TOWN OF ADAMS, MA
HAZARD MITIGATION PLAN UPDATE
APRIL 2024

Town of Adams
8 Park Street
Adams, MA 01220

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https://www.town.adams.ma.us

Prepared by:

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Table of Contents

Table of Figures

Table of Tables

Acknowledgements

The Town of Adams would like to thank the following people for supporting the development of this plan. This group was considered the Hazard Mitigation Planning Committee (HMPC) throughout the planning process.

- John Barrett, Water Department Superintendent
- Tim Cota, Department of Public Works Supervisor
- Eammon Coughlin, Community Development Director
- Sarah Fontaine, Adams Council on Aging Director
- Gerald Garner, Building Commissioner
- Jay Green, Town Administrator
- Stephanie Melito, Administrative Assistant for Department of Public Works
- John Pansechhi, Fire Chief
- Kevin Rayner, Town Planner
- Dave Rhoads, Chair of the Board of Health
- William Schrade, Executive Director, Adams Housing Authority
- Coby Tarjick, Community Development Program Manager

F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement §201.6(c)(5))

Local Adoption Resolution

TOWN OF ADAMS, MASSACHUSETTS
SELECTBOARD
A RESOLUTION ADOPTING THE
TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE
RESOLUTION NO. ___________

WHEREAS the Town of Adams recognizes the threat that natural hazards pose to people and property within the Town of Adams; and

WHEREAS the Town of Adams has prepared a multi-hazard mitigation plan, hereby known as TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS the TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Town of Adams from the impacts of future hazards and disasters; and

WHEREAS adoption by the Town of Adams Selectboard demonstrates its commitment to hazard mitigation and achieving the goals outlined in the TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF ADAMS, MA, THAT:

Section 1. In accordance with M.G.L. c. 40, the Town of Adams Selectboard adopts the TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE. While content related to the Town of Adams may require revisions to meet the plan approval requirements, changes occurring after adoption will not require Town of Adams to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by a vote of ________ in favor and ________ against, and ________ abstaining, this _______ day of _______, _______________.

By: ___________________________________ Christine D. Hoyt, Chairperson

ATTEST: By: ___________________________________ Howard Rosenberg, Vice-Chairperson

APPROVED AS TO FORM: By: ___________________________________

Record of Changes

This Town of Adams, MA Hazard Mitigation Plan Update will be reviewed and approved on a biannual basis by the HMPC and following any major disasters. All updates and revisions to the plan will be tracked and recorded in the following table. This process will ensure the most recent version of the plan is disseminated and implemented by the Town.

Table 1. Summary of Changes.

Date of Change	Entered By	Summary of Changes

Chapter 1. Introduction

The Federal Emergency Management Agency (FEMA) defines hazard mitigation per the Code of Federal Regulations (CFR) 44 Section 201.2 as “any **sustained** action taken to reduce **or eliminate** the **long-term risk** to human life and property from hazards.”

“Disaster Mitigation Act (DMA) 2000 (Public Law 106-390)[1] provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for State, local, and Indian Tribal entities to closely coordinate mitigation planning and implementation efforts.”[2]

The Town of Adams, Massachusetts created this plan as part of an ongoing effort to reduce the negative impacts and costs from damages associated with natural hazards, such as nor’easters, floods, and hurricanes. This plan meets the requirements of the Disaster Mitigation Act 2000. More importantly, the plan was created to reduce loss of life, land, and property due to natural hazards that affect the Town of Adams. It is difficult to predict when natural hazards will impact the planning area, but it is accurate to say that they will. By implementing the mitigation actions listed in this plan, the impact of natural hazards will be lessened.

Local Mitigation Plans must be updated at least once every five years to remain eligible for FEMA hazard mitigation project grants. A local jurisdiction 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 within five (5) years to continue to be eligible for mitigation project grants.

Purpose of the Plan

The purpose of the Local Hazard Mitigation Plan is to provide the Town of Adams with a comprehensive examination of all natural hazards affecting the area, as well as a framework for informed decision-making regarding the selection of cost-effective mitigation actions. When implemented, these mitigation actions will reduce the Town’s risk and vulnerability to natural hazards.

This plan is a result of a collaborative effort between the Town of Adams and the surrounding communities. Throughout the development of the plan, the Hazard Mitigation Planning Committee (HMPC) consulted the public and key stakeholders for input regarding identified goals, mitigation actions, risk assessment, and mitigation implementation strategy. A sample of key stakeholders who

[1] Disaster Mitigation Act of 2000, Pub. L. 106-390, as amended

[2] Disaster Mitigation Act of 2000. https://www.congress.gov/106/plaws/publ390/PLAW-106publ390.pdf

participated, included the Massachusetts Emergency Management Agency (MEMA), the Adams Fire District, the Adams Board of Health, and the Adams Council on Aging.

Guiding Principles for Plan Development

The HMPC adhered to the following guiding principles in the plan's development.[3]

- Plan and invest for the future.
- Collaborate and engage early.
- Integrate community planning.

This plan update meets the requirements outlined 44 CFR § 201.6(d)(3). These requirements are included in the plan in the green call-out boxes, like the one below.

> A local jurisdiction 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 within 5 years in order to continue to be eligible for mitigation project grant funding.

Yellow call-out boxes like the one to the right, are definitions taken from the Federal Emergency Management Agency Local Policy Guide, April 2023. These are included throughout the plan for reference and explanation.

The HMPC prioritized mitigating impacts of climate change, mitigating risk to vulnerable communities, and protecting the built environment both today and in the future.

> ***COMMUNITY RESILIENCE*** *is the ability of a community to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. Activities such as disaster preparedness (which includes prevention, protection, mitigation, response and recovery) and reducing community stressors (the underlying social, economic and environmental conditions that can weaken a community) are key steps to resilience.*[1]

The HMPC identified the following list of hazards to profile. They are shown in alphabetical order below.

- Average and Extreme Temperatures
- Droughts
- Earthquakes
- Flooding from Precipitation and Dam Overtopping
- Hurricanes and Tropical Storms
- Invasive Species

[3] Federal Emergency Management Agency. (April 19, 2022). Local Mitigation Planning Policy Guide, p.13.

- Landslides
- Other Severe Weather
- Severe Winter Storms
- Tornadoes
- Wildfires or Brush Fires

Mitigation Strategy

C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))

The hazard mitigation strategy is the culmination of work presented in the Planning Area Profile (Chapter 2), Risk Assessment (Chapter 4), and Capability Assessment (Chapter 5). It is also the result of multiple meetings and sustained public outreach. The HMPC developed the goals shown below. The goals from the previous Town of Adams Multi-Hazard Mitigation Plan, 2019 and the Town's Municipal Vulnerability Preparedness Plan (MVP), 2018 were revised to develop this current list. Information about the goal development process is in Chapter 6: Mitigation Strategy. The goals are considered "broad policy-type statements"[4] that represent the long-term vision for mitigating risk to natural hazards in the Town of Adams.

[4] Federal Emergency Management Agency. (2013). *Local Mitigation Planning Handbook,* p. 6.

Save Lives and Property

- Reduce risk to people and property from natural hazards and climate change.

Infrastructure

- Mitigate risk to critical facilities and infrastructure from natural hazards and climate change.

Capacity

- Expand the Town's capacity to mitigate risk by adopting a culture of hazard mitigation through regulations, planning, and regional collaboration.

Natural Resources

- Implement actions that minimize risk from climate change and natural hazards to preserve or restore the functions of natural systems.

Education

- Educate all stakeholders about the value of hazard mitigation and how to implement it in their work, businesses, and homes.

Figure 1. Goal Statements.

Land Use and Development

Changes in Development

E1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

***CHANGES IN DEVELOPMENT** means recent development (for example, construction completed since the last plan was approved), potential development (for example, development planned or under consideration by the jurisdiction), or conditions that may affect the risks and vulnerabilities of the jurisdictions (for example, climate change, declining populations or projected increases in population, or foreclosures) or shifts in the needs of underserved communities or gaps in social equity. This can also include changes in local policies, standards, codes, regulations, land use regulations and other conditions.*

The Town of Adams has not seen many significant changes in development since the last plan update in 2019. This is mainly due to a steadily declining population with less demand for new residential and commercial developments, and a land use pattern that has been remarkably stable over the last 60 years. Except for a few small residential subdivisions, development that has taken place in recent years is mainly centered on the rehabilitation of existing structures within the town center.

As described in the Town's Open Space and Recreation Plan, Adams is fortunate to retain its traditional settlement pattern of a distinct town center, industrial development north and south of this center, less dense residential development rising into the hillsides, and finally protected farmland and forestland along the higher elevations. Land use and development in hazard-prone areas is generally constrained by topography with the Hoosac Range and Mount Greylock acting as "natural barriers," in addition to protected open space, farmland, and forestland. Many of the Town's other undeveloped areas are protected by its strong planning and regulatory framework which has a history of preserving natural resources and environmentally sensitive areas. As further described in Chapter 5 (Capability Assessment), land use and development projects in Adams are regulated through the Town's zoning bylaw and other regulations which prevent or restrict activities that could lead to increased hazard vulnerability. This includes preventing irresponsible development in its designated Floodplain District in addition to wetland protection regulations, subdivision regulations, and stormwater management practices that continue to be reviewed and updated as determined necessary.

Over the last five years the Town has shifted to a focus on renewing and restoring old commercial and housing stock, while encouraging developers to restore vacant or underused properties. Examples include the former Adams Community Center, which was vacant for many years and frequently vandalized, being sold to a developer with the condition that they create market-rate apartments in the building. The Town is also currently seeking developers to restore and utilize the former Curtis Fine Paper Mill, a brownfield site that was acquired by the Town and subsequently cleaned up with the assistance of the US Environmental Protection Agency, thus mitigating physical and chemical hazards present on the site. The Town is also in the process of restoring the Adams Memorial School, which will become a new home for the Town's Council on Aging as well as an Emergency Shelter for the Town. The Adams Housing Rehabilitation Program also rehabilitates the Town's housing stock for low-moderate income residents, and for investor owners whose tenants are income eligible. As one of the main priorities of the Program is to eliminate code violations and hazards, the Housing Rehabilitation Program helps to eliminate potential hazards in households that would not likely have the financial ability to do so otherwise.

