respiratory conditions, placing additional strain on healthcare resources. Limited financial resources may also hinder access to adequate shelter or cooling facilities, further magnifying the impact on vulnerable populations. [ii]

The NWS issues a Heat Advisory when the NWS Heat Index is forecast to reach 100 to 104°F for 2 or more hours. The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach 105°F or higher for 2 or more hours. The NWS Heat Index is based both on temperature and relative humidity and describes a temperature equivalent to what a person would feel at a baseline humidity level. It is scaled to the ability of a person to lose heat to their environment.[iii] It is important to know that the heat index values are devised for shady, light wind conditions. Exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can increase the risk of heat-related impacts. Extreme heat temperatures are those that are 10°F or more above the average high temperature for the region and last for several hours. A heat wave, defined as a period lasting three or more days with temperatures surpassing 90°F, infers an extended duration of heightened atmospheric heat stress, leading to temporary lifestyle adjustments and potential health risks among affected populations.[iv]

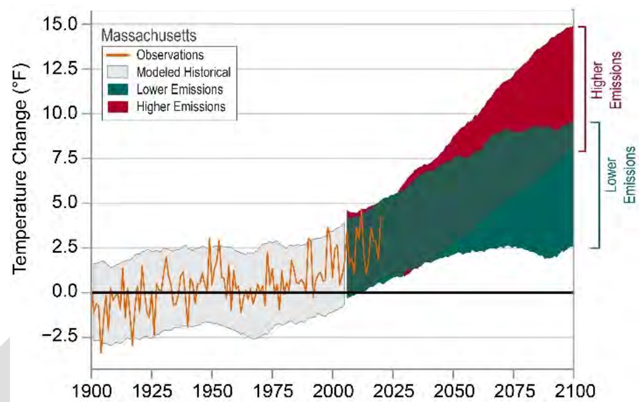
The extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature Index. Wind Chill Temperature is the temperature that people and animals feel when they are outside, and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body loses heat at a faster rate, causing the skin's temperature to drop. The NWS issues a Wind Chill Advisory if the Wind Chill Index is forecast to dip to −15°F to −24°F for at least 3 hours, based on sustained winds (not gusts). The NWS issues a Wind Chill Warning if the Wind Chill Index is forecast to fall to −25°F or colder for at least 3 hours. On

November 1, 2001, the NWS implemented a Wind Chill Temperature Index designed to more accurately calculate how cold air feels on human skin.

Probability

Scientific research indicates that global climate changes are causing shifts in temperatures as weather patterns undergo transformations. Air temperatures are generally on the rise worldwide, with the Northeastern United States experiencing comparatively higher increases.

Figure 3.7 Observed and Projected Temperate Changes for Massachusetts



Sources: Cooperative Institute for Satellite Earth System Studies (CISESS) and National Centers for Environmental Information (NOAA NCEI). Retrieved [Massachusetts State Climate Summaries.]

The Massachusetts Climate Change Clearinghouse (resilient MA) serves as a vital resource, offering access to data and information essential for climate change adaptation and mitigation efforts across the state. It delivers the latest climate change science and decision support tools to aid policymakers, practitioners, and the public in making scientifically sound and cost-effective decisions. Resilient MA serves as the primary information and data source utilized in this hazard mitigation plan for understanding observed and projected temperature changes.

Integral to this initiative is the Department of Interior's Northeast Climate Adaptation Science Center (NE CASC), headquartered at the University of Massachusetts, Amherst. NE CASC is a crucial component of a federal network comprising eight Climate Adaptation Science Centers, collaborating with natural and cultural resource managers to compile scientific data and develop tools necessary for aiding fish, wildlife, and ecosystems in adapting to climate change impacts. Climate change projections for Massachusetts rely on simulations from the latest generation of climate models incorporated into the Coupled Model Intercomparison Project Phase 5 (CMIP5). To provide localized projections, the state employs county- and major watershed-level information derived through statistical downscaling of CMIP5 model results using the Local Constructed Analogs (LOCA) method.

Temperatures in Massachusetts have risen almost 3.5°F since the beginning of the 20th century as indicated in the orange line in Figure 3.7 Observed and Projected Temperate Changes for Massachusetts. Less warming is expected under a lower emissions future (the coldest end-of-year projections being about 2°F warmer than the historical average; green shading) and more warming under a higher emissions future (the hottest end-of-year projections being about 10ºF warmer than the hottest year in the historical record; red shading). [v]

Temperatures vary across Massachusetts, with higher temperatures typical in the southeast and colder ones in the northwest. The 2022 Massachusetts Climate Change Assessment predicts that temperatures are almost certain to rise across the Commonwealth(EOEEA ResilientMA Plan, 2023).

Humidity will rise as well, causing hot days to feel even hotter. These changes could have significant consequences for human and ecosystem health, as human populations and ecosystems in Massachusetts are not adapted or accustomed to these temperatures. Projections show that inland areas are very likely to warm more and experience more extreme heat than coastal areas. Detailed forecasts for the mid-century (2050s) through 2090s specific to the Town of Hancock are provided in Table 3.6.

Degree days are used to measure how much outdoor temperatures deviate from a standard base temperature, typically 65°F in the U.S.

- Heating degree days (HDDs) indicate how much *colder* it is by counting the difference when temperatures fall below 65°F, as heating is typically needed in these conditions. For instance, a day with an average temperature of 40°F results in 25 HDDs.
- Cooling degree days (CDDs) represent *warmer* conditions by tracking how much warmer it is above 65°F. The more degree days, the more extreme the temperatures, which can increase energy consumption and affect public health.

HDDs impact energy consumption and costs, with higher values increasing demand for heating systems. Conversely, higher CDDs may strain air conditioning usage and utility bills. Degree days also affect public health, with elevated HDDs posing cold-related health risks and higher CDDs increasing heat-related illnesses.

Table 3.6 Projected Temperature Changes and Heat Stress Events in Town of Hancock (2050s-2090s)

Variable	Change by 2050s	Change by 2070	Change by 2090s
Max temperature (degrees F)	6.3	8.1	9.9
Days above 90 degrees F (days)	20	33	47
Days above 95 degrees F (days)	4	9	15
Days above 100 degrees F (days)	0	1	2
Number of heat stress events	0	1	3
Cooling degree days (degree days)	644	881	1138
Heating degree days (degree days)	-1654	-2076	-2478

Source: https://resilient.mass.gov/

Historic Data

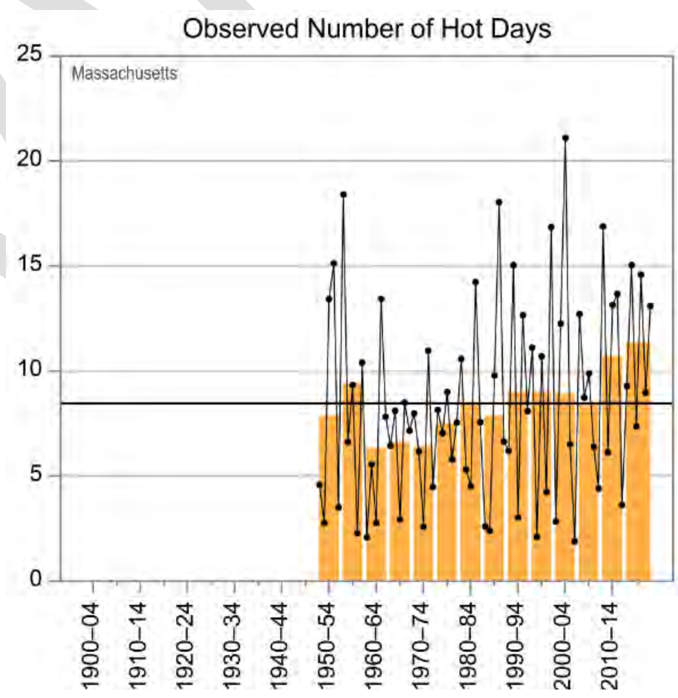
In 2023, NOAA reported that warmest year since global records began in 1850 at 2.12°F above the 20th-century average of 57.0°F. This value is 0.27°F more than the previous record set in 2016. The 10 warmest years in the 174-year record have all occurred during the last decade (2014–2023). Of note, the year 2005, which was the first year to set a new global temperature record in the 21st century, is now the 12th-warmest year on record. The year 2010, which had surpassed 2005 at the time, now ranks as the 11th-warmest year on record. [vi]

Also, in 2023, the contiguous United States experienced its fifth warmest year on record, with an average annual temperature of 54.4°F, surpassing the historical average by 2.4°F. The U.S. Climate Extremes Index (USCEI) for 2023 was particularly noteworthy, registering 65 percent above the average and ranking as the 11th highest in the 114-year record. This elevation in warm extremes was observed not only in maximum temperatures but also in minimum temperatures across portions of the Northeast.

Massachusetts stood out among the warmest states, alongside Texas, Louisiana, Mississippi, and New Hampshire, tying with 2012 as the hottest year on record within the state. This trend of warming temperatures is becoming increasingly apparent. Further analysis from a 2022 climate overview by the University of Massachusetts Amherst highlighted significant temperature anomalies within Massachusetts. The state experienced its eighth warmest July followed by the warmest August on record, contributing to the second warmest summer ever recorded. During this period, the average statewide temperature was 3.4 degrees above the 1901-2000 mean.[vii]

Projections by NOAA and other scientific organizations across the globe expect the trend to continue upwards, with the magnitude of the change depending on the amount of greenhouse gas levels in the atmosphere. In general, the highest temperatures in the Berkshires occur in July, and the lowest tend to occur in January. According to the 2023 Mass State Hazard Mitigation and Climate Adaptation Plan, over the last century, annual air temperatures increased at an average rate of 0.5 °F per decade.

Figure 3.8 Number of Days with Max Temp of 90 °F or Higher



The following are some of the highest temperatures recorded for the period from 1895 to 2017, showing as comparison Boston and three Berkshire County locations with data retrieved from the National Climatic Data Center.

- Boston, MA 103°F
- Pittsfield, MA 95 °F
- North Adams, MA 96°F

Just as the summers in the Berkshires tend to be cooler than in other parts of the state, the winters also exhibit a distinct coolness. The slightly higher elevations of the Berkshire hills, including the

Mount Greylock complex, contribute to the overall cooler temperatures experienced in Hancock. However, the town's lower elevation, coupled with its proximity to the Hoosic River, influences a milder winter climate compared to higher elevation regions. The following are some of the lowest temperatures recorded in the Berkshire region for the period from 1895 to 2017.

- Lanesborough, MA –28°F
- Great Barrington, MA –27°F
- Stockbridge, MA –24°F
- Pittsfield, MA -19°F

Vulnerability Assessment

Geographic Areas Likely Impacted

All of Hancock is exposed to the impacts of extreme temperatures and the change in average temperature. While Hancock is predominantly rural, the impact of heat may vary across different parts of the town, influenced by local topography and land use patterns. Portions of northern Hancock situated in lower elevations, may experience heat differently. Valleys and lower elevations tend to trap heat, resulting in warmer temperatures compared to higher elevations. Therefore, residents living in these areas may experience higher temperatures during heatwaves.

Additionally, homes adjacent to Route 43, which traverses Hancock, may also experience slightly warmer temperatures. Although Hancock may not have significant urban development, the presence of Route 43 can lead to localized heating effects due to increased human activity associated with the road, especially during periods of heavy traffic.

People

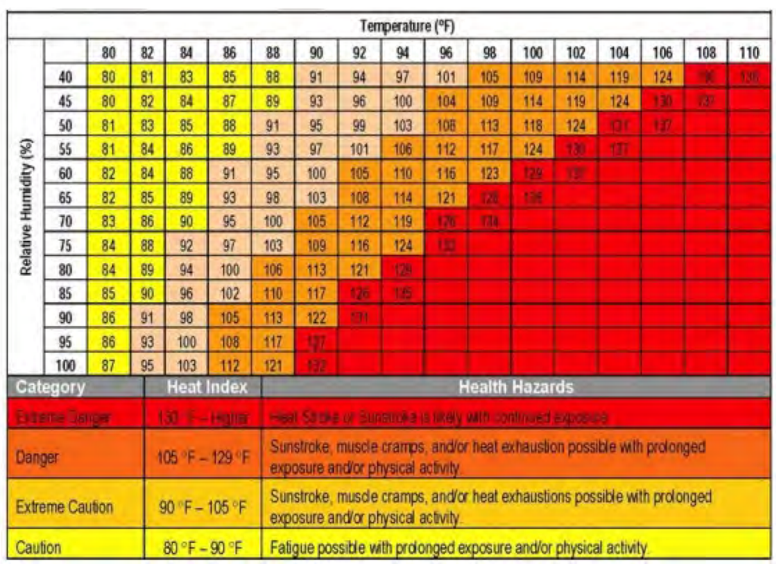
Residents across the Town of Hancock face significant health risks associated with extreme temperatures, with outdoor workers particularly vulnerable. According to the Centers for Disease Control and Prevention (CDC), certain demographics are at heightened risk during extreme heat and cold events. Elderly individuals aged 65 and above, due to age-related physiological changes and health conditions, may struggle to regulate body temperature and access shelters. Similarly, infants and young children under 5 years old, with developing regulatory systems, are more susceptible to temperature fluctuations. Those with pre-existing medical conditions such as heart or kidney disease face heightened risks during extreme temperatures, as do low-income individuals who may lack access to proper heating or cooling. Additionally, individuals with respiratory conditions like asthma or chronic obstructive pulmonary disease (COPD) may experience worsened symptoms during temperature extremes.

Berkshire County experiences a higher rate of asthma-related emergency room visits compared to other parts of the state. Furthermore, people living alone, particularly the elderly and individuals with disabilities, face increased risks of heat-related illnesses due to social isolation and reluctance to seek cooler environments. These vulnerabilities underscore the importance of community support and proactive measures to mitigate the health impacts of extreme temperatures on Hancock residents.

The 2022 Massachusetts Climate Assessment Report underscores the vulnerability of communities in the Berkshires and Hilltowns, including Hancock, to the exacerbation of vector-borne diseases such as West Nile Virus and Lyme disease(EOEEA ResilientMA Plan, 2023). As temperatures rise, the Berkshires are expected to experience shifts in environmental conditions conducive to the proliferation of vector-borne diseases such as West Nile Virus and Lyme disease. Warmer temperatures create more favorable habitats for disease-carrying vectors like mosquitoes and ticks, allowing them to thrive and expand their range into previously unaffected areas, including rural communities like Hancock. Additionally, the increase in temperature can accelerate the breeding cycles of these vectors, leading to higher rates of disease transmission to humans.

Moreover, the reliance on well water in communities like Hancock poses additional challenges in the face of rising temperatures. The strain on clean water supplies exacerbates existing vulnerabilities. As temperatures rise, the demand for water may escalate, placing pressure on groundwater sources tapped by wells. This increased demand, coupled with potential shifts in precipitation patterns and groundwater recharge rates due to climate change, can compromise the quality and quantity of well water. Contaminated or depleted well water resources can undermine public health and sanitation efforts, further heightening the susceptibility of communities to waterborne illnesses and other health hazards.

Figure 3.9 Heat Index Chart and Human Health Impacts



Relative Humidity (%)	Temperature (°F) 80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	[illegible]	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Category	Heat Index	Health Hazards
Extreme Danger	130 °F – Higher	Heat Stroke or Sunstroke is likely with continued exposure
Danger	105 °F – 129 °F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Extreme Caution	90 °F – 105 °F	Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity.
Caution	80 °F – 90 °F	Fatigue possible with prolonged exposure and/or physical activity.

Source: EOEEA and MEMA 2013

The National Weather Service (NWS) issues a Heat Advisory when the Heat Index is forecast to reach 100°-104°F for two or more hours. The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach 105°F or more for two or more hours. The NWS Heat Index is based both on temperature and relative humidity and describes a temperature equivalent to what a person would feel at a baseline humidity level. It is scaled to the ability of a person to lose heat to their environment. It is important to know that the heat index values are devised for shady, light wind conditions. Exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can increase the risk of heat-related impacts. When people are exposed to extreme heat, they can suffer from potentially deadly illnesses, such as heat exhaustion and heat stroke. Heat is the leading weather-related killer in the U.S., even though most heat-related deaths are preventable through outreach and intervention.[viii] It should be noted that temperature alone does not define the stress that heat can have on the human body – humidity plays a powerful role in human health impacts, particularly for those with pre-existing pulmonary or cardio vascular condition.

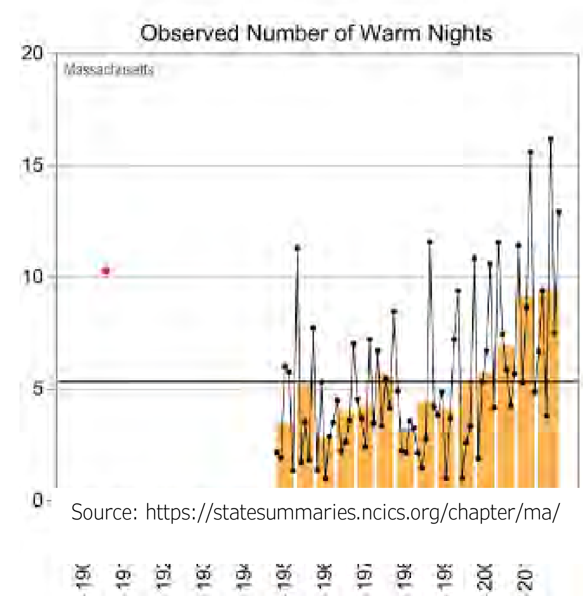
Locally, a significant increase in heat-related deaths has not been reported in Berkshire County. However, many Berkshire communities have begun to develop protocols for opening cooling centers.

What may be more concerning is the trend for higher nighttime temperatures. Warm nights are those where the minimum temperature stays above 70°F. The number of nights where the temperature did not dip below 70°F has increased from a median of slightly more than three in the years 1950 – 1990, to greater than seven in the 2010s (see Figure 3.11).

Figure 3.10 Massachusetts Department of Public Health, Heat related hospitalizations.

Historically the cooler evening temperatures in the Berkshires has allowed residents to cool their body temperatures in the night air and to cool their homes by opening windows and using fans to bring in the cooler air. Human bodies need time to cool off, which typically occurs during sleep when core body temperature naturally dips. Without relief during the night the physiological strain on the body continues unabated. When it is both too hot and too humid for sweat to do its job of dissipating body heat, there can be fatal consequences like organ failure. Warmer and more humid nighttime temperatures will make it increasingly difficult to bring down the temperature in homes that are not equipped with air conditioning.

Figure 3.11 Number of Days with Min Temp of 70°F or Higher



Source: https://statesummaries.ncics.org/chapter/ma/

In the Berkshires, extreme cold temperatures are those that are well below zero for a sustained period of time, causing distress for vulnerable populations that are exposed to the temperatures when outside and straining home heating systems. The severity of extreme cold temperatures is generally measured through the Wind Chill Temperature Index. Wind Chill Temperature is the temperature that people and animals feel when outside and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body is cooled at a faster rate causing the skin's temperature to drop.

The NWS issues a Wind Chill Advisory if the Wind Chill Index is forecast to dip to −15°F to −24°F for at least three hours, using only the sustained winds (not gusts). The NWS issues a Wind Chill Warning if the Wind Chill Index is forecast to fall to –25°F or colder for at least three hours using only the sustained wind. In 2001 the NWS implemented a Wind Chill Temperature Index to more accurately calculate how cold air feels on human skin and to predict the threat of frostbite. According to the calculations, people can get frostbite in as little as 10 minutes when the temperature is -10°F degrees and winds are 15 miles per hour. To date Hancock has not established a protocol for cooling centers.

Built Environment

All components of the built environment are susceptible to the hazards posed by extreme temperatures. The effects of extreme heat on buildings are manifold: increased thermal stresses on building materials accelerate wear and tear, thereby reducing the lifespan of structures; heightened demand for air-conditioning strains HVAC systems and may lead to overheating; and power outages can disrupt essential services, exacerbating the challenges posed by extreme heat (EOEEA ResilientMA Plan, 2023).

Warmer winter temperatures, characterized by less consistency than in the past, have brought about an increase in occurrences of warm "false spring" periods. Consequently, there has been a rise in freeze/thaw events starting earlier in late winter/early spring. This phenomenon has notably affected New England's traditional "mud season," with earlier and more frequent thaw events.

The changing and warming winter climate poses significant concerns for the Town of Hancock and its residents, with implications for both costs and safety. Extreme cold events can result in structural damage to buildings, including frozen or burst pipes and damage from freeze-thaw cycles. Manufactured buildings such as trailers and mobile homes, as well as antiquated or poorly constructed facilities, may be particularly vulnerable to extreme temperatures. Additionally, heavy snowfall and ice storms associated with extreme cold events can cause power outages, underscoring the importance of backup power for critical facilities and infrastructure. Extreme cold can also impact materials such as plastic, making them more susceptible to breakage during severe cold snaps. In addition to these facility-specific impacts, extreme temperatures can have widespread implications for critical infrastructure sectors within the built environment. These impacts are further detailed in the subsequent subsections.

Extreme heat has potential impacts on the design and operation of the transportation system. Impacts on the design include the instability of materials, particularly pavement, exposed to high temperatures over longer periods of time, which can cause buckling and lead to increased failures. High heat can cause pavement to soften and expand, creating ruts, potholes, and jarring, and placing additional stress on bridge joints. Extreme heat may cause heat stress in materials such as asphalt and increase the frequency of repairs and replacements.

Natural Environment

The ramifications of shifting temperatures on the natural environment are myriad and far-reaching. As species within an ecosystem have evolved to thrive within specific temperature ranges, extreme temperature events can exert considerable stress on both individual organisms and the ecosystems they inhabit. Warming temperatures may precipitate a decline in forest health, including diminished biodiversity, biomass, and resilience. Forest types such as high-elevation spruce-fir forests, forested boreal swamps, and higher-elevation northern hardwoods are particularly vulnerable to the effects of climate change. Insect pest populations that are typically reduced in winter are now able to survive and expand year to year. Changing temperature and precipitation patterns are directly affecting forest health. [ix]

Changing climatic conditions alter suitable habitats for native flora and fauna, increase the risk of new species introductions, and escalate competition from established invaders, potentially resulting in losses in native biodiversity and culturally significant species (Parmesan & Yohe, 2003). Moreover, rising temperatures and changing precipitation patterns will likely lead to diminished ambient water quality and alterations in water quantity, causing shifts in habitat quality across rivers, streams, ponds, lakes, and freshwater wetlands (Millennium Ecosystem Assessment, 2005). Higher summer temperatures may disrupt wetland hydrology, leading to habitat loss and wetland desiccation, exacerbated by the heightened incidence and severity of droughts and increased evapotranspiration rates (IPBES, 2019; Walther et al., 2002).

While individual extreme weather events usually exert limited long-term impacts on natural systems, unusual frost events occurring after plants begin to bloom in the spring can cause significant damage Overall, the cumulative impact of changing average temperatures and the shifting frequency of extreme climate events is expected to be extensive and widespread across natural resources.

Economy

The agricultural industry is particularly vulnerable to the economic impacts and damage caused by extreme temperatures and drought events. These climatic changes pose risks to crops like apples, cranberries, and maple syrup, which depend on specific temperature conditions Unseasonably warm temperatures in early spring that are followed by freezing temperatures can result in crop loss of fruit-bearing trees. According to UMASS Amherst, in 2023, Massachusetts lost its entire peach crop on Feb. 4, when temperatures dipped as low as minus 14 degrees Fahrenheit. In May of the same year, one- third of apple orchard were impacted by frost and subsequent blight with some orchards in the Berkshires losing over 75% of their crop.[x] Farmers may have the opportunity to introduce new crops that are viable under warmer conditions and longer growing seasons; however, a transition such as this may be costly. [xi] Most agricultural acreage in Hancock is located in the Northern section, with smaller occurrence in the Southeast corner. The agricultural sector encompasses over 1,200 acres of land, representing 5.28% of the Town's total land use. Given the rural nature and the heavy forested land, this level of land allocation underscores the significant role agriculture plays as a core component of the town's economic sector.

Livestock are also impacted, as heat stress can make animals more vulnerable to disease, reduce their fertility, and decrease the rate of milk production. Additionally, scientists believe the use of parasiticides, and other animal treatments may increase as the threat of invasive species grows. Increased use of these treatments increases the risk of pesticides entering the food chain and could result in pesticide resistance, which could result in additional economic impacts on the agricultural industry.[xii]

Additionally, Maple syrup production, a cultural icon and economic cornerstone of New England, faces significant challenges due to climate change. Researchers predict a northward shift in the maximum maple syrup flow region by 2100, favoring Canadian producers while diminishing production and quality in the Eastern United States.[xiii]This shift threatens New England's maple syrup industry, with projections indicating a potential halving of production by century's end, excluding Northern Maine. [xiv] This change could have profound economic implications, as evidenced by local establishments like Ioka Valley Farm, which welcomes an average of 5,000 visitors during the maple season from February to April.

Future Conditions

As indicated by NOAA, there has been a discernible warming trend globally since the mid-1970s, with temperature changes projected to occur gradually over the coming years. However, meteorologists can reliably forecast extreme events and their severity several days in advance. Across Massachusetts, high, low, and average temperatures are all expected to rise significantly in the next century due to climate change. This trend may lead to increased electricity demand for cooling degree days (CDDs) across the Northeast, potentially straining the New England electricity grid system and resulting in brownouts or controlled blackouts. Such scenarios could adversely affect the health of vulnerable populations and impair critical government and communication functions.

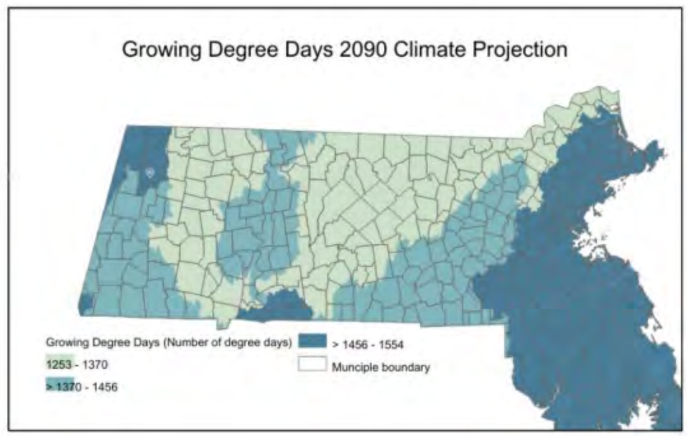
For the Town of Hancock, it will be imperative to establish and maintain communication channels with vulnerable groups, including the elderly, individuals with underlying health conditions, and low-income residents lacking adequate cooling systems in their homes. With rising temperatures becoming more frequent, the necessity for cooling shelters as part of the emergency response strategy may become paramount, especially as the community's demographic ages and residents retire.

Climate change is anticipated to be the second-greatest contributor to the ongoing biodiversity crisis, necessitating a global shift in land use. One notable impact of increasing temperatures could be the northward migration of various plant and animal species. Consequently, the shifting habitats may create a mismatch between the locations of conservation lands and critical species habitats, undermining the efficacy of conservation efforts. Between 1999 and 2018 (fiscal years), the Commonwealth spent more than $395 million on the acquisition of more than 143,033 acres of land

and has managed this land under the assumption of a stable climate. Massachusetts is losing several thousand acres of Natural Working Lands, particularly forests, each year, threatening the essential role of these lands as a net carbon sink and provider of key ecosystem services. [xv]As species adapt to climate change, traditional wildlife and habitat management methods, including land conservation and mitigation of non-climate stressors, may require significant revisions (EOEEA ResilientMA Plan, 2023).

Moreover, warming temperatures are expected to significantly affect waterway sustainability and aquatic habitat connectivity, potentially leading to the drying up of entire river segments and the proliferation of harmful algal blooms. Cold-water fisheries supporting species like brook trout are particularly susceptible to changes in in-stream temperatures.

Figure 3.12 GDD Projections (Resilient MA)



Additionally, warming temperatures may lead to increased survival rates of pests and invasive species, posing significant challenges to agriculture and forestry sectors. While longer growing seasons offer opportunities for new crops, they also present risks such as heightened fungal and bacterial activity, which can adversely affect crop health and increase the prevalence of plant diseases.

Furthermore, climate change is likely to alter the timing and duration of seasons, impacting the life cycles of flora and fauna. While a lengthened growing season(measured by growing degree days) may offer economic benefits, it also brings risks such as increased probability of frost damage and heightened impact of pests and diseases (see Figure 3.12 GDD Projections (Resilient MA).[xvi] Vulnerable populations, particularly those with respiratory issues, may face exacerbated health challenges due to extended periods of plant growth and higher pollen levels, resulting in compromised air quality and respiratory symptoms.

Moreover, the labor force in Hancock, particularly those employed in outdoor industries such as tourism and recreation, is likely to be significantly affected by climate change. With rising temperatures and more frequent extreme weather events, individuals working in sectors like hospitality, outdoor recreation, and agriculture may face challenges related to heat stress, reduced productivity, and disruptions in seasonal employment patterns (EOEEA ResilientMA Plan, 2023)This includes workers employed by major tourism establishments like Club Wyndham Bentley Brook, Fairbank Group LLC (Jiminy Peak Ski Resort), Patriot Resorts Corp, Vacation Village, and Hancock Shaker Village. While these employers typically maintain a year-round workforce of 20-49 employees, they also rely heavily on seasonal workers during peak tourism seasons, potentially sustaining a workforce comprising hundreds of full-time, part-time, and seasonal employees.

Overall, rural communities are highly dependent upon natural resources for their livelihoods and social structures. Climate change-related impacts are currently affecting rural communities. These impacts will progressively increase over this century and will shift the locations where rural economic activities (like agriculture, forestry, and recreation) can thrive.

In anticipating future conditions, it's crucial to recognize that rural communities, such as Hancock, are not insulated from the impacts of climate change. As temperatures continue to rise and weather patterns become increasingly erratic, rural areas face mounting challenges. From shifts in agricultural practices to heightened vulnerability to extreme weather events, the fabric of rural life is being reshaped.

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[i] https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-ecosystems_.html
[ii] https://www.hhs.gov/climate-change-health-equity-environmental-justice/climate-change-health-equity/climate-health-outlook/extreme-heat/index.html
[iii] https://www.epa.gov/climate-indicators/climate-change-indicators-us-and-global-temperature
[iv] https://www.noaa.gov/jetstream/synoptic/heat-index#:~:text=Exposure%20to%20full%20sunshine%20can,adds%20heat%20to%20the%20body.

[v] https://statesummaries.ncics.org/chapter/ma
[vi] National Oceanic and Atmospheric Administration (NOAA). "2023 was the warmest year in the modern temperature record." Retrieved from https://www.climate.gov/
[vii] National Centers for Environmental Information, 2023, https://www.ncei.noaa.gov/news/national-climate-202312#:~:text=There%20were%2028%20separate%20billion,ranking%20fifth%20warmest%20on%20record
[viii] https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths#:~:text=Heat%20is%20the%20leading%20weather,heat%2Devents%2Dguidebook).
[ix] Mass Audubon Forst Health Report 2022
[x] https://www.epa.gov/climateimpacts/climate-change-impacts-agriculture-and-food-supply
[xi] U.S. Department of Agriculture, National Invasive Species Information Center. (n.d.). Economic and social impacts. Retrieved from https://www.invasivespeciesinfo.gov/subject/economic-and-social-impacts
[xii] https://www.berkshireeagle.com/news/local/late-frost-decimates-early-blooming-apple-crop-bartletts-windy-hill-farm/article_72771374-f8dd-11ed-a7f4-f35b09ad8c66.html
[xiii] Smith, J. et al. (2022). "Climate Change Impacts on Maple Syrup Production: A Shift Northward by 2100."
[xiv] IPBES. (2019). Global Assessment Report on Biodiversity and Ecosystem Services
[xv] https://www.mass.gov/info-details/massachusetts-climate-report-card-natural-working-lands
[xvi] *Growing Degree Days (GDD) is a measure used in agriculture to estimate the amount of heat available for plant growth during the growing season. It takes into account the average daily temperature above a certain base temperature threshold. GDD provides an indication of how favorable the climate is for plant growth and development.*

Inland Flooding, including Dam Impacts

Hazard Profile

Inland flooding is the result of moderate precipitation over several days, intense precipitation over a short period, or melting snowpack. Developed, impervious areas can contribute to inland flooding.[i] Common types of local or regional flooding are categorized as inland flooding including riverine, ground failures, ice jams, dam overtopping or failure, beaver activity (tree removal, dam construction, and dam failure), levee failure, and urban drainage. Overbank flooding occurs when water in rivers and streams flows into the surrounding floodplain or into "any area of land susceptible to being inundated by floodwaters from any source."[ii] The hazards that produce these flooding events in the Berkshire County region include spring melt, hurricanes, tropical storms, heavy rain events, winter rain-on-snow, thunderstorms, and recovering beaver populations. This Inland Flooding section will focus on flood impacts due to severe precipitation events that result in impacts approaching the 100-year event or caused significant damages and on potential dam failure risk. Hurricanes/tropical storms, winter-related flooding, thunderstorms, and flood-related contamination are discussed in later sections.

Likely Severity

In general, the severity level of flood damage is affected by flood depth and flood velocity. The deeper and faster flood flows become, the more power they have thereby inflicting greater damage. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity. This correlation is especially true when a channel migrates over a broad floodplain, redirecting high-velocity flows and transporting debris and sediment. (MEMA, 2013) However, flood damage to homes and buildings can occur even during shallow, low-velocity flows that inundate the structure, its mechanical system, and furnishings.

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. The 100-year flood elevation or discharge of a stream or river has a 1% chance of occurring or being exceeded in any given year. In this case, the statistical recurrence interval would be 100 years between the storm events that meet the 100-year discharge/flow. With a 1% chance of occurrence, such a storm is commonly called the 100-year storm. Similarly, the 50-year storm has a statistical recurrence interval of 50 years, and an "annual flood" is the greatest flood event expected to occur in a typical year. It should be understood, however, that these measurements reflect statistical averages only; two or more floods with a 100-year flood discharge can occur in a short time period.

A dam is an artificial barrier that can impound water for storage or flood control. Five dams in Hancock have the potential to cause damage if they were to fail in some way. These are listed in **Table 3.7: Dams with Potential to Impact Hancock**, and their locations are shown on Map 3.1. Size class may be determined by the volume of water stored or height, whichever gives the larger size classification. Small impoundments store between 15-50 acre-feet, Intermediate impoundments store 50-1,000 acre-feet, and large impoundments store over 1,000 acre-feet. An acre-foot is defined as enough water to cover one acre of land one foot deep, which equals slightly less than 326,000 gallons.

The Hazard Potential Classification rating pertains to potential loss of human life or property damage in the event of failure or improper operation of the dam or appurtenant works. Low Hazard dams are those that are defined as being located where failure or mis-operation may cause minimal property damage to others, and loss of life is not expected. High Hazard and Significant dams are those located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s). In Hancock, there are no significant or high-hazard dams. There are two low hazards dams on isolated bodies of water, which can be referenced in Table 3.7 below.

Table 3.7: Dams with Potential to Impact Hancock

Name and Year Completed	Hazard Code	Size Class (Max. acre-feet storage)	Inspection Date & Condition	Owner
Starobin Pond	Low	N/A	N/A	Private
Jiminy Peak Summit Pond Dam	Low	Small	Fair/Poor	Private
Jiminy Peak Pond Dam	N/A	N/A	N/A	Private
Shaker Reservoir Dam	N/A	Intermediate	N/A	Non-jurisdictional
Brodie Mountain Road Dam	N/A	N/A	N/A	Private

*Source: Office of Dam Safety, 2012. Note: Some records may be out of date if procured by Office of Dam Safety prior to 2012. *Non-jurisdictional dams are defined as being less than 6 feet in height and store less than 15 acre-feet of water. There is no data available on the condition of these because inspections are not regulated by the Office of Dam Safety*.