In terms of new or planned development, the Town has engaged in a major development process at Greylock Glen, a 1,060 acre parcel of land at the eastern base of Mount Greylock. In the coming years, the Town of Adams will work with private developers to add several features to the site including a lodge and conference center, camping facilities, a performing arts amphitheater, and an environmental art garden. In total about 25 acres will be developed but all new construction will be accomplished using environmentally conscious and sustainable development methods. The Town will remain an active steward of the developed land upon its completion, which will reduce the possibility of hazards in that area. The development project will also likely yield funds that the Town can then leverage to mitigate other hazards in Town. This includes continuing its efforts to improve its stormwater management and flood control structures that protect existing development, especially along the Hoosic River.

The Town doesn't anticipate significant land development to occur beyond the Greylock Glen project, though three additional areas are identified as potential growth areas in the Town's Stormwater

Management Plan. These areas are briefly described below along with their potential implications for stormwater management.

- Northern Area – off East Road and Spring Road.
  The storm drain system in this area consists of a few catch basins that drain the water across East Road and Spring Road. The area is generally undeveloped, consisting mostly of forest and farmland where stormwater can infiltrate into the ground. The terrain slopes towards East Road. If developed, the stormwater system would have to be upgraded to handle the stormwater flow that would be flowing off the developed land.
- Southern Area 1 – East Orchard Terrace
  East Orchard Terrace has an existing storm drain system established which flows down towards Orchard Street. Future development of this area would most likely tie into this existing system. Portions of East Orchard Terrace are already developed, while the remaining area is comprised of forest and farmland. The terrain generally slopes towards the northwest. Stormwater not captured on East Orchard Terrace can flow northwest towards existing systems on Orchard Street and East Street.
- Southern Area 2 – Off West Road
  There is no stormwater collection system on West Road. This area is characterized by several small hills and the stormwater flows in several directions throughout the area. The area is mostly wooded; however, there are several residences already on West Road. Stormwater infrastructure would need to be built to accommodate future development.

In summary, there is no recent development or planned development in Adams that is believed to be increasing the risks and vulnerabilities of the community to hazards. However, as described in Chapter 4 (Risk Assessment), it is anticipated that climate change and projected future conditions will increase the threats posed by multiple hazards. Among the greatest concerns for Adams is the expected increase in the frequency and/or severity of riverine and stormwater/flash flooding caused by extreme rainfall events and ice or snow melt, along with wildfire, wind, and other extreme weather events. Increasing risks associated with these hazards could result in more frequent and/or more severe impacts to the community and especially those populations considered to be more vulnerable to their effects as described in Chapter 4.

Progress in Mitigation Efforts

E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement §201.6(d)(3))

Priorities in the Town of Adams have shifted to focus more on green initiatives, economic development, and community engagement. In addition to green initiatives, the Town is focused on climate adaptation and has several ongoing drainage projects to address this need. Moving forward the Town intends to expand community engagement to help residents understand natural hazard risks. These priorities are reflected throughout this plan and especially in the list of new mitigation actions in Chapter 6 (Mitigation Strategy).

The status of each mitigation action from the 2019 Multi-Hazard Mitigation Plan is included in Chapter 6: Mitigation Strategy. The text in this chapter includes a designation of Completed, Completed & To Be Continued, Partially Completed/In Progress, Delayed, or Cancelled with a description. In addition, if the mitigation action has moved forward to this Plan's list of actions that is indicated.

The Town of Adams effectively integrated mitigation principles, vulnerability information, and mitigation actions into other planning mechanisms to leverage activities that have co-benefits, reduce risk, and increase resilience. Information from the 2019 Multi-Hazard Mitigation Plan was integrated into several plans developed in 2019. These included the Stormwater Management Plan, the Rapid Recovery Plan, and the 2019 Open Space and Recreation Plan. The HMPC reports that Town plans frequently cross-reference each other.

Authority and Assurances

The Town of Adams will continue to comply with all applicable Federal laws and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 201.6. It will amend its plan whenever necessary to reflect changes in City, State or Federal laws and regulations, as required in 44 CFR 201.6. The list of laws and regulations the Town with adhere to is below.

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended.
- National Flood Insurance Act of 1968, as amended.
- National Dam Safety Program Act (Pub. L. 92-367), as amended.
- 44 CFR Part 201 Mitigation Planning.
- 44 CFR, Part 60, Subpart A, including § 60.3 Flood plain management criteria for flood-prone areas.
- 44 CFR Part 77 Flood Mitigation Grants[10].
- 44 CFR Part 206 Subpart N. Hazard Mitigation Grant Program.

Plan Adoption

The Town of Adams will adopt the Plan when it has received "approved-pending adoption" status from the Federal Emergency Management Agency (FEMA). The Certificate of Adoption is included on page 7.

Document Overview

Below is a summary of the Town of Adams, MA Hazard Mitigation Plan Update chapters, including appendices. The planning process closely adhered to FEMA guidelines and to the intent of those guidelines.

Chapter 2: Planning Area Profile
The Planning Area Profile chapter describes the Town of Adams, including history, population, government, and infrastructure. Included in this chapter is a list of critical facilities identified by the HMPC.

Chapter 3: Planning Process
The Planning Process chapter documents the methodology and approach of the hazard mitigation planning process. The chapter summarizes the HMPC meetings and the public outreach process (including public meetings). This chapter guides the reader through the process of generating this plan and reflects its open and inclusive public involvement process.

Chapter 4: Risk Assessment
The Risk Assessment identifies the natural hazard risks to the Town of Adams and its residents. The risk assessment looks at current and future vulnerabilities based on land use development including structures and infrastructure.

Chapter 5: Capability Assessment
The Capability Assessment looks at the Town's ability to mitigate risk prior to and following disaster. This chapter is structured around the following four categories: planning and regulatory, administrative, and technical, financial, as well as education and outreach. The chapter concludes with information regarding the National Flood Insurance Program (NFIP).

Chapter 6: Mitigation Strategy
This chapter provides a blueprint for reducing losses identified in the Risk Assessment. The chapter presents the hazard mitigation goals and identifies mitigation actions in priority groupings. Each mitigation action includes essential details, such as Town lead, potential funding sources, and implementation timeframe.

Chapter 7: Plan Implementation and Maintenance
The Plan Implementation and Maintenance establishes a system and mechanism for periodically monitoring, evaluating, and updating the Town of Adams Hazard Mitigation Plan Update. It also includes a plan for continuing public outreach and monitoring the implementation of the identified mitigation actions.

Appendices
The Appendices includes documentation regarding the planning process, the list of mitigation actions and the *Hazus* Reports.

Chapter 2: Planning Area, Profile

The Town of Adams, with a population of 8,166[5] is in northwestern Massachusetts in Berkshire County and was settled by European settlers in the mid-1700s. Adams was incorporated as a township in 1778.[6] The Town is bordered by North Adams in the north, Cheshire in the south, Savoy and Florida in the east, and Williamstown and New Ashford to the west. It sits about 138 miles west of Boston and 158 miles north of New York City.[7] The figure below shows the Town of Adams boundaries and its location in Massachusetts.

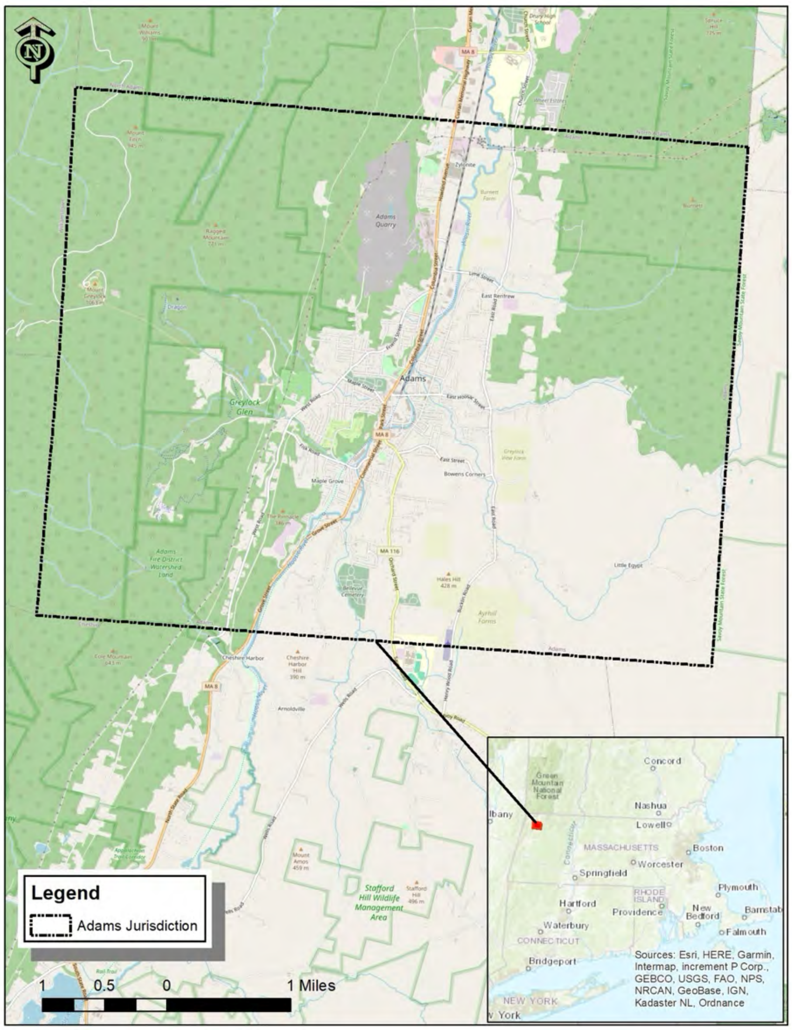

Figure 2. Adams Base Map.