Probability

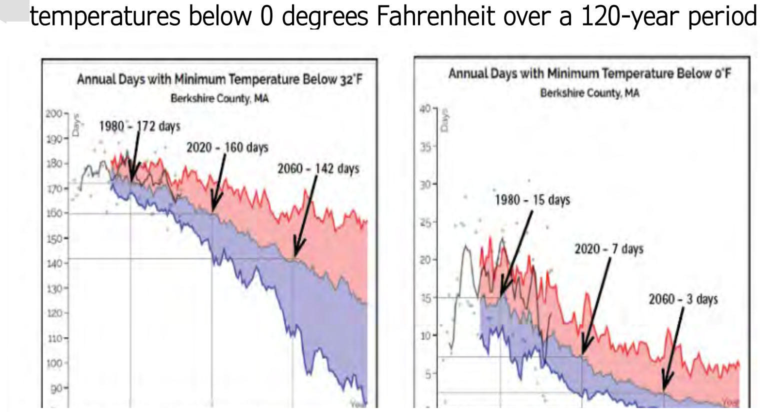
The extent of the area of flooding associated with a 1% annual probability of occurrence (the base flood or 100-year flood), most commonly termed the 100-year floodplain area, is a tool for assessing vulnerability and risk in flood-prone communities. The 100-year flood boundary is used as the regulatory boundary by many agencies, including FEMA and MEMA. It is also the boundary used for most municipalities when regulating development within flood-prone areas. The FEMA Flood Insurance Rate Maps (FIRM) developed in the early 1980s for Berkshire County, typically serve as the regulatory boundaries for the National Flood Insurance Program (NFIP) and municipal floodplain zoning. Due to high slopes and minimal soil cover, Western Massachusetts is particularly susceptible to flash flooding caused by rapid runoff during heavy precipitation combined with spring snowmelt. These conditions contribute to riverine flooding. Frozen ground conditions can also contribute to low rainfall infiltration and high runoff events that may result in riverine flooding.

Table 3.8 Flood Recurrence Intervals and Annual Probability of Occurrence.

Recurrence interval	Probability	Percent chance
500	1 in 500	0.2
100	1 in 100	1
50	1 in 50	2
25	1 in 25	4
10	1 in 10	10
5	1 in 5	20
2	1 in 2	50

Berkshire County is particularly susceptible to flash flooding because its ground is frozen for a more extended period compared to the rest of the state. [iii] According to the Northeast Climate Adaptation Science Center, the county is projected to experience a more than 6.3% annual total precipitation increase by 2030, with a greater increase of 8.2% in the spring. Additionally, the temperature is likely to reach 28° by October 22nd, with a 90% chance of ground-freezing conditions until May 20th the following year. [iv] Future projections for annual days below freezing and deep freezing are expected to decrease, and freeze-thaw cycles will increase, leading to a higher potential for flooding during moderate to heavy precipitation and snowmelt. These conditions are likely to increase inland flooding.

Figure 3.13 Decreasing trend of projected annual days in temperatures below 0 degrees Fahrenheit over a 120-year period



Source: Resilient Ma Clearinghouse, as annotated by the Union of Concerned Scientists (2022).

Factors that contribute to dam failure include design flaw, age, over-capacity stress and lack of maintenance. There are two primary types of dam failure: catastrophic failure, characterized by the sudden, rapid, and uncontrolled release of impounded water, or design failure, which occurs as a result of minor overflow events. Dam overtopping is caused by floods that exceed the capacity of the dam, and it can occur as a result of inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors. Overtopping accounts for 34% of all dam failures in the U.S.[v] In Massachusetts the Office of Dam Safety, within the DCR, is the regulating authority that oversees dam safety.

By state law, dam owners are legally responsible for maintaining their dams, inspecting them on a regular basis and liable for damages and loss of life that occur as a result of a dam failure. Significant Hazard dams must be inspected every five years and Low Hazard dams must be inspected every 10 years. Owners of Significant Hazard dams are required to develop Emergency Action Plans (EAP). This Plan would include a notification flow chart, list of response personnel and their responsibilities, a map of the inundation area that would be impacted, and a procedure for warning and evacuating local residents in the inundation area. The EAP would be filed with local and state emergency agencies. The Town of Hancock has no significant hazard rating dams and, therefore, is not required to have EAPs.

Historic Data

There have been dozens of severe precipitation events that caused flooding in the Berkshire County region, the more severe of which are listed with a brief description in , with entries in bold denoting 1% annual chance flood events. The worst events in Hancock's history are associated with heavy rain and flooding, which have destroyed homes and businesses and led to several deaths.

Between 1938 and August 2023, four flood events equaling or exceeding the 1% annual chance flood have been documented in the Berkshire County region, those being in 1938, 1949, 195,5 and 2011. Not all these events were documented to a 1% chance storm for the region around Hancock. For example, Tropical Storm (T.S.) Irene in 2011 was determined to be a 1% chance flood event in northern Berkshire County and a 2% chance storm (50-year recurrence) in central and southern Berkshire County (using data from the USGS Housatonic River stream gauge in Pittsfield).

The most catastrophic event occurred in July 1945 when a flash flood resulting from a sudden cloudburst, caused substantial damage to infrastructure and human casualties. The town bridge was washed away, incurring $50,000 in damages. Two residents lost their lives as their houses collapsed during heavy rain and flooding in Hancock Valley. Route 20, a crucial transportation route, sustained over $22,000 in damages, impeding local mobility and imposing financial burdens for reconstruction. Evacuation efforts were hindered by damaged telephone lines, highlighting vulnerabilities in emergency communication infrastructure.

The Hadselle-Sharp Wood Working factory, the primary non-agricultural industry in Hancock, suffered considerable damage, leading to a temporary shutdown. This event accentuated the economic strain on the community, emphasizing the susceptibility of single-industry towns to natural disasters. Engineer reports designated Hancock as the "hardest hit" in Berkshire County. A resident's account described the town as "nearly wiped out," underscoring the profound impact of the flash flood on the community.

In July of 1973, three bridges were washed away in the aftermath of a heavy rainstorm, leading to significant disruptions throughout town. The Goodrich Hollow Bridge collapse resulted in the isolation of four families, while 15 nearby homes were left without power. The impact of the rainstorm extended beyond the bridges, as all culverts on the town's back roads were washed out. Moreover, debris-filled culverts on the main roads posed additional hazards, illustrating the widespread nature of the damaged to the town's infrastructure. The cumulative damages from these events amounted to over $500,000, reflecting the extensive financial toll. The economic repercussions were not limited to residential areas, as Jiminy Peak reported damages of $10,000 and $20,000. The rushing floodwater down the mountain not only carved out a significant hole but also inflicted damage to a D-6 bulldozer, further contributing to the overall cost of recovery.

According to the data, local officials and residents, the more notable and damaging flood events that occurred in recent years in were 1945, 1973, 2009, 2014, and 2023.

Table 3.9: Previous Flooding Occurrences in the Berkshire County Region. (Entries in **bold** denote 1% annual chance flood events)

Date of Event	Description of Event
July 1915	"Great Rain Storm" floods trolly tracks with 3 feet of water and washed out 6 feet of tracks and one bridge. The region received over 8 inches of rainfall in 8 days (Berkshire Eagle 1915)
Nov 1927	3 days of heavy rain from a late season Hurricane brought 10 inches of rain, flooding homes near the Housatonic River (Berkshire Evening Eagle Nov 1927),
Sept 1933	A heavy storm caused water to overflow the Housatonic, which flooded several fields, highways, and broke a main gas line. (Berkshire Evening Eagle 1933).
Feb 1938	Heavy rains and melting snow caused flooding problems in basements for many homeowners on Brodie Mountain Rd. (Berkshire Eagle Archives)
1938	**"The Great Hurricane of 1938" was considered a 1% annual chance flood event in several. Flood damages for roads and bridges totaled $70,000 (Berkshire Eagle Sept 1938)**
July 1945	Flash flood from a sudden cloudburst comes through Hancock washing away town bridge and totaling $50,000 in damages. In Hancock Valley, two residents drowned after house collapsed during heavy rain and rising flood waters. Route 20 damage totals more than $22,000. Evacuations were slowed as telephone lines were damaged.

	The Hadselle-Sharp Wood Working factory sustained considerable damage, shutting down the only industry- outside of agriculture- for the town. Engineer reports indicate that Hancock was "hardest hit" in all of Berkshire County. One resident reported "town nearly wiped out." (Berkshire Eagle Archives]
1955	Hurricanes Connie and Diane combined to flood many of the communities in the region and registering in 1% - 0.2% annual chance flood event (100-500-year flood event) (FEMA 1977-1991).
July 1973	Heavy rain caused the Kinderhook Creek to overflow washing away the Black Bridge in Hancock.
July 1976	Three bridges were washed out after heavy rainstorm. The Goodrich Hollow Bridge washedout stranded four families while 15 homes were without power in the same area. All culverts on the town's back roads were washed out and all the culverts on the main roads were nearly filled with debris. Damages reached over $500,000. Jiminy Peak noted $10,000 and $20,000 damages and that rushing flood water down the mountain carved out a big hole that damaged a D-6 bulldozer.(Berkshire Eagle Archives]
May 1984	3 days of heavy rain caused main roads and highways to close. (Berkshire Eagle 1984). *In MA this event was 80-year event in the Housatonic River Watershed.*
April 1987	A pair of spring storms occurring in March and April 1987 combined with snowmelt produced record or major flooding in New England. Berkshires were declared a disaster area and 500 people were evacuated. The county receives $600,000 in emergency funding for repairs (North Adams Transcript, 1987).
Jan 1996	Heavy rain and melting snow cause major flooding in basements and lead to major road closures. The Housatonic River was observed reaching the bottom of bridges. High winds snapped power lines and felled trees throughout the town (Berkshire Eagle, 1996).
Sept 1999	The remnants from Hurricane Floyd brought between 2.5-5" of rain and produced significant flooding throughout the region. Due to significant amounts of rain and the accompanying wind, there were numerous reports of trees down.
Dec 2000	A complex storm system brought 2-4" of rain with some areas receiving an inch an hour. The region had numerous reports of flooding
March 2003	An area of low pressure brought 1-2" of rain, however this and the unseasonable temperatures caused a rapid melting of the snowpack.

Sept 2004	The remnants from Hurricane Ivan brought 3-6" of rain. This, combined with previously saturated soils, caused flooding throughout the region.
Aug 2005	The remnants of Hurricane Katrina dropped up to 4.17 of rain and caused gusty winds that blew down trees and tree limbs. State declares Berkshires a disaster zone (MA State Hazard Mitigation Plan 2018).
Oct 2005	Remnants of Tropical Storm Tammy and Subtropical Depression Twenty-Two produced torrential rains over interior New England During this 10-day period, approximately 6 to 15 inches of rainfall occurred within New England River basins. Flooding was reported on the Hoosic and Housatonic rivers and in small streams, creeks, urban areas, and poorly drained areas due to rainfall exceeding an inch per hour. These series of storms resulted in a presidential disaster declaration (FEMA-DR-1614) and Massachusetts received over $13 million in individual and public assistance. (Berkshire Eagle 2005, MA State Hazard Mitigation Plan 2018).
April 2007	A coastal storm brought wet snow, sleet, and rain to western Massachusetts. Snowmelt and heavy rain caused moderate flooding of small streams and creeks. Affected counties received over $8 million in public assistance from FEMA. The storm mainly rained due to warmer temperatures, but higher elevations experienced significant snow and ice (NWS).
Sept. 2007	Moderate to heavy rainfall occurred, which lead to localized flooding.
Mar. 2008	Heavy rainfall ranging from 1-3" impact the area. Combined with frozen ground and snowmelt, this led to flooding across the region.
Aug. 2008	A storm brought very heavy rainfall and resulted in flash flooding across parts of the region.
Dec. 2008	A storm brought 1-4" of rain to the region, with some areas reporting ¼ to 1/3 of an inch an hour of freezing rain, before changing to snow. Moderate flooding and ponding occurred throughout the region.
June 2009	Numerous slow-moving thunderstorms developed across the region with intense rainfalls and up to 6" of hail. This led to flash flooding in the region.
July 2009	Eastern New York and Berkshires suffer severe flooding, Route 43 in Hancock was shut down for hours. Lightening strikes 1 home in Hancock. Neighboring town of New Lebanon was declared state of emergency closing Route 22 North

Jan 2010	A recent storm, melting snow and ice, and record-warm days led to rising water levels throughout the county (North Adams Transcript 2010).
Mar. 2010	Heavy rainfall of 1.5-3" across the region closed roads due to flooding.
Oct. 2010	The remnants from Tropical Storm Nicole brought 50-60 mph winds and 4-6" of rain resulting in urban flooding.
Aug. 2011	Two distinct rounds of thunderstorms occurred, producing heavy rainfall and localized flooding of roads.
Aug. 2011	**T.S. Irene tracked over the region with widespread flooding and damaging winds. Riverine and flash flooding resulted from 3-9 inches of rain within a 12-hour period. Widespread road closures occurred throughout the region. In MA, this event was a 1% annual chance flood event in the Hoosic River Watershed and a 50-year event in the Housatonic River Watershed.**
Sept. 2011	Remnants of Tropical Storm Lee brought 4-9" of heavy rainfall to the region. Due to the saturated soils from T.S. Irene, this rainfall led to widespread flooding on rivers as well as small streams.
Aug. 2012	Remnants from Hurricane Sandy brought thunderstorms repeatedly bringing heavy rains over the region. Upwards of 4-5" of rain occurred and flash flooding caused the closure of numerous roads.
May 2013	Thunderstorms brought wind and heavy rainfall caused flash flooding and road closures in areas.
Aug 2013	Heavy rainfall repeatedly moved across the region causing more than 3" of rain in a few hours causing streams and creeks to overflow their banks and flash flooding.
Sept. 2013	Showers and thunderstorms tracked over region and resulted in persistent heavy rain, flash flooding and road closures.
June 2014	Slow moving showers and thunderstorms developed producing very heavy rain over a short period of time. This led to some flash flooding and road closers, especially in urban and poor drainage areas.
July 2014	A cluster of strong to severe thunderstorms broke out causing heavy rainfall and flash flooding with 3-6" of rainfall occurring.
Aug. 2017	Widespread rain moved through the area, resulting in isolated flash flooding.

Jan 2018	Heavy rains flooded roads, roiled rivers and even caused mudslides across the Berkshires. (Berkshire Eagle, 2018)
Sept 2018	Rain from the remnants of Hurricane Florence caused rivers to swell and streets to flood in the region. (Berkshire Eagle, 2018).
July 2019	Monsoon-like rain brought 3 inches of rain in three hours, washing out several roads and causing widespread flooding in the Berkshires (Berkshire Eagle, 2019).
Dec 2020	A significant rain event combined with snowmelt caused urban flooding.
July 2021	Flash flooding after intense rain closes roads (Berkshire Eagle, 2021).
July 2023	A nightlong deluge dumped torrents of rain on Berkshire County, causing damage and disruption throughout the region. Northern Berkshires received a state of emergency. Overall, there were almost 10 inches of rain in July alone. Normally western Massachusetts sees an average of 3.36 inches. (Berkshire Eagle, 2023).
Sept 2023	Hurricane Lee, a tropical storm turned Category 2 hurricane, brought high winds and heavy rain from September 15th- 17th, resulting in a presidential disaster declaration for Massachusetts, including Berkshire County (EM-3599-MA).

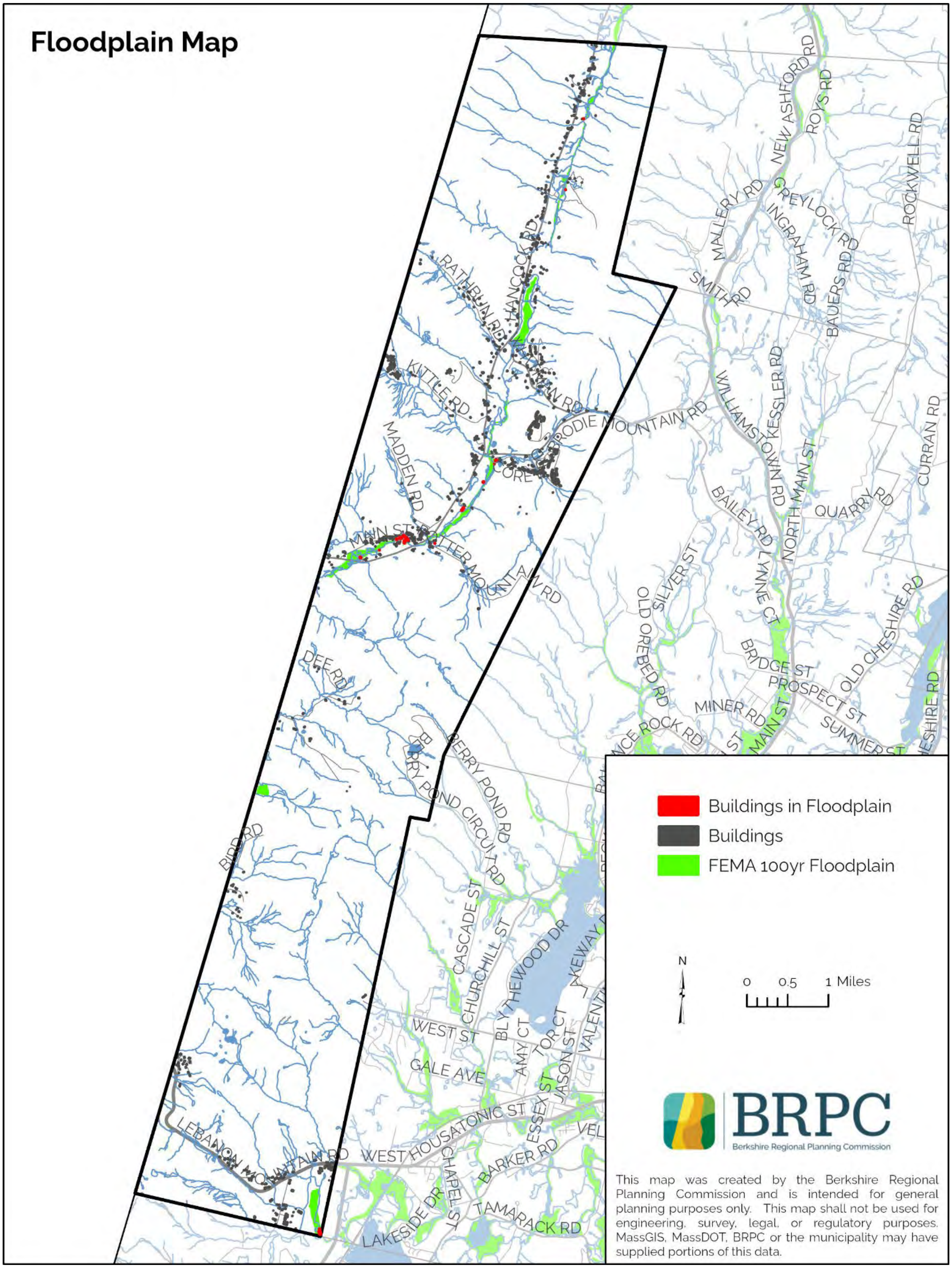
Vulnerability Assessment

Geographic Areas Likely Impacted

Due to the hilly terrain and narrow stream corridors, there are relatively few floodplain acres in Hancock. The floodplain acreage is concentrated in Northern Hancock along Kinderhook Creek. Additional floodplain areas exist around the Mount Lebanon Brook and associated wetlands in Southern Hancock that borders the Hancock and Pittsfield line. The analysis of FIRM flood hazard area data indicates that 248.67 acres, accounting for 1.08% of the total town, are designated as the 100-year floodplain. Of this, 8.38 acres (1.44%) are currently developed, leaving 240.29 acres potentially developable. However, it is crucial to note that the town lacks a current floodplain bylaw.

Hancock faces potential hazards related to its numerous waterways, including the West Branch of the Green River, Kinderhook Creek, Whitman Brook, Bentley Brook, Rathburn Brook, Lilly Brook, Shaker Brook, North Brook, and Lebanon Brook. Notably Starobin Pond, located near Route 43 just north of Hancock Elementary School, contributes to the town's vulnerability regarding flooding. Areas at risk due to flooding are highlighted on Figure 3.14

Figure 3.14 Town of Hancock- FEMA 100-year floodplain- FIRM data



People

The impact of flooding on life, health, and safety is contingent upon various factors with severity of the event and the availability of adequate warning. The 2023 Massachusetts State Hazard Mitigation Plan lists inland flooding and dam overtopping from precipitation as very high likelihood occurrence (almost certain to occur multiple times in a year) with very high human magnitude of consequences.(EOEEA ResilientMA Plan, 2023). Residents in or near floodplain-prone areas, particularly vulnerable populations, such as those with low socioeconomic status, individuals over 65, young children, those with medical needs, and those with low English language fluency, face heightened vulnerability during flood events. For instance, economic considerations may impact evacuation decisions for those of low economic status, while challenges in evacuating or accessing medical facilities increase vulnerability for the elderly and medically dependent. Those with low English language fluency may not receive or understand the evacuation warnings. Vulnerable populations may also be less likely to have adequate resources to recover from the loss of their homes and jobs. Given Hancock's positive growth, particularly the increase in elderly residents and young children, the town must prioritize flood preparedness and response strategies that address the unique needs of these vulnerable groups. These strategies include ensuring that emergency communication is accessible to all residents and that evacuation plans consider the mobility and health needs of older adults and young children.

At this time FIRM floodplain boundaries have been delineated for the Town of Hancock providing guidance for steering future development away from floodplain area. The Massachusetts Wetlands Protection Act provides some protection for wetland resources, requiring that development be conducted outside wetland and riverfront areas. Where development does occur within these areas, wetland mitigation can be required, including flood storage replication.

The total number of injuries and casualties resulting from typical riverine flooding is generally limited due to advance weather forecasting, blockades, and warnings. The historical record from 1993 to 2017 indicates that there have been two fatalities in in Massachusetts associated with flooding, both in Topsfield during the Mother's Day Flood of 2006, and five injuries associated with two flood events, occurring within two weeks of each other in March 2010. While six inches of moving water can cause adults to fall, 1 foot to 2 feet of water can sweep cars away. Downed powerlines, sharp objects in the water, or fast-moving debris that may be moving in or near the water all present an immediate danger to individuals in the flood zone. Events that cause loss of electricity and flooding in basements, which are where heating systems are typically located in Massachusetts homes, increase the risk of carbon monoxide poisoning. Carbon monoxide results from improper location and operation of cooking and heating devices (grills, stoves), damaged chimneys, or generators.

According to the U.S. Environmental Protection Agency (EPA), floodwater often contains a wide range of infectious organisms from raw sewage. These organisms include intestinal bacteria, MRSA (methicillin-resistant staphylococcus aureus), strains of hepatitis, and agents of typhoid, paratyphoid, and tetanus.[vi] Floodwaters may also contain agricultural or industrial chemicals and hazardous materials swept away from containment areas. The 2023 Massachusetts State Hazard Mitigation Plan details that residents can face water quality and safety threats as excessive groundwater from flooding may compromise drinking water sources, especially for residents who rely on well water.

Individuals who evacuate and move to crowded shelters to escape the storm may face the additional risk of contagious disease; however, seeking shelter from storm events when advised is considered far safer than remaining in threatened areas. Individuals with pre-existing health conditions are also at risk if flood events (or related evacuations) render them unable to access medical support. Flooded streets and roadblocks can also make it difficult for emergency vehicles to respond to calls for service, particularly in rural areas. Flood events can also have significant impacts after the initial event has passed. For example, flooded areas that do not drain properly can become breeding grounds for mosquitos, which can transmit vector-borne diseases. Exposure to mosquitos may also increase if individuals are outside of their homes for longer than usual because of power outages or other flood-related conditions.

Finally, the growth of mold inside buildings is often widespread after a flood. Investigations following Hurricane Katrina and Superstorm Sandy found mold in the walls of many water-damaged homes and buildings. Mold can result in allergic reactions and can exacerbate existing 32 respiratory diseases, including asthma.[vii] Property damage and displacement of homes and businesses can lead to loss of livelihood and long-term mental stress for those facing relocation. Individuals may develop post-traumatic stress, anxiety, and depression following major flooding events.[viii]

Built Environment

Floodwaters can severely damage or completely destroy homes and business structures. As noted by FEMA, owning a property is one of the most important investments most people make in their lives. Flooding is the most common and costly natural disaster in the U.S., just one inch of water can cause $25,000 in damages to residential homes. [ix] According to code of federal regulations (44 CFR § 77.2(i))

Repetitive loss structure means a structure covered under an NFIP flood insurance policy that

(1) has incurred flood-related damage on two occasions, in which the cost of repair, on average, equaled or exceeded 25% of the value of the structure at the time of each such flood event; and

(2) at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

Severe repetitive loss structure (44 CFR § 77.2(j) means a structure that is covered under an NFIP flood insurance policy and has incurred flood-related damage

(1) for which four or more separate claims have been made under flood insurance coverage, with the amount of each claim (including building and contents payments) exceeding $5,000 and with the cumulative amount of such claims payments exceeding $20,000; or

(2) for which at least two separate flood insurance claims payments (building payments only) have been made, with cumulative amount of such claims exceeding the value of the insured structure.

Based on the most recent NFIP_HUDEX policy and loss data and FEMA records (accessed February 2025), Hancock does not have any NFIP-insured Repetitive Loss (RL) or Severe Repetitive Loss (SRL) properties. The town has had only one paid flood insurance claim, totaling $4,353, since joining the NFIP.

This Hazard Mitigation Plan attempts to quantify the potential losses to building owners if their buildings were flooded during a 100-year flood event. To determine potential losses, MassGIS FIRM and MassGIS assessor parcel data were reviewed, and all properties that were fully or partially located within the FIRM boundaries were selected for analysis. Assessor building value data relating to those properties was used to estimate potential structural losses. It should be noted that values here are at assessed value, not market or replacement value, and therefore, they likely underestimate the costs needed to bring a building back to its pre-disaster value. Also, this analysis includes only buildings and does not include potentially significant losses from infrastructural damage to roads, water lines or utility systems. For this analysis, the value of contents for residential buildings is 50% of assessed value, and the value of commercial contents is 100% of assessed value. Currently, there are 2 businesses, 2 government buildings, and 12 residential buildings in the floodplain. The percentage of buildings is then multiplied by the total property value, as determined by the Department of Revenue, to calculate a potential loss. In addition, an additional percentage of the value was added to represent the contents of the properties. See Table 3.9 for potential losses due to a 100-year flood event. As of 2025, Hancock has 26 active NFIP policies, totaling over $2.6 million in coverage, suggesting that a significant number of policies are voluntary and may reflect increased public awareness or concern about localized flood risks not captured on the current 1982 FEMA flood map.

Table 3.10: Properties in the 100-year Floodplain and Estimates of Losses (U.S Dollars)

TYPE OF BUILDING	NUMBER OF UNITS	BUILDING VALUE	LAND VALUE	TOTAL
RESIDENTIAL	12	$2,095,500	$957,000	$3,052,500
COMMERCIAL	2	$398,500	$3,287,715	$3,686,215
TOWN OWNED (HANCOCK TOWN HALL AND LIBRARY]	2	$571,600	$148,800	$720,400
TOTAL	16	$3,065,600	$4,393,515	$7,459,115

In the Berkshire region, rivers and streams tend to be dynamic systems, with stream channel and bank erosion common in both headwater streams and in the level, meandering floodplains of the Housatonic and Hoosic Rivers. Fluvial Erosion is the process where the river undercuts a bank, usually on the outside bend of a meander, causing sloughing and collapse of the riverbank. Fluvial erosion of stream and riverbanks can creep towards the built environment and threatens to undercut and wash away buildings, roads, and bridges. Many roads throughout the region follow streams and rivers, having been laid in the floodplain or carved along the slopes above the bank. Older homes, barns, and other structures were also built in floodplains or just upgradient of stream channels in both rural and urban areas. Fluvial erosion can also scour and down-cut stream and river channels, threatening bridge pilings and abutments. This type of erosion often occurs in areas that are not part of a designated floodplain.

Landslides on steep slopes can occur when soils are saturated and give way to sloughing, often dislodging trees and boulders bound by the soil. The damage from T.S. Irene in 2011 to Route 2 in the Florida/Charlemont and the Savoy area was a combination of fluvial erosion from the Cold and Deerfield Rivers and a landslide on the road's upland slope.

Flooding of homes and businesses can impact human safety and health if the area of inundation is not properly dried and restored. Wood framing can rot if not properly dried, compromising building structure and strength. Undetected populations of mold can establish and proliferate in carpets, duct work, wallboard, and almost any surface that is not properly dried and cleaned. Repeated inundation brings increased risks of both structural damage and mold.

Regarding dam failures, all structures, critical facilities and roadways in the inundation zone are vulnerable to damage. Flood waters may potentially cut off evacuation routes, limit emergency access, and destroy power lines and communication infrastructure.

Increased floodwater poses a heightened risk of forming and dislodging ice dams during winter. Ice blocks can accumulate in streams and rivers, creating physical barriers that impede the flow, leading to water backup and overflow. Rainfall or snowmelt, coupled with a thaw, amplifies the potential for breaking up ice jams as rising water assists in lifting and fragmenting the ice. Large ice jam blocks breaking away downstream can inflict damage on culverts, bridges, and roadways with restricted openings. Swift rises behind the jams may result in temporary lakes and flooding of homes and roads along riverbanks. The sudden release of a jam can trigger flash flooding below, incorporating large ice pieces that can damage or destroy structures in their path.[x] A brief thaw with minimal rain or snowmelt may not suffice to break up thick ice. It's important to note that FEMA's FIRMs do not include calculations or representations of flooding caused by ice jams.

From 1915 to 2018, Berkshire County encountered 43 reported ice jams. Sandisfield's West Branch of the Farmington River led with 18 jams, followed by Lenox's Marsh Brook with 11 jams. Williamstown's Green River, Dry Brook in Adams, and the Hoosic River in Adams each experienced three jams. Notably, three recent ice jams in January 2018 occurred in the towns of Cheshire, Stockbridge, and Lee due to unseasonable warm temperatures and heavy rains.

Electrical power outages can occur during flood storm events, particularly when storm events are accompanied by high winds, such as during hurricanes, tropical storms, thunderstorms, and micro-bursts. Fortunately, most flooding in the Berkshire region is localized and has resulted in few widespread outages in recent years, and where it occurs, service has typically been restored within a few hours. A severe flood event can threaten the functionality or structural integrity of the dams that are overtopped or fail.

Natural Environment

Flooding and saturated soil has the potential to affect the natural environment in several ways. Septic systems can flood, contaminating the surrounding areas, posing health risks, and damaging the environment. Flooding from increased runoff from impervious surfaces can spread chemical and bacterial contamination potentially harmful to people, the environment, and wildlife as well as increase nutrient and contaminant concentrations in freshwater bodies. Recreational, open space, natural area, and working land service impacts, including temporary loss of recreational fishing and boating access, impacts to habitat in natural areas that could limit access for recreational users, and loss of protected open space that could negatively affect species living in these areas (EOEEA ResilientMA Plan, 2023).

Flooding can remove trees, other vegetation, rocks and soil causing erosion, high turbidity and the loss of community assets. Excessive sedimentation of stream and lake beds can disrupt aquatic life cycles by smothering aquatic life and fish eggs. Sedimentation of lakes and ponds can create shallower, warmer shoreline conditions that favor infestation of invasive aquatic plants such as Phragmites, purple loosestrife, Eurasian water milfoil, water chestnut, and a host of others. Invasive aquatic plant species are a major environmental and public health concern in Laurel Lake. Invasive species can be carried downstream and dispersed into new areas in flood waters, particularly those like Japanese knotweed that readily spreads via broken plant fragments.

Stormwater drainage systems collect contaminants and sediment from roads and other surfaces and transport them into waterways if there is not a sufficient buffer to filter out the contaminants and sediment. Typically, there is no infrastructure in place to protect from nonpoint source pollution of this type.

The sudden and potentially extreme volumes of water released during dam failures can result in ecological damage both upstream and downstream of the dam. River channels downstream of the dam can experience severe scouring, banks can experience erosion and mass wasting, and boulders can become dislodged and move downstream. Trees and other vegetation can become uprooted and add to the debris moved by floodwaters, potentially clogging and threatening the integrity of culverts and bridges. Upstream of the dam the former impoundment could become partially or completely dewatered, altering, and potentially destroying lacustrine aquatic habitat.

Future Conditions

In the realm of future conditions, a study on flooding in New England warns that what was once considered a 100-year flood event, with a mere 1% chance of occurring annually, could transform into a recurring, yearly phenomenon by the late 2100s. This escalating frequency poses a significant threat to dams, with dam overtopping already standing as the leading cause of dam failures in the U.S., contributing to 34% of such failures[xi]

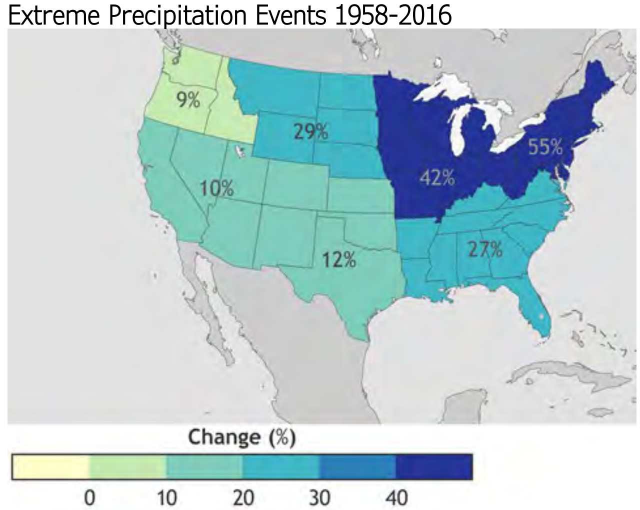
Analyzing data from the Northeast Climate Science Center (NECSC), Berkshire County has witnessed a gradual increase in yearly precipitation, rising from 40.1 inches in the 1960s to 48.6 inches in the 2000s. Projections indicate a further increase by 3.55 inches in the 2050s and 4.72 inches in the 2090s.[xii] According to the 2023 Massachusetts State Hazard Mitigation Plan, such changing precipitation patterns place the Berkshires and Hilltowns Region's infrastructure, particularly electric transmission and distribution systems and clean water supply, which heavily relies on groundwater, in a vulnerable position.

The scientific consensus echoes the reality of climate change altering precipitation patterns. The Intergovernmental Panel on Climate Change projections foresee temperature increases between 2.5-5.0°C (36-41°F) across the U.S. in the next century. These projections bring forth potential risks like increased mid-winter cold/thaw events, heightened rain-on-snow storm events, and a substantial rise in the frequency and magnitude of extreme storm and flood events, increasing the risk of ice jams. Many studies agree that warmer temperatures late in the year will result in more rain-on-snow storm events, leading to higher spring melt flows, which are typically the highest flows of the year.

Data from USGS streamflow gages across the northeast show a clear increase in flow since 1940, with an indication that a sharp "stepped" increase occurred in the 1970s. This is even though much of the land within many New England watersheds has been reforested, and this type of land cover change would tend to reduce, rather than increase, flood peaks.