[5] QuickFacts Adams town, Berkshire County, Massachusetts. (2022). United States Census Bureau.

[6] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[7] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

The Town is in the valley of the Hoosic River's South Branch and the Hoosic River flows north through the Town's Center.[8] To its west, is Mount Greylock and to its east is the Hoosac Range, which makes the Town home to a striking natural landscape. [9] Due to the Hoosic River, Adams became a vibrant mill town during the nineteenth century. The work provided by several mills in the Town, alongside access to the railroad in 1843, made Adams' population grow significantly as it became home to families coming from Europe.[10] With the steady decline of industry after World War II, the mill economy in Adams faded away which resulted in fewer jobs, a decrease in the Town's customer base, and a loss of general wealth, which continues to impact Adams' economy to this day.[11] The Town is in the process of developing the Greylock Glen Resort, a multi-use resort with a campground, amphitheater, and retailer, at the base of Mount Greylock.[12]

Adams "mountain setting" has shaped the Town's character and its natural resources and proximity to open space has been a draw to residents and visitors alike. Many Berkshire communities have been working to capitalize on their "scenic, rural and cultural resources as an incentive for tourism."[13]

The Town has a Town Administrator that acts as the Chief Administrative and Fiscal Officer and a Selectboard form of government. The Chief Administrator appoints and removes all Town officials with the approval of the Board.[14]

People

As of 2020, 94.6% of the Town identified as White, while 0.3% identified as Black or African American. Additionally, 0.8% of the population identified as Asian and 3.0% identified as Hispanic or Latino. The foreign-born population in Town is 2.4%. There are approximately 4,041 households in Adams and the median household income is $54,677. The number of people living in poverty is 13.8%. Ninety-three percent of the Town, aged 25 years or older, have a high school or higher diploma.[15] The median household age is 46, older than the State's average of 39 years. [16]

The State of Massachusetts' defines "Environmental Justice Populations" as areas of a community where at least one of the following criteria it true:

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[8] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.

[9] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.

[10] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[11] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[12] Berkshire County Outdoor Recreation Plan. (2020). Berkshire Regional Planning Commission.

[13] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[14] Town Administrator. (n.d.). Town of Adams, Massachusetts.

[15] QuickFacts Adams town, Berkshire County, Massachusetts. (2022). United States Census Bureau.

[16] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

1. Annual median household income is 65% or less of the state's annual median household income.
2. Minorities make up 40% or more of the city or town's population.
3. Twenty-five percent or more of households speak English "less than very well."
4. Minorities make up 25% or more of the population *and* the annual median household income of the municipality where the neighborhood is located does not exceed 150% of the statewide annual median household income.[17]

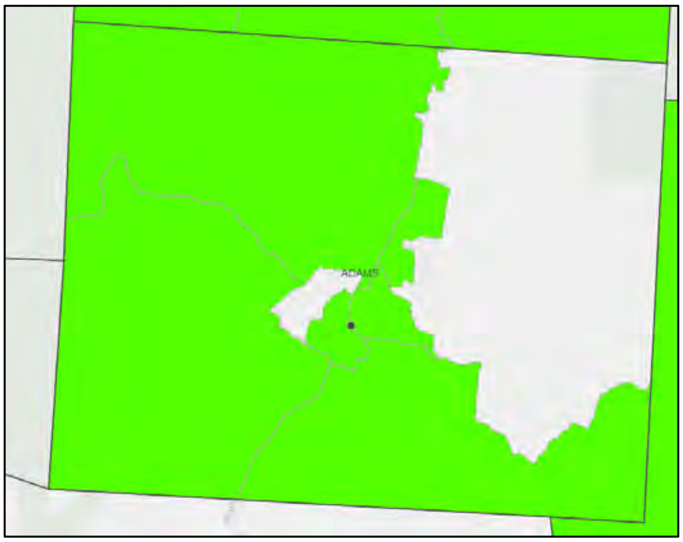

Figure 3. Environmental Justice Communities in Adams.

These populations are more vulnerable due to being disproportionately affected by the negative impacts of natural hazards nationwide. The data for identifying Environmental Justice Populations comes from the Executive Office of Energy and Environmental Affairs (EEA) who uses American Community Survey data.[18]

Figure 3 from the 2020 Massachusetts Environmental Justice Communities Map Viewer shows the location of Adams' EJ Communities which are located mostly in the western and southern portions of the Town. These census block groups, identified in green are Environmental Justice populations that fit the "Income" criteria.[19] There are eight population block groups in Adams, six of them are considered low income and Environmental Justice communities. Those six comprise 83% of the Town's population.

Land Use and Development (Structures)

As a rural community, Adams has a "compact development pattern" which includes a densely developed downtown with some commercial and industrial facilities, these are surrounded by a densely populated residential area. Beyond this "core" of high-density development is a less densely developed residential area that is located closer to the Town's periphery. Land use and development is impacted by topography with the Hoosac Range and Mount Greylock acting as "natural barriers" and protected open

[17] "Environmental Justice Populations in Massachusetts." (2024). Commonwealth of Massachusetts. https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

[18] "Environmental Justice Populations in Massachusetts." (2024). Commonwealth of Massachusetts. https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

[19] "Massachusetts 2020 Environmental Justice Populations Map Viewer." (2022). State of Massachusetts.

space. [20] As a result of this development pattern, Adams has a variety of land uses ranging from the downtown core to mixed use areas that then lead to more suburban neighborhoods and rural open spaces.[21] Adams' zoning districts and regulations account for this variety and help maintain the character of the Town while planning for future development. For example, the Town's Open Space Zoning District is occupied by the Mount Greylock State Reservation and Savoy State Forest, while low-density subdivisions have been allowed on inactive farmland recently. [22]

For future growth, the Town's 2019 Stormwater Management Plan identified four areas which include:

- "Northern Area – off East Road and Spring Road
- Southern Area 1 – East Orchard Terrace
- Southern Area 2 – off West Road
- Western Area – Greylock Glen (off Gould Road)." [23]

Natural Resources

Natural resources provide habitats for plants and animals, increase biodiversity, and support various ecosystems while also providing recreational opportunities and access to the natural environment. Natural resources include features such as bodies of water like rivers and wetlands and open space like forests and parks. These features play an important part in maintaining environmental sustainability and life, but they are also threatened by natural hazards and climate change. As a result, they need to be protected and managed to mitigate risk to people and the built environment, prevent irreparable damage to the resources themselves, and lessen the impacts of major threats such as floods or drought.

Rivers

The Hoosic River has a mainstem as well as south and north branches. The northern branch begins in Readsborough, Vermont and flows into Clarksburg, Massachusetts until it joins the south branch in North Adams. The southern branch begins in Pittsfield, Massachusetts and flows through Adams to its confluence with the north branch. At the confluence, the main stem travels west as it leaves Massachusetts through Vermont and New York, where it enters the Hudson River in Stillwater, New York.[24]

Seven major tributaries flow into the Hoosic River in Adams and that includes:

1. Dry Brook

[20] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.
[21] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.
[22] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.
[23] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.
[24] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

2. Hoxie Brook
3. Miller Brook
4. Pecks Brook
5. Reed Brook
6. Southwick Brook
7. Tophet Brook.[25]

The river and the seven tributaries that flow into it comprise approximately 100 miles of surface water resources in the Town. [26]

Watersheds

The Town of Adams falls within the Greater Hudson Basin which includes three sub-basins: the Hoosic, Kinderhook, and Bashbish. The entire Town, aside from a small, forested area in the Savoy State Forest, is within the Hoosic watershed. This watershed is made up of the Hoosic River, Green River, and other tributaries that drain from the Hoosac Range and Mount Greylock. These rivers supply the aquifers and surface waters in Adams. The Hoosic River Watershed Association (HooRWA) founded in 1986, aims to protect and promote awareness for the Hoosic River. HooRWA works with Adams and the State to provide water quality monitoring for the Hoosic River.[27]

Wetlands

Adams has riverine (deep water habitats in a channel) and palustrine (vegetated non-channel) wetlands that are associated with the perennial rivers and streams. Riverine wetlands, located near a river or stream, can have a variety of plant species and the "vegetative character" are likely shrub, scrub, or broad-leafed deciduous. The Palustrine wetlands are lowland areas that are covered in "emergent vegetation." The typical wetlands found in Town include fens (peat-forming wetlands that receive nutrients from sources other than precipitation), floodplains, swamps, wet meadows, and small ponds. The University of Massachusetts conducted a wetland mapping for the Hoosic Watershed back in 2006 and wetlands make up 1.5% of Adams.[28]

Outdoor Recreation

The Town of Adams is full of outdoor recreational opportunities due to its abundance of and proximity to natural resources. Some famous Appalachian Trail segments pass through portions of Adams as it climbs Mount Greylock which reaches a summit of 3,491 feet and offers majestic scenic views.[29]

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[25] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[26] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[27] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[28] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[29] Berkshire County Outdoor Recreation Plan. (2020). Berkshire Regional Planning Commission.

Additionally, Greylock Glen, a recreation center that will include the Greylock Glen Resort, is located east of the Mount Greylock State Reservation The development will include a lodge, conference center, on-site campground, and a large Outdoor Center, and an outdoor retailer. An updated plan also includes an amphitheater and sculpture garden. The site presently offers 18 miles of trails that can be used for hiking, snowshoeing, skiing, and biking.[30]

Critical Facilities and Infrastructure

Critical facilities and infrastructure are considered community lifelines; towns rely on these facilities before, during, and after a disaster. Critical facilities and infrastructure are important to identify and manage because of the services and access they provide daily. Mitigating risks related to natural hazards and climate change improves a town's resilience and economic vitality.

Water & Sewer Service

Water Supply

Over 90% of water users in Adams draw from the municipal water supply. The Adams Fire District draws from a series of wells known as the "Cheshire Harbor Wellfield" located in the neighboring Town of Cheshire. The Bassett Brook Reservoir, located off Route 8 in Cheshire, is used as a back-up water supply, it was a primary source of water until 1995. To protect the Town's water supply, Adams and Cheshire collaborated to implement a "Zone II Wellhead Protection Overlay District" in 2007. Special requirements within the district, like limiting uses and activities that can take place, have been adopted into Cheshire's Zoning Bylaws.[31]

Sewer Service

In 1971, the Adams Wastewater Treatment Plant was completed in the northeast section of Town. It is a separate collection system that collects sanitary and industrial waste while stormwater is diverted through a system that empties directly into the Hoosic River and its tributaries. The Treatment Plant "treats an average 2.18 million gallons of wastewater each day (mgd). The plant has a design capacity of 4.6 mgd and it is permitted to treat 3.5 mgd from June to November and 4.6 mgd the remainder of the year." [32]

Most the Town's residential and commercial units, 94%, use the Town's sewer system. The remainder of the Town uses private septic systems. Most of these homes are located on "West Road, West Mountain Round, Gould Road, Notch Road, parts of East Road, East Hoosac Street, Walling Road, East Mountain Road, Burlingame Road, and Bucklin Road. [33]

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[30] Berkshire County Outdoor Recreation Plan. (2020). Berkshire Regional Planning Commission.

[31] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[32] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[33] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

Stormwater

Stormwater management in the Town includes flood control chutes on the Hoosic River that travel through downtown. More than 175 “major drainage-related structures” such as stormwater outfalls, dikes, levees, basins, diversion channels, and weirs are present. Most of the rainfall and runoff in the more urban areas of Town are managed by catch basins, drainage manholes, and pipes. The pipes often discharge directly into adjacent streams. Some of the drainage structures upstream of the Hoosic River about 75-100 years old. The Town has an updated Stormwater Management Plan to support its efforts.[34]

Critical Facilities

The term “critical facilities” is often used to describe structures necessary for a community to respond and recover in emergency situations. These facilities often include emergency response facilities (fire stations, police stations, rescue squads, and emergency operation centers [EOCs]), custodial facilities (jails and other detention centers, long-term care facilities, hospitals, and other health care facilities), schools, emergency shelters, utilities (water supply, wastewater treatment facilities, and power), communications facilities, and any other assets determined by the community to be of critical importance for the protection of the health and safety of the population. The adverse effects of damaged critical facilities can extend far beyond direct physical damage. Disruption of health care, fire, and police services can impair search and rescue, emergency medical care, and even access to damaged areas.

> The Local Mitigation Planning Handbook (FEMA, 2013) explains that *“Critical facilities are structures and institutions necessary for a community’s response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery. When identifying vulnerabilities, it is important to consider both the structural integrity and content value of critical facilities and the effects of interrupting their services to the community.”*

The number and nature of critical facilities in a community can differ greatly from one jurisdiction to another, and usually include both public and private facilities. Each community needs to determine the relative importance of the publicly and privately owned facilities that deliver vital services, provide important functions, and protect special populations.

A list of the critical facilities in Adams is provided in the table below. This list was obtained from the previous edition of the hazard mitigation plan and the MVP-funded Community Resilience Building (CRB) plan; and reviewed by the HMPC throughout the planning process.

The Adams Fire Station, Adams Police Station, and Wastewater Treatment Plant are the only facilities with backup power. The Memorial Middle School functions as the Town’s shelter.

[34] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

Table 1. Critical Facilities in the Town of Adams.

Name	Address
Town Hall	8 Park Street
Adams Fire Station	3 Columbia Street
Adams Forest Warden	1 Warden Drive
Adams Police Station	4 School Street
Dept. of Public Works	90 North Summer Street
Council on Aging/Visitor Center	3 Hoosac Street
Hoosac Valley ES	14 Commercial Street
Memorial MS	30 Columbia Street
Berkshire A&T Charter School	1 Commercial Street
St. Stanislaus Kostka School	108 Summer Street
Housing Authority	4 Columbia Street
Library	92 Park Street
Wastewater Treatment Plant	273 Columbia Street
Water Facility	
Adams Station	4 Hoosac Street
Substation	

Critical Transportation Infrastructure

Transportation to and from Adams is restricted by its overall location within Berkshire County. State Route 8 which runs north to south, and Route 116 which runs east to west act as the major transportation corridors. Residents and visitors must travel approximately 36 miles south of Adams to access the Massachusetts Turnpike (I-90).[35]

The Town's network of roads is limited by topography and protected open space. An example of this includes no direct road access to the summit of Mount Greylock from within Adams, though it is one of the most prominent features in the Town and the surrounding landscape. Roads, along with any development, are concentrated in the lower land areas along the Hoosic River. [36]

Adams also has a terminus at Lime Street for the Ashuwillticook Rail Trail which extends from Lanesborough to Adams' downtown. The Rail Trail is 12.2 miles, but a proposed recreational path will travel the length of Berkshire County from Connecticut to Vermont. The most recent section of the trail

[35] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[36] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

was completed and opened in 2017 and aims to offer an alternative form of transportation in the Northern Berkshire region. [37]

The Town is a member of the Berkshire Regional Transit Authority (BRTA) that provides a fixed-route bus service to Adams and the neighboring area with connections to other parts of the Berkshires. The BRTA also provides para-transit services for the elderly and disabled community. [38] The neighboring community of North Adams also has a freight rail and the Harriman & West Airport.[39]

Dams

The dams in Adams are listed below in alphabetical order. There are no "high" hazard dams located in Adams, but there are three "significant" hazard dams which are the Arnold, Fisk Brook, and Greylock Greenhouse dams.

1. Anthony Dam
2. Arnold Dam
3. Fisk Brook Dam
4. Greylock Glen Pond #1 Dam
5. Greylock Glen Pond Dam
6. Greylock Greenhouse Dam
7. Hall Brook Dam
8. Peck's Brook dam
9. Plunkett Dam #2
10. Plunkett Dam #3
11. Town Infirmary Dam

Economy

Historically, the Town's economy was driven by industry, which was common for the region and many cities and towns across the State. The Hoosic River drove much of this industry and development due to the water powering mills. Presently, however, the Town's manufacturing industry has declined "dramatically," typical throughout the Berkshires. Adams is working to capitalize on its natural assets used for recreation by serving tourists who frequent the Berkshires.

There has been a significant revitalization process in the downtown which includes the "Downtown Façade & Signage Improvement Program" and the "Housing Rehabilitation Program." Additional

[37] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[38] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

[39] Town of Adams Open Space and Recreational Plan. (2019-2024). Town of Adams, Massachusetts.

renovations are occurring on Russell Field which is a regional recreational resource near the downtown, and the Town Common.[40]

As of 2020, Adams' top three industries by occupation according to the United States Census include:

1. Educational services, healthcare and social assistance
2. Retail trade
3. Manufacturing.[41]

Historic and Cultural Resources

Historic and cultural resources shape a community's character and identity while also creating a sense of place for residents and visitors. Many New England cities and towns are home to significant sites and structures that capture the history and heritage of an area. Some resources may date back centuries, like burial grounds, while others can be more recent, like newly designated historic districts. Their importance lies in what they mean to a community and how they represent its people and place. Historic and cultural resources can be at risk due to the negative impacts of natural hazards and climate change. This plan identifies these resources so the HMPC may consider their vulnerability and potential need for mitigation.

The Town of Adams has many significant historic and cultural resources. Some major points of interest include:

- Ashuwillticook Rail Trail – a paved scenic path, that was a former railroad corridor, offering recreation through Adams, Cheshire, and Lanesborough parallel to Route 8. Ashuwillticook originated from a Native American term meaning "at the pleasant river between the hills."
- Greylock Glen – located at the base of Mount Greylock, will be the future site of a campground, Outdoor Center, amphitheater, and lodge.
- Pecks Falls – a distinct waterfall that captures "wild natural beauty" can be found in the upper portion of Pecks Brook that flows to Adams from Mount Greylock.
- Susan B. Anthony's Birthplace – located on East Road and home to a historical figure who was an activist and played a pivotal role in the women's suffrage movement.
- The Quaker Meeting House – located in the Maple Street Cemetery is a memorial to those who built it. The Meeting House was built in 1784 and is open for tours seasonally, on Sundays.

[40] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.

[41] "Industry By Occupation for the Civilian Employed Population 16 Years and Over ACS 5-Year Estimates." (2020). United States Census Bureau.

- The Birthplace of George N. Briggs – located at 11 Weber Street is the home to the former Governor of Massachusetts who served seven terms between 1844 and 1851 that is located at 11 Weber Street.
- The Thunderbolt Ski Trail – beginning near Mount Greylock's summit, this ski trail has a vertical drop of 2,150 feet and is 1.6 miles long. It is classified as an "Expert Class A Racing Trail.
- McKinley Square – this Square is home to the locations of the Adams Free Library, the Armory, a monument to President William McKinley, and the Notre Dame Church.[42]

There are two nationally significant historic districts in Adams which include:

1. "Summer Street National Register Historic District: This district along Crandall, Center, East, Liberty, Orchard and Summer Street is about 350 acres and contains 75 properties. This residential area contains several unique and architecturally distinctive private homes dating from the 1890s; the majority of these are in excellent condition." [43]
2. "Mount Greylock Summit National Register Historic District: Five buildings, 10 structures and about 1,200 acres of the summit of the State Reservation make up this district. The designation is based on historic events at the site and the architecture of Bascom Lodge."[44]

All these historical and cultural resources must be considered in future hazard mitigation planning due to the risk of the Town's significant districts, sites, and structures being damaged or threatened by natural hazards and climate change.