NOAA has documented that extreme or heavy precipitation events have grown more frequent since the start of the twentieth century, and such events are likely to become even more frequent over the twenty-first. Heavy precipitation is defined by NOAA as those heavy rain or snow events ranking among the top 1 percent (99th percentile) of daily events, has increased 55% in the Northeast between 1958-2012.[xiii] See **Figure 3.15**Figure 3.16 It should be noted that during this period, a nine-year drought from 1961-1969, the drought of record for this region, occurred

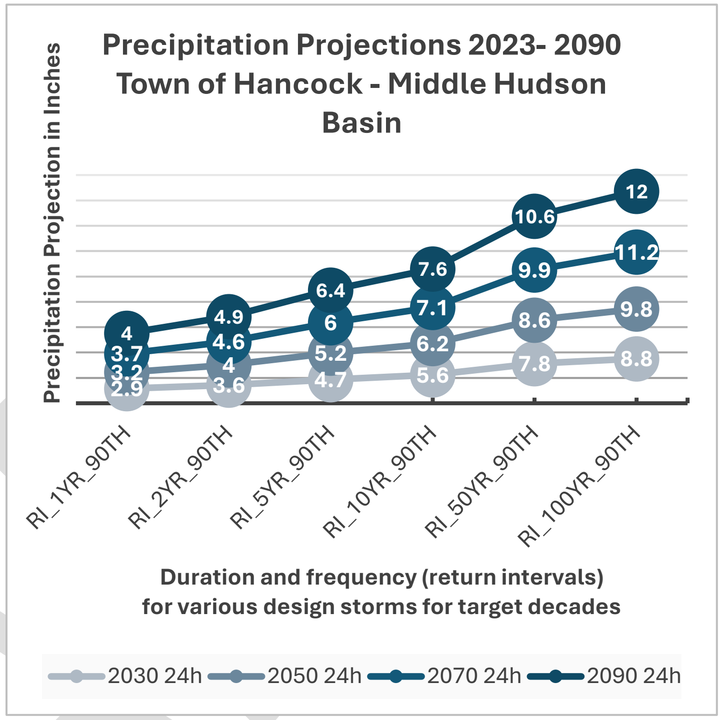
Figure 3.15 Increase in Precipitation Falling in Top 1% Extreme Precipitation Events 1958-2016



during this period. As such, this may underestimate the overall trend for future projections.

The Massachusetts Climate Change Projections report looked at the precipitation changes expected by greenhouse gas effects within the state's major watersheds. According to an upper-level scenario, the days per year with precipitation of more than one inch in the Housatonic River Watershed is predicted to increase from the baseline of six days per year to nine days by the 2050s, and to 10 days by the 2090s. The baseline reflects precipitation data 1971-2000. The upper scenario represents a 47% increase in these storms from the baseline by mid-century and a 66% increase by end of century.

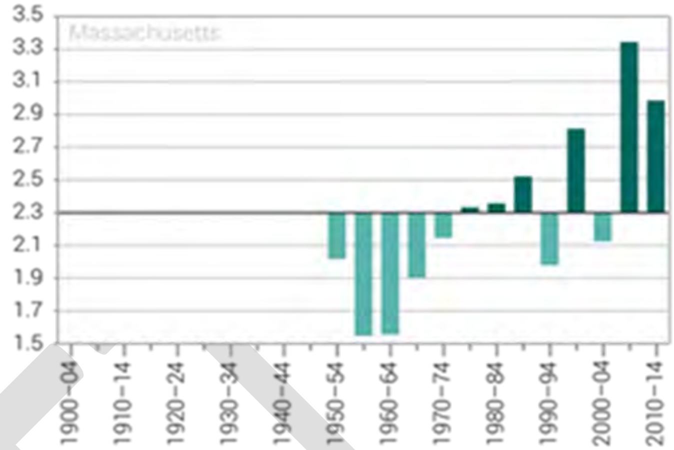
Figure 3.16 Precipitation Projections for Town of Hancock



The Town of Hancock lies within three watersheds, with majority of town development in the Middle Hudson Basin. Total precipitation is expected to increase by 8.9% by 2050 and 10.8% by 2070 (EOEEA ResilientMA Plan, 2023). Figure 3.16 displays the duration and frequency for precipitation for various design storms at the 90th percentile during decades 2030-2090.[xiv] As the return interval increases (Year 1 to Year 100), there is a consistent growth in precipitation levels for each target decade. This upward trend implies that extreme weather events with higher return intervals are expected to increase precipitation over time.

Summer is currently a season when there is the greatest chance for extreme precipitation events to occur, and summer is projected to continue to be the season of greatest chance and the season with the greatest increases in the number of days with extreme precipitation. Already observed in Massachusetts, the number of extreme precipitation events, those defined as more than two inches in one day, has increased since the 1980s, with the greatest increase in the past decade, see Figure 3.17.

Figure 3.17 Number of Extreme Precipitation Events of 2" or more in 1 Day. *Source: NOAA Climate.gov*



This trend has direct implications on the design of municipal infrastructure that can withstand extreme storm and flood events, indicating that all future designs must be based on the most updated precipitation and stream gauge information available. Ensuring unimpeded road access is imperative due to the substantial influx of daily commuters for work and for buses but also for emergency services.

To ensure new stormwater management and flood control systems can handle increased flow, it may be wise to slightly overdesign their size. Even a small increase in the dimensions of piped systems like culverts, ditches, and swales can significantly boost capacity with minimal added cost. Similarly, expanding the capacity of retention/detention ponds, if space allows, can be cost-effective. Bioretention cells can also be engineered to hold more water during extreme storms by enlarging the surface ponding area around the central soil media, without increasing the size of the more expensive engineered components. In Hancock, the lack of an updated inventory of culverts, many of which are expected to be very old, adds another layer of concern. As the town considers replacing it's aging infrastructure, it will be essential to prioritize the upsizing of these systems to handle future storm capacity.

If climate change results in a greater number of severe precipitation events and shortens recurrence intervals them, as is predicted, it will require dam operators to become more vigilant in monitoring precipitation and temperature patterns. Individual rain events, particularly during periods of saturated or frozen soils that cannot absorb rainfall, may require dam operators to open spillways, flashboards and other safety features more often, causing a greater number of high discharges events and possible flooding on properties downstream of the dam. Although climate change may not increase the probability of catastrophic dam failure, it may increase the probability of design failures that were based on outdated precipitation patterns (EOEEA ResilientMA Plan, 2023).

Hancock's primary economy is centered on tourism, and future economic developments are likely to continue this trend. Over the past decade, Jiminy Peak Ski Resort, the largest tourist attraction, has expanded its summer programming, supporting not just winter tourism but year-round activities. Additionally, a new $8 million low-key glamping campsite is slated to open in June 2025, featuring 123 campsites and four-season tiny houses, which will draw visitors year-round.

This increase in tourism, particularly through developments like the new campsite, will have significant implications for Hancock in several ways. The development of new tourism infrastructure, such as the campsite, which involves the creation of impermeable surfaces, may exacerbate flood risks by reducing natural land cover that absorbs rainwater, leading to more frequent and severe flooding events.

Changes in population patterns, driven by the influx of tourists and the town's growing reliance on seasonal visitors, will also complicate emergency management and strain existing resources. With a higher transient population unfamiliar with local risks, there is a heightened vulnerability during disasters, particularly floods. The lack of an ambulance service within Hancock's jurisdiction further complicates emergency response, requiring the continued and strengthened coordination between Northern Berkshire EMS and Pittsfield's private ambulance companies to ensure effective responses during peak tourist seasons. For any future land developed whether for tourism, commercial or residential, the town will need to adopt zoning laws to limit construction in flood-prone area.

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i NOAA, 2017, US Climate Resilience Toolkit found at climate.gov
ii FEMA, 2011 as cited in MEMA & EOEEA, 2018
[iii] MA Climate Change Clearinghouse (mass.gov)
[iv] Lanier, Jason D. "MASSACHUSETTS FREEZE/FROST OCCURRENCE DATA," n.d. https://ag.umass.edu/sites/ag.umass.edu/files/fact-sheets/pdf/freeze_frost_MA.pdf
[v] FEMA, "Living with Dams" (2013)
[vi] Department of Labor, Occupational Safety and Health Administration (OSHA) https://www.osha.gov/sites/default/files/publications/OSHA3471.pdf
vii Environmental Protection Agency: Mold and Health https://www.epa.gov/mold/mold-and-health
viii Fontalba-Navas, A., Lucas-Borja, M., Gil-Aguilar, V., Arrebola, J., Pena-Andreu, J., & Perez, J. (2017). Incidence and risk factors for post-traumatic stress disorder in a population affected by a severe flood. Public Health, 144, 96-102. https://doi.org/10.1016/j.puhe.2016.12.015
ix FEMA, Protect Your Home from Flooding
[x] http://www.weather.gov/media/aly/Hydrology/IceJamInfo.pdf
[xi] Scientific America July 2023, "Climate Change Is Stressing Thousands of Aging Dams across the U.S."
[xii] Northeast Climate Science Center, 2018
[xiii] Scott, Michon, 2019. Prepare for More Downpours. NOAA. Found at https://www.climate.gov/news-features/featured-images/prepare-more-downpours-heavy-rain-has-increased-across-most-united-0
[xiv] Data retrieved from ResilientMA Maps and Data Center, Cornell University, U.S. Geological Survey and Tufts University, the Massachusetts Climate and Hydrologic Risk Project (Phase 1) "Precipitation Frequency Table" Dec. 2023

Hurricanes/Tropical Storms

Hazard Profile

Hurricanes and tropical storms are powerful types of tropical cyclones, organized systems of thunderstorms with rotating winds, that form over the warm ocean waters of the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Sustained winds, heavy rainfall, and low-pressure systems characterize them. These systems can cause severe impacts, including wind damage, flooding, and erosion, threatening communities, infrastructure, and natural ecosystems. In the Atlantic, tropical cyclones are classified as:

- Tropical depression- a low-pressure center in the tropics has winds of 25 33 mph.
- Tropical storm (T.S.) is a named event defined as having sustained winds from 34 to 73 mph.
- A hurricane is a storm with sustained winds reaching 74 mph or greater. Wind gusts associated with hurricanes may exceed the sustained winds and cause more severe localized damage.

Tropical cyclones form when ocean temperatures reach at least 80°F (27°C), allowing large quantities of warm, moist air to rise and create the ideal conditions for cyclonic circulation. Once formed, these storms can move across the ocean and may travel hundreds of miles inland, bringing high winds and intense rainfall even to areas far from the coast. In lower latitudes, hurricanes generally move from east to west. However, as a storm shifts further north, the westerly flow in the mid-latitudes often causes it to curve toward the north and east, potentially accelerating its forward speed. This dynamic is one reason why some of the most intense hurricanes on record have reached New England (MEMA & EEOEA SHMCAP, 2018).

The impacts of a hurricane vary depending on its intensity, size, and the geography of the affected area. Wind Damage is one of the primary threats, as hurricane-force winds can tear roofs off buildings, uproot trees, down power lines, and create hazardous airborne debris. Inland areas are more likely to experience rainfall-induced flooding, where heavy, sustained rainfall overwhelms rivers, streams, and drainage systems, leading to flash flooding and prolonged inundation. Hurricanes also increase the risk of secondary hazards like landslides and soil erosion in hilly or flood-prone areas.

Likely Severity

Hurricanes are classified using the Saffir-Simpson Hurricane Wind Scale, which rates them from Category 1 to Category 5 based on their sustained wind speeds:

- Category 1 (74–95 mph): Minimal damage, potential for some roof and siding damage and power outages.

- Category 2 (96–110 mph): Moderate damage, with substantial roof and siding damage and widespread power outages.
- Category 3 (111–129 mph): Extensive damage, including major structural damage to small buildings and homes.
- Category 4 (130–156 mph): Severe damage, with total roof failure on homes and many trees and power lines downed.
- Category 5 (157+ mph): Catastrophic damage, with a high percentage of homes destroyed, fallen trees, and prolonged power outages.

In Berkshire County, hurricane-related concerns are focused on flooding, as hurricane-force winds are less common. The region's higher elevations and mountain ranges provide some protection, weakening storms when they reach inland. Additionally, most hurricanes that make landfall in New England are weakened to Category 1 due to energy loss over land or cooler waters after forming in the tropics. As a result, heavy rainfall and flooding are typically the primary risks from hurricanes in Western Massachusetts.

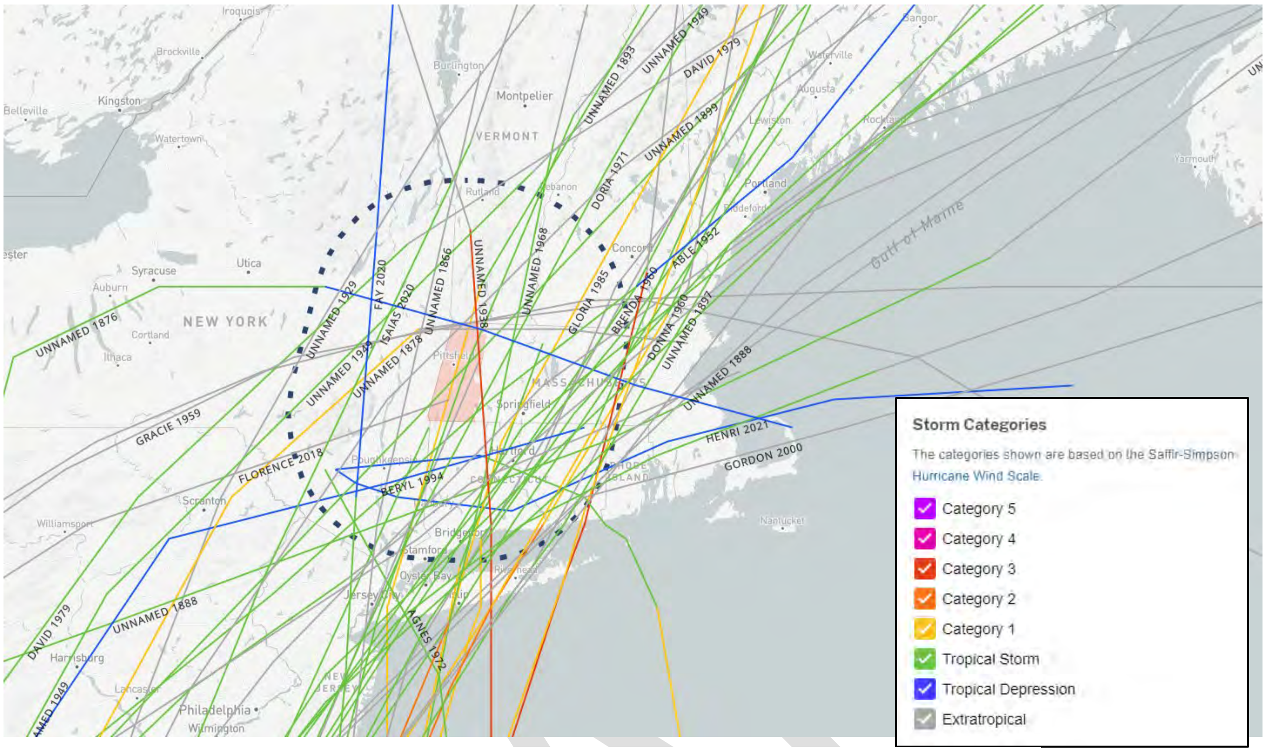
Probability

From 1842 to 2022, 97 hurricanes or tropical storms have occurred near Massachusetts, averaging one storm every two years. Four of these storms occurred between 2020 and 2022, suggesting a possible increase in frequency. (EOEEA ResilientMA Plan, 2023). Given Berkshire County's location, approximately 85 miles from Long Island Sound and 115 miles from Boston Harbor, the region is expected to continue experiencing impacts from hurricanes and tropical storms. Rising ocean temperatures may further increase the recurrence rate as warmer waters provide more energy for hurricanes to form and intensify.

The NOAA Hurricane Research Division has published probability maps showing the likelihood of a tropical storm or hurricane affecting a given area during hurricane season (June to November). Based on historical data from 1944 to 2020, this analysis indicates that Berkshire County has historically experienced around 10 to 29 named storms per 100 years.

In New England, hurricanes and tropical storms are most likely to occur in August and September. This pattern largely results from the time it takes for waters south of Long Island to reach the temperatures necessary to sustain these storms at northern latitudes. Additionally, as fall approaches, the upper-level jet stream develops more dips, causing steering winds to flow from the Great Lakes southward toward the Gulf States and then back northward along the eastern seaboard. This flow pattern can capture a tropical system over the Bahamas and accelerate it northward toward New England. Figure 3.18 displays the historical hurricane paths within 60 miles of the Berkshires.

Figure 3.18 Historical Hurricane Paths within 60 miles of the Berkshires



Source: NOAA Historical Hurricane Tracks Online Tool, 2024

Historic Data

The National Oceanic and Atmospheric Administration (NOAA) is the primary agency that maintains and publishes historical data on hurricanes. Within NOAA, the National Hurricane Center (NHC), which is part of the National Weather Service (NWS), is responsible for tracking and archiving hurricane data, including storm paths, intensities, and impacts. NOAA and its predecessors have been documenting hurricanes since the mid-1800s. However, systematic and more accurate record-keeping began in 1944, when routine aerial reconnaissance flights started monitoring hurricanes, providing more consistent and detailed data on storm location, intensity, and movement. Further improvements came with the launch of weather satellites in the 1960s, which allowed for continuous, reliable observation of storms over the ocean. This technology significantly enhanced tracking and data accuracy, enabling NOAA to document hurricanes even before they reached land.

As shown in **Figure 3.18**, several tropical storms and hurricanes have passed through Berkshire County. Although high winds are a notable aspect of these storms, heavy rainfall and flooding typically cause the most significant impacts in this inland region, including injuries, fatalities, and property damage. Between 1954 and 2023, Berkshire County received six FEMA disaster declarations related to hurricanes or tropical storms. **Table 3.10** highlights major storm events directly impacting

Berkshire County with associated FEMA declarations. However, hurricane effects in the Berkshires aren't limited to local landfalls; atmospheric currents and jet streams can bring heavy rainfall and flooding from distant storms in the mid-Atlantic and southeastern U.S., impacting the region indirectly. The Inland flooding section discusses additional details on documented flooding events.

Table 3.11 Historical Tropical Storm Activity across the Berkshire County Region

Date	Description of Event
8/17/1867	(unnamed) Tropical Depression
9/19/1876	(unnamed) Tropical Storm
10/24/1878	(unnamed) Tropical Depression
8/24/1893	(unnamed) Category 1 Hurricane
8/29/1893	(unnamed) Tropical Storm
11/1/1899	(unnamed) Tropical Depression
9/30/1924	(unnamed) Tropical Depression
9/21/1938	"The Great Hurricane of 1938" was considered a Category 2 hurricane a 1% annual chance flood event. Flood damages for roads and bridges totaled $70,000 (Berkshire Eagle Sept 1938)
9/1/1952	Tropical Storm Able made landfall near Beaufort, South Carolina, on August 31, 1952, as a Category 2 hurricane. By the time it reached New England, it had diminished to a tropical storm. Despite this weakening, Able brought significant rainfall to the area, leading to localized flooding and minor wind damage. The storm's remnants contributed to swollen rivers and streams.
10/1/1959	Tropical Depression Grace made landfall near Beaufort, South Carolina, in late September 1959 as a Category 4 hurricane and weakened as it moved inland, bringing light rainfall and minimal impact to the area.
8/28/1971	Tropical Storm Doria brought heavy rainfall and moderate winds, leading to localized flooding and minor wind damage across the region.
10/28/1985	Hurricane Gloria (FEMA Declaration DR-751-MA) brought strong winds and heavy rainfall, leading to widespread power outages, downed trees, and minor structural damage.
August 2005	Hurricane Katrina, though primarily devastating the Gulf Coast, indirectly impacted Berkshire County by prompting a FEMA emergency declaration for evacuee assistance. While Berkshire County did not experience direct storm

	impacts, the declaration facilitated support for displaced residents who relocated temporarily to Massachusetts. (FEMA Declaration EM-3252-MA)
8/26/2011	T.S. Irene tracked over the region with widespread flooding and damaging winds. Riverine and flash flooding resulted from 3-9 inches of rain within a 12-hour period. Widespread road closures occurred throughout the region. In MA, this event was a 1% annual chance flood event in the Hoosic River Watershed and a 50-year event in the Housatonic River Watershed. (FEMA Declaration EM-3330-MA)
10/28/2012	Hurricane Sandy brought high winds, downing trees and utility lines and leaving over 5,000 homes and businesses without power. Rainfall was minimal, with only 1.6 inches recorded in Savoy, while wind gusts reached 77 mph in Hancock, 61 mph in Otis, and 58 mph in Pittsfield. No injuries were reported, with the wind being the primary impact of the storm (FEMA Declaration EM-3350-MA).
9/17/2018	Hurricane Florence brought moderate rainfall, where 3 inches of rain fell at Pittsfield Municipal Airport. The average for the entire month was shy of 4 inches (Berkshire Eagle Archives).
8/4/2020	Tropical Storm Isaias brought strong winds that downed trees and utility lines. The storm left approximately 50,000 Berkshire residents without power, with some outages lasting several days. Road closures occurred due to fallen trees, and utility crews worked to restore power to affected areas.
8/21/2021	Tropical Strom Henri brought moderate rain, with towns receiving 1-2" of rain.
9/15/2023	After weakening from a Category 5 hurricane to a post-tropical cyclone, Hurricane Lee brought strong winds and moderate rainfall. Saturated soils from an unusually rainy season resulted in localized flooding, downed trees, and power outages throughout North Adams, Adams, Williamstown, and Clarksburg. The FEMA declaration (EM-3599-MA) supported recovery efforts, including debris removal and infrastructure repairs.

The Great Hurricane of 1938 remains one of the most memorable historic storms, with almost seven inches of rain falling over a three-day period. Rainfall from this hurricane resulted in severe river flooding across sections of Western Massachusetts, with three to six inches falling in the region. The rainfall from the hurricane added to the amounts that had occurred with a frontal system several days before the hurricane struck. The combined effects from the frontal system and the hurricane produced 10-17 inches rainfall across most of the Connecticut River Valley. In the Berkshires, 700 families were evacuated, two deaths occurred, many other people were injured, and 300 people were left homeless. Downtown North Adams and nearby Adams were flooded, and martial law was declared in North Berkshire.

In October 2005, the remnants of Tropical Storm Tammy, followed by a subtropical depression, produced significant rain and flooding across western Massachusetts. It was reported that between 9 and 11 inches of rain fell.13.73 inches fell at the Pittsfield Airport -- more than four times higher than the average for that month.

Tropical Storm Irene (August 27-29, 2011) produced significant rain, inland flooding, and wind damage across southern New England and much of the east coast U.S. The National Weather Service reported rainfall totals between 3 and 10 inches in northwestern Massachusetts. The NOAA's National Centers for Environmental Information recorded August 2011 as the second wettest August in Massachusetts in the past 117 years of precipitation records.[i] In western Massachusetts, the rainfall measured 11.21 inches, more than three times the average August rainfall of 3.41 inches, according to the Massachusetts DCR.[ii] Before the arrival of Tropical Storm Irene, western Massachusetts was already experiencing saturation of its soils due to excessive rainfall, making it vulnerable to flash flooding. [iii]The storm resulted in $40 million worth of damages in Berkshire County. A presidential disaster was declared (FEMA DR-4028) and the Commonwealth received over $31 million in individual and public assistance from FEMA.

Regionally, T.S. Irene is one of the most memorable storm events in recent history due to the flooding that occurred in northern Berkshire and Franklin Counties in Massachusetts and in southern Vermont. It caused flood levels equal to or greater than a 100-year flood event in Williamstown and North Adams. Extensive flooding in the Deerfield River watershed caused, among other damages, the closing of Route 2 in Florida/Charlemont (due to the collapse of the road and a landslide). Immediately after this, even the USGS recorded flood levels and recalculated and red-delineated the boundaries for the 100-year floodplain for the Hoosic River as it flows through portions of North Adams and Williamstown. This is one of the very few areas in Berkshire County where floodplain maps have been updated since the 1980s.

A year later, Hurricane Sandy was one of the largest storms to have hit New England. Fortunately, the Berkshires suffered relatively little damage compared to coastal communities. Throughout the county, heavy winds toppled trees and power lines, closing roads and causing widespread power outages. In Hancock, this resulted in downed trees and lines along Route 43, impacting access between Hancock and Williamstown and requiring significant cleanup efforts to restore road accessibility and power.

Vulnerability Assessment

Geographic Areas of Concern

The entire Town of Hancock is vulnerable to hurricanes and tropical storms, with the level of impact depending on each storm's specific track. Inland areas, particularly those in floodplains, near waterways, or isolated in hilly and mountainous regions, face heightened flooding risks from heavy rainfall and wind damage. In Hancock, much of the damage following hurricanes and tropical storms typically stems from residual wind impacts and inland flooding, as recent storms have demonstrated.

People

Historical records indicate that the only fatalities from tropical storms in Berkshire County occurred during the 1938 hurricane, primarily due to flooding rather than high winds. While high winds from tropical storms and hurricanes can cause severe damage by downing trees, limbs, and power lines, damaging buildings, and creating hazardous debris, flooding remains the primary cause of fatalities. Vulnerable populations, including economically distressed individuals, the elderly, and others with limited physical or financial resources, are particularly susceptible. This susceptibility stems from factors such as their ability to respond during a hazard, the location of their residences, and the construction quality of their housing.

Research shows that human behavior can significantly contribute to flood-related fatalities. For instance, during the flooding at The Spruces in Williamstown, some residents required forcible evacuation by emergency personnel. Additionally, individuals living or working near facilities that store or use toxic substances, such as those located near railroad tracks, the town garage, or the transfer station, face heightened exposure risks during flood events.

The most vulnerable populations include people with low socioeconomic status, individuals over 65, those with medical needs, and residents with limited English proficiency. These groups often face specific preparedness challenges, such as limited access to emergency alerts, difficulties in securing transportation for evacuation, and a lack of resources for storm preparations. Furthermore, the mental health impacts of tropical storms can be significant, especially for elderly residents and those with existing health needs, as the stress of evacuation or the loss of a home can lead to lasting psychological effects. Vulnerable groups may also have fewer resources to recover from property loss, job displacement, or relocation from damaged neighborhoods, particularly if they lack adequate insurance or financial support.

During and after a storm, rescue and utility workers are at increased risk from high water, swift currents, and submerged debris, especially when working in areas with extended flooding. Addressing these vulnerabilities through targeted emergency planning and resource allocation is essential for protecting public health and safety (MEMA & EEOEA SHMCAP, 2018).

Built Environment

All elements of the built environment are exposed to severe weather events such as hurricanes and tropical storms. The most pressing concern is the impact from high winds and flooding on infrastructure, roadways, and electrical systems.

Hancock's residential and commercial buildings, particularly older structures and those located in flood-prone or low-lying areas, are at risk from both wind damage and flooding. Older homes may lack modern wind-resistant construction, making them vulnerable to structural damage. Additionally, buildings situated on slopes or near water sources may face flooding and erosion, which can lead to water infiltration and long-term structural issues.

Hancock relies on a few key routes for connectivity. Route 43 is the main north-south route, linking residents to Williamstown and providing the primary path for emergency response. Route 20, which briefly crosses into New York, connects to Pittsfield, and Route 7 is accessible via Brodie Mountain Road for additional county access. With these limited connections, hurricanes and tropical storms could severely impact access; downed trees, landslides, and washouts on unpaved roads risk isolating residents and complicating emergency response efforts along Route 43.

Power lines along main and secondary roads are highly susceptible to damage from high winds and falling trees, making power outages a primary concern during hurricanes. Extended power losses would impact both homes and critical facilities, potentially disrupting emergency response operations and essential communications. Areas reliant on private wells, power outages can also interrupt access to water, posing challenges for residents and tourists during recovery efforts. Additionally, communication networks may be compromised, limiting the town's ability to coordinate emergency services and keep residents informed.

Several residential, commercial, and industrial buildings were destroyed during the floods of 1938, 1949, and 1955 in northern Berkshire County during tropical storm events. Most recently, the full destruction and permanent removal of all homes in The Spruces mobile home park in Williamstown demonstrates the vulnerability of structures due to hurricane-related flooding.

Natural Environment

Hurricanes and tropical storms in Hancock can cause environmental impacts similar to those of inland flooding, severe winter storms, and other intense weather events. During storms, flooding disrupts ecosystem functions, while high winds may uproot trees and damage vegetation. Forested areas are especially vulnerable, as invasive species like the Emerald Ash Borer have left many ash trees dead and easily felled by strong winds. Falling trees can lead to habitat loss for local species, but they also provide nutrients to the soil as they decompose, supporting regrowth.

Wind- and water-borne debris poses an additional hazard, potentially injuring animals or displacing them into unsuitable habitats.

In the long term, hurricanes and tropical storms reshape ecosystems. Floodwaters can scour riverbeds, alter habitats, and redistribute sediment, impacting aquatic life and increasing soil erosion. Wetlands, which serve as natural buffers, may be overwhelmed by intense rainfall, reducing their flood-mitigation function and further endangering local habitats. Invasive plants like knotweed spread more readily when floodwaters carry fragments, threatening native vegetation and biodiversity. Additionally, storm-driven pollutants can contaminate ecosystems, disrupting food and water supplies and causing lasting effects on wildlife populations.

Economy

Hurricane and tropical storm events can severely impact the economy, causing loss of business function, damage to inventory, relocation costs, wage loss, and rental loss due to the repair or replacement of buildings. Extended closures for repairs can lead to significant revenue losses. Wind and water damage and transportation disruptions can lead to significant economic repercussions. For example, the Commonwealth received over $31 million in individual and public assistance from FEMA following Tropical Storm Irene in 2011 (FEMA DR4028). Regional storm impacts are further detailed in the Inland Flooding section of this plan.

Hancock's economy is particularly vulnerable due to its reliance on tourism and small businesses. The town's primary attractions, including Jiminy Peak, Hancock Shaker Village, and seasonal businesses, draw approximately 75,000 visitors annually. Storm-related disruptions, such as road closures, flooding, and power outages, could heavily impact these attractions, leading to revenue losses during peak tourism seasons and potentially deterring future visitors. Seasonal and part-time employees, in particular, might face greater job insecurity.

The long-term economic impacts of hurricanes extend beyond immediate revenue loss. Repeated storms or prolonged recovery periods could alter visitor perceptions, leading to a decline in tourism and weakening Hancock's reputation as a reliable vacation destination. Natural areas damaged by storms, including trails and scenic landscapes, may take years to recover fully, reducing the appeal of outdoor activities and nature-based tourism central to Hancock's economic identity. Additionally, public infrastructure repair costs may strain local budgets, posing a challenge for the town in maintaining critical services and potentially impacting tax rates.

Future Conditions

Recent Atlantic hurricane seasons have shown increasing intensity. According to the NOAA, Hurricane Summary reports

- *2020:* A record-setting year with 30 named storms, including 12 U.S. landfalls. This marked the fifth consecutive above-normal season, attributed to the warm Atlantic Multi-Decadal Oscillation phase, which has fueled stronger, more frequent storms since 1995.
- *2022:* Though fewer storms formed (14 total), hurricanes like Category 4 Ian (with wind speeds of 150 mph) caused severe damage in Florida and Puerto Rico.
- *2023*: High activity continued with 20 named storms, the fourth highest on record, including seven hurricanes, three of which reached major hurricane status. Record-warm Atlantic temperatures and an El Niño pattern contributed to the storm intensity.
- *2024:* Although the full report is not yet available, Hurricane Milton, the second hurricane to develop within two weeks, has been recorded as the most intense hurricane in the Atlantic basin.

In a warming world, intense hurricane seasons will likely become more common. Higher temperatures, rising sea levels, and shifting weather patterns create ideal conditions for larger, more powerful, and longer-lasting storms. Oceans absorb over 90% of the excess heat trapped by greenhouse gases, and sea surface temperatures have risen about 2.8°F since the early 20th century.[iv] This additional heat fuels tropical storms, making them more destructive when they reach land.

Warmer air temperatures also enable the atmosphere to hold more moisture, allowing hurricanes to draw in and release more rainfall. This moisture release further intensifies the storm as it condenses, adding heat to the system. Research estimates that human-caused warming has increased extreme hourly rainfall rates in hurricanes by approximately 11%, indicating that tropical storms will likely continue to bring heavier rain upon landfall.[v]

Most models show no change or a decrease in overall hurricane frequency in a warmer climate. However, more storms will likely reach Category 4 or 5 intensity. Since 1975, the number of Category 4-5 hurricanes has roughly doubled, meaning that while there may be fewer storms, those that do form are more likely to be highly intense and destructive. As a result, the secondary hazards of hurricanes like, like flooding, landslides, and power outages, are also expected to increase. Heavier rainfall can lead to widespread flooding and landslides in vulnerable areas, while stronger winds raise the risk of downed trees and power lines, resulting in extended power outages.

As severe hurricanes and storm surges increasingly affect coastal areas of Massachusetts and states in the South, some residents may choose to relocate to inland towns like Hancock, which are perceived as safer. This climate migration could pressure Hancock's housing market, potentially increasing housing demand and costs. With limited affordable housing options, vulnerable groups, such as low-income residents and older adults, may face challenges in finding and maintaining housing. An influx of new residents could also strain local resources, including emergency services and health infrastructure, particularly if these newcomers include individuals with high support needs or limited familiarity with local emergency protocols.

With potential population growth, Hancock may experience development pressures to expand housing and infrastructure. Future land use decisions must address these pressures while mitigating hurricane-related risks. According to the Insurance Institute for Business & Home Safety (IBHS), Massachusetts ranks 9th among hurricane-prone states for building codes and resilience measures, indicating room for improvement in preparing structures for intense wind and storm conditions.[vi] This ranking highlights the need for stronger local building codes and resilience measures, particularly wind resistance and stormwater management. Enhanced building code regulations will ensure that new developments are equipped to withstand future storms. Limiting development in flood-prone areas and protecting natural flood buffers like wetlands will also be crucial for managing stormwater and reducing flood risk.

Vector-borne Diseases

Hazard Profile

Vector-borne diseases (VBD) are illnesses transmitted to humans and animals through vectors such as mosquitoes, ticks, and fleas. These vectors carry pathogens like bacteria, viruses, and parasites that can cause diseases such as Lyme disease, West Nile virus, Eastern equine encephalitis (EEE), and babesiosis. Climate change, environmental factors, and human activity can influence these vectors' range, abundance, and behavior, increasing the likelihood of disease transmission (EOEEA ResilientMA Plan, 2023). VBDs are included in hazard mitigation planning because natural hazards like flooding can amplify vector risks, threatening public health and community resilience.

Likely Severity

The severity of vector-borne diseases depends on several factors, including the type of vector, the prevalence of the disease, environmental conditions, and the population's vulnerability. In Massachusetts, West Nile Virus (WNV) and Eastern Equine Encephalitis Virus (EEEV) transmitted to humans by mosquitoes (*Culex spp. and Culiseta spp*. respectively), and Lyme disease and Anaplasmosis transmitted to humans by ticks (*Ixodes spp.)* are the most prevalent VBDs. These diseases cause significant morbidity and mortality both globally and in the highly populated state of Massachusetts, with regional variability in exposure risk.

EEEV, while rare, has a high fatality rate of 30% and often results in permanent neurological damage among survivors (CDC, 2024b). West Nile virus is more common but generally less severe, with most cases being asymptomatic or presenting mild flu-like symptoms; however, severe neurological complications can occur in older adults and those with compromised immune systems. EEEV or WNV outbreaks depend on favorable environmental conditions, such as warm, wet summers promoting mosquito breeding. The most important public health threat from ticks is Lyme Disease. The severity of tick-borne illnesses, such as Lyme disease, anaplasmosis, and babesiosis, varies but can include chronic fatigue, joint pain, and, in some cases, life-threatening complications if untreated.

Overall, these diseases can substantially impact a community, leading to significant consequences that affect the quality of life, work capacity, loss of specific bodily functions, increased long-term illness, and mortality rates. For example, in 2022, the Center for Disease Control (CDC) estimated the total societal cost, costs incurred by patients, healthcare systems, or third-party payers, of diagnosed Lyme disease ranges from $345 million to $968 million (U.S DHHS & CDC, 2024). However, reported cases tell only a portion of the story as it's is estimated that only one in ten West Nile virus cases are reported, and the number of treated Lyme disease cases is possibly 10 times higher than the number reported by CDC. (U.S DHHS & CDC, 2024).

The Berkshires, including the Town of Hancock, are particularly susceptible to tick-borne diseases due to the area's abundant forested landscapes and high deer populations, which sustain tick habitats. With climate change driving longer vector activity seasons and potential introductions of new vector species, the frequency and severity of vector-borne disease outbreaks are expected to increase, posing heightened risks to human health.