[42] Annual Town Report. (2022). Town of Adams, Massachusetts.

[43] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.

[44] Stormwater Management Plan. (2019). Town of Adams, Massachusetts.

Chapter 3: Planning Process

The planning process was developed in full compliance with the current planning requirements of the Federal Emergency Management Agency (FEMA) per the following rules and regulations:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000
- Code of Federal Regulations – Title 44, Chapter 1, Part 201 (§201.6: Local Mitigation Plans)
- Federal Emergency Management Agency Local Mitigation Planning Policy Guide, (Released April 19, 2022, Effective April 19, 2023)
- In addition, the plan was prepared with the suggestions found in the Demonstrating Good Practices Within Local Hazard Mitigation Plans, FEMA Region 1, January 2017.

A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))

A priority through the planning process was equity, which FEMA defines as the "consistent and systematic fair, just and impartial treatment for all individuals." This was a central theme throughout the planning process and effort was made to develop an inclusive planning process. The whole community (individuals, communities, private and nonprofit sectors, faith-based organizations, and all levels of government) were given an opportunity to participate.

The planning process for this updated mitigation plan began in September 2023 and concluded in April 2023 (this does not include the months of plan review and adoption). The Town developed a Municipal Vulnerability Preparedness (MVP) Program summary of findings in 2018. This planning effort contributed to the update of the mitigation plan. Below is a graphical display of the plan development timeline.

Table 2. Planning Process Schedule.

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Task 1. Convene Local HMPC	Kick-off Meeting	HMPC Meeting	HMPC Meeting & Public Meeting		HMPC Meeting		HMPC Meeting & Public Meeting	
Task 2. Update Hazard Profiles								

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Task 3. Update Critical Facility Inventory								
Task 4. Update Mitigation Goals								
Task 5. Update Mitigation Actions								
Task 6. Plan Review, Evaluation, and Implementation							Complete Draft for HMPC Review	
Task 7. Public Review of Draft							Public Review	
Task 8. Review and Approval								Submit Plan to MEMA

Hazard Mitigation Planning Committee

The Town Planner, Kevin Rayner, developed the Hazard Mitigation Planning Committee (HMPC) and was the point of contact for the Consulting Team. The HMPC included Town employees who represented five sectors of the community shown in the table below. A full list of HMPC members is shown in the table after that. The HMPC met four times, October 26, 2023, November 30, 2023, January 25, 2024, and March 6, 2024. All the meetings were conducted via Zoom, however sometimes Town employees gathered at the Town office. A list of participants at each of these meetings is included in Appendix A.

Table 3. Sectors of the Community Represented on HMPC.

Sectors of the Community	HMPC Members
• Emergency Management	• Fire Chief
• Economic Development	• Community Development Director • Town Administrator • Town Planner
• Land Use and Development	• Community Development Director

Sectors of the Community	HMPC Members
	• Department of Public Works Supervisor • Department of Public Works Administrative Assistant • Town Administrator • Town Planner
• Health and Social Services	• Board of Health • Council on Aging Director • Housing Authority Executive Director
• Infrastructure	• Community Development Director • Department of Public Works Supervisor • Administrative Assistant for Department of Public Works • Building Commissioner • Town Administrator • Town Planner

Table 4. HMPC Members.

First Name	Last Name	Title	Affiliation	Phone	Email
John	Barrett	Water Department Superintendent	Adams Fire District	(413) 743-0978 ext.13	johnbarrett@adamsfiredistrict.com
Tim	Cota	Department of Public Works Supervisor	Town of Adams	(413) 743-8300 Ext. 172	tcota@town.adams.ma.us
Eammon	Coughlin	Community Development Director	Town of Adams	(413) 743-8300 Ext. 130	ecoughlin@town.adams.ma.us
Sarah	Fontaine	Adams Council on Aging Director	Town of Adams	(413) 743-8333 Opt. 4	sfontraine@town.adams.ma.us
Gerald	Garner	Building Commissioner	Town of Adams	(413) 743-8300 Ext. 105	ggarner@town.adams.ma.us
Jay	Green	Town Administrator	Town of Adams	413-743-8300 Ext. 102	jgreen@town.adams.ma.us
Stephanie	Melito	Admin. Assistant for Department of Public Works	Town of Adams	(413) 743-8300 Ext. 122	smelito@town.adams.ma.us
John	Pansecchi	Fire Chief	Adams Fire District	(413) 743-0179 Ext. 16	jpansecchi@town.adams.ma.us
Kevin	Rayner	Town Planner	Town of Adams	(413) 743-8300 Ext. 132	krayner@town.adams.ma.us
Dave	Rhoads	Chair, Board of Health	Town of Adams	(413) 743-8300 Ext. 106	drhoads@town.adams.ma.us
William	Schrade	Executive Director, Adams Housing Authority	Town of Adams	(413) 652-1617	bills@ahauthority.com
Coby	Tarjick	Community Development Program Manager	Town of Adams	(413) 743-8300 Ext. 127	jtarjick@town.adams.ma.us

A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))

The first HMPC Meeting was held on October 26, 2023, and provided an opportunity for the consulting team and the Town Planner to introduce the HMPC to the mitigation planning process. After an introduction to the plan, the HMPC identified natural hazards and critical facilities which include the Town's Senior Center & Visitor Center, Middle School, Library, Ambulance Station, and Water Pump Stations. They then discussed the Town's existing or in-progress plans which include:

- Community Development Strategy (created in 2018)
- Strategic Plan (2017)
- Open Space Recreation Plan (2019)
- Comprehensive Emergency Management Plan (worked on in 2019 but no formal plan)
- Housing Needs Assessment (no date provided).

The HMPC members noted that a large development at the base of Mountain Greylock, Greylock Glen Resort, is in the works. The Town is also working on managing water by way of upgrading culverts and drainage pipes, especially those under installed under Grant Street. The HMPC noted that the several flooding and drainage projects underway in Adams showcase a key problem for the Town regarding natural hazards and major weather events.

The HMPC also shared that the Town priorities include green initiatives, economic development particularly with the new Greylock Glen Resort, managing flooding comprehensively, increasing community engagement and education, and improving community-wide infrastructure.

The second HMPC meeting, held on November 30, 2023, began with a discussion on public outreach for the first public meeting. Ideas shared by the HMPC included posting the flyer on the following places, Town website, Town facilities, restaurants, and stores. The HMPC also agreed to share the press release and flyer with local news outlets, all Town committees, boards, and departments, and specific outreach to the Council on Aging and Visitor Center as well as, local schools through the local school superintendents.

The Town's capabilities were discussed and the HMPC noted the Town is working on a Stormwater Bylaw for 2024 and has also created an updated Stormwater Management Plan as of 2019. They also stated that there were twenty active National Flood Insurance Program (NFIP) policies, and that Adams has very outdated floodplain maps from FEMA. The conversation then moved onto critical facilities and identifying which facilities had back-up power, such as the Police Station, Fire Station, and Wastewater Treatment Plant. The HMPC identified a need for a generator for the Council on Aging and Visitor Center.

The HMPC then discussed each natural hazard and reviewed impacts over the last five to ten years. The main hazards that were discussed focused on flooding and climate change, which included the Housing Authority Buildings being exposed to flooding and the need for a more secure water supply. Additionally, some neighborhoods have poor drainage or inadequate stormwater systems like those in the Jordan Street Area, Staples Street, and East Hoosac Street. Wildfires and landslides are less of an issue, but the Town has been dealing with the invasive Japanese Knotweed for years. River wall erosion, vegetation removal, water conservation, dam risks, and earthquakes were also discussed in relation to the Town.

The focus for the third HMPC meeting, held on January 25, 2024, was the Town's capabilities, in addition to hazard rankings and the creation of mitigation actions. The HMPC continued to stress how flooding is the main problem in their community. For extreme temperatures, the Town does have the Visitor Center as a designated cooling center. The HMPC noted the hard work of the Department of Public Works stating that they are the "best in Berkshire County" alongside the Highway Department, for managing and maintaining infrastructure during winter storms. The HMPC stated that the Town has had some droughts which required water restrictions. The HMPC shared that the Town had recently gone through public review and adoption of a Vegetation Management Plan. To further mitigation efforts, the HMPC plans to meet twice a year and post-disaster while also integrating the Hazard Mitigation Plan Update into their Open Space and Recreation Plan Update as well as an updated Municipal Vulnerability Preparedness Report.

The focus for the fourth HMPC meeting, held on March 6, 2024, was public meeting outreach for the second Public Meeting scheduled for March 26, 2024, and for Plan Review. In addition, the HMPC reviewed the final hazard ranking list, confirmed the mitigation plan goal statements, and discussed the list of mitigation actions and how they are prioritized. The public meeting was scheduled to take place in a hybrid environment at the Visitor's Center and on Zoom. The HMPC agreed to distribute and post flyers to local media, Facebook, Town's website, to the Council on Aging, and to all Boards, Committees, and Town departments. They also agreed to post the announcement in the Buzz, the Council on Aging newsletter. The Housing Authority agreed to help get the word out and the Town Planner agreed to share the information with the Berkshire Regional Planning Commission. They intend to do the same outreach activities for the plan's public review including posting hard copies at the Visitor Center and on the first floor in the Town Hall and at the Library.

The HMPC also participated in two public meetings, one on December 14, 2023, and one on March 26, 2024. Finally, the HMPC reviewed the draft Town of Adams, MA Hazard Mitigation Plan Update prior to sending it to the Massachusetts Emergency Management Agency (MEMA) for their review in April 2024.