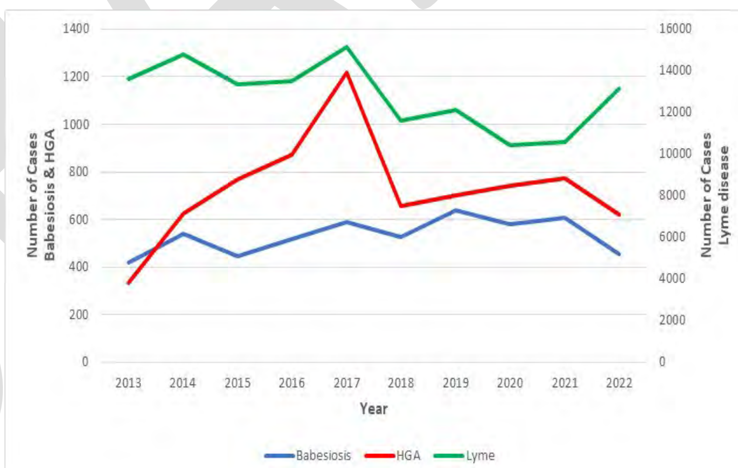
Authoritative organizations, such as The Massachusetts Department of Public Health (MDPH), carry out surveillance and reporting of these diseases, in collaboration with the State Reclamation and Mosquito Control Board (SRMCB) and The Northeast Massachusetts Mosquito Control and Wetlands Management District. The Regional Mosquito Control Districts (MCD), the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA), and local health departments monitor vector populations and guide prevention and control measures.

Probability

Various factors, including climate, land use, socioeconomic conditions, pest control efforts, healthcare access, and human behavior, influence the likelihood of vector-borne diseases (VBDs). Climate change is particularly significant, driving shifts in the geographic range of vectors and pathogens, while local weather variations, animal host diversity, and human activities further shape disease dynamics and transmission patterns. Most mosquito-borne disease cases statewide occur between June and August, with higher rates observed in Dukes and Nantucket counties.

According to the CDC, mosquito, flea, and tick-borne illnesses in the U.S. tripled between 2004 and 2016. During this period, at least seven new tickborne pathogens were identified in humans, and annual reported tickborne disease cases more than doubled. By 2019, tickborne diseases accounted for approximately 90% of all reported VBD cases nationwide (50,865 of 56,045 total cases).

Figure 3.19 Ten-trend of number of cases of Babesiosis and Anaplasmosis, and Lyme disease in Massachusetts, 2013-2022



**Babesiosis and HGA include confirmed and probable cases; Lyme includes confirmed, probable, and suspect cases. Source: MDPH Bureau of Infectious Disease and Laboratory Sciences, 2022.*

In Massachusetts, Lyme disease remains the most reported vector-borne illness, with 5,113 probable cases recorded in 2022, representing an incidence rate of 72.7 cases per 100,000 residents (Bureau of Infectious Disease and Laboratory Sciences, 2022). Lyme disease risk peaks in late spring and summer when nymph-stage ticks are most active, although adult ticks can transmit the disease year-round when temperatures remain above freezing. Black-legged ticks, the primary Lyme disease vector, thrive in grassy and wooded environments with abundant deer and mice populations.

Historic Data

Massachusetts has never had a state or federal emergency or disaster-related to vector-borne diseases (VBDs). However, the state has experienced periodic outbreaks of diseases like West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE), which have caused fatalities and heightened public health responses.

Between 2000 and 2019, Massachusetts reported 246 cases of WNV, resulting in 15 fatalities, and 43 cases of EEE, leading to 22 deaths. Historically, EEEV cases have been sporadic, but in the summer of 2024, heightened mosquito populations prompted the first reported human EEEV case in four years. This outbreak raised risk levels to "critical" in several eastern counties, leading towns to close parks from dusk to dawn to reduce exposure. In the same period, the Berkshires were elevated to "moderate" risk for WNV, with 18 human cases and 333 mosquito-positive samples reported. Additionally, the region documented 4 human EEE cases and 97 mosquito-positive samples.[vii]

Table 3.12 tick-borne disease-related emergency department (ED) visits in Berkshire County

Year	Total Visits	Number of Tick Borne Disease Visits	Rate (Per 10,000) of Tick-borne Disease Visits
2019	74,978	79	10.54
2020	62,6914	75	11.92
2021	67,626	128	18.93
2022	72,064	86	11.93
2023	71,688	82	11.4
2024	60,987	94	15.58

Source: mass.gov/lists/monthly-tick-borne-disease-reports

For tick-borne diseases, Berkshire County reported 87 cases of anaplasmosis, 52 cases of babesiosis, and 12 cases of Lyme disease to the CDC between 2016 and 2019. Tick-borne illnesses are a persistent concern in the region, with most cases occurring during the warm months when ticks are most active. The MDPH publishes an annual Tick Exposure and Tick-Borne Disease report to monitor trends and guide public health initiatives. **Table 3.12** highlights tick-borne disease-related emergency department (ED) visits in Berkshire County.[viii]

Vulnerability Assessment

Geographic area of concern

The entire town is susceptible to vector-borne diseases, with exposure risks present in residential, recreational, and some commercial areas. Outdoor locations with tall grasses, standing water, wooded areas, and unmanaged properties pose the highest risk for exposure to vectors such as ticks and mosquitoes. Recreational spaces like parks, hiking trails, and open fields are particularly vulnerable during warmer months when vector activity peaks.

People

The risk of VBDs in Hancock varies by population demographics and behaviors. Children and older adults, particularly those aged 55 to 74, are more vulnerable to VBDs due to weaker immune systems or increased time spent outdoors for recreation or gardening. People with weakened immune systems, such as those undergoing medical treatments (e.g., chemotherapy) or with chronic illnesses, are more susceptible to severe complications from vector-borne diseases.

Outdoor workers, including landscapers, construction workers, and farm laborers, are also at higher risk due to prolonged exposure to tick and mosquito habitats.

Residents who live near wooded areas, wetlands, or areas with tall grasses face greater exposure to ticks and mosquitoes. Additionally, seasonal visitors participating in outdoor activities like hiking or camping may be less familiar with preventative measures, further increasing their risk. Individuals in lower-income households may face financial barriers to accessing protective measures like repellents, protective clothing, or timely medical care, making them more vulnerable to the effects of VBDs. Those living in homes without proper window screens or air conditioning may be at increased risk of mosquito exposure indoors.

Vulnerable populations, such as low-income residents, may lack access to proper pest control measures (e.g., screens, repellents) or healthcare for early diagnosis and treatment. Additionally, the absence of medical facilities in Hancock forces residents to travel outside the Town for their healthcare needs disproportionately impact vulnerable populations, such as the elderly, children, or individuals with limited mobility or financial means to travel.

Built Environment

VBDs can indirectly affect the built environment by straining healthcare facilities, increasing the demand for medical services, and necessitating upgrades to infrastructure for disease prevention and control. For instance, standing water in drainage systems, culverts, and retention basins can serve as breeding grounds for mosquitoes, prompting efforts to redesign or improve these systems to reduce risk. Public spaces, such as parks, playgrounds, and outdoor recreation areas, may also require modifications, such as enhanced maintenance or mosquito-control measures, to ensure public safety.

Additionally, the presence of VBDs could lead to increased operational demands on public health facilities, emergency services, and municipal staff, especially during peak transmission seasons.

Natural Environment

The rise in vector-borne diseases often necessitates increased use of chemical pesticides and herbicides to control vector populations. While effective for vector suppression, this heightened chemical usage can have unintended consequences on the natural environment, including negative impacts on vegetation, waterways, and wildlife. For example, reductions in tick and mosquito populations may disrupt food chains, affecting animals that rely on these vectors as a food source.

Additionally, diseases carried by insects, such as West Nile Virus and Lyme disease, can directly affect wildlife populations, potentially causing declines in species health and diversity. Efforts to modify the environment to reduce vector habitats, such as draining wetlands or altering natural landscapes, may further disrupt ecosystems, potentially causing long-term harm to biodiversity and ecosystem health.

Economy

VBDs can impose significant economic burdens on communities. Direct costs include medical treatment, hospitalization, and preventive care, while indirect costs stem from lost productivity due to illness and absenteeism, as well as a potential decline in tourism. Public health departments and local governments may face increased expenditures for disease surveillance, vector control programs, and public education initiatives to mitigate the spread of diseases. Additionally, businesses reliant on outdoor recreation or tourism may experience revenue losses if disease prevalence discourages visitors or disrupts activities.

Future Conditions

Climate change is expected to expand the geographic range and increase the prevalence of vector-borne diseases. Warmer temperatures and prolonged growing seasons create more favorable conditions for vectors such as ticks and mosquitoes, leading to earlier seasonal activity and extended breeding periods. Increased precipitation and extreme weather events, such as floods, may contribute to standing water, fostering mosquito habitats, while milder winters may reduce tick mortality. These environmental shifts heighten the risk of Lyme disease, WNV, and Eastern Equine Encephalitis (populations are relatively controlled but vulnerable to expansion.

As Hancock's population continues to age, with a growing percentage of residents aged 55 and older, susceptibility to vector-borne illnesses may increase. Older adults are more likely to experience severe health outcomes and complications from diseases. Additionally, seasonal and recreational visitors drawn to Hancock's natural landscapes may inadvertently increase human-vector interactions, particularly during peak activity periods. Increased outdoor activity in warmer weather could raise exposure risks for residents and visitors.

Hancock has generally limited suburban sprawl and promoted revitalization in existing developed areas. Renovation projects, particularly in areas near wooded lots or water bodies, may inadvertently disturb vector habitats, increasing human-vector interactions. Redevelopment of existing structures and infrastructure should consider measures to reduce potential breeding grounds, such as improving drainage to prevent standing water and incorporating landscaping practices that minimize tick habitats. Measures such as green infrastructure, improved drainage systems, and retention basins can help mitigate breeding habitats for vectors. Land use regulations may require stricter guidelines for water drainage, wetlands management, and pest control in development planning.

Ticks thrive in grassy and wooded areas where humans, deer, and mice interact. Changes in land use, such as expanding residential or commercial areas into previously undeveloped, wooded, or wetland areas, may inadvertently increase human exposure to ticks and mosquitoes.

Inadequate infrastructure, such as poorly maintained drainage systems or a lack of green space planning, can exacerbate vector breeding habitats. New developments may need to incorporate climate-adaptive designs, such as improved stormwater management systems, sustainable landscaping to reduce standing water, and natural repellents. Promoting native plants and controlling invasive species like Japanese barberry can reduce tick habitats by eliminating the dense, humid environments they favor. Public education on maintaining native, well-managed gardens can lower exposure risks and enhance biodiversity. Recreational developments, including parks and trails, may need to account for disease mitigation strategies, such as periodic vegetation control and public awareness signage.

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[i] NOAA, 2016a, Data tools 1981–2010 accessed February 2, 2023, at https://www.ncdc.noaa.gov/cdo-web/datatools/normals.

[ii] Massachusetts DER, 2011, Monthly precipitation composite accessed February 1, 2023, at http://www.mass.gov/ eea/agencies/dcr/waterres-protection/water-data-tracking/ rainfall-program

[iii] Lombard, P. J., Bent, G. C., & Dudley, R. W. (2016). Flood-inundation maps for the Housatonic River, Massachusetts, from the confluence of the East and West Branch Housatonic Rivers at Pittsfield downstream to Great Barrington (Scientific Investigations Report No. 2016–5027). U.S. Geological Survey. https://doi.org/10.3133/sir20165027

[iv] https://www.epa.gov/climate-indicators/climate-change-indicators-sea-surface-temperature

[v] Holland, G., & Bruyère, C. L. (2014). Recent intense hurricane response to global climate change. Climate Dynamics, 42(3–4), 617–627. https://doi.org/10.1007/s00382-013-1713-0

[vi] Insurance Institute for Business & Home Safety. (2024). Rating the states: 2024 edition. Retrieved from https://ibhs1.wpenginepowered.com/wp-content/uploads/RTS_2024_v2.pdf

[vii] WNV and EEEV 2024 data retrieved from Department of Public Health. https://www.mass.gov/doc/2024-eee-and-wnv-risk-level-and-data/download

viii Data presented in this table were collected through the Massachusetts Syndromic Surveillance Program (MSSP), which monitors emergency department visits statewide. These figures are based on patient-stated reasons for visits and diagnostic codes and should be interpreted as indicative of trends rather than comprehensive case counts.

Invasive Species

Hazard Profile

"Invasives" are non-native plants and animals living in areas where they do not naturally exist and are likely to cause significant harm to the environment, economy, or human health. It's important to distinguish that "non-native" and "invasive" are not interchangeable. Many commonly grown fruits and vegetables, such as tomatoes and lettuce, are not native to this country. A considerable difference is that invasives compete with native plants and wildlife for resources, disrupt beneficial relationships, spread disease, cause direct mortality, and can significantly alter ecosystem function.[i]

The Massachusetts State Hazard Mitigation Plan categorizes invasive species as an environmental hazard with multifaceted implications. From a hazard mitigation planning aspect, the unchecked proliferation of invasive species can alter soils, affecting crop production, increasing erosion, and increasing wildfire risks. Invasive species further impede climate change mitigation efforts, notably diminishing forest carbon sequestration rates (EOEEA ResilientMA Plan, 2023). As such, the state recognizes the management of invasives as a high priority.

Specific costs associated with invasive species include control and management activities, prevention and early detection, rapid response programs, funding for research, public outreach campaigns, and removal and restoration programs. Several agencies assist with the detection, control, and education regarding invasives, such as the Massachusetts Department of Agricultural Resources (MDAR), UMass Extension Agriculture and Landscape Program, United States Department of Agriculture/ Animal and Plant Health Inspection Service, and the Massachusetts Invasive Plant Advisory Group (MIPAG). Combined, these collaborations assist the state, private, and public sectors with guidance to manage invasives.

Massachusetts also has a variety of laws and regulations in place that attempt to mitigate the impacts of these species. The Massachusetts Department of Agricultural Resources (MDAR) maintains a list of prohibited plants for the state, including federally noxious weeds and invasive plants recommended by MIPAG and approved for listing by MDAR. Species on the MDAR list are regulated with importation, propagation, purchase, and sale prohibitions in the Commonwealth. Additionally, the Massachusetts Wetlands Protection Act (310 CMR 10.00) includes language requiring all activities covered by the Act to account for and take steps to prevent the introduction or propagation of invasive species. Regulations 302 CMR 18.00 is designed to protect Massachusetts freshwater systems by establishing standards, criteria, and procedures for an effective aquatic nuisance control program. It enables the Department of Conservation and Recreation (DCR) to suppress, eradicate, control, and mitigate the spread of ANS (Aquatic Nuisance Species). In 2000, Massachusetts passed an Aquatic Invasive Species Management Plan, making the Commonwealth eligible for federal funds to support and implement the plan through the federal Aquatic Nuisance Prevention and Control Act. MassDEP is part of the Northeast Aquatic Nuisance Species Panel, which was established under the federal

Aquatic Nuisance Species Task Force. This panel allows managers and researchers to exchange information and coordinate efforts to manage aquatic invasive species.

Several state laws also pertain to invasive species. Chapters 21, 128, 130, and 132 of Part I of the state's General Laws include language addressing water chestnuts, Japanese knotweed, Zebra mussels, the Asian longhorn beetle, and several other species. These laws also allow spaces to be surveyed for invasive species and quarantines to be implemented at any time.

Likely Severity

Invasive species can rapidly establish and spread, causing significant disruptions to local ecosystems. The severity of their impact can vary depending on the type of invasive species, the extent of their spread, and the resilience of the affected areas. Experts estimate that about 3 million acres within the U.S. (an area twice the size of Delaware) are lost each year to invasive plants (from Mass.gov "Invasive Plant Facts"). The massive scope of this hazard indicates that all of Massachusetts is susceptible to the effects of invasive species. For example, the prevalence of the Emerald ash borer (EAB) targeting ash trees (Fraxinus spp.) poses a significant threat. To date, this invasive beetle is responsible for the loss of tens of millions of ash trees across 36 states. According to (DCR), 217 Massachusetts counties have detected EAB.[ii] Additionally, of the 2263 plant species in Massachusetts that have been documented as native or naturalized (established newcomers introduced directly or indirectly by humans), about 725 (32%) are naturalized. Of these, the MIPAG recognized 72 species as "Invasive," "Likely Invasive," or "Potentially Invasive."

Furthermore, the ability of invasive species to travel far distances (either via natural mechanisms or accidental human interference) allows invasive species to propagate rapidly over a large geographic area, both on terrain and in aquatic systems. Areas with high amounts of plant or animal life may be at higher risk of exposure to invasive species than less vegetated urban areas. However, invasive species can disrupt ecosystems of all kinds. Due to the abundance of plant and animal life throughout Hancock and the Berkshire region, the severity of the invasive species hazard is likely moderate to high.

Probability

Expanding global trade and travel routes have significantly increased the introduction of exotic species. This increase is particularly concerning in the case of international trade in ornamental plants, as many invasive species in the U.S. were originally imported for ornamental purposes. Massachusetts has established prohibitions on the propagation and sale of numerous invasive plant species to combat this issue. Despite these efforts, invasive species can still spread via animals, people, equipment, and machinery traveling through the region's landscapes and waterways. For instance, hikers, mountain bikers, ATVs, and boaters can unintentionally transport invasive species from infested areas to non-infested ones. As outdoor recreational tourism continues to rise in the Berkshires, this risk is expected to increase.

Natural hazards also play a significant role in the spread of invasive species. Flood events can uproot and transport invasive plant species, spreading them to new areas. For example, plant fragments and seeds from semi-aquatic and aquatic plants like Japanese knotweed, purple loosestrife, common reed, water chestnut, Eurasian water milfoil, and curly leaf pondweed can be widely distributed during floods. Similarly, berries and seeds from terrestrial invasive plants are often spread along river corridors and floodplain areas. Additionally, wind, ice storms, or poor forestry practices that fragment or open up the tree canopy can stress the remaining trees, creating temporary conditions that allow invasive species to establish and suppress the regeneration of native trees. The same windstorm that damages the tree canopy may also facilitate the dispersal of invasive plant seeds into the damaged forest.

Wildfires, typically surface fires in the Berkshires, burn forest duff and damage or kill seedlings and ground forbs. The temporary die-back of plants on the forest floor opens the way for invasive understory species such as honeysuckles, buckthorns, bittersweet, and hardy kiwi vine to establish. The risk of invasive infestation increases if the burned area is near, especially downwind of, existing invasive species populations and seed sources. This risk is further elevated if hikers and mountain bikers track seeds or plant fragments from infested areas into the burned sites.

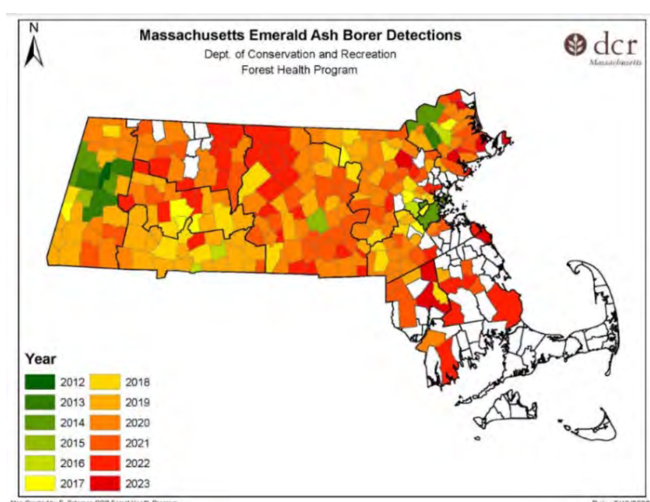
The spread of forest pests is influenced by their life cycle, dispersal capabilities, and the abundance of their preferred food sources. For example, the emerald ash borer is a capable flyer, allowing it to move easily through the Berkshire landscape, which is rich in ash trees. The woolly adelgid spreads through wind, mammals, and birds, particularly from March through July, threatening connected hemlock landscapes.

The risk of invasive aquatic and riparian species spreading from one riverine, pond, or lake ecosystem to another is largely due to human activity. However, birds and mammals can also transport these species. Plant fragments, seeds, and aquatic animals easily travel from one water body to another via kayaks, canoes, boats, equipment, and waders.

Historic Data

The Emerald Ash Borer (EAB) is recognized as one of the most destructive insects in North America, feeding exclusively on ash trees. Ash trees are prevalent in northern hardwood forests, riparian areas along rivers and lakes, and wetlands. They provide essential food and habitat for wildlife and are also widely planted in developed/urbanized environments, making their decline a significant risk to both people and property due to falling trees.

Figure 3.20 Massachusetts EAB Detection (DCR)



EAB was first reported in the Berkshires in 2012, in the Town of Dalton, making Massachusetts the 18th state to detect EAB. There are now 36 states with confirmed cases. By 2013, confirmed cases were documented in Hancock (see Figure 3.20 Massachusetts EAB Detection (DCR)

). Berkshire County, which contains 64% of the state's forest, has 12% of its forested area composed of ash trees. In 2021, 204 acres of forest in Southern Hancock were damaged by EAB; by 2022, the same area also noted 155 acres of damage. In 2023, the forest health report noted 1,055 acres damaged by frost in an area previously affected by Emerald Ash Borer (EAB). Trees weakened by EAB are more vulnerable to stressors like frost, as the damage impairs their ability to withstand cold. EAB infestation also leads to canopy thinning, reducing protection for remaining trees and increasing frost exposure. Therefore, the extensive frost damage is most likely correlated with the earlier EAB infestation.[iii]

Each year DCR completes an annual aerial survey of the state forests to identify any significant forest events. In 2021, over 80,000 acres statewide were impacted from mix of biotic (pathogens and insects) and abiotic (wind, storms, etc) with Pitch Pine needle case impacting 45%, White pine needle damage 18%, Spongy Month 14%, and EAB 4%.[iv] In 2022, Spongy Moth damage accounted for 30,895 acres of damage (56%) statewide. [v] Table 3.13 displays the total area of impact from forest according to the 2022 forest health report for Berkshire County. For Hancock, 465 acres in the Pittsfield State forest were impacted by *Lymantria Dispar (*Spongy Moth).

The Massachusetts Invasive Plant Advisory Group (MIPAG) provides comprehensive lists of invasive and likely invasive plant species across the state. Table 3.13 below list the plants reported for Berkshire County, last updated in 2022.

Table 3.13: DCR's 2022 State Forest Health Report - Berkshire County

Damaging Agent	Number of Acres Damaged
Lymantria Dispar (*Spongy Moth)*	24,350
Emerald Ash Borer	3,126
White Pine Needle Disease	2,059
Hemlock Woolly Adelgid	406
Elongated Hemlock Scale	132
Norway Spruce Needle cast	154
Red Pine Scale	75

Table 3.14: MIPAG Lists of Invasive and Likely Invasive Plants for Berkshire County, 2022

	Plant Names
Trees (Invasive)	Acer platanoides (Norway maple), Acer pseudoplatanus (Sycamore maple), Ailanthus altissima (Tree-of-heaven), Alnus glutinosa (Black alder, European alder), Robinia pseudoacacia (Black locust), Salix atrocinerea/Salix cinerea L. (Large Gray Willow/Rusty Willow)
Shrubs (Invasive)	Berberis thunbergii (Japanese barberry), *Elaeagnus umbellata (Autumn olive), Euonymus alatus (Winged euonymus; Burning bush), Frangula alnus (European buckthorn; glossy buckthorn), *Rosa multiflora (Multiflora rose), Salix atrocinerea/Salix cinerea (Large Gray Willow/Rusty Willow)
Vines (Invasive)	*Celastrus orbiculatus (Oriental bittersweet), Cynanchum louiseae (Black swallow-wort), Lonicera japonica (Japanese honeysuckle), Lonicera morrowii (Morrow's honeysuckle), Lonicera x bella (Bell's honeysuckle), Polygonum perfoliatum (Mile-a-minute vine or weed)
Perennial Herbs (Invasive)	Aegopodium podagraria (Bishop's goutweed),* Alliaria petiolata (Garlic mustard), Euphorbia esula (Leafy spurge), *Fallopia japonica (Japanese knotweed), Ficaria verna (Lesser celandine), Hesperis matronalis (Dame's rocket), Iris pseudacorus (Yellow iris), Lepidium latifolium (Broad-leaved pepperweed), Lysimachia nummularia (Creeping jenny), Lythrum salicaria (Purple loosestrife), Phalaris arundinacea (Reed canary-grass)
Aquatic Plants (Invasive)	Cabomba caroliniana (Carolina fanwort), Myriophyllum heterophyllum (Variable water-milfoil), Potamogeton crispus (Crisped pondweed), *Phragmites australis (Cav.) Trin. ex Steud. subsp. australis (Common reed)
Grasses (Invasive)	Eragrostis curvula (Weeping lovegrass)
Trees (Likely Invasive)	Phellodendron amurense Rupr. (Amur cork-tree), Pinus thunbergii Parl. (Japanese black pine), Pyrus calleryana Decne. (Callery Pear; Bradford Pear)
Shrubs (Likely Invasive)	Berberis vulgaris L. (Common barberry), Cytisus scoparius (Scotch broom), Ligustrum obtusifolium (Border privet), Lonicera tatarica L. (Tatarian honeysuckle), Rubus phoenicolasius Maxim. (Wineberry; Japanese wineberry; wine raspberry)
Vines (Likely Invasive)	Actinidia arguta (Hardy kiwi), Ampelopsis brevipedunculata (Porcelain-berry), Humulus japonicus (Japanese hops), Pueraria montana (Kudzu; Japanese arrowroot)

Perennial Herbs (Likely Invasive)	Anthriscus sylvestris (Wild chervil), Cardamine impatiens (Bushy rock-cress), Centaurea stoebe (Spotted knapweed), Cynanchum rossicum (European swallow-wort), Epilobium hirsutum (Hairy willow-herb), Euphorbia cyparissias (Cypress spurge), Festuca filiformis (Hair fescue), Heracleum mantegazzianum (Giant hogweed), Microstegium vimineum (Japanese stilt grass), Miscanthus sacchariflorus (Plume grass), Mycelis muralis (Wall Lettuce), Myosotis scorpioides (Forget-me-not)
Aquatic Plants (Likely Invasive)	Egeria densa (Brazilian waterweed), Hydrilla verticillata (Hydrilla; water-thyme)
Grasses (Likely Invasive)	Festuca filiformis Pourret (Hair fescue; fineleaf sheep fescue)
*most prevalent throughout the Berkshires Note: Once plant species are recognized as invasive, likely invasive or potentially invasive by "MIPAG", the Massachusetts Department of Agricultural Resources holds a hearing to determine if species newly listed by MIPAG should be added to the list of noxious weeds regulated with prohibitions on importation, propagation, purchase and sale in the Commonwealth. Also, the Massachusetts Assocmoiation of Conservation Commissions (MACC) now encourages Commissioners to consider the wetland impacts of these invasive species during project reviews as part of their jurisdiction under the Wetland Protection Act.	

Vulnerability Assessment

Geographic areas likely impacted

All of Hancock and the surrounding region are at risk of invasive species, including its rivers, creeks, and wetlands, making it particularly vulnerable to nuisance aquatic vegetation, with phragmites and Japanese knotweed as the major concerns. Phragmites, also known as common reeds, are tall wetland grass that harms the environment. It is an invasive species that can grow in any moist area, such as along highways, city streets, and farmland ditches. This plant has taken over valuable habitats, reducing the diversity of wetland plants and wildlife. Its dense growth can impede water flow, causing increased flood risks and compromising the natural hydrology of wetland areas. The extensive root system of phragmites can alter soil characteristics and drainage patterns, exacerbating flooding in affected areas. Similarly, Japanese knotweed is another invasive species threatening native habitats, particularly along waterways. This plant can easily spread through its underground rhizomes and broken stem pieces, making it difficult to control. Flooding and water flow can carry rhizome and stem fragments downstream, leading to new infestations along riverbanks, stream edges, and other riparian areas. It can be found in various environments, including vacant lots, yards, and other areas where it can gain a foothold. Phragmites and Japanese knotweed are major concerns for conservation efforts for the Kinderhook Creek and the Green River.

Hancock has 475 acres of wetlands and open water, equal to 2% of the town area. This figure includes emergent, scrub or shrub, and forested wetland ecosystems, but it does not include the smaller wetlands throughout the town near or in developed areas. Larger wetlands are located mostly in wooded areas at the following locations:

- Green River Wildlife Management Area, Route 43
- Along Hancock Road and the Green River
- Near Bently Brook and Whitman Road
- Near Kinderhook Creek and Potter Mountain Road
- Western end of Main St.
- Along Mt. Lebanon Brook in Southern Hancock

Hancock has a vast forested landscape, encompassing 88% of its total area, with 52.4% (11,982 acres) designated as open space protected in perpetuity. However, this forested landscape faces significant threats from pests such as the spongy moth, emerald ash borer, Asian longhorned beetle, hemlock woolly adelgid, and southern pine beetle. These pests can cause widespread tree death and disrupt entire ecosystems. Additionally, pathogens such as spruce needle rust and beech bark disease are also common in the landscape. The Massachusetts and New York Departments of Conservation and Recreation (DCR) have reported these threats within the Pittsfield State Forest and Misery Mountain Wildlife Management Area (WMA). Additionally, residents have observed fallen ash trees along Route 43, which could threaten utility lines, nearby infrastructure, and road access.

People

Invasive species pose significant health risks to human populations. These risks arise from direct contact with harmful plants, the spread of diseases, and the exacerbation of existing health conditions. Certain invasive species are directly harmful to human health. For example, Giant Hogweed can cause severe skin reactions. Contact with its sap, especially when exposed to sunlight, can lead to painful blisters and long-lasting scars. This makes outdoor activities in infested areas hazardous, particularly for children and those unaware of the plant's dangers. Common Ragweed produces large amounts of pollen, exacerbating allergies and respiratory conditions like asthma. Increased pollen levels can affect vulnerable populations, including children, the elderly, and individuals with preexisting respiratory issues.

Invasive species can contribute to the spread of vector-borne diseases. For instance, invasive mosquito species like the Asian Tiger Mosquito (Aedes albopictus) can transmit diseases such as West Nile Virus and Eastern Equine Encephalitis (EEE). These mosquitoes thrive in the stagnant water often found in urban areas, increasing the risk of disease transmission to humans. Invasive plants like

Japanese Barberry can alter local ecosystems in ways that increase the risk of tick-borne diseases. Dense barberry thickets create favorable habitats for white-footed mice and deer, both key hosts for black-legged ticks (Ixodes scapularis). These ticks are vectors for Lyme disease, anaplasmosis, and babesiosis. Higher tick populations in barberry-infested areas elevate the risk of these diseases to humans. People with compromised immune systems or pre-existing health conditions, children under five, and people over 65 might be particularly vulnerable to new diseases or aggravated health problems.

Invasive aquatic plants, such as Hydrilla, can create dense mats on water surfaces, affecting water quality and promoting conditions conducive to harmful algal blooms. These blooms can produce toxins harmful to human health, causing skin rashes, gastrointestinal illnesses, and respiratory problems when people come into contact with contaminated water during recreational activities.

Loss of urban tree canopy from invasive species and pests can lead to higher summertime temperatures and greater vulnerability to extreme temperatures. Additionally, compromised recreational bodies of water can reduce people's means of cooling off during extreme heat days.

Built Environment

Invasive plant species can cause significant damage to infrastructure. Mature roadside trees provide natural and cultural benefits to the community, creating the rural New England landscape that defines the region. Trees help to hold roadside soils in place and can act as windbreaks. Accelerated die-back of roadside trees can occur due to invasive pests such as the woolly adelgid or emerald ash borer or stressed and pulled down by prolific invasive vines such as bittersweet. [vi] Damage and die-off of these trees present increased risk to homeowners who live in close proximity, to utility lines and to travelers who frequent the roads they are located on. Additionally, invasive insects like termites or wood-boring beetles can infest and damage wooden structures, causing significant financial losses and compromising building safety.

Facilities that rely on biodiversity or the health of surrounding ecosystems, such as outdoor recreation areas or agricultural/forestry operations, could be vulnerable to impacts from invasive species. Japanese knotweed is known to decrease streambank stability and contribute to topsoil erosion, which can contribute to flood damage. Japanese knotweed also grows on roadways, sometimes growing large enough to impair sightlines and growing over guardrails; this can contribute to maintenance and safety issues.

Buildings are expected to be directly impacted by invasive species under circumstances similar to our roadways. Roadways and roadside drainage areas are most acutely impacted by herbaceous invasives such as stilt grass and phragmites in wetland areas. Both species tend to grow in thick mats and through compacted soil, a particular problem for town roads which are almost all gravel. Maintenance of roadside ditches to remove invasives is required to allow for runoff transportation. Facilities that rely on native species, biodiversity or the health of surrounding ecosystems, such as outdoor recreation areas, public or botanical gardens or agricultural/forestry operations, are more vulnerable to impacts from invasive species.

Invasives can disrupt water management systems, creating potential hazards. Aquatic invasive plants like Hydrilla and Eurasian Watermilfoil can clog water intake systems, irrigation channels, and drainage ditches, increasing the risk of flooding and water contamination in developed areas. A study in Vermont following Tropical Storm Irene (TSI) found that 70% of new plants established after the storm originated from underground rhizomes.[vii] The study suggests that flooding and erosion facilitate the spread of Japanese knotweed by dispersing its rhizomes. Consequently, as Japanese knotweed spreads and establishes dense thickets, it further obstructs waterways and drainage systems, exacerbating erosion and reducing their capacity to handle heavy rainfall. This cycle not only promotes the invasiveness of Japanese knotweed but also increases the likelihood of flooding during storm events, creating a feedback loop of environmental disruption.

Natural Environment

The majority of the land area in the town consists of forests, wetlands, waterbodies, and watercourses. Invasive plants can outcompete native vegetation through rapid growth and prolific seed production, reducing plant diversity by dominating forests. When invasive plants dominate a forest, they can inhibit the regeneration of native trees and plants. This reduced regeneration capability further diminishes the forest's ability to recover effectively following a disturbance event. Additionally, invasive plants provide less valuable wildlife habitat and food sources than native species.

As previously discussed, the movement of invasive insects and diseases has increased with global trade. Many of these pests, such as the hemlock woolly adelgid, the Asian long-horned beetle, and beech bark disease, have been found in New England. These organisms have no natural predators or controls and significantly affect forests by altering species composition as susceptible trees are selectively killed.

Invasive species interact with other forest stressors, such as climate change, exacerbating their negative impacts. Examples include:

- An earlier growing season, more frequent gaps in the forest canopy from wind and ice storms, and carbon dioxide fertilization are likely to favor invasive plants over native trees and vegetation.
- Larger deer populations' preferential browsing of native plants may favor invasive species and inhibit forest regeneration after disturbances.
- Warming temperatures favor some invasive plants, insects, and diseases, whose populations have historically been kept in check by colder climates.
- Periods of drought weaken trees, making them more susceptible to insects and diseases.

Aquatic invasive species pose a particular threat to water bodies. Natural Heritage Endangered Species Program ranks invasive species as the number one threat to the Housatonic Watershed, followed by channeling/ alternation and pollution.[viii] In addition to threatening native species, invasives can degrade water quality and wildlife habitats. The impacts of aquatic invasive species include:

- Reduced diversity of native plants and animals

- Impairment of recreational uses, such as swimming, boating, and fishing
- Degradation of wildlife habitat
- Local and complete extinction of rare and endangered species

Several studies have documented the impact of invasive species on endangered species, specifically in Massachusetts.

- The impact of invasive species on American eelgrass in the Charles River has been documented. Invasive water chestnut significantly reduces the growth and survival of this native plant, which is crucial for aquatic habitats.[ix]
- The MIPAG has reported that invasive species such as purple loosestrife and Phragmites australis (common reed) have severely impacted wetland habitats across the state, out-competing native vegetation and altering hydrology, which threatens the habitat of several rare and endangered species
- Research by the Massachusetts Department of Fish and Game indicates that invasive plant species like Japanese knotweed and multiflora rose have encroached on the habitats of the endangered bog turtle, contributing to its decline by altering its habitat and food sources.