Public Outreach

A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))

The Public Outreach Strategy was designed to involve the whole community in the mitigation planning process. The public was engaged in the planning process during the drafting of the plan and prior to plan approval through two public workshops (a flyer for the first workshop is shown below). Both public meetings were held in a hybrid format, in-person and on Zoom. The public was also given a chance to look over the plan and provide feedback prior to its review by MEMA or FEMA. The purpose of public engagement was to:

- Generate public interest in mitigation planning.
- Identify and accommodate special populations.
- Solicit public input.
- Engage local stakeholders.
- Create opportunities for public and local stakeholders to be actively involved in the mitigation planning process.

Each public meeting included a PowerPoint presentation and plenty of opportunity for questions and discussion. In addition, Mentimeter was used to facilitate input from meeting participants during the first meeting. This has proven to be an effective tool when engaging people who may not be comfortable speaking up in a virtual meeting. The HMPC participated in each meeting.

COMMUNITY LIFELINES *are the most fundamental services in the community that, when stabilized, enable all other aspects of society.*

Representatives from all community lifelines were included in public engagement efforts. Community lifelines are a driving force behind FEMA's strategic goals for building a culture of preparedness and readying the nation for catastrophic disasters. The eight community lifelines can be a powerful tool for local governments when evaluating risk and developing mitigation actions. The HMPC considered the eight community lifelines when conducting outreach through this planning process. The eight community lifelines and their respective components are shown in Figure 4.

Outreach for the public meetings and for plan review was sent via press release, email blasts, and reaching out to adjacent communities. The Town website (https://www.town.adams.ma.us/) included announcements for meetings, the press releases were sent to local organizations and posted around the

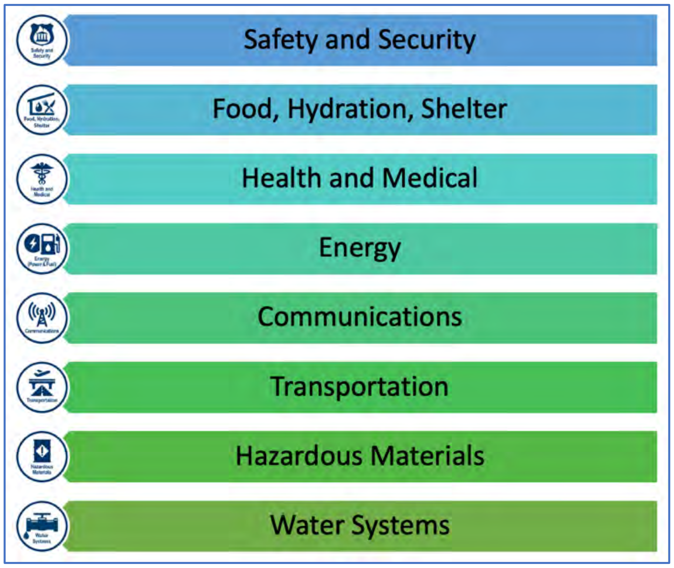


Figure 4. Community Lifelines.

Town at frequented buildings and sent to schools alongside the Housing Authority and Council on Aging facilities. The HMPC considered the Council on Aging to be the best resource for public outreach.

Information gathered during the public meetings contributed to the plan's development. The first public meeting was held on December 14, 2023. An accurate list of participants was not gathered due to the Zoom format, but there was approximately 6 people in attendance.

The meeting asked participants a series of questions to engage them and help them understand the process of developing a hazard mitigation plan. The questions are listed below.

- Who lives and works in your community?
- What buildings and infrastructure are critical to your community?
- What weather related hazards can impact your community?
- Name specific locations in your community that flood or are vulnerable to natural hazards.
- What can be done to mitigate risks you have identified? Think of activities to protect the people, buildings, and infrastructure named previously.

When asked about concerns about natural hazards in the Town of Adams the following responses were provided:

- Flooding
- Erosion
- Landslides

The participants were concerned with the aging and unmaintained "river walls" which are concrete or stone-lined sections of the Hoosic River right before entering flood chutes in Adams. The walls are collapsing and need repair, especially at River Street. The safety of bridges was also discussed, particularly the ones that are very small and privately-owned structures, which have had issues with gaining entry approvals in the past. Regarding emergency services, participants were concerned with the closure of the Adams Ambulance Service and identified the local hospital in neighboring North Adams since they are close to opening an Emergency Department.

Few mitigation actions were brought up such as conducting a flood and drainage study to better inventory and identify all flood control structures and stormwater systems. The meeting concluded with a discussion about natural hazard impacts on the community which included damage to property as the main concern including some high-risk culverts, bridges in need of repair, and the potential loss of mass transit (e.g., losing bus stops).

The second public meeting was held on March 26, 2024, and five people were in attendance. The meeting began with a description of the project and an update of information gathered at Thunderfest (described below in detail). The Chair of the Board of Health actively participated in the meeting and mentioned the need for additional outreach and engagement with the community, so they are aware of resources such as heating and cooling centers or shelters. The Water Superintendent described his work with Bassett Reservoir and how he maintains Emergency Action Plans and risk and resilience plans as well. The consulting team shared an overview of the plan contents and how to review the draft plan.

In addition to the public meetings, the Town Planner engaged the community during Thunderfest on March 24, 2024. Thunderfest is an outdoor winter festival that occurs after the Thunderbolt Ski Race on Mount Greylock. Thunderfest is held at the Adams Visitor Center and includes music, food, craft exhibits and other outdoor activities. The Town Planner distributed a one page survey with four questions to engage the public in the Hazard Mitigation Planning Process. A copy of the blank survey is included in Appendix A. A list of questions is shown below:

1. Circle the hazards that you think pose the largest threat to Adams.
2. On a scale of 1-5 how much does flooding affect you?
3. Please list any infrastructure you think presents a hazard or needs to be addressed.
4. Please list any comments or questions you have about the Hazard Mitigation Plan or hazards you may wish to have addressed by the plan.

The biggest hazard threats reported, in order of high to low, was flooding, high wind events, and winter storms. Specific areas of concern included:

- Adding seating along Town streets for seniors.
- Better flood control systems for rain and snow events.
- Fix the drainage system along East Upper Hoosac Street.
- Improve flood control on Lime Street.
- Change the rail trail crosswalk on Park Street.

Contributions from the HMPC and public engagement impacted the plan in multiple ways. The table below indicates some of the contributions, others are included above and throughout the plan.

Table 5. Where Public Engagement Informed the Plan.

Area of the Plan Impacted	Contributions
Planning Area Profile	• The HMPC updated the list of critical facilities, shown in Appendix B. They also contributed information regarding current land use practices.
Planning Process	• Participated in every aspect of the planning process and made recommendations regarding how to engage the public and key stakeholders.
Risk Assessment	• Described extent of hazard impacts based on previous events. • Offered first-hand insight and experiences of Town residents. • Added the qualitative review to the risk analysis for determination of the hazard risk ranking.
Capability Assessment	• Contributed plans, bylaws, and reports for review. • Completed three Capability Assessment questionnaires including the National Flood Insurance survey and the Safe Growth survey.
Mitigation Strategy	• Identified and prioritized mitigation actions based on their concerns. • Focused on the concerns raised by community members.
Implementation Plan	• Committed to integrating this plan more thoroughly throughout Town government and to posting the plan on the Town's website.

List of Key Stakeholders Invited to Public Meetings

The following groups were considered "key stakeholders" and invited to public meetings and to review the draft plan.

- Members of all Adams Committees
- Members of all Adams Boards
- Town of Adams Employees
- Town of North Adams
- Town of Cheshire
- Town of Savoy
- Town of Florida

- Town of Williamstown
- Town of New Ashford
- Adams Fire District and Fire Department
- Adams-Cheshire Regional School District
- Berkshire Regional Planning Commission
- Hoosac Valley Regional School District

Review of Draft Plan

The Town made the plan available for public review for two weeks in April 2024. A press release announcing the availability to review the plan was sent and the announcement was posted to the Town website in addition to all the outreach described above. Hard copies of the plan were kept in the Town Hall, the Visitor's Center, and the Library. Comments from the public were collected by the Town Planner.

Chapter 4. Risk Assessment

Hazard Identification

> ***RISK** for the purpose of hazard mitigation planning, is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure, or natural and cultural resources.*

The first step in the risk assessment was to revisit and evaluate the hazards identified for study and inclusion in the Town's previous draft hazard mitigation plan. This was a key topic of discussion at the first Hazard Mitigation Planning Committee (HMPC) meeting, along with the consideration of any additional hazards to include in the updated risk assessment. While only natural hazards are required to be addressed by FEMA, other hazards such as technological and human-caused hazards may be included if they are of significant concern to the community and determined to be a mitigation priority.

In completing the updated hazard identification process, the HMPC considered the results of the Town's Municipal Vulnerability Preparedness (MVP) planning effort (completed in 2018), as well as the "ResilientMass Plan" (2023[45]) which is the formal update to the 2018 State Hazard Mitigation and Adaptation Plan (SHMCAP). As a result of this process all hazards from the prior hazard mitigation plan (adopted in 2019) remain in this updated risk assessment. For this updated assessment, some hazards have been consolidated or renamed to be consistent with the ResilientMass Plan, as further described below. The top natural hazards identified for the MVP effort are thoroughly covered in this assessment, which are flooding, winter storms, wildfires, wind events, and extreme weather. Invasive species as a hazard was added to reflect the concern for this becoming a more prevalent challenge with projected climate change; and to ensure that the risk assessment is aligned with the ResilientMass Plan. The profiled hazards are as follows:

- Average/Extreme Temperatures
- Drought
- Earthquakes
- Flooding from Precipitation and Dam Overtopping
- Hurricanes and Tropical Storms
- Invasive Species
- Landslides

[45] https://www.mass.gov/doc/resilientmass-plan-2023

- Other Severe Weather
- Severe Winter Storms
- Tornadoes
- Wildfires

One "hazard" profiled in the ResilientMass Plan – "changes in groundwater" – is included as appropriate in the flood and drought hazard profiles in this plan.