BioMap, developed by the Massachusetts Division of Fisheries and Wildlife's Natural Heritage & Endangered Species Program (NHESP) and The Nature Conservancy, has identified several core habitats crucial for conservation in Hancock and the surrounding region. Core habitats are critical areas designated for conservation due to their high biodiversity value and their importance for the survival of rare, threatened, and endangered species. These habitats are essential for maintaining the region's ecological integrity, providing the necessary conditions for species to thrive, reproduce, and sustain their populations. Within the Town of Hancock and surrounding area, the identified core habitats include:

- Rare Species Core: 1,564.3 acres
- Forest Core: 13,284 acres
- Aquatic Core: 574 acres
- Wetland Core: 142 acres
- Vernal Pool Core: 85 acres
- Priority Natural Communities: 7 acres

With the shifting climate favoring invasive species, these critical habitats are increasingly threatened, leading to a potential large-scale biodiversity loss.

Economy

Invasive species pose significant threats to the economy of the Town of Hancock and the broader region. They impact various sectors, including outdoor recreation, agriculture, and tourism. The economic consequences of invasive species can be far-reaching, affecting local businesses and property values.

The Town of Hancock is renowned for its outdoor recreational opportunities, vital to the local economy. The presence of invasive species can significantly diminish the appeal of these activities. The Pittsfield State Forest and other nearby conservation areas are major draws for hikers. Invasive species can overgrow trails, making them less accessible and less enjoyable for hikers. This reduced trail quality can lead to fewer visitors, negatively impacting local businesses that rely on tourism. Similarly, invasive aquatic plants can dominate river banks, impeding fishing, kayaking, and swimming activities.

The fall foliage season attracts numerous tourists to the region, generating significant revenue for the local economy. However, invasive pests like the Emerald Ash Borer and the Asian Long-Horned Beetle can decimate native trees, such as ash and maple, crucial for vibrant fall colors and maple syrup production. The decline in these trees not only diminishes the quality of fall foliage, potentially deterring tourists, but also impacts the local maple syrup industry. The loss of sugar maples affects syrup producers and associated industries, such as tourism, during the sugaring season. This dual impact on tourism and agriculture reduces income for hotels, restaurants, and other local businesses that thrive during these seasons.

Invasive plants like Japanese Knotweed, Multiflora Rose, and Garlic Mustard can destabilize soil and increase erosion, particularly on ski resort slopes and trails. These invasives displace native vegetation with deeper, more stabilizing root systems, increasing soil instability and erosion. The resulting damage to trails and slopes poses safety risks to skiers and can compromise the resort's infrastructure. These impacts could significantly affect Jiminy Peak, as travelers inadvertently spread non-native species, exacerbating the problem. The reduced attractiveness and safety of the ski slopes could threaten the economic vitality of the Town of Hancock, which relies heavily on the resort, leading to fewer visitors and decreased revenue.

Managing invasive species requires significant financial investment. The cost of controlling invasive species, whether through mechanical removal, chemical treatments, or biological controls, is substantial. Nationally, the economic impact of invasive species is profound. According to the Native Plant Trust, invasive species alter 3 million acres of habitat annually in the United States, costing 36 billion dollars a year to control and eradicate.[x] Municipal budgets often need to allocate additional resources to manage these issues, straining local finances. For example, the Commonwealth of Massachusetts spends over $95,000 per year on invasive species control at state properties and over $290,000 annually for control efforts in over 290 infested lakes (EOEEA ResilientMA Plan, 2023).

Individuals particularly vulnerable to the economic impacts of invasive species include those working in forestry and agriculture-related fields, as well as those whose livelihoods depend on outdoor recreation activities such as hunting, hiking, or aquatic sports. Other noteworthy forest-based recreational activities include cross-country skiing, mountain biking, wildlife tracking, and birdwatching. A 2015 report estimated that about 9,000 people are employed in the diverse industries that support this sector, with a total annual payroll equivalent of $293 million.[xi] Another report in 2020 estimated that forest related recreation was a $2.2 billion industry in Massachusetts.[xii] This includes all individuals working in outdoor recreation activities and tourism based on maintaining a natural landscape. This is especially important in Berkshire County, where the scenic beauty and outdoor recreational opportunities complement the region's international status as a cultural destination. Homeowners whose properties are adjacent to vegetated areas or waterbodies experiencing a decline from an invasive species outbreak could experience decreases in property value.

The agricultural sector is vulnerable to increased invasive species associated with increased temperatures. More pest pressure from insects, diseases, and weeds may harm crops and cause farms to increase pesticide use. Farmers may face additional challenges as they are forced to invest in new pest control measures and deal with lower yields and poorer quality crops. In addition, floodwaters may spread invasive plants that are detrimental to crop yield and health.

Future Conditions

Climate change is expected to exacerbate the spread and impact of invasive species, increasing their abundance and expanding their habitat ranges. As ecosystems become stressed due to climate-related factors such as drought, increased temperatures, and wildfires, they become more susceptible to invasions. Key factors influencing species survival, such as temperature, atmospheric CO_2 concentration, frequency and intensity of hazardous events, and available nutrients, are likely to be altered by climate change. This alteration will stress native ecosystems and increase the chances of successful invasions. Elevated atmospheric CO_2 concentrations, for example, can reduce ecosystems' ability to recover after major disturbances like floods or fires, giving invasive species, which often establish more rapidly following disturbances, a greater chance of successful establishment or expansion.

Several climate change impacts could increase the severity of the invasive species hazard as noted in the Massachusetts State Hazard Mitigation and Climate Adaption Plan:

- Elevated CO_2 Levels: Higher atmospheric CO_2 can enhance photosynthetic rates in some organisms, improving their competitive advantage.
- Changes in Atmospheric Conditions: Decreased transpiration rates in some plants could increase soil moisture, benefiting species that capitalize on the increased water availability.
- Nitrogen Deposition: Fossil fuel combustion results in widespread nitrogen deposition, favoring fast-growing, often invasive, plant species.
- Shifts in Growing Season: As the growing season shifts earlier, invasive species like garlic mustard, barberry, buckthorn, and honeysuckle, which flower earlier, can outcompete native plants. The growing season in Massachusetts has increased by approximately 10 days since the 1960s.

- Increase in Forest Pests: Warming temperatures benefit ectothermic forest pests, leading to increased populations of defoliating insects and bark beetles. Warmer winters result in fewer pests being killed off, allowing populations to grow beyond previous limits.
- Aquatic Environment Changes: Increased water temperatures decreased oxygen levels, and changes in pH can facilitate the spread of aquatic invasive species, enabling year-round establishment of species that previously could not survive New England winters.

Some invasive plant species can alter ecosystem conditions, such as soil chemistry and wildfire intensity. Invasive species that are not fire-adapted may take over fire-prone grassland or forest areas, thereby increasing wildfire risk. Invasive species can trigger a cascade of lost ecosystem services and reduce the resilience of ecosystems to future hazards by placing constant stress on these systems.

In addition to climate change, shifts in population patterns and land use in Hancock could further influence the spread and impact of invasive species. As Hancock experiences growth in tourism and seasonal residents, the movement of people, plants, and goods increases the likelihood of introducing new invasive species. Tourists and seasonal residents may inadvertently transport seeds, insects, or other organisms that can establish in local ecosystems, particularly in areas near recreational sites and new developments.

Increased development, especially in previously undeveloped or natural areas, can disturb soil and create conditions favorable to invasive species. Construction activities, for instance, may introduce invasive plant seeds that take advantage of disturbed environments. The concentration of development in certain areas could also fragment habitats, weakening native ecosystems and making them more vulnerable to invasion. Additionally, the expansion of outdoor recreational activities, such as hiking and camping, can further contribute to the movement and establishment of invasive species in natural areas.

Given that Hancock currently lacks extensive land use regulations, the town may face increased vulnerability to the impacts of invasive species, especially as climate change and population growth heighten these risks. The absence of strong regulations could make it easier for invasive species to spread unchecked, particularly in new developments or areas disturbed by construction.

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[i] MassWildlife Climate Action
[ii] Department of Conservation and Recreation | Emerald Ash Borer Guide
[iii] Massachusetts DCR Forest Health Program (arcgis.com)
[iv] Massachusetts 2021 Forest Health Highlights (usda.gov)
v Massachusetts 2022 Forest Health Highlights (mwra.com). Note: A large tract of forest bordering on the Southern Hancock line crossing over into Richmond was counted into this figure.
[vi] U.S. Forest Service, 2020
[vii] AASHTO Center for Environmental Excellence. (2019). Threat assessment for Japanese knotweed. https://environment.transportation.org/teri-idea/threat-assessment-for-japanese-knotweed/

[viii] EEE0A and US FWS, Rare Species and Natural Community Surveys in the Housatonic River Watershed of Western Massachusetts, July 2020.
[ix] Smith, R. (2005). The Impact of Invasive Water Chestnut on Native American Eelgrass in the Charles River. Journal of Aquatic Plant Management
[x] https://www.nativeplanttrust.org/conservation/invasive/
[xi] EOEEA, DCR, Bureau of Forest Fire Control & Forestry, 2020
[xii] DCR, Massachusetts Forest Action Plan, 2020.

Wildfires

Hazard Profile

A wildfire can be defined as any non-structure fire that occurs in vegetative wildland containing grass, shrubs, leaf litter, and forested tree fuels. Wildfires can be caused by natural events (e.g., lightning), drought, extreme heat, forest management practices, invasive species, and human activity (e.g., smoking, campfires). They often begin unnoticed but spread quickly, igniting brush, trees, and potentially homes. In the Commonwealth, 98% of wildfires are human caused (EOEEA ResilientMA Plan, 2023). There are three different classes of wildfires.

- Surface fires are the most common type and burn along the floor of a forest, moving slowly and killing or damaging trees.
- Ground fires are usually started by lightning and burn on or below the forest floor.
- Crown fires spread rapidly by wind, jumping along the tops of trees.

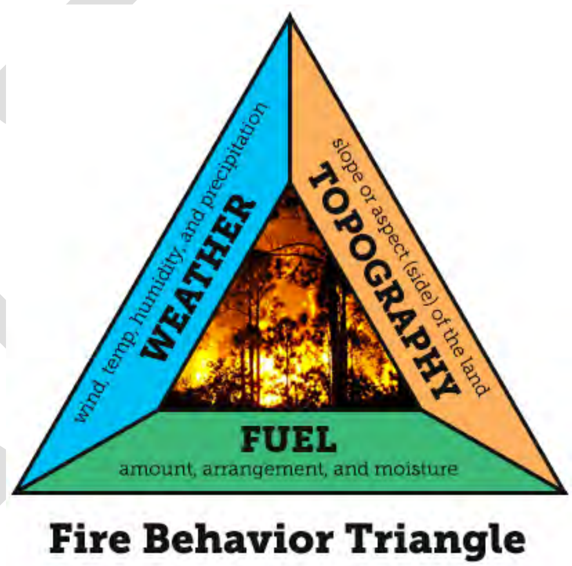
A wildfire differs greatly from other fires by its extensive size, speed at which it can spread out from its original source, potential to unexpectedly change direction, and ability to jump gaps such as roads, rivers, and fire breaks. Wildfire season can begin in March and usually ends in late November. The majority of wildfires typically occur in April and May, when most vegetation is void of any appreciable moisture, making them highly flammable. Once "green-up" occurs in late May to early June, the fire danger is usually reduced somewhat. The National Wildfire Coordinating Group (NWCG) classifies the severity of wildfires based on their acreage as follows:

- Class A - one-fourth acre or less.
- Class B - more than one-fourth acre, but less than 10 acres.
- Class C - 10 acres or more, but less than 100 acres.
- Class D - 100 acres or more, but less than 300 acres.
- Class E - 300 acres or more, but less than 1,000 acres.
- Class F - 1,000 acres or more, but less than 5,000 acres.
- Class G - 5,000 acres or more (NWCG, 2023).

Likely Severity

The severity of wildfires can vary significantly based on several factors, including weather conditions, vegetation type, and topography. Three main factors influence wildfire behavior, often depicted as the Fire Behavior Triangle: weather, fuel, and topography (Figure 3.21 Fire Behavior Triangle).

Figure 3.21 Fire Behavior Triangle



Source: WeatherStem

Weather: Weather conditions such as wind, temperature, humidity, and precipitation are crucial in wildfire behavior. Dry spring and summer conditions, or drought at any point of the year, increase fire risk. Similarly, the passage of a dry, cold front through the region can increase sudden wind speed and changes in wind direction. Wind can drive the fire's spread, pushing flames and embers ahead of the main fire front. High temperatures can increase the fire's intensity, while low humidity can dry out vegetation, making it more flammable. Conversely, precipitation can help control or extinguish fires. Thunderstorms in Massachusetts are usually accompanied by rainfall; however, during periods of drought, lightning from thunderstorm cells can result in fire ignition. Thunderstorms with little or no rainfall are rare in New England but have occurred.

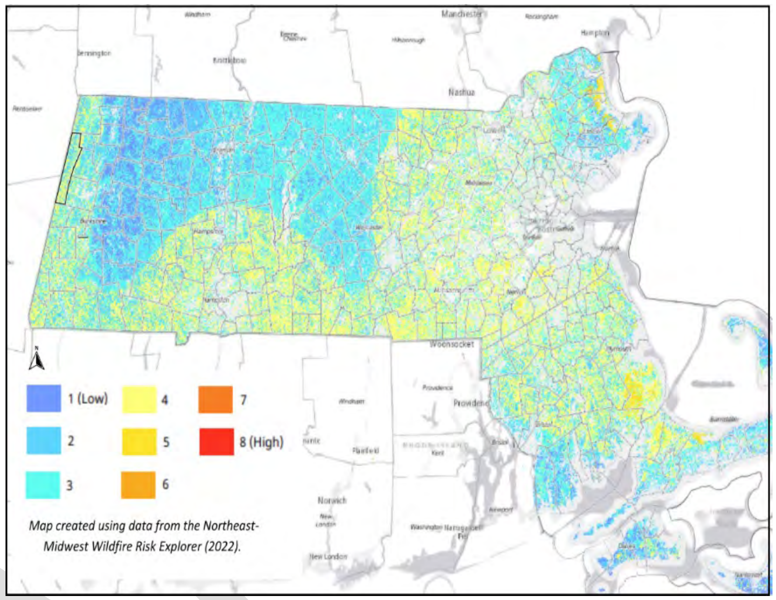
Fuel: The type, amount, arrangement, and moisture content of vegetation and other combustible materials are critical in determining how a wildfire spreads and its intensity. For example, dry grasses can ignite and spread fire rapidly, while wetter, greener vegetation may slow it down. Areas with dense forests, brush, and dry grasses are particularly susceptible to wildfires. The accumulation of dead plant material, such as leaves, twigs, and logs, serves as fuel, enabling fires to spread rapidly.

Topography: The landscape, including slope and aspect (the direction a slope faces), influences wildfire behavior. Fires tend to move faster uphill due to the preheating of vegetation above the fire. The shape and features of the landscape can also channel winds, affecting the fire's direction and speed. Steeper terrains can thus be more vulnerable to rapid fire spread.

Probability

It is difficult to predict the likelihood of wildfires in a probabilistic manner as several factors affect fire potential and because some conditions, such as ongoing land use development patterns, location, and fuel sources, exert changing pressure on the wildland-urban interface zone. Wildland-urban interface (WUI) refers to areas where human-made structures and infrastructure are near wildland vegetation, This term will be discussed in greater detail later in this section.

Figure 3.22 Wildland-Urban Risk Assessment of the Commonwealth



A working group led by the U.S. Forest Service developed the Northeast Wildfire Risk Assessment model that considered three components: 1) fuels, 2) wildland-urban interface, and 3) topography (slope and aspect). These three characteristics are combined to identify wildfire-prone areas where hazard mitigation practices would be most effective. Figure 3.22 Wildland-Urban Risk Assessment of the Commonwealth

displays Hancock as a low to medium wildfire risk, with higher risks concentrated slightly more in Southern Hancock, which is dominated by large tracts of state forest. However, medium risk levels are also noted throughout the Town's more residential sections where there is a greater density of people and, therefore, more pronounced forest-human interactions. Comparatively, in the eastern portion of the state, there are ranging moderate risk areas, which are a combination of fire-prone forest types (pitch pine-scrub oak and oak) and significant forest-human interaction.

Historic Data

Since 1983, the National Interagency Fire Center has documented an average of approximately 70,000 wildfires per year, with the number of burned areas increasing since the 1980s. Of the 10 years with the largest acreage burned, all have occurred since 2004, including the peak years in 2015 and 2020.[i] This period coincides with many of the warmest years nationwide, with the largest increases in the spring and summer months.[ii]

Land area burned by wildfires varies by state. Fires burn more land in the western United States than in the East, an average of 1.8 million acres burned in July of each year from 2003 to 2021.[iii] In Massachusetts, the extent of burned land increased by 0.01 acres per square mile in 2003- 2021 compared to 1994-2002.[iv] In 2022, Massachusetts was reported as having 1,192 wildfires with 1,756 acres burned.[v]

According to the 2019 Massachusetts Fire Incident Reporting System (MFIRS), the trend of wildfires (by incident, not by acres burned) reported to the DCR in the past five years has generally been downward.[vi] Between 2007 and 2016, 901 fire incidents, both urban and wildland, were recorded in Berkshire County. Of these, 411 incidents (46%) occurred in Pittsfield, the region's urban center. During this period, 832 acres were burned in the county, with 631 acres (76%) classified as wildland.

This data indicates that, on average, 63 acres of wildland were burned annually in Berkshire County over the ten years.

Among the 901 incidents, only 12 burned more than 10 acres; of these, two fires exceeded 100 acres. Notably, there were two significant wildland fires during this period: a 168-acre fire in Lanesborough in 2008 and a 272-acre fire in Clarksburg near the Williamstown border in 2015. Excluding these outliers, the average total burned acreage from 2007 to 2016 would be 39 acres, with the average wildland acreage burned to be 19 acres. In 2021, a wildfire that started in eastern Williamstown rapidly spread eastward across the town border into Clarksburg, consuming approximately 950 acres of forest land.

One of the largest wildfires in Massachusetts on record was in Plymouth in May 1957. This catastrophic fire burned 15,000 acres and destroyed about 40 structures. Another large fire in the same area in 1964 burned 5,500 acres. [vii] Table 3.15 list the Federal and State declarations of emergencies for wildfires in the Commonwealth.

Table 3.15: Federal and State Declaration of Emergencies for Wildfires

Date	Description of Event
5/19/1957	Plymouth, 15,000 acres: One of the largest wildfires on record destroyed about 40 structures.
10/16/1973	Suffolk County: FEMA declared disaster (DR 405).
12/3/1981	Essex County: FEMA declared disaster (DR 650).
1964	Plymouth, 5,500 acres: Large fire, destroyed cottages on Charge Pond.
9/12/1995	State Wide: FEMA declared disaster (DR 2116).
12/6/1999	Worcester: FEMA declared disaster (DR 3153).
07/05-07/2002	Western Massachusetts: Smoke from wildfires in northern Quebec obscured the sky, reduced visibility, and issued advisories.
04/04-05/2012	Dry conditions, combined with wind gusts between 25 and 30 mph, produced ideal conditions for fire spread. A brush fire in Brimfield moved into an area of blown down debris from a tornado and became difficult to control. Due to a thunderstorm, firefighters had to stop until the storm passed. This brush fire burned approximately 50 acres. No structures were destroyed; however, many homes were threatened.
4/19/2012	Leicester-Paxton, 1 acre: Fire in meadowlands off Route 56, one firefighter injured.

04/19-20/2012	Dedham-Boston, 100 acres: Fire spread near Route 128, burned meadowlands.
03/08-09/2016	Westfield, 60 acres: Brush fire on Tekoa Mountain, spread due to dry weather, no structures in the area.
07/22-24/2016	Joint Base Cape Cod, 125 acres: Lightning-caused fire, burned through night, contained after 36 hours, helicopters assisted.
Source: 2018 SHMCAP, FEMA Declaration for States and Counties	

Image 3.2 Wildfire in Clarksburg (2015)

Source: Berkshire Eagle, Photo Credit- Shane Naughton

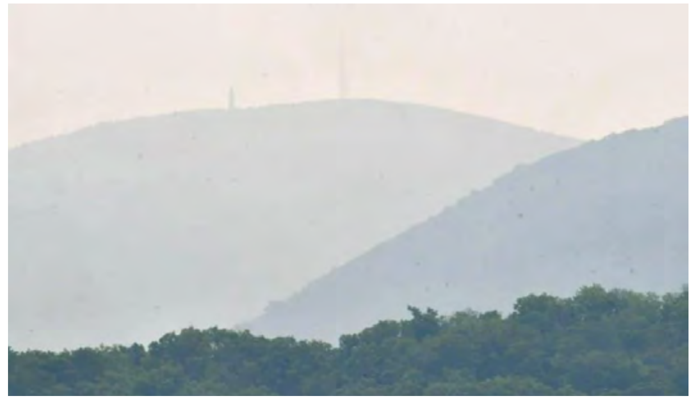
The Town of Clarksburg in northern Berkshire County has faced the two largest forest fires recorded in the county, occurring in 2015 and 2021. The 2015 fire began as a cooking fire at the Sherman Brook primitive campsite along the Appalachian Trail, which spread out of control under dry, Class 4 High fire danger conditions (Image 3.2 Wildfire in Clarksburg (2015)

It eventually consumed 272 acres within the Clarksburg State Forest. Incident reports indicated it was largely a surface fire, burning hardwood leaf litter and Mountain Laurel shrubs, rather than becoming a significant tree or crown fire. The firefighting efforts were complicated by the fire's inaccessible location and rugged, steep terrain. Initial firefighting required crews to hike with backpacks, portable water pumps, and refilling equipment from small mountain streams. Firebreaks were created using shovels, chainsaws, and leaf blowers. The fire was ultimately contained when the National Guard's Black Hawk helicopter began dropping 500 gallons of water at a time from the Mount Williams Reservoir in North Adams.[viii]

The 2021 East Mountain fire started on May 14th off Henderson Road in Williamstown and spread rapidly eastward. By May 16th, the fire had grown to almost 800 acres; by May 18th, it had consumed 950 acres, predominantly in Clarksburg. Similar to the 2015 fire, this blaze occurred in steep, rugged terrain inaccessible to fire trucks or tankers, necessitating firefighters and equipment being transported via ATVs or on foot. Firefighters accessed the site from landings in Williamstown and North Adams. Over 120 firefighters from 19 different companies and agencies in Massachusetts and Vermont battled the fire for four days, with support from water-dropping helicopters from the state police and National Guard. This fire, like the 2015 fire, was predominantly a surface fire, fueled by dry conditions likely resulting from the previous year's dry summer and fall season.[ix]

From June to July 2023, a nearly stationary low-pressure system near Maine and the Canadian Maritime Provinces caused persistent northerly winds to transport smoke from wildfires in Quebec into the northeastern U.S. This smoke event severely affected air quality for millions of people, resulting in Air Quality Index (AQI) readings that reached very unhealthy and hazardous levels in some areas. Visibility dropped to as low as one-half mile in places from Washington, D.C., to New York City, an uncommon occurrence given the distance from the source of the wildfires. (See Image 3.5).

Image 3.5 Berkshires blanketed in wildfire smoke during the 2023 Canadian Wildfires



Source: Berkshire Eagle, 2023. Photo Credit-Gillian Jones

The most significant near-surface smoke and poor air quality were observed on June 7th. During this period, tens of millions of people were under air quality alerts from June 6th through June 7th, with dense smoke advisories issued for near-shore waters. Air quality alerts remained in effect for several days across the northeast. In Massachusetts, five counties, including the Berkshires, exceed the Federal air quality standard for 24-hour particle pollution levels, prompting health officials to encourage people to wear masks, avoid going outside, and routinely check in with Air Quality updates.

Overall, more than 120 million people, roughly a third of the U.S. population, were affected by the smoke. In Canada, a record number of more than 20 million acres were charred by wildfires. The smoke led to schools adjusting outdoor activities and canceling recesses and field trips. The worsening air quality in New York was declared "an emergency crisis." For the Berkshires, it was considered the worst air quality event in 20 years. [x]

Vulnerability Assessment

Geographic Areas Likely Impacted

Hancock's vulnerability to wildfires is imparted due to its heavily forested landscape, which includes northern hardwoods, hemlock, and white pine, especially prominent in the Taconic Mountains and the Berkshire and Pittsfield State Forests. The lower slopes support forests dominated by sugar maple, American beech, yellow birch, and northern red oak, with some areas featuring a mix of eastern hemlock and eastern white pine. These second-growth forests, typical of New England, add to the fire risk due to their dense understory and accumulation of leaf litter. The ecosystems most susceptible to the wildfire hazard are pitch pine, scrub oak, and oak forests, which contain the most flammable vegetative fuels.

While the trees in Hancock are generally less fire-prone, the presence of eastern hemlock and eastern white pine does increase the likelihood of wildfire. Eastern white pine, in particular, has a high resin content, contributing to fire spread. However, Hancock has a lower wildfire risk compared to the eastern part of the state, where pitch pine and scrub oak communities are more abundant as well as large expansions of significant forest-human interaction.

Other areas susceptible to wildfires are those at the urban-wildland interface, shown in Figure 3.22. The SILVIS Lab at the University of Wisconsin-Madison Department of Forest Ecology and Management classifies exposure to wildfire hazards as "interface" or "intermix." [xi]

Intermix communities are those where housing and vegetation intermingle, with more than 50 percent vegetation and a housing density greater than one house per 16 hectares (approximately 6.5 acres).

Interface communities are defined as those in the vicinity of contiguous vegetation, with more than one house per 40 acres, less than 50 percent vegetation, and within 1.5 miles of an area of more than 500 hectares (approximately 202 acres) that is more than 75 percent vegetated.
To assess potential exposure and impacts related to wildfire hazards, inventoried assets such as population, building stock, and critical facilities were overlaid with these data. This method helps determine the most risky areas and requires focused wildfire management and mitigation efforts.

Hancock contains mostly intermix with the highest concentrations in Northern Hancock, indicating a moderate probability of wildfire impact compared to the rest of the town. The presence of intermixed areas, where housing and vegetation intermingle, increases the risk of wildfires spreading and impacting both natural and built environments. The assessment model has a flaw in that it does not consider human activity outside the wildland interface and intermix areas. Local firefighters and other first responders highlight that many wildfires occur in remote areas where campfires or discarded lit cigarettes cause the fires. Due to lack of access, these fires can gain significant ground before fire crews and equipment can reach them.

For example, the two largest wildfires in Berkshire County in the last 100 years, one in April 2015 (272 acres burned) and another in May 2021 (over 950 acres burned), occurred in areas in Clarksburg assessed as Low Wildfire Risk. An out-of-control campfire along the Appalachian Trail caused the 2015 fire. The cause of the 2021 fire was not specifically determined, but dry forest leaves and kindling due to drought contributed to its spread. The assessment modeling predicted a low risk of wildfire in the Clarksburg areas where the fires occurred, presumably because of a lack of a wildland-urban interface. These fires burned remote areas within Clarksburg State Forest, highlighting the model's limitations in accounting for human activities in remote locations.

People

People living in Wildland-Urban Interface areas are among the most vulnerable to wildfires. These areas are where homes and communities are near wildlands and forests, creating a higher risk due to the combination of human structures and flammable vegetation.[xii] The elderly and people with disabilities are particularly at risk because they may have limited mobility, making rapid evacuation challenging. Landowners with pets or livestock may face additional challenges in evacuating if they cannot easily transport their animals.

Changes in population patterns, such as an increasing population density and an aging population, can significantly affect the vulnerability to hazards. The higher population density in the northern and central portion of Hancock increases the number of individuals at risk during disasters. The elderly and people with disabilities are particularly at risk because they may have limited mobility, making rapid evacuation challenging. Given Hancock's aging population, which includes significant increases in age groups 70 and over, there is an elevated need for specialized emergency response strategies. The older adult population is more likely to have mobility issues, chronic health conditions, and a reliance on medical equipment, all of which complicate evacuation and sheltering during wildfire events.

Smoke and air pollution from wildfires can be a severe health hazard. Smoke generated by wildfire consists of visible and invisible emissions containing particulate matter (soot, tar, and minerals), gases (water vapor, carbon monoxide, carbon dioxide (CO2), and nitrogen oxides), and toxics (formaldehyde and benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Other public health impacts associated with wildfire include difficulty in breathing, reactions to odor, and reduction in visibility. Due to the high prevalence of asthma in Massachusetts, there is a high incidence of emergency department visits when respiratory irritants like smoke envelop an area. Additionally, they may suffer from health conditions that are exacerbated by smoke and poor air quality.

Low-income populations often live in less resilient housing and may lack access to transportation or resources needed for effective evacuation and recovery, as well as less access to information and emergency services. Children are also highly vulnerable due to their reliance on adults for evacuation and safety, as well as their increased susceptibility to the health effects of smoke and poor air quality.[xiii]

Outdoor workers, such as firefighters, construction workers, and agricultural laborers, face increased risks due to their direct exposure to fire and smoke. Individuals with respiratory conditions, such as asthma or chronic obstructive pulmonary disease (COPD), are particularly vulnerable to the smoke and poor air quality associated with wildfires. Additionally, homeless populations, who often lack the means to evacuate and are more exposed to immediate dangers and harmful effects of smoke, are at significant risk.

Built Environment

All buildings and other facilities are vulnerable to wildfire through direct impacts of burning or indirect through cut off from utilities. Building materials and design play a critical role; structures constructed with combustible materials such as wood are more likely to sustain damage, while those made with fire-resistant materials like brick, stucco, and metal are better protected. If any portion of a communications or electrical system were impacted by wildfire, it would impact a portion or the entire system. Additionally, the proximity of buildings to dense vegetation increases the risk, as flammable plants and trees can serve as fuel for fires. The layout of a community also affects its vulnerability, with narrow roads and inadequate evacuation routes impeding emergency response and evacuation efforts. Fires can create conditions that block or prevent access, and they can isolate residents and emergency service providers.

In addition to the immediate threat of flames, wildfires can cause secondary hazards that further impact the built environment and public health. One significant secondary hazard is the contamination of water reservoirs with ash and debris. When wildfires burn, the resulting ash can settle on surfaces and be washed into water bodies during subsequent rainfall. This can lead to degraded water quality in reservoirs, lakes, and rivers, affecting water supply and aquatic ecosystems. Ash in water can increase harmful substances, such as heavy metals and organic pollutants, making water treatment more challenging and expensive.

Wildfires can also lead to soil erosion and an increased risk of landslides. Removing vegetation by fire destabilizes the soil, making it more susceptible to erosion during heavy rains. This erosion can result in landslides that further damage infrastructure, block roads, and pose additional community hazards.

Natural Environment

Fire is a natural part of many ecosystems and serves important ecological purposes, including facilitating nutrient cycling from dead and decaying matter, removing diseased plants and pests, and regenerating seeds or stimulating the germination of certain plants. However, many wildfires, particularly man-made ones, can have significant negative impacts on the environment. In addition to direct mortality, wildfires and the ash they generate can disrupt nutrient flow through an ecosystem, reducing the biodiversity it can support. Frequent wildfires can eradicate native plant species and encourage the growth of invasive species.

Increased wildfire frequency can lead to forest health degradation in ecosystems not adapted to frequent fires.[xiv] These ecosystems can suffer long-term damage as they lack the natural resilience to recover quickly, leading to further ecological imbalances. Insects outbreaks, particularly in pine forests, can also occur following wildfires. Fortunately, most of the denser pine forests are located in the eastern part of the state, which may help mitigate this risk in other areas.

There are also risks related to hazardous material releases during wildfires. Containers storing hazardous materials can rupture due to excessive heat, acting as fuel for the fire and causing rapid spreading. This escalation can lead to unmanageable wildfire levels. Additionally, these materials can leak into surrounding areas, saturating soils and seeping into surface waters, causing severe and lasting environmental damage.[xv]The risk of hazardous material releases is higher in urban-wildland intermix and interface area.

Economy

Wildfires can have profound economic impacts on affected communities and regions, encompassing both immediate costs and long-term financial burdens. The immediate costs include firefighting expenses, which cover the deployment of firefighters, equipment, and resources to combat wildfires. These costs also include salaries, overtime pay, fuel, maintenance of equipment, and the use of aircraft for water and retardant drops. During severe fire seasons, these firefighting expenses can strain local and state budgets. Additionally, property damage from wildfires leads to significant financial losses for homeowners, businesses, and insurance companies, with the destruction of property necessitating substantial rebuilding and repair costs. Moreover, wildfires increase the demand for state and municipal government services to address the impacts of loss and damage. This increased demand can stretch local resources and budgets, leading to higher taxes or reallocation of funds from other essential services.

Evacuation and emergency services also add to the immediate economic burden, as costs associated with evacuations, emergency shelter, food, and medical care for displaced residents can quickly accumulate. [xvi] There are also many direct and indirect costs to local businesses that excuse volunteers from work to fight these fires.[xvii]

According to the Incident Status Summary, drafted by the state DCR Bureau of Forest Fire Control, at the close of the Clarksburg State Forest Fire of 2015, the cost to put out that fire was estimated to be between $20,000-30,000. This figure was for state-incurred costs and did not include locate fire company costs. The cost to the Clarksburg Fire Company was in the low thousands of dollars for food, water, equipment and other direct costs; uncompensated were the hundreds of volunteer firefighters who attended the fire and the local citizens who came to the staging area and provided food and support to the firefighters and other first responders at the scene.

Wildfires can disrupt local economies by forcing businesses to close, leading to a loss of income for business owners and employees. Tourism-dependent regions, in particular, suffer from decreased visitor numbers due to fire-related closures and perceived safety concerns. The agricultural and forestry sectors also face severe impacts, as wildfires can devastate agricultural lands and lead to crop losses, causing financial hardship for farmers. The forestry industry suffers from the loss of timber resources and long-term impacts on forest management and production. [xviii]

Future Conditions

During the summer months, Hancock experiences a significant population influx due to tourism and seasonal residents. This seasonal increase in population can exacerbate the impacts of wildfires in several ways:

- Increased Human Activity: More people means a higher likelihood of human-caused ignitions, such as campfires, barbecues, and discarded cigarettes.

- Evacuation Challenges: Evacuating a larger population, including tourists who may not be familiar with the area or evacuation routes, can be more complex and time-consuming.

With warming temperatures, it is likely that the Berkshires, known for its more temperate climate, will see an increase in population. This influx could occur seasonally, as more people visit during the summer months, and individuals from hotter regions permanently seek cooler areas to reside. This population increase may pressure emergency services and infrastructure, particularly during peak tourist seasons.

Hancock is rural, with a significant amount of land protected or lacks suitability for aggressive expansion. These restrictions confine any future development to the Town's existing developed areas, where opportunities exist for new housing in previously developed and lower-density development sites. This concentration of development increases the density of people living in the interface areas, where residential developments directly abut wildland vegetation, thereby elevating the risk of wildfire spread and impact.

Climate change is expected to significantly impact the occurrence and severity of wildfires through various mechanisms. Rising global temperatures lead to increased evaporation and reduced soil moisture, resulting in drier vegetation that fuels fires. Extended periods of drought, a consequence of climate change, further exacerbate this drying effect, making forests and grasslands more susceptible to ignition. Additionally, climate change is predicted to alter precipitation patterns, with some regions experiencing more intense and less frequent rainfall. This can create a cycle of wet conditions that promote vegetation growth followed by prolonged dry periods that increase fire risk. As droughts become more frequent and severe, forest types that do not usually burn and are not fire-adapted will be more likely to burn. This impact will negatively affect the timber harvest and production, recreation, and residents living near forested areas.

Furthermore, higher temperatures and changing weather patterns contribute to longer fire seasons. Historically, wildfire seasons have been limited to specific months, but climate change is extending these periods, allowing fires to occur more frequently throughout the year. Increased frequency of extreme weather events, such as heatwaves, strong winds, and lightning, also heightens the risk and intensity of wildfires.