Massachusetts Emergency Declarations

The Town of Adams has been subject to numerous federal disaster declarations along with the entirety of Berkshire County. Some of these disaster declarations correspond to emergency declarations in portions of Massachusetts. The following table cross-references the 13 Massachusetts emergency declarations starting in 2011 with the corresponding federal disaster declarations. All the Massachusetts emergency declarations corresponding to Adams have involved natural hazards addressed in this plan except for the shelter capacity crisis, which is not a natural hazard and not profiled in this plan. Hazards that do not appear in this table (i.e., earthquakes) have not been subject to Massachusetts emergency declarations.

Table 3. Massachusetts Emergency Declarations.

Massachusetts Emergency	Start	Termination	Corresponding Federal Disaster Declaration	FEMA Public Assistance Available	Applicable to Adams?
Storm Lee	9/15/2023	9/16/2023	Not applicable	Not applicable	Yes
Severe Weather and Flooding	9/12/2023	9/16/2023	Not applicable	Not applicable	Yes
Shelter Capacity Crisis	8/8/2023	Pending	Not applicable	Not applicable	Yes, but not a natural hazard and not a FEMA declaration for Massachusetts
COVID-19	3/10/2020	5/11/2023	DR-4496-MA	All counties	Yes

Massachusetts Emergency	Start	Termination	Corresponding Federal Disaster Declaration	FEMA Public Assistance Available	Applicable to Adams?
Merrimack Valley Gas Explosion	9/14/2018	10/4/2018	Not applicable	Not applicable	No
Coastal Storm	3/3/2018	3/6/2018	DR-4372-MA	Essex, Norfolk, Plymouth, Bristol, Barnstable, and Nantucket Counties	No
Winter Storm	2/9/2015	2/25/2015	Not applicable	Not applicable	No
Winter Storm	1/26/2015	1/28/2015	DR-4214-MA	Worcester County and eastward	No
Winter Storm	2/8/2013	2/13/2013	DR-4110-MA	All counties	Yes
Hurricane Sandy	10/27/2012	11/1/2012	DR-4097-MA	Suffolk, Bristol, Plymouth, Barnstable, Dukes, and Nantucket Counties	No
Nor'easter	10/29/2011	11/7/2011	DR-4051-MA	Berkshire, Franklin, Hampshire, Hampden, Worcester, and Middlesex Counties	Yes
Hurricane Irene	8/26/2011	9/6/2011	DR-4028-MA	Berkshire, Franklin, Hampshire, Hampden, Norfolk, Bristol,	Yes

Massachusetts Emergency	Start	Termination	Corresponding Federal Disaster Declaration	FEMA Public Assistance Available	Applicable to Adams?
				Plymouth, Barnstable, and Dukes Counties	
Tornadoes	6/1/2011	6/19/2011	DR-1994-MA	Hampden and Worcester Counties	No

Link to Massachusetts Climate Change Assessment

The *2022 Massachusetts Climate Change Assessment* report was issued in December 2022 (https://www.mass.gov/info-details/massachusetts-climate-change-assessment#read-the-report-). This report provided statements about the impacts of climate change in five sectors within each of seven designated regions of Massachusetts. Adams is in the "Berkshires and Hilltowns" region shown in dark green in the figure below.

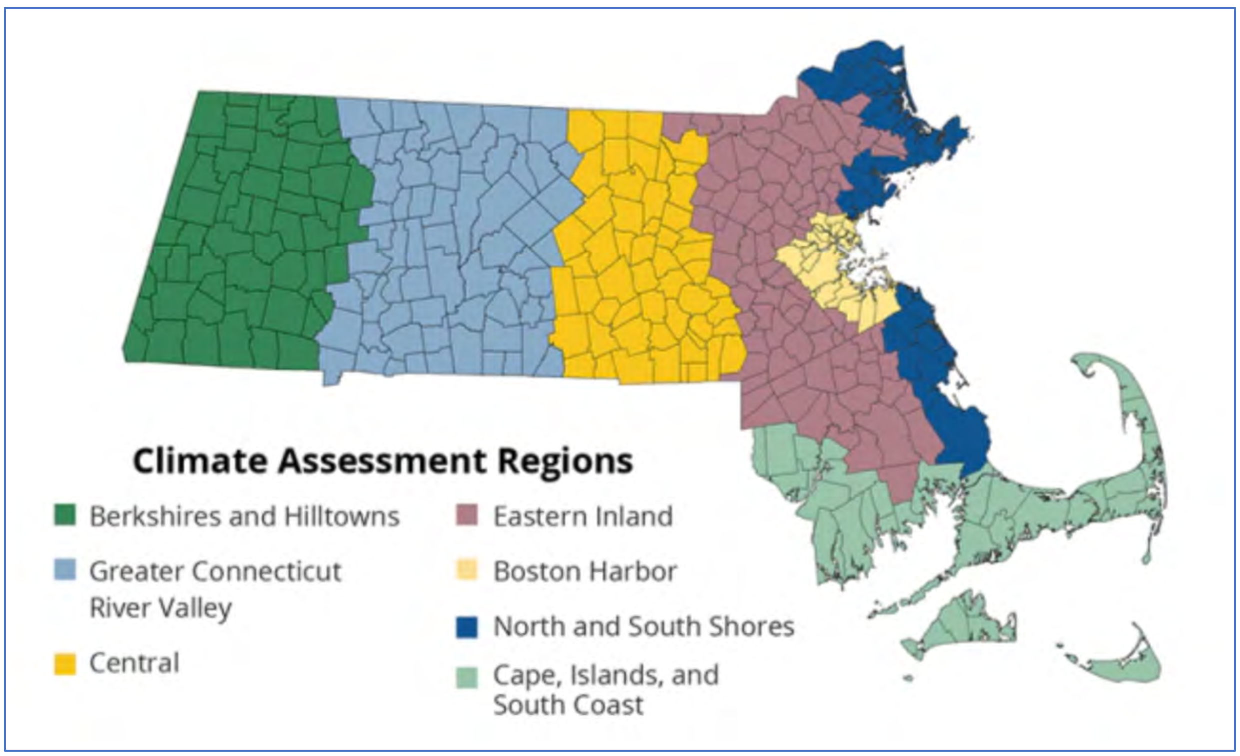


Figure 5. Climate Assessment Regions. Adams is in the Berkshires and Hilltowns Region.

The table below lists the top two or three impacts of climate change in each of the five sectors within this region.

Table 4. Top Impacts of Climate Change per Sector in Berkshires and Hilltowns Region.

Sector	Top Impacts per Sector	Comments
Human	Increase in vector-borne disease incidence and bacterial infections	Including West Nile Virus and Lyme due to favorable conditions for mosquitos and ticks
	Reduction in food safety and security	Causes are production and supply chain issues as well as spoilage during outages
Infrastructure	Damage to buildings	Causes are heavy rainfall and overwhelmed drainage
	Reduction in clean water supply	Causes are changes in precipitation, flooding of surface water supplies, risks to dams, and droughts
	Damage to electric transmission and distribution	From heat stress and extreme storms
Natural Environment	Freshwater ecosystem degradation	Causes are warming waters, drought, and runoff
	Forest health degradation	Causes are warming temperatures, changing precipitation, wildfire frequency, and increasing pests
Governance	Increase in costs of responding to climate migration	Includes planning for abrupt increases in local populations
	Increase in demand for State and municipal services	Emergency response, food assistance, and health care
Economy	Reduction in availability of affordably priced housing	Direct damage (floods) and scarcity caused by demand
	Damage to tourist attractions and amenities, particularly those associated with seasons	All hazards may impact seasonal tourism, from flooding to droughts, and from invasive species to wildfires. Changes in temperatures and winter storms will affect winter recreation.

The Town proposes to incorporate these top climate change impacts in this edition of its plan as outlined below.

Table 5. How This Plan Addresses the Top Impacts of Climate Change per Sector.

Sector	Top Impacts per Sector	Approach to Incorporating Impacts
Human	Increase in vector-borne disease incidence and bacterial infections	Vector-borne and infectious diseases are a hazard profiled in this plan.
	Reduction in food safety and security	Local droughts that impact food security will be addressed. Food safety and security nationwide will not be directly addressed, but the capability assessment will help describe townwide capabilities for food security.
Infrastructure	Damage to buildings	Damage to buildings is addressed in the vulnerability assessment for each hazard.
	Reduction in clean water supply	Droughts are profiled in this plan. Hazards that can secondarily affect water supply such as invasive species and severe storms (which can cause power outages) are also profiled.
	Damage to electric transmission and distribution	Severe weather events that damage transmission and distribution are hazards profiled in this plan.
Natural Environment	Freshwater ecosystem degradation	Changes in precipitation, drought, and invasive species are all hazards addressed in this plan.
	Forest health degradation	Extreme temperatures, changing precipitation, wildfires, and invasive species are all hazards addressed in this plan.
Governance	Increase in costs of responding to climate migration	The capability assessment and related mitigation actions will help address response functions.
	Increase in demand for State and municipal services	The capability assessment and related mitigation actions will help address increased demands for municipal services.
Economy	Reduction in availability of affordably priced housing	The individual hazards addressed in this plan can reduce the availability of affordably priced housing,

Sector	Top Impacts per Sector	Approach to Incorporating Impacts
		and the specific actions for each hazard will help protect housing options and opportunities.
	Damage to tourist attractions and amenities, particularly those associated with seasons	The hazards that may impact seasonal tourism are discussed in this plan.