Scientific studies indicate that these climate change-driven factors already contribute to more severe and frequent wildfires. For instance, the Intergovernmental Panel on Climate Change (IPCC) has reported that climate change has increased the risk of wildfires in many regions, and this trend is expected to continue as global temperatures rise.[xix] Overall, wildfires are projected to increase worldwide by 14% by 2030, 30% by 2050, and 50% 2100.[xx]

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i NIFC (National Interagency Fire Center). (2024). Total wildland fires and acres (1983–2023) [Data set]. Retrieved February 21, 2024, from www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html
ii MTBS (Monitoring Trends in Burn Severity). (2023). Direct download. Retrieved December 1, 2023, from www.mtbs.gov/direct-download

iii USDA (U.S. Department of Agriculture) Forest Service. (2014). 1991–1997 wildland fire statistics
iv NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2024). https://www.ncei.noaa.gov/access/billions/, DOI: 10.25921/stkw-7w73
v National Interagency Fire Center. Retrieved from Insurance Information Institute. Wildfires by Year. https://www.iii.org/table-archive/23284. Accessed July 2024
vi MFIRS 2019 Annual Report https://www.mass.gov/doc/2019-mfirs-annual-report/download. Note: 2019 is the most up-to-date publicly available report.
vii SHMCAP, 2018. EOEEA & MEMA, Boston, MA
viii Daniels, T., 5-1-15. "Clarksburg Brush Fire Contained on Third Day", as reported in iBerkshires
ix Guerino, Jack, 5-17-21. "Tuesday UPDATE: Forest Fire Operation Transitioning to 'Mop Up'", as reported in iBerkshires
x Berkshire Eagle. (2023). Wildfire smoke haze from Canada brings air quality alert to Berkshire County, Massachusetts.
xi 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan
xii U.S. Fire Administration. (n.d.). What is the WUI? Retrieved from https://www.usfa.fema.gov/wui/what-is-the-wui.html
xiii U.S. Environmental Protection Agency. Which populations experience greater risks of adverse health effects resulting from exposure to wildfire smoke?
xiv ResilientMass Plan: 2023 MA State Hazard Mitigation and Climate Adaptation Plan
xv, 96 Mass. Emergency Management Agency (MEMA) & the Exec. Office of Energy and Environmental Affairs (EOEEA), 2018. Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), Boston, MA.
xvi U.S. Fire Administration
xvii
xviii Headwaters Economics. (2018). The Full Community Costs of Wildfire. Retrieved from https://headwaterseconomics.org/wp-content/uploads/full-wildfire-costs-report.pdf
xix Intergovernmental Panel on Climate Change. (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg2-chapter14-1.pdf
xx ResilientMass Plan: 2023 MA State Hazard Mitigation and Climate Adaptation Plan

Drought

Hazard Profile

Drought is a period characterized by long durations of below-normal precipitation. Drought conditions occur in virtually all climatic zones, yet their characteristics vary significantly from one region to another relative to the normal precipitation in that region. A drought can last months or years and substantially impact the affected region's environment, ecosystem, and agriculture. Direct impacts of droughts include reduced crop, rangeland, and forest productivity, increased fire hazard, reduced water levels, increased livestock and wildlife mortality rates, and damage to wildlife and fish habitat.

The Massachusetts Office of Energy and Environmental Affairs (EEA) and MEMA partnered to develop the Massachusetts Drought Management Plan, of which December 2023 is the most updated version. The state's Drought Management Task Force, comprised of state and federal agencies, maximizes the state's ability to assess, prepare for, and respond to drought conditions effectively. Specifically, the DMP aims to minimize drought impacts on the Commonwealth by improving agency coordination, enhancing monitoring and early drought warning capabilities, and outlining preparedness, response, and recovery activities for state agencies, local communities, and other drought-related entities (EOEEA, 2019).

The Massachusetts Department of Conservation & Recreation (DCR)'s Office of Water Resources compiles data from various state agencies and develops a monthly Hydrologic Conditions Report. This report summarizes the condition of water resources across the Commonwealth, including the calculation of six drought indices: 1) Precipitation, 2) Groundwater, 3) Streamflow, 4) Lakes and Impoundments 5) Evapotranspiration, and 6) Fire- Keetch-Byram Drought Index.

Precipitation and groundwater are the main factors that determine drought or reduce the drought level. These two factors have the greatest long-term impact on streamflow, water supply, reservoir levels, soil moisture, and potential for forest fires. Precipitation is crucial because it directly influences the onset and improvement of drought conditions. Groundwater levels, however, respond more slowly to changes in precipitation, making them reliable indicators of long-term recovery to normal conditions.

Likely Severity

The severity of a drought is determined by several factors, including its duration, intensity, and the specific environmental and socioeconomic conditions of the affected area. Short-term droughts may primarily affect surface water and soil moisture, leading to moderate impacts such as reduced crop yields, increased wildfire risk, and stress on local water supplies. However, as drought conditions persist, the severity increases, with more significant consequences including prolonged water shortages, reduced streamflow, declining groundwater levels, and severe ecological impacts. The

Northeast can also experience “flash” droughts, the rapid onset of intense dry periods that can follow a period of normal to above-normal precipitation. While these flash droughts may last only 2–6 months, they can impact the region, resulting in agricultural losses, shortages in public water supplies, and very low stream flows.[i] Droughts are not usually associated with immediate impacts on people or property, but they can significantly impact agriculture, which can impact the region's farming community. According to the National Drought Mitigation Center, droughts related to agriculture are quite common. Over the period from 2000 through 2023, roughly 10 to 70 percent of the U.S. land area experienced conditions that were at least abnormally dry at any given time[ii]. Droughts are typically regional events affecting large areas rather than specific, localized spots. Because of this, when a drought occurs, it is likely to impact the entire community rather than just a small portion. In a town like Hancock, which relies heavily on well-based systems and an agricultural economy, a drought would likely affect over 80 percent of the town, making the location of occurrence "large."

According to the state’s DMP, drought conditions are classified into five levels:

1. Level 0 Normal (No Drought)
2. Level 1 Mild Drought (formerly listed as Advisory)
3. Level 2 Significant Drought (formerly listed as Watch)
4. Level 3 Critical Drought (formerly listed as Warning)
5. Level 4 Emergency Drought (formerly listed as Emergency)

These levels were selected to distinguish between different levels of drought severity and for adequate warning of worsening drought conditions. The U.S. Drought Monitor (USDM) uses percentile ranges to classify drought levels. The 2019 Massachusetts Drought Management Plan adopted similar thresholds but with four categories instead of USDM’s five. Both use these ranges to assess drought severity. However, Massachusetts does not rely solely on the USDM because it is a national tool and doesn’t account for local data such as the Commonwealth’s groundwater, lakes, and reservoirs. See Table 3.16 below.

Table 3.16 Comparison of Percentile Ranges for the Massachusetts DMP and the USDM

USDM Names	Recurrence	Percentile Ranges	MA DMP Levels	MA Percentile Ranges	MA DMP Names
D0: Abnormally Dry	once per 3 to 5 years	21 to 30	1	>20 and ≤30%	Mild Drought
D1: Moderate	once per 5 to 10 years	11 to 20	2	>10 and ≤20%	Significant Drought
D2: Severe Drought	once per 10 to 20 years	6 to 10	3	>2 and ≤10%	Critical Drought
D3: Extreme Drought	once per 20 to 50 years	3 to 5			
D4: Exceptional Drought	once per 50 to 100 years	0 to 2	4	≤2%	Emergency

Source: Massachusetts Drought Management Plan (2023)

The drought levels provide a framework from which to take actions to assess, communicate, and respond to drought conditions. Drought levels are used to coordinate both state agency and local response to drought situations. Water restrictions might be appropriate at the significant drought stage, depending on the capacity of each individual water supply system. A critical drought level indicates a severe situation and the possibility that a drought emergency may be necessary. A drought emergency is one in which mandatory water restrictions or use of emergency supplies is necessary.

MassDEP has the authority to declare water emergencies for communities facing public health or safety threats as a result of the status of their water supply systems, whether caused by drought conditions or for other reasons. The Department of Public Health in conjunction with the DEP, monitors drinking water quality in communities.

Probability

Berkshire County, including the Town of Hancock, generally faces a lower drought risk than other areas in Massachusetts. However, the potential for drought still exists, as historical records show instances where severe drought conditions were narrowly avoided. As temperatures rise, the likelihood of drought increases due to faster evaporation from reservoirs, waterways, and soils, as well as higher evapotranspiration rates in plants. These factors suggest that while the overall risk may be lower, the probability of drought cannot be ignored, especially with the potential impacts of climate change.

Historic Data

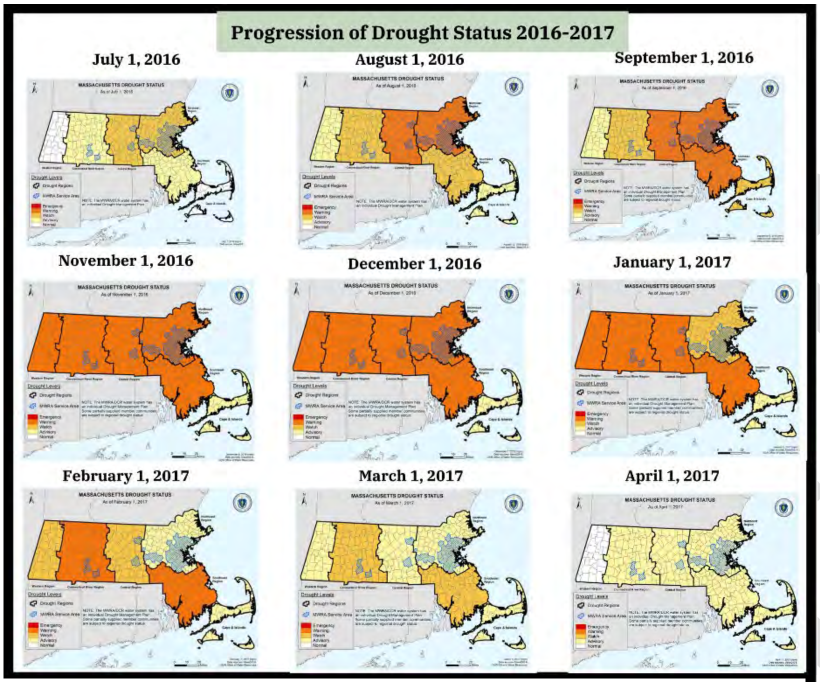
Massachusetts is a water-rich state that has never received a Presidential Disaster Declaration for a drought-related disaster; however, a few occurrences have been documented. The most severe, state-wide droughts occurred in:

- 1879-1883
- 1908-1912
- 1929-1932
- 1939-1944
- 1961-1969
- 1980-1983
- 2016-2017
- 2022

Several less severe droughts occurred in 1999, 2001, 2002, 2007, 2008, 2010, 2014, 2020, 2023, and 2024. The nine-year drought from 1961-1969 is considered the drought of record. The longevity and severity of this drought forced public water suppliers to implement water-use restrictions, and numerous communities utilized emergency water supplies. Residents have reported increasing instances of wells running dry or becoming contaminated with sediment, with such occurrences becoming more frequent over the past 15 years. Residents reported wells running dry or becoming dirty, occurring more frequently in the last 15 years.[1]

[1] This information was collected through a town-wide survey conducted as part of the hazard mitigation planning process.

Figure 3.23 Progression of Drought 2016-2017



Source: Drought Management Task Force, mass.gov

The most recent and significant drought in Massachusetts since the 1960s occurred during a 10-month span in 2016-17. In July 2016 Advisory and Watch drought levels began to be issued for the eastern and central portions of the state, worsening in severity until the entire state was under a Drought Warning status for the months of November-December 2016.

In general, the central portion of the state faired the worst, and Berkshire County faired the best, with the county entering the drought later and emerging earlier than most of the rest of the state. Berkshire County was under an Advisory (yellow on Figure 3.23 Progression of Drought 2016-2017) or Watch status (gold) for five months and under a Warning status (orange) for three months during the height of the drought. The Massachusetts Water Resources Commission stated that the drought was the worst since the state's Drought Management Plan was first issued in 2001 and the most severe since the 1960s drought of record. While the 2016-2017 drought showed precipitation totals at or above the 1960s drought, the streamflow and groundwater impacts were more severe than those of the 1960s drought.[iii] (EOEEA, 2019).

Vulnerability Assessment

Geographic areas likely impacted

To track drought conditions across Massachusetts, the state is divided into six regions, with Berkshire County forming the Western Region. The Town of Hancock, which relies solely on well water, is considered at risk of drought across its entire area despite the absence of a recent widespread drought event.

People

The entire population of Hancock is vulnerable to the effects of drought. Public health issues such as dehydration, heat-related illnesses, and respiratory problems can arise, with the elderly, young children, and those with preexisting health conditions being particularly vulnerable. Drought often brings extreme heat, which compounds these health risks, making it more difficult for these populations to stay cool and hydrated.

In periods of limited rainfall, both human and animal behavior can change in ways that increase the likelihood of other vector-borne diseases. For instance, during dry periods, wild animals are more likely to seek water in areas where humans live. These behaviors increase the likelihood of human contact with wildlife, the insects they host, and the diseases they carry. Drought reduces the size of water bodies and causes them to become stagnant, providing additional breeding grounds for certain types of mosquitoes (for example, Culex pipiens).[iv,v] Outbreaks of West Nile virus, transmitted to humans via mosquitoes, have occurred under such conditions. Inadequate water supply can cause people to collect rainwater, leading to stagnant water collections that can become manmade mosquito breeding areas.

Prolonged dry periods can significantly impact residents, particularly those who rely on well water, as the town does not have a public water supply. Drought conditions can lead to reduced groundwater levels, which may cause wells to dry up or produce lower yields, directly affecting residents' access to drinking, cooking, and sanitation water. Viruses, protozoa, and bacteria can pollute groundwater and surface water when rainfall decreases. People who rely on water from private wells may be at higher risk for drought-related infectious diseases. Other groups also at increased risk include those who have underlying chronic conditions.

Drought conditions can also lead to a decline in well water quality. Lower water levels in wells can increase the concentration of naturally occurring minerals, such as iron and manganese, which can affect the taste and color of the water. More concerning, however, is the potential increase in the concentration of harmful substances like arsenic, which is naturally present in the groundwater but may reach unsafe levels during periods of drought. [vi] These changes in water quality can pose significant health risks, particularly since these contaminants may not be detectable by taste or smell.

Farmers and hobbyist growers are especially at risk, as reduced water availability can lead to lower crop yields, limited growing season, financial stress, and long-term economic instability.

During a drought, there is also a risk of increased levels of airborne dust and pollen as dry soil and plants release more particles into the air. This rise in airborne particles can exacerbate respiratory issues, such as asthma and allergies, especially in individuals sensitive to aeroallergens. While mold typically thrives in damp conditions, droughts followed by sudden rains or irrigation can create environments conducive to mold growth. Previously dry areas exposed to moisture may see an increase in mold spores, which can trigger allergic reactions and respiratory problems.

Built Environment

Drought does not threaten the physical stability of critical facilities in the same way as wind-based or flood-related events. However, secondary hazards, such as reduced bank stability from dry soil in root zones, can increase erosion. Additionally, the risk of wildfires rises during drought conditions. Drought conditions severely complicate Hancock's firefighting efforts, as reduced stream levels limit the available water for drawing. This forces emergency services to shuttle water over longer distances, delaying response times and reducing effectiveness during wildfires. This reliance on limited water sources increases the risk to residents and infrastructure during fire emergencies.

Natural Environment

The natural environment is highly vulnerable to drought. Prolonged dry periods can lead to low streamflow and decreased groundwater levels, threatening the flow of streams and rivers. Cold-water fishery streams, which are critical habitats for native brook trout and other cold-water species, may become too dry or warm to support these species, leading to population declines.

Lower water levels in lakes and ponds force aquatic life into smaller volumes of water with lower oxygen levels, increasing stress and the likelihood of fish kills. Reduced groundwater recharge during drought further diminishes streamflow, degrading freshwater ecosystems that rely on consistent water levels.

Drought also stresses terrestrial ecosystems. Lower soil moisture can cause vegetation to die back, resulting in leaf drop in trees and dieback in forbs. This reduction in moisture limits the decomposition of plant and animal matter, leading to a build-up of dry material on the forest floor, which increases the risk of wildfires.

Forest health is particularly at risk, as drought weakens trees, making them more susceptible to pests and diseases. This weakening can lead to shifts in species composition, with drought-tolerant species potentially replacing those less adaptable. Drought conditions can also alter the distribution of both native and invasive species, allowing resilient invasive species to spread and further disrupt local ecosystems.

Economy

Drought can have significant economic impacts, particularly in the agriculture, recreation and tourism, energy, and forestry sectors. Agriculture is especially vulnerable, as drier summers and intermittent droughts can strain irrigation supplies, stress crops, and livestock, and either delay or force premature harvests. Hancock has 1,207 acres designated for agricultural use, making it the second-largest land use category after forests. A drought would directly impact this sector, leading to broader economic consequences for the town. Drought-related disruptions can reduce agricultural productivity, resulting in economic losses for farmers, farm workers, and nurseries while potentially increasing operational costs.

The tourism sector could also suffer, particularly recreation activities such as camping and water-based outdoor activities like fishing and kayaking. Reduced water levels and the deterioration of natural attractions due to drought could lead to a decline in visitors, affecting local businesses that rely on tourism.

During drought conditions, there is often an increased demand for electricity due to the higher use of air conditioning and irrigation systems, especially during hotter, drier summers. This energy demand can strain the local energy grid and potentially lead to higher energy costs.

Future Conditions

Climate change is expected to impact future drought conditions in Massachusetts significantly. Rising temperatures and shifting precipitation patterns will likely increase the length, frequency, and intensity of droughts. Although total annual precipitation is anticipated to rise over the next century, this increase will be accompanied by more severe and unpredictable dry spells. As discussed in greater detail in the Changes in Average Temperature/Extreme Temperature section of this plan, greenhouse gas emission models project a continued rise in temperatures, leading to a higher prevalence of days above 90°F and 95°F, as well as an increase in the frequency and duration of heatwaves. These extreme heat events are strongly correlated with drought conditions, as higher temperatures accelerate evaporation rates, further drying out soils and reducing water availability.

More intense rainfall over shorter periods will reduce groundwater recharge, as saturated ground cannot absorb as much water as more evenly distributed rainfall. This trend will be further exacerbated by a projected reduction in snowpack, which traditionally serves as a critical water source during the spring melt. The faster-than-normal snowmelt increases the risk of flooding and shortens the period during which groundwater can be recharged, reducing the natural water availability during the spring growing season. This reduced recharge will affect the stream's base flow, essential for sustaining ecosystems and groundwater-based water supply systems during dry periods.

Ground and reservoir-based water supply systems, such as the one at Hancock Shaker Village and Jiminy Peak, may also face challenges in meeting future demand, requiring adjusting operating rules to accommodate precipitation patterns and hydrology changes.

In terms of population patterns, Hancock may see an influx of people migrating from regions with severe climate impacts, like the western United States, which has experienced significant increases in heatwaves, droughts, and wildfires. This increase in population, particularly among socially vulnerable groups, could complicate emergency management during droughts. As the town grows, enhancing emergency communications will be important to ensure all residents are informed and prepared.

Although aggressive development is not planned for Hancock, the town's reliance on private wells and significant agricultural presence raises concerns about water availability during droughts. In many rural towns without a public water supply, specific land use policies or bylaws for drought planning may not be common. However, water conservation practices and integrating such measures into local guidelines are becoming a best practice as towns adapt to local climate changes. These integrated measures such as promoting efficient irrigation techniques, encouraging drought-resistant landscaping, and raising awareness about water conservation, aim to help residents and farmers manage water resources more effectively during dry periods.

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i National Integrated Drought Information System (NIDIS). Massachusetts drought. Drought.gov. https://www.drought.gov/states/massachusetts
ii National Drought Mitigation Center. (2024). U.S. drought monitor. Retrieved February 1, 2024, from https://droughtmonitor.unl.edu
iii MA Water Resources Commission, 2017. Annual Report, Fiscal Year 2017. Boston, MA.
iv https://www.mass.gov/info-details/mosquitoes-in-massachusetts
v https://www.cdc.gov/drought-health/health-implications
vi U.S. Geological Survey. July 2018. Drought may lead to elevated levels of naturally occurring arsenic in private wells. https://www.usgs.gov/news/national-news-release/drought-may-lead-elevated-levels-naturally-occurring-arsenic-private

Landslides

Hazard Profile

Landslides are the downslope movement of earth materials (like rock, debris, and soil) that can occur slowly over time or suddenly, sometimes moving faster than a person can run. In Massachusetts, the most common types of landslides are rotational and translational slides. Rotational slides involve a curved slip surface, causing the material to rotate as it moves, while translational slides occur on a flat surface, allowing debris to slide straight down. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors (USGS, 2013).

1) *Geologic* - Weak or sensitive materials, like clay or weathered rock, make some areas more prone to landslides.
2) *Morphologic* - Natural changes, such as erosion from rivers, glaciers, or waves, and events like earthquakes, volcanic activity, or vegetation loss from fires, can destabilize slopes.
3) *Human Activities* - Human actions like excavation, deforestation, mining, and adding heavy structures can increase landslide risks by disturbing slopes.

Most landslides require two key ingredients: a trigger and a suitable landscape. Common triggers include intense rainfall, drought, and geological events like earthquakes, while steep or mountainous areas are particularly prone to landslides. Slope saturation by water is a primary cause of landslides in the Commonwealth. This effect can be in the form of intense rainfall, snowmelt, changes in groundwater level, and water level changes along coastlines, earth dams, and the banks of lakes, rivers, and reservoirs. Water added to a slope can not only add weight to the slope, which increases the driving force, but can increase the pore pressure in fractures and soil pores, which decreases the internal strength of the earth materials needed to resist the driving forces (MEMA & EEOEA SHMCAP, 2018).

Likely Severity

Landslides can deliver sudden, devastating impacts, potentially burying homes, damaging infrastructure, and disrupting transportation and utilities. They are highly unpredictable and can range from slow-moving shifts to rapid, destructive flows that travel thousands of feet, even over flat ground.

Although most landslide-prone areas are concentrated in Western U.S., landslides still cause approximately 25 to 50 deaths annually in the United States, primarily due to debris flows that can occur without warning.[i] The financial toll is estimated to be in the billions annually, though indirect losses, like road closures that disrupt commercial traffic, are less well documented.

There is no universally accepted measure of landslide extent, but it has been represented as a measure of destructiveness varying with volume and speed. A 2001 study (Cardinali et al., 2002) estimated landslide destructiveness based on the volume and speed of material movement. Destructiveness varies by landslide type: fast-moving rock falls are the most intense, rapid debris flows are moderately intense, and slow-moving slides have the lowest intensity. Volume estimates depend on factors like movement depth for slides, catchment size and debris volume for flows, and block size for rock falls. For context, the 2011 Mohawk Trail landslide involved around 5,000 cubic yards of material.

Table 3.17 Risk of Landslide Destructiveness

Estimate Volume (cubic yards)	Expected Landslide Velocity		
	Fast moving (rock fall)	Rapid moving (debris flow)	Slow moving (slide)
<0.001	Slight intensity	--	--
<0.6	Medium intensity	--	--
>0.6	High intensity	---	--
<654	High intensity	Slight intensity	--
654-13,080	High intensity	Medium intensity	Slight intensity
13,080 – 65,398	Very high intensity	High intensity	Medium intensity
>653,976	--	Very high	High intensity
>>653,976	--	--	Very high intensity

Source: Cardinali, et al, 2002.

According to the Massachusetts Department of Transportation (MassDOT), the estimated average annual cost of highway contracts to address landslide problems from 1986 to 1990 was $1,000,000, with an additional $2,000,000 spent annually on landslide-related maintenance to keep highways safe. These figures only account for state highways and do not include local roads or private properties. For instance, remediation and cleanup of debris from four landslide-related events during an October 2005 rainstorm cost MassDOT $2,300,000.[ii]

Probability

For the purpose of this plan, the probability of future landslide occurrences is based on past events over a set period. From 1996 to 2012, nine notable landslides were reported in Massachusetts, though many occur in remote areas and go unobserved.[2] The Massachusetts Department of Transportation

[2] Available reports on landslide incidence, history, and probability in Massachusetts are limited, with few resources published after 2013 from state and federal sources.

(MassDOT) estimates that between 1986 and 2006, roughly 30 landslide events occurred, equating to one to three incidents annually.

Several key factors influence the probability of landslides in Massachusetts. Intense rainfall is a primary trigger, as heavy or prolonged precipitation saturates the soil, reducing slope stability. Soil type and geological composition also play a significant role; areas with clay-rich or loose soil are more prone to landslides due to their lower cohesion. Steep slopes in regions like the Berkshires increase landslide risk, particularly along highways and developed areas where slope modifications have occurred. Additionally, human activities such as construction, deforestation, and excavation can exacerbate landslide risk by altering natural slopes and drainage patterns.

With its hilly terrain and periodic heavy rain events, Massachusetts' landscape is particularly vulnerable to landslides during the spring thaw and following hurricanes or tropical storms. These environmental and human factors combine to increase the likelihood of future landslides across the Commonwealth.

To assess instability risk, the Massachusetts Geological Survey created an updated landslide hazard map in 2013, funded by FEMA's Hazard Mitigation Grant Program. This map helps the public and local governments identify areas at risk of landslides, especially during prolonged moisture or high-intensity rainfall. The results of this study for the Town of Hancock are illustrated in Figure 3.24 Town of Hancock Slope Stability Map, with a corresponding map legend on the following page.

Figure 3.24 Town of Hancock Slope Stability Map

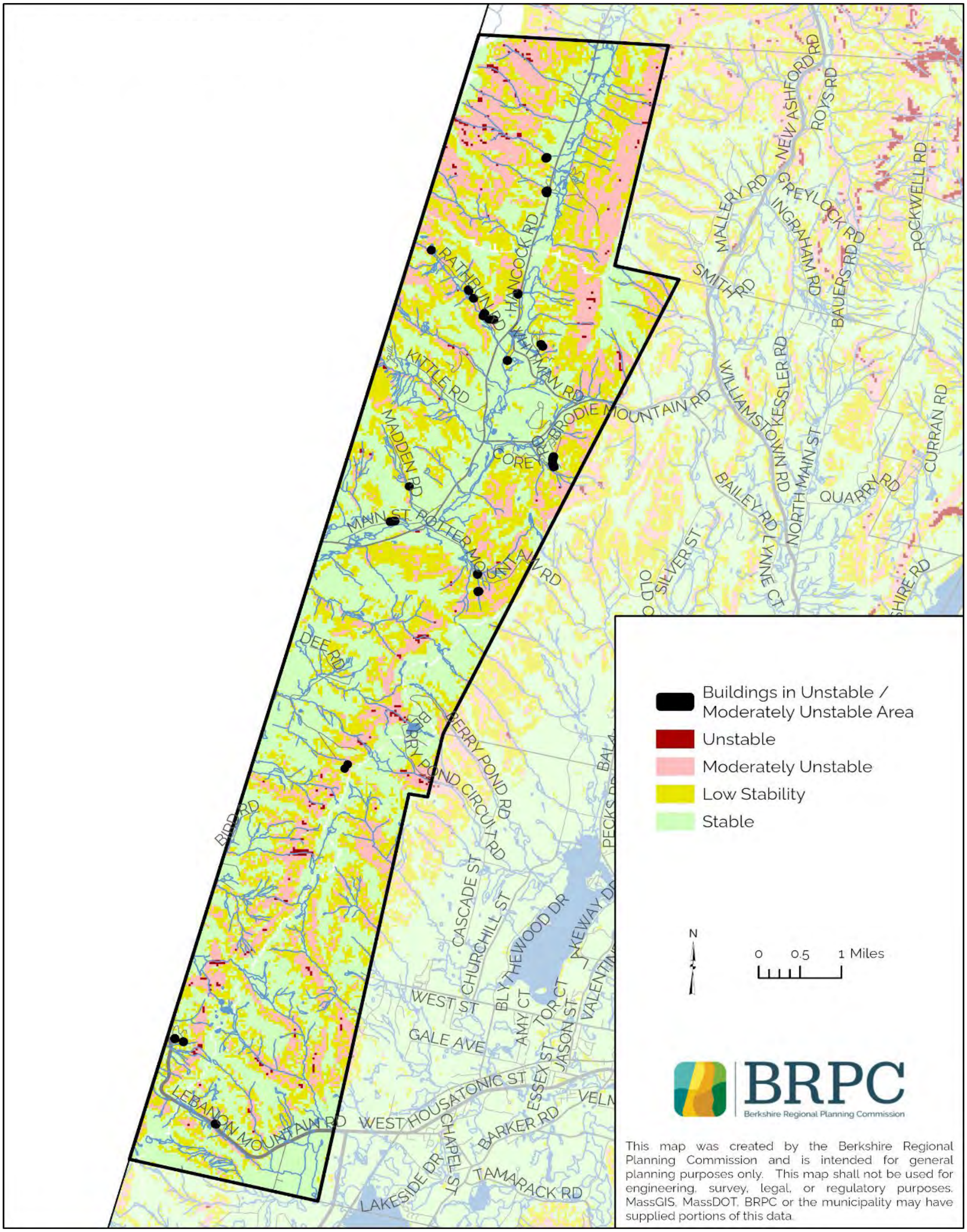

Table 3.18 Landslide Hazard and Stability Classification Table

Map Color Code	Predicted Stability Zone	Relative Slide Ranking[1]	Stability Index Range[2]	Factor of Safety (FS)[3]	Probability of Instability[4]	Predicted Stability With Parameter Ranges Used in Analysis	Possible Influence of Stabilizing or Destabilizing Factors[5]
	Unstable	High	0	Maximum FS<1	100%	Range cannot model stability	Stabilizing factors required for stability
	Upper Threshold of Instability		0 - 0.5	>50% of FS≤1	>50%	Optimistic half of range required for stability	Stabilizing factors may be responsible for stability
	Lower Threshold of Instability	Moderate	0.5 - 1	≥50% of FS>1	<50%	Pessimistic half of range required for instability	Destabilizing factors are not required for instability
	Nominally Stable	Low	1 - 1.25	Minimum FS=1	–	Cannot model instability with most conservative parameters specified	Minor destabilizing factors could lead to instability
	Moderately Stable		1.25 - 1.5	Minimum FS=1.25	–	Cannot model instability with most conservative parameters specified	Moderate destabilizing factors are required for instability
	Stable	Very Low	>1.5	Minimum FS=1.5	–	Cannot model instability with most conservative parameters specified	Significant destabilizing factors are required for instability

Source: Massachusetts Geological Survey, Mabee and Duncan (2013)

Relative Slide Ranking: This column designates the relative hazard ranking for the initiation of shallow slides on unmodified slopes.

Stability Index Range: The stability index is a dimensionless number representing the relative hazard for initiating shallow translational slope movements. It is calculated from the factors of safety at each point on a 9-meter (~30-foot) DEM grid derived from the National Elevation Dataset. This index, generated by the SINMAP model, assesses stability by considering both the most and least favorable stability parameters. The ranges are based on default values recommended by SINMAP developers.

Factors of Safety: The factor of safety (FS) is a dimensionless number representing the ratio of stabilizing to destabilizing forces for a slope, computed using a modified version of the infinite slope equation within SINMAP. An FS > 1 indicates a stable slope, while an FS = 1 represents a marginally stable condition where stabilizing and destabilizing forces are balanced.

Probability of Instability: This column reflects the likelihood that a factor of safety within the map unit is less than one (FS < 1), indicating instability, based on the range of parameters used. For instance, a probability of instability below 50% means the location is more likely to be stable than unstable under the analyzed conditions.

Possible Influence of Stabilizing and Destabilizing Factors: This column describes factors that may affect stability. Stabilizing factors include improved soil strength, root reinforcement, and drainage. Destabilizing factors include increased wetness, additional loading, or a loss of root strength.

Historic Data

According to FEMA, Landslides are a significant geologic hazard across the United States, occurring in all 50 states, with annual damages of $1-2 billion and over 25 fatalities on average. Landslides often occur alongside other major natural disasters, such as earthquakes and floods, complicating relief and reconstruction efforts.

In Massachusetts, landslides typically follow a pattern of two or more months of above-average precipitation, culminating in a single, high-intensity rainfall event of several inches or more (MEMA & EEOEA SHMCAP, 2018). Massachusetts has never had a federal disaster declaration specifically for landslides or mudslides. Table 3.17 Landslide Hazard and Stability Classification Table 3.18 below denotes significant historical occurrences, sourced from the State Geologist Office at the University of Massachusetts Amherst unless otherwise specified.

Image 3.6 Landslide in Savoy, MA along Mohawk Trail, 2011

Source: Massachusetts Geological Survey, Mabee and Duncan (2013)

The most severe landslide to occur in the Berkshire region occurred along Route 2 in Savoy during T.S. Irene in 2011(Image 3.7 Landslide in Savoy, MA along Mohawk Trail, 2011). The slide was 900 feet long, approximately 1.5 acres, with an average slope angle is 28° to 33°. The elevation difference from the top of the slide to the bottom was 460 feet, with an estimated volume of material moved being 5,000 cubic yards. Only the top 2 to 4 feet of soil material was displaced (BRPC, 2012). The soil and tree debris covered the entire width of Route 2 and caused its closure for weeks. The landslide has a significant impact on norther Berkshire County communities because Route 2 is a major east-west transportation route in that region.

Table 3.19 Historic Landslides in Massachusetts

Date	Event Description
1901	11 landslides occurred along the east face of Mount Greylock after heavy rains (Mabee, 2010).
1936	One home was destroyed, and six others were evacuated during a slide in North Adams (Mabee, 2010).

June 13, 1996	Thunderstorms brought torrential rain and strong winds to western and central Franklin County. Mudslides and flooding damaged the Ashfield Inn, Greenfield Senior Citizens Center, and several homes in Greenfield.
April 16, 2007	A strong coastal storm caused flooding and a mudslide that closed a portion of Route 112 in Colrain, Franklin County.
September 6, 2008	Remnants of Tropical Storm Hanna caused widespread flooding in central Hampden County, resulting in minor mudslides on Route 32 in Wilbraham.
September 2008	A small landslide in Holyoke covered several cars and a paved area under mud and debris, likely caused by saturated soils and poor drainage.
July 7, 2009	Showers and thunderstorms led to flooding and mudslides in Middlesex County, particularly affecting Framingham and Marlborough.
March 14, 2010	Heavy rainfall caused a mudslide across Route 1 in Topsfield, closing the road in both directions.
March 7, 2011	Heavy rains and melting snow led to a mudslide in Greenfield, Franklin County, causing property damage and evacuations, totaling approximately $100,000 in losses.
August 2011	Hurricane Irene caused landslides, debris flows, and extensive road damage along a 5.8-mile section of Route 2 from West Charlemont to South County Road in Florida. Temporary repairs were estimated at $23.5 million (Mabee and Kopera, 2011).
October 2011	Post-October snowstorm slides in Deerfield caused culverts clogging, leading to wetland siltation and flooding of nearby homes (Mabee, 2010).

Vulnerability Assessment

Geographic Areas of Concern

As mentioned previously, the most common time of landslides in Massachusetts results from slope saturation which happens when water infiltrates and saturates soil layers on a slope, increasing the likelihood of failure. Landslides triggered by saturation usually occur on steep slopes underlain by bedrock (solid rock beneath the surface) and glacial till (a mix of unsorted sediment deposited by glaciers). Bedrock and glacial till are relatively impermeable compared to the soil layer above them, which allows water to accumulate at the interface, increasing pore pressure and creating a potential plane of weakness. When these conditions align, slope failure can occur (Mabee, 2010, as cited in MEMA & EOEEA, 2018).

Certain geologic conditions further increase landslide susceptibility, particularly in areas with marine or lacustrine clay deposits, clays with low strength that often formed in ancient glacial lakes. These deposits are scattered throughout specific parts of Massachusetts and are especially prone to landslides when saturated (MEMA & EEOEA SHMCAP, 2018). While individual landslides are unpredictable, slope stability maps help identify areas where landslides are more likely to occur following heavy rainfall or rapid snowmelt.

The slope stability map (Figure 3.24 Town of Hancock Slope Stability Map) identifies unstable and moderately unstable areas primarily along the steeper slopes of the Taconic Mountains, which encompass significant portions of the Taconic Trail State Park, Forbush Sanctuary, and the Misery Mountain Wildlife Management Area on the western aspect of north and central Hancock. Similarly, on the eastern aspect, ridgelines associated with the Pittsfield State Forest (Berkshire Mountains) also exhibit notable vulnerability. Conservation and agricultural status limit development in these unstable zones. Residential areas, critical facilities, and the Jiminy Peak Mountain Resort, Hancock's primary economic driver, are in more stable regions. In total, approximately 183 acres are categorized as "Unstable" and 4,193 acres as "Moderately Unstable."

People

23 residential structures, majority of which are on Rathbun Rd, are located within areas classified as unstable or moderately unstable. The town's geography, situated between the Taconic and Berkshire Mountain ranges and within a central valley, creates significant concerns regarding road access. Landslides have the potential to block vital routes, especially for households on dead-end streets, isolating residents and delaying emergency response. The risk is heightened by unpaved roads, which are more susceptible to erosion and instability during periods of heavy precipitation, a common trigger for landslides in the northeast.

Populations reliant on roads for critical transportation, including access to healthcare and emergency services, are particularly vulnerable. Increasing development on slopes and bluffs exacerbates this risk, potentially exposing more residents to landslide hazards. For Hancock, the greatest human impacts stem from infrastructure damage that restricts emergency access and disrupts essential services. Landslides on major roads can deposit large volumes of debris, leading to extended closures and significant repair costs, compounding the challenges faced by the community.

Residents most vulnerable to landslides include:

- Lower-income residents may live in older or less stable housing, lacking structural reinforcements to withstand landslide forces, and have fewer resources to recover from displacement or property damage.
- Older residents with limited mobility may face difficulties evacuating quickly and may lack support networks for preparedness and recovery.
- People with disabilities or medical needs may need specialized assistance during evacuations and may face disrupted access to essential services in landslide-prone areas.

- Tourists in Hancock's scenic areas, trails, and resorts may be unfamiliar with local risks and evacuation routes, increasing their vulnerability.

Loss of life from landslides can occur due to the sudden, powerful movement of earth and debris, which can bury or crush anything in its path before individuals have time to evacuate. While landslides lack a standardized early warning system, a combination of weather monitoring, soil movement sensors, and public awareness can sometimes provide limited advance notice, allowing residents in high-risk areas to take precautionary steps.

Built Environment

The slope stability analysis for Hancock identifies a total of 25 structures that are fully or partially located within areas classified as Unstable or Moderately unstable with 23 of them as Residential Single family, 1 each for Residential Two family, residential multi family, and residential multi family. The remaining is (1) agricultural on Lebanon Mtn Rd and (1) commercial industrial/office) as Berkshire Valley Inn. The combined value of buildings on properties in both unstable and moderately unstable areas in Hancock is estimated at $6,020,100. Including building contents, estimated at 50% of building value, the potential total building loss due to landslide risk rises to approximately $12,040,200.

It's important to note, as referenced in the Inland Flooding cost estimate analysis that these figures are based on assessed values rather than market or replacement values. Consequently, the actual reimbursement needed to restore buildings to pre-disaster conditions may be higher, as assessed values often underestimate full replacement costs.

Buildings, transportation routes, and essential infrastructure in Hancock are highly vulnerable to both direct and secondary impacts from landslides. Landslides pose immediate threats by causing structural damage and obstructing key routes such as Route 43, potentially isolating parts of the community and delaying emergency response efforts. In the mountainous terrain of Hancock, landslides impacting transmission towers could lead to prolonged power outages, affecting residents and critical facilities, and creating hazardous conditions for both residents and emergency responders.

Secondary hazards from landslides are a significant concern for water quality. Landslides often carry sediment, rocks, and other potentially harmful materials into local waterways, leading to contamination (EOEEA ResilientMA Plan, 2023). While these draw from deeper sources, contamination of nearby rivers and streams could seep into groundwater over time, impacting water quality and requiring costly cleanup.

Natural Environment

Landslides impact multiple aspects of the natural environment, including the landscape, water quality, and habitat health. Soil and organic materials can be carried into streams, reducing water quality and harming aquatic ecosystems. Forest health may suffer as the mass movement of soil can uproot trees and understory vegetation, and the stripped landscape often lacks the topsoil necessary for flora to re-establish. Streams and water bodies near landslide areas face heightened pollution risks, and excess sediment can create natural dams, impacting both water quality and fish habitats (EOEEA ResilientMA Plan, 2023).

Economy

Landslides pose economic risks for Hancock by potentially damaging property, infrastructure, and key services. Buildings, roads, and utility lines in steep-slope areas are especially vulnerable, and landslides in these locations could lead to disruptions due to road closures and utility outages. For individuals who work from home or operate as a small home business, these interruptions can impact operations, while damage to transportation routes could delay the movement of goods. Additionally, property values in affected areas may decline, reducing the town's tax revenue base. The financial burden of cleanup, debris removal, and infrastructure repair can also strain town and state resources, adding to the economic impact of landslides. For example, the damage to a 6-mile stretch of Route 2 caused by tropical storm Irene in 2011, which included debris flows, four landslides, and fluvial erosion and undercutting of infrastructure, cost $23 million for the initial repairs (MEMA & EEOEA SHMCAP, 2018).

Landslides may disrupt access routes to farms and result in delayed delivery of supplies and products, which can affect income for local farmers. Furthermore, soil displacement and debris from landslides could contaminate fields or water sources used for irrigation, increasing costs for recovery and remediation.
Trails and natural attractions frequented by tourists in both summer and winter are increasingly susceptible to landslides and erosion. Heavy use, combined with weather shifts and more frequent intense storms, may degrade popular trails, requiring more maintenance or rerouting, especially in landslide-prone zones.

Future Conditions

The increased likelihood of landslides is directly linked to the projected rise in heavy precipitation events. As outlined in the Inland Flooding section of this plan, climate models project an increase in annual precipitation of 3.55 inches by the 2050s and 4.72 inches by the 2090s. Coupled with these projections and anticipated frequent and intense storms, driven by warming atmospheric and ocean conditions, are expected to lead to prolonged soil saturation, elevating landslide and mudflow risks. Additionally, warmer winter temperatures leading to more frequent freeze-thaw cycles keep soils wetter and more susceptible to movement. Projected increases in droughts and wildfires also pose indirect landslide risks by reducing vegetation cover, which compromises soil stability.

Shifts in population patterns, such as climate migration, could bring more people to the area. For instance, people relocating from urban areas with higher risks of climate-related hazards (e.g., coastal flooding or extreme heat) may seek refuge in quieter, rural settings like Hancock. Even small increases in population could increase the number of residents living near landslide-prone areas, raising the importance of preparedness and response planning for potential landslide events. As Hancock and Jiminy Peak adapt to unpredictable snow seasons by promoting more year-round activities, there will likely be an influx of visitors during spring and fall, when landslide risk from soil saturation is higher. This shift in tourism patterns increases the exposure of visitors to landslide risks, necessitating public education, trail management, and possibly even seasonal restrictions or enhanced safety measures in certain areas.

Upgrading existing infrastructure or residential additions, could impact landslide vulnerability. Increased access to rural or steep-sloped areas, for instance, might require road maintenance or slope stabilization measures. Future land use decisions, even minor ones, will benefit from evaluating and minimizing risks to ensure that homes, roads, and utility lines aren't placed in vulnerable areas. Furthermore, limiting development in steep or landslide-prone regions helps maintain natural land buffers that contribute to slope stability.

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[i] https://community.fema.gov/ProtectiveActions/s/article/Landslide
[ii] MassDOT estimates retrieved from the Massachusetts slope stability map and landslide risk assessment. https://www.geo.umass.edu/stategeologist/Products/Landslide_Map/Slope_Stability_Map_MA_Report.pdf

Earthquakes

Hazard Profile

Earthquakes are natural events caused by the sudden release of energy within the Earth's crust, creating seismic waves. Earthquakes have no season or time of day; they can occur anytime without warning. Because earthquakes originate in the rock miles below the earth's surface, they are unaffected by the weather. Earthquakes occur along faults, fractures in the Earth's crust, where tectonic plates move and shift. The northeastern U.S. is part of a stable continental interior, with less intense seismic activity than along tectonic plate boundaries. However, earthquakes in this region can still cause damage due to the underlying geological conditions, which can amplify seismic waves.

Although earthquakes in Massachusetts are less frequent than in more seismically active regions, they still pose a potential hazard. Although Hancock and the broader Berkshire County region are not near major fault lines, the state has experienced low-magnitude earthquakes.

Several agencies oversee the monitoring and mitigating of earthquake impacts in Massachusetts and across the U.S. The U.S. Geological Survey (USGS) monitors seismic activity and provides hazard assessments, while the New England Seismic Network (NESN) tracks regional seismic events. At the federal level, the National Earthquake Hazards Reduction Program (NEHRP) coordinates efforts through agencies like FEMA, NIST, and NSF to support research, establish building codes, and enhance public preparedness. Locally, the Massachusetts Emergency Management Agency (MEMA) helps ensure statewide readiness and response to earthquake risks.

Likely Severity

The severity of an earthquake is determined by its magnitude, focal depth, and location relative to population centers. Earthquakes with shallow focal depths (up to 43.5 miles) generally cause more surface damage because seismic waves lose less energy as they travel toward the surface. Though potentially powerful, deeper earthquakes tend to have a lesser impact on surface structures.

Magnitude is measured on the Richter scale, which records the amplitude of seismic waves. Earthquakes with a magnitude of 5.0 or higher have the potential to cause damage near their epicenter. However, damage is also dependent on the local population density and building resilience. Even from quakes of the same magnitude, a densely populated area can experience greater devastation than a remote location.

The intensity of shaking, as perceived by those in the affected area, is described using the Modified Mercalli Intensity (MMI) scale below. Unlike the Richter scale, which measures seismic energy, the MMI scale rates how strongly the earthquake is felt and the extent of damage in specific locations, ranging from I (not felt) to XII (total destruction). This variability in intensity explains why a single earthquake can be barely noticeable in one place but cause severe damage in another.

Figure 3.25 Modified Mercalli Intensity (MMI) Scale

I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Due to the low frequency of earthquakes and typically mild ground shaking, both the Commonwealth of Massachusetts and the Town of Hancock face a low to moderate risk of earthquake damage compared to other regions in the country (NESEC, n.d.). However, impacts at the local level can vary based on types of construction, building density, and soil type, among other factors (EEOEA SHMCAP, 2018; EOEEA ReslientMA Plan, 2023). For example, unreinforced masonry buildings are especially vulnerable to damage from ground shaking. Secondary hazards from earthquakes can affect critical infrastructure and non-critical structures alike. Fires in residential buildings, landslides, and wildfires, are common secondary impacts.

There is a small but present risk of soil liquefaction in areas with loose, water-saturated soils, such as river valleys or floodplains. This phenomenon occurs when intense shaking causes these soils to behave like a liquid, potentially damaging buildings and infrastructure. Although liquefaction generally requires an earthquake of magnitude 5.0 or higher, uncommon in the region, the risk exists in areas with susceptible soil profiles. Much of the soil in Western Massachusetts is composed of glacial till and other dense materials that are less prone to liquefaction compared to areas with more extensive sandy or loose soils (NESEC, n.d.)

Probability

The USGS has characterized the Northeast U.S. as a low to moderate earthquake hazard region indicating an approximately 2% chance of experiencing a potentially damaging earthquake over the next 50 years. However, the probability of an earthquake with a magnitude of 5.0 or greater occurring within New England in a 10-year period is estimated to be around 10–15%, though not all such earthquakes would necessarily cause significant damage (EOEEA ResilientMA Plan, 2023).

While statistically low, the occurrence of an earthquake is not impossible. According to the Massachusetts Geological Survey and the New England Seismic Network, earthquakes of magnitude 3.0 to 4.0 occur periodically in the region, but significant earthquakes are rare (Ebel, 2012).Earthquakes in other parts of New England or Canada could also affect the Commonwealth.

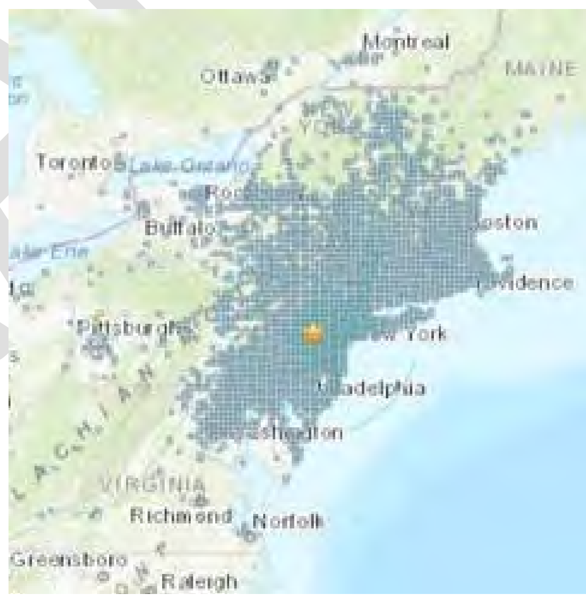
Historic Data

USGS reports that two smaller earthquakes are felt each year throughout New England. Massachusetts has never been a state or federal disaster declaration for earthquakes. However, historical records show that the Commonwealth has experienced larger earthquakes. For example, in 1727, an earthquake, estimated at a magnitude of 5.6 to 6.0, struck near Newbury, Massachusetts, causing structural damage and being felt as far away as Pennsylvania and Nova Scotia. In 1755, the Cape Ann earthquake, estimated at a magnitude of 6.0 to 6.3, struck off the coast of northeastern Massachusetts on November 18, 1755. It caused widespread damage to New England's chimneys, buildings, and infrastructure. This remains one of the most significant seismic events in the region's history.

On April 20, 2002, a 5.1-magnitude earthquake shook Berkshire County, waking residents and causing noticeable vibrations. People described the shaking as loud, like a passing train or truck, with items rattling on walls. The only reported damage was a cracked foundation on Houghton Street in Clarksburg, and no injuries occurred. Another notable earthquake, centered in Virginia on August 23, 2011, was also felt in Western Massachusetts. Small earthquakes seem to occur regularly in some places in New England. For example, since 1985, there has been a small earthquake approximately every

2.5 years within a few miles of Littleton, Massachusetts. It is not clear why some localities experience such clustering of earthquakes, but a possibility suggested by Weston Observatory at Boston College is that these clusters occur where strong earthquakes were centered in the prehistoric past. The clusters may indicate locations with an increased likelihood of future earthquake activity. According to the Weston Observatory Earthquake Catalog, thousands of earthquakes have occurred in New England and adjacent areas. However, only 35 of these events were considered significant ((MEMA & EEOEA SHMCAP, 2018).

Figure 3.26 An earthquake centered in New Jersey in



Source: USGS as reported in the NY Times 2024

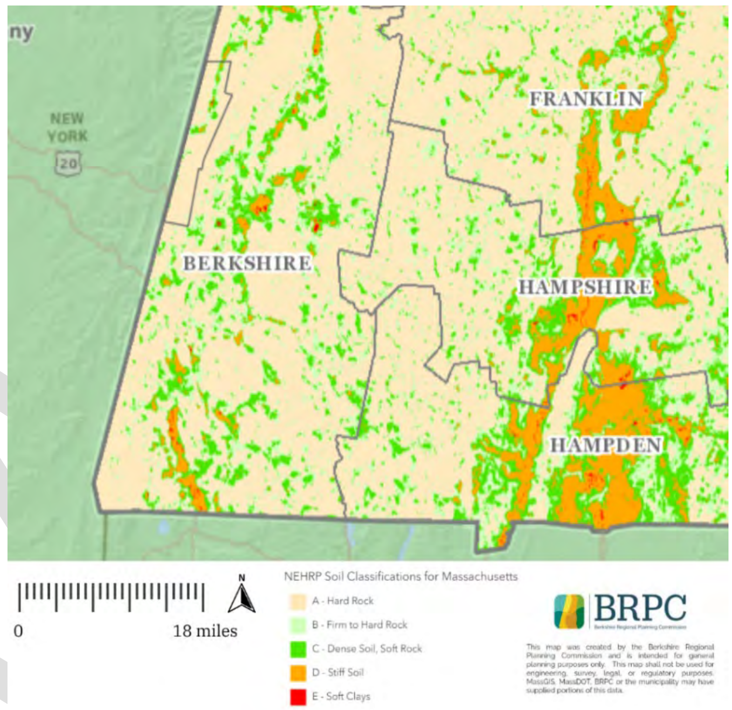
More recently, in April 2024, a 4.8-magnitude earthquake occurred in NJ and was recorded by the USGS as the strongest earthquake in Massachusetts in the past 10 years. The relatively mild earthquake caused noticeable shaking and startled residents, but no major damage or injuries were reported. (Davis et al., 2024). See **Figure 3.25** An earthquake centered in New Jersey in 2024 was felt through much of the Northeast..

Vulnerability Assessment

Geographic areas of concern

New England lies in the middle of the North American Plate, which is being compressed by global tectonic movements. The plate's western edge collides with the Pacific Plate, while the eastern edge spreads away from the European and African Plates in the Atlantic Ocean. This compression causes cracks in the Earth's crust, leading to earthquakes. Unlike regions with well-defined fault lines, New England's earthquakes do not follow mapped faults or specific geological structures, meaning seismic activity could occur anywhere in the region. A probabilistic analysis using HAZUS, nationally recognized software program developed by FEMA, to elevate earthquake impacts in Massachusetts for various Mean Return Periods (100, 500, 1,000, and 2,500 years) (MEMA & EEOEA SHMCAP, 2018). Statistical findings are noted further in this section.

Figure 3.27 NEHRP Soil Classification (2024)



Ground shaking is the primary cause of earthquake damage to man-made structures, and this damage can be worsened by soft soils that amplify shaking. The velocity at which soil or rock transmits shear waves (S waves) affects how much shaking is amplified. The National Earthquake Hazards Reduction Program (NEHRP) classifies soils from A (hard rock, which reduces ground motions) to E (soft soils, which amplify shaking and increase damage). Soil classifications are incorporated into the HAZUS analysis to assess earthquake exposure and vulnerability in Berkshire County (MEMA & EOEEA, 2018). Hancock's most developed area consists primarily of dense soil and soft rock, which suggests that ground shaking during an earthquake could be moderately amplified. This characteristic could lead to an increased risk of damage to structures, highlighting the need for proper building standards to account for potential seismic activity.

People

The entire population of Massachusetts is vulnerable to direct or indirect impacts from earthquakes, with risks influenced by factors such as building construction, soil type, and proximity to faults. Structures built on soft soils amplify ground shaking, increasing damage potential. Earthquakes can disrupt daily life through business interruptions, road closures, and utility loss, even for those without direct damage.

Vulnerable groups, including the elderly, low-income residents, and residents in substandard housing, face greater risks due to limited resources for preparation and recovery. HAZUS modeling provides estimates of injuries and casualties depending on the time of day and the severity of the event, highlighting peak vulnerability during times of high occupancy, such as residential hours at 2 a.m. and commuting periods at 5 p.m. Table 3.19 summarizes potential injuries and casualties in Berkshire County under various scenarios.

Additionally, displaced residents may need temporary or long-term shelter, although shelter needs vary. Many displaced individuals may prefer hotels or families to shelters. HAZUS estimates offer general guidance, particularly noting that shelter demands may rise during winter if an earthquake leads to infrastructure failures, such as heat loss. While these estimates are valuable for planning purposes, they should be seen as broad averages rather than exact figures (MEMA & EEOEA SHMCAP, 2018).

Table 3.20 Estimated Number of Injuries, Causalities, Sheltering Needs in Berkshire County based upon Mean Return Period

Mean Return Period (MRP)	100-Year MRP			500-Year MRP			1,000-Year MRP			2,500-Year MRP		
Time of Event	**2 am**	**2 pm**	**5 pm**	**2 am**	**2 pm**	**5 pm**	**2 am**	**2 pm**	**5 pm**	**2 am**	**2 pm**	**5 pm**
Injuries	0	0	0	4	6	4	9	13	10	22	35	25
Hospitalization	0	0	0	0	1	1	1	2	1	3	6	5
Casualties	0	0	0	0	0	0	0	0	0	1	1	1
Displaced Households	0			21			51			143		
Short-Term Sheltering Needs	0			12			29			82		

Source: MEMA & EOEEA, 2018 HAZUS

Built Environment

All elements of Hancock's built environment are exposed to earthquake hazards. Municipal water, sewer lines, and energy infrastructure, including power plants, gas lines, and transmission systems, could be damaged, leading to widespread service disruptions. Earthquakes may also trigger hazardous material releases from facilities, transportation, and pipelines, posing significant environmental risks. Secondary hazards like soil liquefaction, landslides, and wildfires could amplify damage. Liquefaction, in particular, threatens building foundations and infrastructure in water-saturated areas, increasing the risk of structural failure. State estimates that Estimated transportation and utility losses of nearly $10.1 million from a 100-year MRP earthquake and over $1.3 billion from a 2,500-year MRP earthquake (EOEEA ResilientMA Plan, 2023; MEMA & EEOEA SHMCAP, 2018). Earthquakes may damage cultural resources, which can be irreplaceable and hold significant historical, social, or economic value. The loss of these assets not only affects the community's heritage but can also have long-term impacts on tourism and local identity.

Natural Environment

Earthquakes can significantly impact natural resources and ecosystems through direct and secondary effects. Gas pipe damage may lead to hazardous material spills, contaminating water sources and local environments. Fires triggered by earthquakes can devastate ecosystems, while strong shaking may cause trees to fall or cliffs to collapse, disrupting habitats. Physical changes to ecosystems can disturb species balance, leaving areas more vulnerable to the spread of invasive species. Soil erosion, landslides, and contamination of water bodies may further compound the environmental impacts (EOEEA ResilientMA Plan, 2023; MEMA & EEOEA SHMCAP, 2018).

Economy

Economic impacts from earthquakes include loss of business functions, inventory damage, relocation costs, and wage and rental losses due to building repairs. Business interruption losses occur when businesses cannot operate, and temporary living expenses may be incurred for displaced residents.

In agriculture, earthquakes can cause crop and livestock losses and damage to barns and equipment, especially if landslides occur. Additional costs, such as debris removal and repair of transportation and utility systems, further compound economic losses. Table 3.20 Economic Loss Estimates, HAZUS Probabilistic Scenarios summarizes building-related losses for earthquake scenarios in Massachusetts (EOEEA ResilientMA Plan, 2023; MEMA & EEOEA SHMCAP, 2018).

Table 3.21 Economic Loss Estimates, HAZUS Probabilistic Scenarios

Economic Losses for Berkshire County	100-Year MRP	500-Year MRP	1,000-Year MRP	2,500-Year MRP
Building-Related Loss Estimates, Hazus Probabilistic Scenarios	$570,000	$25,660,000	$66,220,000	$200,810,000
Transportation and Utility Losses	$170,000	$7,800,000	$23,180,000	$74,200,000

Source: MEMA & EOEEA, 2018 HAZUS

Future Conditions

While climate change does not directly cause earthquakes, the resulting environmental changes could amplify secondary hazards. Increased precipitation, shifting weather patterns, and the destabilization of soils could elevate the risk of landslides following seismic activity, compounding the damage from earthquakes. These environmental shifts may also increase the risk of soil erosion, especially in rural areas like Hancock, where soil conservation is vital for the landscape's stability (EOEEA ResilientMA Plan, 2023; MEMA & EEOEA SHMCAP, 2018).

The population dynamics in Hancock, particularly its aging demographic, will also affect future earthquake resilience. Older populations tend to have less mobility and may rely more on infrastructure vulnerable to damage, such as bridges, roads, and hospitals. This reliance could increase the demand for emergency services and disaster response capabilities following an earthquake. (EOEEA ResilientMA Plan, 2023; MEMA & EEOEA SHMCAP, 2018)

Building codes should be updated to ensure that renovations and small projects meet seismic safety standards. Retrofitting older structures will also enhance their ability to withstand earthquake forces. (MEMA & EEOEA SHMCAP, 2018).

Chapter 4 : Capability Assessment

44 CFR § 201.6(c)(iii-iv)

Purpose

The capability assessment evaluates a community's ability to address hazard risks and identifies opportunities to strengthen policies, programs, and activities. Along with the risk assessment (Chapter 3), it forms the foundation for an effective hazard mitigation strategy.

It is important to assess which hazard mitigation actions (listed in Chapter 5) are feasible based on the Town's capacity of staff and departments. This assessment identifies feasible measures aligned with the community's existing authorities, policies, programs, and resources while highlighting gaps that require attention and strengths that should be expanded.

CAPACITY BUILDING is strengthening skills, knowledge, and systems to build a foundation for more effective hazard mitigation.

Existing Protections

Hancock has a range of existing capabilities to support hazard mitigation efforts. These capabilities are the foundation for the Town's ability to reduce risks from natural hazards and adapt to future challenges.

Planning & Regulatory Tools

The Town has adopted the Massachusetts Building Code (780 CMR), among the country's most stringent. This code ensures structures meet high standards for resilience against snow loads, wind resistance, seismic activity, and flood risk. The building inspector and the planning board manage the enforcement of these standards and ensure compliance with state and local regulations. The state must certify local municipal building inspectors to be eligible for the position. Additionally, Hancock enforces a Fire Detection and Alarm System Bylaw, improving fire safety by requiring maintenance and monitoring of alarm systems.

The Subdivision Control bylaw helps manage development by requiring adequate roads, drainage, and open space, but it lacks specific hazard mitigation measures such as floodplain development restrictions or formal stormwater management best practices (BMPs). Wetlands receive protection under the Massachusetts Wetlands Protection Act, offering some indirect flood mitigation benefits, but the Town has no dedicated stormwater management regulations. Nature-based hazard mitigation solutions, such as green infrastructure, are currently absent from town policies.

Hancock's zoning bylaw includes minimum lot size and height restrictions, which can indirectly support hazard mitigation by limiting dense development and encouraging rural land use patterns. However, the bylaw does not currently include provisions specific to hazard-prone areas such as floodplains, steep slopes, or wildfire-prone zones. Incorporating hazard-based overlay districts or development review criteria in the future could strengthen zoning protections.

Additionally, Hancock's local bylaws are maintained in printed form and are not easily accessible online. Making bylaws, particularly those related to development, fire safety, and hazard mitigation, available on the town website would improve transparency, public access, and regulatory awareness. This is especially important for new residents, prospective applicants, and regional/state partners reviewing the town's readiness for grant-funded mitigation efforts. The Town could also benefit from a regular review and update of its bylaws to integrate the latest hazard risk reduction practices, enhancing long-term resilience.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a federal program managed by FEMA that provides flood insurance to property owners, renters, and businesses in communities that adopt floodplain management regulations. It aims to reduce flood damage and financial loss by encouraging responsible development in flood-prone areas. Table 4.1 list the Town's current status with NFIP compliance.

Table 4.1 Town of Hancock's NFIP Requirement Status

Requirement	Current Status
Adoption of NFIP Minimum Floodplain Management Criteria	Hancock has not yet adopted a local floodplain management bylaw.
Adoption of the Latest Effective FIRM	Hancock's current FIRM is dated June 1, 1982.
Enforcement of Floodplain Regulations in SFHAs	The Town does not currently enforce floodplain-specific permitting. While the Building Inspector reviews subdivision maps, there is no process for reviewing development in mapped flood zones.
Designation of a Floodplain Administrator	No formal floodplain administrator has been designated. Responsibilities are informally assumed by the building inspector
Implementation of Substantial Improvements (SI)/Substantial Damage (SD) Provisions	The Town has no identified process for determining or enforcing substantial improvement/substantial damage provisions after a hazard event.

Emergency Management and Response

The Town has no full-time emergency response personnel and depends on the Hancock Volunteer Fire Department, which operates on a fully volunteer basis with limited resources. The Fire Department operates on a $53,000 annual budget. No formal ambulance service exists within the town; Northern Berkshire EMS serves the northern portion, while private ambulance companies from Pittsfield cover the southern region. The Hancock Volunteer Fire Department (HVFD) has a successful track record of leveraging existing grant sources for equipment, backup generators, and shelter supplies.

Hancock is a Central Berkshire Regional Emergency Planning Committee member, which helps coordinate emergency preparedness efforts across multiple towns. The Town also has mutual aid agreements, including with the Town of Richmond for emergency response along Route 20. Hancock is working on updating its Continuity of Operations Plan (COOP) to enhance emergency preparedness. Through these channels, Hancock maintains strong and effective communication and coordination for its emergency management.

Infrastructure Investments

Hancock does not have a formal capital improvement plan, but it has completed targeted infrastructure investments that contribute to community resilience. Notably, the Town undertook paving and catch basin upgrades on Brodie Mountain Road, a major connector, which helps manage runoff and reduce erosion. Approximately $200,000 in facility improvements were made at the elementary school, including roof replacement and new windows, investments that enhance building durability and may support the school's future use as an informal emergency shelter.

Hancock has an unknown number of culverts, and while some maintenance occurs, there is no formal inventory or scheduled inspection process. Maintenance is often reactive, based on resident complaints, particularly in the Village area, where excessive debris has been reported. The Town has also paved some previously unpaved roads, improving transportation but potentially increasing stormwater runoff. Without formal stormwater management regulations, these changes may elevate flood risk in certain areas. As road improvements continue, it will be important to integrate culvert upgrades and drainage enhancements into future projects.

Beyond town-led projects, National Grid upgraded power lines in the Goodrich Hollow area, improving electrical reliability and reducing outages during storms. A longer-term investment in resilience was the relocation of the Town Hall in 1976 to higher ground, reducing its flood exposure and improving accessibility during severe weather events.

Table 4.2 below provides an overview of Hancock's existing hazard mitigation protections, including their effectiveness, current gaps, and capacity for expansion. Effectiveness reflects how well each measure reduces risk, considering enforcement, resource availability, and community impact.

Effectiveness Ratings:

- Very Effective – Strong enforcement, widely used, and significantly reduces risk.
- Effective – Works well but has minor gaps or areas for improvement.
- Somewhat Effective – Provides benefits but has notable limitations.
- Ineffective – Fails to reduce risk or is poorly implemented.
- Unknown – Needs further assessment.

Table 4.2 Town of Hancock Existing Protections

Existing Protection	Description/Responsible Authority	Area Covered	Effectiveness	Improvements Needed	Ability to Expand/Implement
Planning/ Regulatory Tools					
Massachusetts Building Code (780 CMR)	Ensures resilience to snow, wind, seismic, and flood risks. The building inspector and the planning board manage the enforcement of these standards. It is limited due to a lack of new construction in Hancock, where housing stock median build year of 1987, which predates many hazard-resilient code updates.	Town Wide	Somewhat Effective	None	The building code is adopted and updated at the state level. Local efforts could include public education, promotion of voluntary retrofits, and applying for grants that assist homeowners with resilience improvements.
Subdivision Control Law	Provides some infrastructure and environmental protections	Town Wide	Somewhat effective	Regulations should be updated to incorporate floodplain protections and modern stormwater BMPs.	The Planning Board has the authority to amend regulations, but additional technical expertise or funding may be needed for enforcement.
Zoning Bylaw	Establish minimum lot size (1 acre) and height and limits (50ft) for residential development	Town Wide	Somewhat effective	Consider adding overlay districts or zoning criteria for flood-prone, erosion-prone, or wildfire-risk areas. Incorporate stormwater standards into zoning or site plan reviews.	Would require Planning Board and Select Board support. Could use state model bylaws or BRPC assistance to draft hazard-focused zoning updates.

Fire Detection & Alarm System Bylaw	Regulates the installation, maintenance, and operation of fire alarms in privately owned structures, including residential, commercial, industrial, and institutional buildings. Ensures that fire alarms are properly installed and maintained to enhance fire safety and emergency responses.	Town Wide	Somewhat effective	Require automatic alarm notification to emergency services. Establish periodic inspections based on occupancy and risk. Publish the bylaw online and consider adding stricter standards for high-risk properties, including those in WUI or Intermix Zones	The town can amend the bylaw through the Select level is feasible but Board or Town Meeting. Enforcement and inspections may require additional staffing or funding. Expanding requirements based on occupancy or risk would need coordination with emergency services to define appropriate thresholds
Wetlands Protection Act	The Conservation Commission administers the Act to protect Wetland Resources as defined, including floodplains	Wetland resources as designated by the Act	Somewhat Effective	Improve enforcement and monitoring to ensure flood risk reduction and protection of wetland integrity; provide education on wetland importance and regulations.	Expand resources for enforcement and monitoring; collaborate with state agencies for technical and funding support. Consider a shared position for conservation agent to assist with enforcement.
Emergency Management and Response					
Emergency Management Department	Oversees National Incident Management System (NIMS) compliance, emergency planning, and coordination. Manages MEMA grants and reviews emergency sheltering and COOP plans. The Director	Town Wide	Somewhat effective	Improve NIMS compliance through additional staff training which is available free online through FEMA. Develop a written emergency resource	Expansion is possible but will require support from the Select Board and collaboration with MEMA. Most improvements are low-cost and procedural

	is active and engaged, but emergency coordination is limited by staffing, resource availability, and lack of formal documentation or delegation authority.			plan, including a pre-approved contractor and equipment list for post-disaster response. Strengthen backup planning for situations where the Select Board cannot be reached.	but will require staff time and leadership support.
Reverse 911 Emergency Notifications	Ensure residents receive emergency alerts. Hancock is covered by the Berkshire County Sheriff's Office's Motorola Command Central Notify Reverse 911 System, which delivers emergency alerts via landline, mobile phone, text, or email. Landlines are automatically included, while residents using cell phones, VoIP lines, or email must self-register. Separately, the Town Clerk and Emergency Management Director maintain a local call list, updated annually, to provide direct outreach for road closures and local emergencies	Town Wide	Somewhat effective	Ensure the town participates in state-level discussions on program expansion for digital access. Improve local outreach to inform residents on how to sign up.	The Town can improve awareness by updating its website with sign-up instructions and promoting enrollment at fire department events.
Town Website for Emergency Communications	A platform for sharing emergency alerts, hazard mitigation information, and disaster preparedness	Town Wide	Ineffective	Update and maintain the website with clear, accessible emergency information and hazard	Improvements require administrative commitment and possible

or Hazard Education	resources. Currently underutilized and lacks consistent updates, limiting its effectiveness as a public information too			education. Ensure it includes sign-up details for emergency alerts and resources for disaster preparedness.	funding for better functionality and outreach.
Emergency Shelters	The elementary school, Hancock Shaker Village, and Jiminy Peak are potential informal shelters but not designated.	Town Wide	Somewhat Effective	Formal shelter planning, backup power coordination, and resource delegation	Feasible with coordination and minor funding
Hancock Volunteer Fire Department (HVFD)	Provides fire suppression and emergency response services. Operates on a fully volunteer basis with limited resources.	Town Wide	Somewhat Effective	Increase recruitment, training, and funding for equipment. Expand fire prevention efforts, including public education and wildfire risk reduction.	Expansion depends on volunteer availability and external funding.
Land and Natural Resource Management					
Vegetation and Wildfire Management	No formal town program for wildfire prevention. Utilities perform some roadside tree trimming. No defensible space policies or community guidance.	Town-wide; utility corridors	Ineffective	Develop outreach on wildfire risk and defensible space practices. Explore state resources for fuel reduction.	Expansion is limited due to volunteer-based emergency services and lack of dedicated staff. However, the Fire Department could provide basic wildfire education with support from state or regional partners (e.g., DCR, MEMA). Larger landowners may present opportunities for targeted

					outreach or voluntary risk reduction efforts.
Invasive Species Management	No town-managed invasive species control for vegetation or pests.	Town wide	Ineffective	Establish roadside or conservation-focused control program. Collaborate with conservation groups or DCR.	Town staffing limitations make direct implementation difficult. However, the town could support regional efforts or participate in education/outreach initiatives led by conservation groups or BRPC. A program would likely require external leadership and funding, but awareness is growing in the region due to concerns about pests and vector-borne disease.
Protected Lands	No local use of conservation easements or open space protections for hazard mitigation. DCR conducts occasional forest management.	Town Wide	Ineffective	Explore voluntary conservation easements or nature-based flood mitigation strategies.	The town could collaborate with land trusts or state agencies to encourage voluntary landowner participation. Expansion is possible through partnerships and grant-funded nature-based mitigation projects, especially on privately owned land in flood-prone or forested areas.

Capacity and Capability Overview

This section evaluates Hancock's current ability to support hazard mitigation through its administrative, technical, financial, and outreach resources. Each subsection includes improvement actions that strengthen local capacity. While these actions do not directly reduce risk, they lay the groundwork for the mitigation strategies presented in Chapter 5.

The section highlights key strengths, gaps, and practical steps to improve the Town's capability. As Hancock continues to build capacity, it will be better positioned to identify and implement future risk reduction opportunities as part of its long-term hazard mitigation strategy.

Administrative and Technical Capacity

Hancock is a small, rural town with a dispersed population, minimal staffing, and a strong culture of volunteerism and self-reliance. Formal municipal capacity is limited, there is no Department of Public Works, police department, or planning department. Most administrative and emergency functions are carried out by a small number of part-time officials and volunteers, many of whom serve on multiple boards. Hancock maintains essential emergency and governance functions despite limited staffing through a core group of dedicated individuals. The Town has a volunteer Planning Board that reviews development proposals and a volunteer Conservation Commission, though neither group has specific training in hazard mitigation. Berkshire Regional Planning Commission (BRPC) handles hazard-related GIS data and mapping coordination externally. The Building Inspector is trained in resilience-related construction practices but does not have a formal hazard mitigation enforcement role. The Hazard Mitigation Committee, which includes representatives from the Select Board and Emergency Management, is critical in coordinating local planning efforts. The Board of Health, while not heavily involved in hazard mitigation, oversees functions such as well water testing.

The Community Compact Grant, the EOEEA Technical Assistance Grants, the Executive Office of Public Safety Development Grant, and the Rural Development Fund are applicable grant programs related to the improvement actions listed below.

Administrative and Technical Improvement Actions

- Provide basic hazard mitigation and land use training for the Planning Board and Conservation Commission.
- Implement a reverse 911 system, such as Blackboard Connect or Code RED
- Designate the Building Inspector or another staff member as the Town's official Floodplain Administrator and provide basic training or resources to support permit review in mapped flood zones.
- Publish key local bylaws on the town website, including zoning, subdivision, and fire safety regulations, to improve transparency and promote voluntary compliance with hazard-related policies.

- Regular review and update of bylaws to integrate the latest hazard risk reduction practices.
- Identify shared equipment/resource opportunities with nearby towns
- Create and maintain a shared binder or drive for hazard maps, past storm impacts, resilience priorities, and identified needs to support future grant applications.
- Establish staff redundancy protocols by identifying secondary personnel for critical administrative roles (e.g., Town Clerk) to ensure continuity during absences, transitions, or emergencies.
- Pursue a Memorandum of Understanding (MOU) with neighboring towns (e.g., Richmond, Lanesborough, and New Ashford) to support shared staffing during emergencies, transitions, or other times of need.

Financial Capacity

The Select Board, Emergency Management Director, and BRPC handle grant writing and management. While the town does not have a formal capital improvement plan, it conducts an annual budget review and has access to general obligation bonds, special taxation, and general funds to cover matching grant requirements. Hancock does not charge water/sewer or development impact fees and is not part of the Community Preservation Act.

Financial Improvement Actions

- Develop a capital needs list with a hazard mitigation lens, identifying infrastructure projects that reduce risk from flooding, winter storms, and power outages (e.g., culvert upgrades, backup power, drainage improvements).
- Continue partnering with BRPC to pursue grants for Community One Stop for Growth, MVP, HMGP, and other hazard-related infrastructure funding.
- Explore adoption of the Community Preservation Act (CPA) to diversify funding for nature-based hazard mitigation, open space protection, and cultural asset preservation.

Education and Outreach Capacity

The Town communicates with the public primarily through its website, flyers at municipal locations, and word-of-mouth. The Fire Department maintains a social media presence, and the Town Clerk maintains an annually updated phone list of residents for emergency calls. Outreach also occurs through Council on Aging (COA) lunches, the library, and community events like the Ioka Farm Car Show and a community dinner hosted for the Fire Department.

Though there are no formal mutual aid agreements for public works or emergency road repairs, residents and highway personnel from neighboring towns routinely assist one another during storms, often informally, with chainsaws in their trucks. This approach reflects the town's "neighbors-helping-neighbors" ethos, a major social strength during weather-related disruptions. Many long-term residents are well-prepared for hazard events, keeping backup power, heating fuel, and emergency supplies on hand. However, newer residents may not be aware of how seasonal hazards affect life in Hancock. A "Welcome to Hancock" webpage with seasonal preparedness tips would be a low-cost, high-impact tool to close that knowledge gap.

The Council on Aging supports vulnerable residents and is an important point of contact for the senior population, which may require assistance during extreme weather.

Applicable grant programs related to improvement actions listed below include EOEEA Technical Assistance, MVP Action Grant, Mass Clean Energy Center, and Community Compact.

Education and Outreach Improvement Actions

- Create a “Welcome to Hancock” webpage for new residents with seasonal preparedness tips, generator safety, and emergency contacts.
- Provide public education on home resilience strategies, especially for older buildings not subject to current building code standards. Include information on voluntary retrofits, storm proofing, generator safety, and funding opportunities (e.g., Mass Save energy efficiency/weatherization programs).
- Use existing channels, tax bill inserts, flyers, COA lunches, and Fire Department events, to share preparedness and mitigation information.
- Improve the town website as a central location for hazard communication and emergency alerts
- Include a sign-up form on the website for residents to be notified of emergencies.
- Support and host frequent social gatherings to create community cohesion and less isolation

Emergency Response and Preparedness

Hancock’s most valuable asset in emergency preparedness is its people, volunteers, neighbors, and long-time residents who step up when disaster strikes. To build on these strengths, the Town can take steps to strengthen communication networks, formalize key partnerships, improve resident outreach, and enhance coordination with regional emergency services. By focusing on practical, community-driven improvements, Hancock will be better positioned to protect its residents during emergencies and support a faster, more organized recovery after extreme events.

Applicable grant programs related to improvement actions listed below include The Executive Office of Public Safety and Security, EOEEA MVP Action Grants, Mass Save Community First Partnership, FEMA Assistance to Firefighters Grant (AFG) and Staffing for Adequate Fire and Emergency Response (SAFER), Emergency Response and Crisis Management Grant, and Emergency Management Performance Grants (EMPG).

- Identify programs such as Mass Save to promote heat pump installation, especially for homes without air conditioning, to reduce public health risks during extreme heat. Advocate for expanded weatherization programs for Hancock’s older housing stock.

- Educate residents about carbon monoxide risks associated with backup generator use during power outages and electrical fire risks related to solar panels and battery storage systems.
- Provide residents with guidance and resources during poor air quality events; explore funding to purchase air purification equipment for vulnerable households and establish a town-wide notification system for air quality alerts.
- Establish a Memorandum of Understanding (MOU) with Hancock Shaker Village and Jiminy Peak to serve as designated Town Emergency Shelters during disasters.
- Implement a neighborhood "Road Captain" system, where designated volunteers report road conditions and resident needs to the Fire Department during emergencies.
- Develop a phone tree system using volunteers with snowmobiles and ATVs to assist residents who become isolated during severe weather.
- Form a community preparedness committee to support informal neighborhood groups; develop a survey and contact list of at-risk residents, and coordinate wellness checks during extreme events.
- Improve the Town’s emergency communications page by publicizing emergency numbers, alerts, and preparedness information in a clear, accessible format.
- Strengthen coordination with paid, full-time area fire departments to enhance emergency response capabilities and resource sharing.
- Purchase new radios and communication equipment for emergency response operations.
- Develop a written emergency resource plan that includes contractor contact lists and delegation procedures if Select Board members are unavailable.
- Explore recruitment strategies to increase the number of volunteers for the fire service.
    - Partner with local high schools to create junior firefighter programs and introduce fire service careers to students.
    - Target new residents by including fire department volunteer information in welcome packets and property tax mailings.
    - Participate in annual community events to promote volunteer opportunities.
    - Create a recruitment page on the town website for easy volunteer sign-ups.
    - Collaborate with veterans' groups to recruit military veterans who may be interested in volunteer fire service roles.

Chapter 5 : Mitigation Strategy

44 CFR § 201.6(c)(3)(i-iv)

Purpose

The hazard mitigation strategy is the culmination of work presented in the planning area profile, risk assessment, and capability assessment. It is also the result of multiple meetings and thorough public outreach. The work of the Hazard Mitigation Planning Committee (HMPC) was essential in developing the mitigation goals and actions included in this chapter. The HMPC worked consistently and coordinately to identify and prioritize the goals and mitigation actions for this Plan.

Hazard Mitigation Goals

Mitigation goals represent broad statements that are achieved through the implementation of more specific mitigation actions. These actions include hazard mitigation policies (such as land use regulations) and hazard mitigation projects (such as structure or infrastructure projects). The HMPC developed the goal statements in the figure below to represent their vision and priorities regarding hazard mitigation for the Town of Hancock

- Reduce Flooding and Erosion Risks to Protect Infrastructure and Natural Resources; mitigate flood risks through infrastructure upgrades, improved stormwater management, and preservation of natural flood buffers.

- Enhance Emergency Preparedness; improve emergency response systems, communication networks, and community outreach to protect lives and property.

- Minimize Risks to Roads, Utilities, and Public Services; protect roads, utilities, and services through infrastructure upgrades, vegetation management, and drainage improvements.

- Strengthen Land and Forest Management to Reduce Wildfire and Invasive Species Risks; promote sustainable land management, wildfire prevention, and invasive species control through partnerships and education.

- Protect Public Health and Strengthen Community Resilience; reduce risks to residents, especially vulnerable populations, through education, home mitigation, and community partnerships.

Identifying and Evaluating Mitigation Actions

> *A MITIGATION ACTION is a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment.*

To develop an effective hazard mitigation strategy, the Town of Hancock first identified a range of potential actions that were informed by Chapter 3's risk assessment data, public input (see Appendix A), and anticipated climate change impacts identified through the Massachusetts Municipal Vulnerability Preparedness (MVP) program. Once potential mitigation actions were identified, the HMPC conducted a structured evaluation to determine their feasibility, effectiveness, and alignment with the Town's long-term planning goals. Only actions that met key evaluation criteria were considered for prioritization.

Evaluation Criteria

The HMPC evaluated and ranked mitigation actions using the following criteria:

Cost-Benefit Analysis	Do the expected benefits (e.g., risk reduction, economic savings, life safety) justify the costs?
Feasibility	Are the actions technically, legally, and politically viable?
Impact on Vulnerable Populations	Does the action address equity and support underserved groups?
Alignment with Goals	Does the action align with the plan's mitigation goals and broader community objectives?
Urgency	How critical is the action in addressing immediate risks?
Resource Availability	Are funding and staffing available for timely implementation?

Prioritization Categories

Once mitigation actions were evaluated and deemed viable, the Town of Hancock prioritized them based on urgency, impact, and feasibility for implementation. While hazard ranking listed in Table 3.2 played a role in prioritization, additional factors, such as funding availability, policy alignment, community needs, and disaster recovery priorities, were also considered.

Each mitigation action was assigned to one of three priority levels:

- *High-priority actions* addressed high-risk hazards, offered significant risk reduction benefits, and aligned with existing initiatives.
- *Medium-priority actions* supported long-term goals but required additional planning or resources for implementation.
- *Low-priority actions,* while valuable, addressed lower-risk hazards or offered more limited immediate benefits.

Mitigation Action Table Explanation

Primary mitigation actions are categorized into one or more of the following categories:

Local Plans and Regulations: Government authorities, policies, or codes that shape how land and buildings are developed and maintained. Examples include plans, land use ordinances, subdivision regulations, building codes, master plans, and stormwater regulations.

Structure and Infrastructure: Projects modifying existing infrastructure to remove it from a hazard area or building new structures to reduce the impacts of hazards. Examples include structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.

Natural Systems Protection: Actions that reduce damage and losses and preserve or restore natural systems' functions. Examples include sediment and erosion control, forest management, conservation easements, and wetland restoration.

Education and Awareness Programs; Actions that reduce damage and losses, and that preserve or restore the functions of natural systems. Examples include sediment and erosion control, forest management, conservation easements, and wetland restoration.

Each action includes the following components:

Problem Statement, which identifies the specific hazard or issue the action aims to address. It clearly defines the risk or vulnerability in the community that necessitates the proposed mitigation action, providing context and rationale for why the action is needed.

Description of Action provides a brief statement of the specific action or project. It describes what will be done to address the identified problem.

Primary Implementation Responsibility identifies the agency or organization responsible for carrying out the action, including ownership and jurisdiction of the facility or action being mitigated or receiving funding.

Secondary and/ or Support Implementation Responsibility identifies additional organizations, boards, or agencies to assist with implementing the proposed action.

Timeframes denote how long the project will take once initiated. Funding cycles can affect the start of an action. Ongoing is for multi-phased projects or projects that will be ongoing once implemented (e.g., a vegetation management program that has no end date).

Cost is the estimated cost of each action into three broad ranges:

- Less than $50,000: Low-cost actions, typically involving smaller-scale projects or initiatives.
- Between $50,000 - $499,999: Medium-cost actions, typically involving more extensive planning, resources, or infrastructure changes.
- Over $500,000: High-cost actions, typically involving large-scale projects with significant infrastructure changes or long-term investments.

Resources and Funding for each action are known or potential technical assistance, materials and funding for the type of project identified.

Table 5.1 is the Mitigation Action for the Town of Hancock and provides a roadmap for the Town to increase resiliency. It will be updated with the new plan in five years.

The actions marked in **bold** are those identified by the committee as the highest priority for immediate attention.

Table 5.1 Mitigation Action Plan for the Town of Hancock

Category of Action	Problem Statement	Description of Action	Secondary and/ or Support Implementation Responsibility	Timeframe	Priority	Cost	Resources/Funding
Primary Implementation Responsibility: Select Board							
Local Plans and Regulations (Flooding)	Hancock currently lacks a formal process for assessing substantial damage after flood events	Develop a substantial damage inspection process to guide post-disaster assessments of buildings in mapped flood hazard areas, ensuring that damaged structures are identified, documented, and rebuilt to meet flood-resistant standards, reducing future flood risk and supporting NFIP compliance.	Building Inspector	1 -3 years	High	Less than $50,000	MVP Action Grant, FEMA FMA (technical assistance), FEMA PA (post-disaster)
Structure and Infrastructure Project (Flooding)	The state-owned culvert at the end of Route 43 is undersized and prone to flooding. The Town can play a role in advocating for and supporting necessary upgrades through risk documentation and interagency coordination.	Coordinate with MassDOT to support the replacement and upsizing of the state-owned culvert at the end of Route 43 to reduce flood risk	MassDOT	3-5 yeas	Medium	Over $500,000	MassDOT TIP

Primary Implementation Responsibility: Select Board							
Education and Awareness Programs (Flooding)	Many Hancock residents and property owners are unaware of their potential flood risks, available NFIP insurance options, or the requirements for safe rebuilding in mapped flood hazard areas.	Provide public outreach materials to residents and businesses with information on flood risks, mapped flood zones, available flood insurance through the NFIP, safe rebuilding practices, and how to reduce flood damage.	Building Inspector	1 -3 years	Medium	Less than $50,000	EOEEA MVP Action Grant, FEMA FMA, Staff Time, Staff Time
Education and Awareness Programs (Vector-Borne Diseases)	Many residents and visitors may not be aware of simple ways to reduce their risk of mosquito- and tick-borne illnesses.	Create and distribute a simple "Protect Yourself from Mosquitoes and Ticks" flyer at Town Hall, the library, and on the Town website, focusing on personal protection tips and tick-safe landscaping.	Town Clerk/ Library	1 - 3 years	Low	Less than $50,000	Rural Development Fund, MA Department of Public Health Mini-Grants, Town Budget, Staff time
Education and Awareness Programs (Invasive Species)	Many landowners are unaware of the role invasive vegetation plays in weakening trees and increasing risks to roads, utilities, and homes	Provide educational materials to private landowners on invasive vegetation management, pest management, and tree maintenance. Join the Mohawk Woodland Trail Partnership to access technical assistance for landowners, supporting sustainable forest, plants, and insect management.	Town Clerk Library	1 -3 years	Low	Less than $50,000	EOEEA MVP Action Grant, MassWildlife Habitat Management Grant Program, Working Forest Initiative, Woodland Partnership Institute, Massachusetts Collaborative for Private Forestland - Regional Conservation Partnership Program (RCPP)

Primary Implementation Responsibility: Highway Department							
Local Plans and Regulations (Flooding)	Hancock has many aging or undersized drainage structures, including culverts and ditches, that are prone to overtopping and failure during heavy rain events. Without a comprehensive inventory, the Town cannot prioritize upgrades to reduce flood risk or support resilient infrastructure planning	Conduct a full drainage inventory to identify undersized or failing culverts and ditches, and prioritize sites for upsizing and replacement to reduce flood risk during high-intensity storms.	Select Board	1-3 years	High	Between $50,000 - $499,999	EOEEA MVP Action Grant
Structure and Infrastructure Project (Flooding)	Drainage ditches along critical roadways are undersized or poorly maintained, leading to debris accumulation and stormwater overflow near Kinderhook Creek.	Upsize or improve ditch drainage around town roads, especially those that connect to Route 43 and 20 to avoid debris buildup and flood risk at the Kinderhook Creek. Coordinate with MassDOT to prioritize ditch clearing and debris removal along Route 43 to reduce roadway flooding and culvert backups during high-intensity rainfall.	MassDOT	3-5 years	High	Between $50,000 - $499,999	EOEEA MVP Action Grant, MassDER Culvert Replacement Municipal Assistance Grant Program

Primary Implementation Responsibility: Highway Department							
Structure and Infrastructure Project (Landslides)	Many of Hancock's unpaved roads traverse steep, moderately unstable slopes where heavy rainfall can lead to erosion, sediment loss, and localized landslides.	Upgrade and maintain unpaved roads in unstable slope areas to reduce erosion and risk of slope failure during heavy storms. Improvements may include grading, ditch stabilization, adding cross-drains, and installing erosion control features such as water bars or stone-lined swales	Planning Board and Con Com	3- 5 years	Medium	Between $50,000 - $499,999	Rural Development Fund, EOEEA MVP Action Grant, MassWorks Infrastructure Grant , Highway Dept Budget
Structure and Infrastructure Project (Flooding)	The existing culvert at Beaver Pond is undersized and vulnerable to blockage or overtopping during storm events and beaver dam breaks.	Upsize culvert at Beaver Pond	Conservation Commission / Select Board	5-10 years	Low	Over $500,000	EOEEA MVP Action Grant, MassDER Municipal Culvert Replacement Assistance Grant
Natural Systems Protection and Nature-based Solution (Severe Winter Storms, Change in Average Temperatures)	Conventional road salt contributes to environmental degradation and may be less effective during extreme cold events.	Pilot and implement alternative winter road treatment strategies (e.g., pre-treatment brine or enhanced deicers) on critical emergency routes to reduce icing hazards and maintain road access during severe winter storms.		1-3 years	Low	Less than $50,000	MassDOT Winter Recovery Assistance Program, Clear Roads Research, Staff Time

Primary Implementation Responsibility: Conservation Commission							
Local Plans and Regulations (Flooding, Dam Failure)	Unmanaged beaver activity at Beaver Pond increases the risk of flooding and sudden dam breaks, which threaten nearby infrastructure and roads. There is currently no formal management approach to address these recurring risks.	Implement beaver management strategies at Beaver Pond, including relocation or controlled flow devices, to reduce flooding and dam break risks to downstream infrastructure.		3-5 years	High	Less than $50,000	MassWildlife Habitat Management Program
Natural Systems Protection and Nature-based Solution (Flooding)	Low-lying areas along Kinderhook Creek and Goodwin Hollow experience recurring flooding due to poor drainage and increased storm intensity.	Implement green infrastructure practices in flood-prone areas of the Kinderhook Creek watershed and Goodwin Hollow, such as bioswales, rain gardens, or wetland restoration, to reduce runoff and flood risk		1-3 years	High	Less than $50,000	EOEEA MVP Action Grant, DER Culvert Replacement Municipal Assistance Grant Program
Local Plans and Regulations (Flooding)	The Town lacks policies to manage development in hazard-prone areas, making low-lying areas more vulnerable to increased stormwater runoff and flooding from impervious surface expansion.	Develop and adopt land use policies or conservation restrictions to limit impervious surface expansion in flood-prone areas and preserve open space to reduce runoff and flood risk.	MassWildlife	1-3 years	Low	Less than $50,000	EOEEA MVP Action Grant, Clean Water Act 604b Funds, DLTA Open Space and Rec Plan Funding, EEA Planning Assistance Program, EOHLC Community Planning Grant

Primary Implementation Responsibility: Conservation Commission							
Natural Systems Protection and Nature-based Solutions (Invasive Species)	The Town's extensive natural landscapes support tick populations, elevating the risk of tick-borne diseases, particularly in areas with tall grasses, standing water, and wooded environments.	Partner with DCR or local conservation groups to manage trailheads, picnic areas, and parking lots near conserved lands by maintaining low vegetation buffers and posting signage about tick-safe zones.	DCR	3- 5 years	Low	Between $50,000 - $499,999	DCR, Staff Time
Natural Systems Protection and Nature-based Solution (Vector-Borne Diseases)	Large tracts of DCR-managed forestland in Hancock increase wildfire risk to nearby homes and infrastructure.	Partner with DCR to identify and prioritize fuel management projects within Hancock's state forest lands adjacent to developed areas.	DCR	3- 5 years	Low	Less than $50,000	DCR, Staff Time
Natural Systems Protection and Nature-based Solution (Flooding)	Flooding east of Route 43 is influenced by uncontrolled water flow from ponds located on the west side of the roadway. Many of these ponds are on private property and lack formal outflow controls or flood storage management.	Reduce downstream flooding east of Route 43 by identifying and mitigating high-risk private ponds on the west side through coordinated site assessments and installation of appropriate outflow controls or stabilization measures. Support this effort by creating a pond inventory and conducting outreach to landowners to encourage safe pond management practices		1-3 years	Low	Less than $50,000	Rural Development Fund, EOEEA MVP Action Grant, FEMA FMA, MassDEP 604(b)

Primary Implementation Responsibility: Tree Warden							
Local Plans and Regulations (High winds, Severe Winter Storms, Tropical Storms)	Downed trees on utility lines during storms cause prolonged power outages and emergency response delays. .	Coordinate with public utilities to increase proactive tree trimming and removal around utility lines in high-risk areas to reduce outages and infrastructure damage during storms. Request annual vegetation maintenance schedules and hazard tree reports to prioritize mitigation zones.	Highway Dept.	1-3 years	High	Less than $50,000	Department of Public Utilities
Natural Systems Protection and Nature-based Solution (Invasive Species)	Invasive plants and pests are weakening roadside trees in Hancock, increasing the risk of storm damage, blocked roads, and erosion.	Identify and manage invasive plants that increase risks from hazard trees and streambank erosion along town roads. Maintain a list of high-risk sites for targeted annual clearing, focusing on trees weakened by invasives like Oriental bittersweet and removing fallen trees that pose new hazards. Collaborate with partners such as MDAR to monitor forest pests like emerald ash borer, and join the Mohawk Woodland Trail Partnership for technical and financial support.	Highway/ Select Board/ Con Com	1 - 3 years	Low	Between $50,000 - $499,999	Rural Development Fund, EOEEA MVP Action Grant, DCR Urban and Community Forestry grants, Highway Dept. Budget, Tree Warden Budget

Primary Implementation Responsibility: Planning Board							
Local Plans and Regulations (Flooding)	Without a local floodplain bylaw, Hancock cannot enforce protections in flood-prone areas, increasing property risk and threatening FEMA disaster aid and insurance eligibility.	Adopt a local floodplain management bylaw that meets minimum NFIP requirements to regulate development in mapped flood zones.	Select Board	1 -3 years	High	Less than $50,000	MVP Action Grant, FEMA FMA (technical assistance)
Local Plans and Regulations (Flooding, Landslides, Erosion)	Many driveways are built on steep slopes without proper grading or drainage, raising the risk of erosion, landslides, and blocked emergency access. Without design standards, continued hillside development could make these issues worse.	Update zoning or development regulations to require slope-stabilizing driveway designs and limit steep grades in new construction or redevelopment on unstable slopes. Include standards for grading, drainage, and surface stabilization to reduce the risk of erosion and landslides.	Select Board	1- 3 years	Medium	Less than $50,000	MVP Action Grant, FEMA FMA (technical assistance), MEMA Non-Disaster Mitigation Grant, MEMA HMGP, EEA Planning Assistance Program, EOHLC Community Planning Grant
Local Plans and Regulations (Wildfires)	Hancock's current zoning does not address wildfire risks.	Amend zoning bylaws to include wildfire mitigation standards for new development and major redevelopments such as minimum defensible space, driveway access standards for emergency vehicles, and fire-resistant landscaping.	Select Board	1- 3 years	Medium	Less than $50,000	Rural Development Fund, EEA Planning Assistance Program, EOHLC Community Planning Grant, Community Compact Grant

Primary Implementation Responsibility: Planning Board							
Local Plans and Regulations (Flooding, Land Slides)	Current zoning regulations in Hancock may allow development in areas vulnerable to flooding and erosion. Lot size, frontage, and setback requirements are not optimized to minimize exposure or provide buffers in high-risk areas.	Update zoning bylaws to reduce future development risk in hazard-prone areas by revising frontage, lot size, and setback requirements particularly in flood-prone and steep slope areas	Select Board	3-5 years	Medium	Less than $50,000	EEA Planning Assistance Program, EOHLC Community Planning Grant, and BRPC District Local Technical Assistance
Primary Implementation Responsibility: Jiminy Peak							
Structure and Infrastructure Project (Flooding)	Undersized culverts near Jiminy Peak are prone to overtopping during heavy rainfall, threatening access to the area's largest employer and critical tourism revenue source. Flooding in this location can cause economic disruption and isolate the facility during emergencies.	Upsize culverts near Jiminy Peak to reduce localized flooding and protect access to the region's largest employer and economic driver.	Select Board	5-10 years	High	Over $500,000	Jiminy Peak

Primary Implementation Responsibility: Emergency Management Director							
Education and Awareness Programs (Wildfire)	Homes located in Hancock's northern and central Wildland-Urban Intermix zones are surrounded by dense vegetation, increasing the risk of wildfire spread. Narrow roads and remote properties make firefighting access difficult.	Promote defensible space practices for properties located in the northern and central portions of Hancock where Wildland-Urban Intermix zones are concentrated. Provide residents with guidance on vegetation management, home hardening techniques, and safe outdoor fire practices to reduce the risk of wildfire spread.	Highway Dept./, Con Com	1 -3 years	Medium	Less than $50,000	EOEEA MVP Action Grant, FEMA HMPG, FEMA Fire Prevention and Safety Grants, Staff Time
Structure and Infrastructure Project (Drought)	Hancock lacks a public water system and pressurized hydrants, leaving firefighting dependent on ponds and streams. During droughts, low water levels limit access and force crews to haul water from farther away delaying response and increasing the risk of fire spread and property loss.	Establish a Memorandum of Understanding (MOU) with Jiminy Peak to allow emergency water access from the Jiminy Peak snowmaking pond for firefighting and drought response. This source maintains higher and more consistent water levels than other freshwater bodies in Hancock and offers a reliable location for water drafting during low-flow conditions	Highway Dept./, Con Com	3- 5 years	Low	Between $50,000 - $499,999	Executive Office of Public Safety and Security (EOPSS) – Development Grant, EOEEA Action Grant, FEMA Hazard Mitigation Grant Program (HMGP), Assistance to Firefighters Grant, Staff Time

Chapter 6 Plan Maintenance

44 CFR § 201.6(c)(4)(i-iii)

The Town of Hancock's Hazard Mitigation and Climate Adaptation Plan (HMCAP) is a living document. It must be monitored, evaluated, and updated over time to remain valuable and relevant. This chapter outlines how the Town will track its progress on the plan's goals, review its effectiveness, and update the plan every five years. It also explains how this plan will be used alongside other planning tools and decisions in town.

Continued Public Participation

The Town of Hancock is committed to maintaining meaningful public engagement throughout the five-year life of this plan. Community members will be invited to provide feedback during regularly scheduled review meetings, particularly after major hazards or new risks emerge. The Select Board and the EMD will lead efforts to engage the public and ensure transparency as the plan is implemented. Public participation will take multiple forms, including:

- Posting updates and announcements on the Town's website
- Keeping the plan accessible online and providing hard copies at the Select Board Office
- Sharing any future updates through the Town's website and with other boards
- Collaborating with private industry, regional agencies, and neighboring communities to share information and strengthen implementation

Residents are encouraged to stay involved and contact the Select Board Chair or the Hazard Mitigation Committee with concerns, questions, or ideas.

Tracking Progress of Mitigation Actions

The Town of Hancock will track the status of mitigation actions using a spreadsheet system maintained by the HM/MVP Committee. Under the leadership of the Select Board and the EMD, this Committee will meet biannually to review the status of each action identified in the Mitigation Strategy. Tracking will include noting actions that have been completed, initiated, or delayed; identifying any new challenges or opportunities; and documenting new hazard events or risk areas. Site visits, updates from responsible departments, and public feedback will inform progress. As needed, the Town will share updates with the Berkshire Regional Planning Commission, which maintains a countywide GIS system that supports regional planning and resilience coordination.

Evaluating the Plan's Effectiveness

The HM/MVP Committee will evaluate the plan's effectiveness annually by reviewing whether the goals outlined in Chapter 5 are being met and whether implemented actions reduce hazard risk and improve community resilience. Evaluation criteria will include:

- The number of completed mitigation actions

- Progress on in-progress actions
- Lessons learned from recent hazard events
- Feedback from the public and responsible departments
- Whether goals and priorities remain relevant given current conditions Results of the evaluation will inform whether mid-cycle adjustments to the plan's priorities are necessary and guide preparations for the five-year update.

Updating the Plan

The plan will be updated at least once every five years, with technical support provided by the Berkshire Regional Planning Commission (BRPC). The Town will initiate the update process at least one year before the current plan expires. The HM/MVP Committee will reconvene to:

- Review the status of each action item
- Assess the continued relevance of goals and vulnerabilities
- Update hazard data and maps as needed
- Gather input from town departments, regional partners, and the public

Public outreach will be conducted through the Town's website, public notices, and inserts in tax bills. Updates will be coordinated with regional planning efforts and integrated with other local plans as applicable.

Integration Process

The Town of Hancock will integrate the goals, data, and recommended actions from this HMCAP into other local planning mechanisms over the next five years. The Select Board and EMD will play a central role in identifying integration opportunities and ensuring that mitigation strategies are considered in land use decisions, infrastructure planning, and resource allocation.

The process will include:

- Using hazard data and identified vulnerabilities to prioritize capital investments and infrastructure upgrades, especially during the annual budget review process.
- Applying risk and vulnerability assessments when developing or revising zoning bylaws, subdivision regulations, and stormwater management strategies
- Collaborating with Berkshire Regional Planning Commission and other regional partners to align this plan with regional and state resilience efforts

Integration will occur incrementally as opportunities arise through project development, permitting, and plan updates. The Planning Board, Conservation Commission, Highway Department, and the Select Board will be involved as appropriate.

Specific Planning Mechanisms for Integration

The following local planning mechanisms have been identified as appropriate avenues for integrating hazard mitigation principles, data, and actions from this HMCAP:

- Town Budget Process in order to allocate local resources toward mitigation and preparedness activities.
- Emergency Operations Plan to coordinate response and recovery efforts with long-term risk reduction, such as prevention and education.
- Municipal Vulnerability Preparedness (MVP) and Climate Resilience Planning, for which this HMCAP can be used to inform future MVP Action Grant applications, community resilience projects, and climate adaptation strategies.
- Annual Town Report and Town Meeting Warrant Process may highlight hazard mitigation goals and action items in the Town's annual report or cited in support of warrant articles related to infrastructure, land use, or public safety.

Chapter 7 Plan Adoption

44 CFR § 201.6(c)(5)

The Town of Hancock will formally adopt the Hazard Mitigation and Climate Adaptation Plan following receipt of FEMA and MEMA's Approval-Pending-Adoption (APA) letter. Once adopted by the Select Board, documentation of adoption (including a signed resolution and meeting minutes) will be inserted into the final plan and included in this section.

Signed Resolution of Adoption

(To be inserted following formal adoption by the Hancock Select Board)

Major References Cited

Al-Rubaish, A. M. (2007). THUNDERSTORM-ASSOCIATED BRONCHIAL ASTHMA: A FORGOTTEN BUT VERY PRESENT EPIDEMIC. Journal of Family & Community Medicine, 14(2), 47–51. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3410145/

Bureau of Infectious Disease and Laboratory Sciences. (2022). Tick-borne Disease Surveillance Summary, 2022. Massachusetts Department of Public Health. https://www.mass.gov/lists/tick-borne-disease-surveillance-summaries-and-data

Burguen Salas, E. (2023, December 4). Summary of National Hazard Statistics for 2022 in the United States. National Weather Service. https://www.weather.gov/media/hazstat/sum22.pdf

CDC. (2024a, April 23). Lightning Strike Victim Data. https://www.cdc.gov/lightning/data-research/index.html

CDC. (2024b, August 29). About Eastern Equine Encephalitis. Eastern Equine Encephalitis Virus. https://www.cdc.gov/eastern-equine-encephalitis/about/index.html

Davis, W. B., Jones, J., Dong, M., Gamio, Lazaro, Malsky, B., & Keefe, J. (2024). Earthquake in New York and New Jeresey. The New York Times. https://www.nytimes.com/interactive/2024/04/05/nyregion/earthquake-new-york-new-jersey.html#

Ebel, J. E. (2012). New England Seismic Network. Boston Colleg Weston Observatory. https://earthquake.usgs.gov/cfusion/external_grants/reports/G10AC00086.pdf

EOEEA. (2019). Massachusetts Drought Management Plan. mass.gov. https://www.mass.gov/doc/massachusetts-drought-management-plan/download

EOEEA ResilientMA Plan, M. E. O. of E. and E. A. (2023). ResilientMass Plan. mass.gov. https://www.mass.gov/doc/resilientmass-plan-2023/download

Gentile, D. (2013). 40 years ago today, a tornado ripped through West Stockbridge. The Berkshire Eagle. https://www.berkshireeagle.com/news/local/40-years-ago-today-a-tornado-ripped-through-west-stockbridge/article_bf6121e4-b51e-51b1-9be5-2f2b96982187.html

McKeever, A. (2011, July 11). Berkshire Eagle. Pittsfield Slammed By Surprise Microburst Storm. https://www.iberkshires.com/story/39092/Pittsfield-Slammed-By-Surprise-Microburst-Storm.html

MEMA & EEOEA SHMCAP. (2018, September). SHMCAP. mass.gov. https://www.mass.gov/doc/state-hazard-mitigation-and-climate-adaptation-plan/download

NESEC. (n.d.). Earthquakes Hazards. Northeast States Emergency Consortium. https://nesec.org/earthquakes-hazards/

NOAA. (n.d.). High Wind Threats. High Wind Safety Rules; NOAA's National Weather Service. Retrieved October 7, 2024, from https://www.weather.gov/mlb/seasonal_wind_rules

NOAA NWS Storm Prediction Center. (2018). What Is Severe Weather? https://www.spc.noaa.gov/misc/about.html

NWS. (2017). Lightning fatality and fatality rate. U.S. Department of Commerce. https://www.weather.gov/media/safety/59-16_State_Ltg_Fatality%2BFatality_Rate_Maps.pdf

NWS Surface analysis 18z. (2017). National Weather Prediction Center Surface Analysis Archive. https://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive.php

Thunderstorm and Lightning. (n.d.). Thunderstorm and Lightning Safety Tips | Mass.Gov. Retrieved October 7, 2024, from https://www.mass.gov/info-details/thunderstorm-and-lightning-safety-tips

US Department of Commerce, N. (2020). NWS. 25th Anniversary Great Barrington Tornado; NOAA's National Weather Service. https://www.weather.gov/aly/25th_Anniversary_Great_Barrington_Tornado

U.S DHHS, & CDC. (2024). The National Public Health Strategy to Prevent and Control Vector-Borne Diseases in People. The U.S. Department of Health and Human Services and the U.S. Centers for Disease Control and Prevention.