B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR §201.6(c)(s)(i))

B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does the summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR §201.6(c)(s)(ii))

Hazard Profiles

IMPACTS *are the consequences or effects of each hazard on the participant's assets identified in the vulnerability assessment. For example, impacts could be described by referencing historical disaster damages with an estimate of potential future losses (such as percentage of damage vs. total exposure).*

The risk assessment for the ResilientMass Plan describes the natural hazards that have the potential to impact the Commonwealth and provides the underlying narrative for this hazard profile for the Town. Because this section repeats information from the ResilientMass Plan, some citations have been removed for brevity. The original citations can be found in the ResilientMass Plan.

Profiles have been developed for each identified hazard, organized by primary climate change interaction. Hazard profiles include the following sections: Hazard Description, Location, Previous Occurrences, Extent, Probability of Future Events, and Vulnerability Assessment; these are described in the table below.

Table 6. Hazard Characterization.

Category/Method	Definition
Description	Description of hazard, its characteristics, and potential effects.
Location	Describes geographic areas within the town that are affected by the hazard.

Category/Method	Definition
Previous Occurrences	Provides information on the history of previous hazard events for the region, including their impacts on people and property.
Extent	Describes potential strength or magnitude of a hazard. Where possible, extent is described using established scales.
Probability of Future Events	Describes likelihood of future hazard occurrences in the town based on best available and climate-informed science.
Vulnerability Assessment	Describes potential impact on the community, including estimated potential losses and the anticipated effects of climate change.

To describe previous occurrences, this plan update highlights major events from history but relies primarily on a roughly ten-year lookback (2014 through 2023) ending with any events from the date of plan development (2023-2024). This helps maintain a concise narrative. Where applicable, narratives about warning times (i.e., floods, heat advisories, and wildfires) are incorporated into the *"Extent"* subsections.

The vulnerability assessment characterizes how hazards have impacted and may impact the different aspects of the community. In the vulnerability assessment sub-sections, the magnitude and likelihood of a hazard event are evaluated, and impacts are quantified using hazard models. Some hazards, like earthquakes and winter storms, will impact the entire community while other hazards, like floods and landslides, impact specific locations in the community. The areas that could be impacted are defined as the community's exposure. The results of the vulnerability assessment are used to help identify mitigation measures the community may take to lessen the impact and better understand their benefits.

Average and Extreme Temperatures

According to the ResilientMass Plan, extreme heat for Massachusetts is usually defined as daily high temperatures above 90 degrees Fahrenheit (°F) which may be accompanied by high humidity. Extreme cold is also considered relative to the normal climatic lows in a region. Extreme cold is a period of excessively low temperatures, particularly with the addition of wind chill. The ResilientMass Plan notes that typically in Massachusetts the highest temperatures are experienced in the southeast while the coldest are typical in the northwest where Adams is located.

Description

Extreme cold is a dangerous situation that can result in health emergencies for susceptible or vulnerable people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without heat. Extreme cold events are events when temperatures drop well below normal in an area. When winter temperatures drop significantly below normal, staying warm and safe can become a challenge. Extremely cold temperatures often accompany a winter storm, which may also cause power failures and icy roads. During cold months, carbon monoxide may be high in some areas because the colder weather makes it difficult for car emission control systems to operate effectively, and temperature inversions can trap the resulting pollutants closer to the ground.

Likewise, extreme heat is a dangerous situation that can result in health emergencies for susceptible and vulnerable people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without adequate cooling.

A heat wave is defined as three or more days of temperatures of 90°F or above. A basic definition of a heat wave implies that it is an extended period of unusually high atmosphere-related heat stress, which causes temporary modifications in lifestyle, and which may have adverse health consequences for the affected population. Heat waves cause more fatalities in the U.S. than the total of all other meteorological events combined. According to the EPA, more than 11,000 Americans have died from heat-related causes (EPA, 2016) since 1979.[46]

Heat impacts can be particularly significant in urban areas. Buildings, roads, and other infrastructure replace open land and vegetation. Dark-colored asphalt and roofs also absorb more of the sun's energy. These changes cause urban areas to become warmer than the surrounding areas. This forms "islands" of higher temperatures, often referred to as "heat islands." Heat islands can affect communities by increasing peak energy demand during the summer, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and death, and water quality degradation (EPA).

Many conditions associated with heat waves or more severe events (including high temperatures, low precipitation, strong sunlight, and low wind speeds) contribute to a worsening of air quality in several ways. High temperatures can increase the production of ozone from volatile organic compounds and other aerosols. Weather patterns that bring high temperatures can also transport particulate matter air pollutants from other areas of the continent. Additionally, atmospheric inversions and low wind speeds allow polluted air to remain in one location for a prolonged period of time.

Location

The Massachusetts Climate Assessment (2022) explains that recent efforts to characterize extreme heat have underscored that risks are present throughout the entire commonwealth. Therefore, the entire town of Adams is subject to extreme heat. As with the entire commonwealth, Adams is also exposed to extreme cold temperatures.

[46] https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths#:~:text=Some%20statistical%20approaches%20estimate%20that,set%20shown%20in%20Figure%201.

Previous Occurrences

Extreme Cold: The ResilientMass Plan notes that since 1995, there have been 120 cold weather events within the Commonwealth, ranging from Cold/Wind Chill to Extreme Cold/Wind Chill events. The NOAA Storm Events database (https://www.ncdc.noaa.gov/stormevents/) for Berkshire County lists numerous extreme cold and/or wind chill events for the area of Adams during the timeframe 2014-2023, with 37 separate dates listed from all years except 2020.

Extreme Heat: The ResilientMass Plan notes that according to the NOAA's Storm Events Database there have been 118 warm weather events (Heat to Excessive Heat events) between 2010 and 2022. Excessive heat results from a combination of temperatures well above normal and high humidity. Whenever the heat index values meet or exceed locally or regionally established heat or excessive heat warning thresholds, an event is reported in the database.

In 2012, Massachusetts temperatures broke 27 heat records. Most of these records were broken between June 20 and June 22, 2012, during the first major heat wave of the summer to hit Massachusetts and the East Coast. In July 2013, a long period of hot and humid weather occurred throughout New England. One fatality occurred on July 6, when a postal worker collapsed as the Heat Index reached 100°F. August 2022 was the hottest August on record for the Commonwealth, and 2020 and 2022 were the two hottest records for the state. Boston experienced two six-day heat waves and 17 days above 90 degrees in 2022.

The NOAA Storm Events database (https://www.ncdc.noaa.gov/stormevents/) for Berkshire County lists numerous extreme heat events for the area of Adams in the timeframe 2014-2023. These are listed below, with notations for temperatures and dates differing from entry to entry as reported by the various contributors:

Table 7. NCEI Severe Storm Database Entries Covering Heat in Adams.

Date	Description
7/1/18	A hot and humid airmass brought excessively high heat indices to western Massachusetts during the beginning of July. Temperatures soared as high as the mid to upper 90s on July 1st, the hottest day of the stretch. Combined with dewpoints in the mid-70s, heat indices reached near 105 degrees in the warmest areas. July 4th marked the fourth consecutive day with a high temperature in the 90s at Pittsfield. In addition to the hot daytime temperatures, overnight low temperatures only falling into the 70s was common, which exacerbated heat-related problems. The extensive heat prompted the opening of many cooling centers across the region.
8/29/18	Hazy, hot and humid conditions enveloped the region from Tuesday, August 28th through Wednesday, August 29th. This prompted a heat advisory to be issued both days

Date	Description
	for all locations below 1000 feet. Maximum heat index values ranged from the low 90's to the low 100's.
9/3/18	A late-season heat wave impacted western Massachusetts during the first week of September. A persistent warm and moist airmass characterized by daytime highs in the upper 80s to low 90s and dewpoints in the 70s resulted in heat index values reaching 90-100 degrees during the afternoon hours. This heat wave coincided with the first week of school for many, and the heat prompted some schools to dismiss classes early and postpone or cancel sports practices.
7/19/19	A heat wave gripped western Massachusetts from July 19th through the 21st. Temperatures soared to the low 90s with dewpoints in the low to mid-70s. This resulted in heat index values in the 95 to 105 range in the warmest valleys. Saturday, July 20th was the hottest day for most areas. Due to the excessive heat, cooling centers were opened and pool hours were extended. The hot and humid airmass provided fuel for thunderstorms that formed along the Lake Ontario shoreline during the late afternoon of the 20th. One storm advanced into Berkshire County in the evening, resulting in a report of wind damage.
7/19/20	Temperatures soared into the 90s throughout the lower elevations of western Massachusetts on July 19th, reaching as high as the mid-90s. The combination of the heat and a humid airmass brought heat indices into the 95 to 105 degree range. Heat indices exceeded 95 degrees again in some of the lower elevations again on July 20th, but were not quite as high as the previous day.
7/27/20	Another hot and humid airmass impacted western Massachusetts on the 27th, with heat indices reaching 95 degrees in some portions of Berkshire County.
6/28/21	A hot and humid airmass developed over western Massachusetts on June 28th and persisted through June 30th. Heat indices ranged between 95F to 105F.
8/11/21	A dome of high pressure settled across western Massachusetts bringing high heat and humidity each day, mainly during the afternoon hours. Heat indices reached 95 to 102 degrees each of these days.
8/26/21	A hot and humid air mass developed ahead of an approaching cold front across western Massachusetts... Heat indices reached 95 to 101 degrees across Berkshire County during the afternoon hours.

Date	Description
8/422 - 8/8/22	A dome of high pressure brought a stretch of hot and humid weather resulting in heat indices reaching between 95F and 104F degrees across western Massachusetts on both August 4 and August 8, 2022.

Evidence demonstrates that several extreme heat events occurred in Adams in July-August 2022 and July-August 2023. However, the Town did not need to open its cooling centers (the Visitor Center and the Memorial School) in 2022 or 2023.

Cold events are typically reported with winter storms and will be described in the winter storm section of this chapter.

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index. The events related to extreme temperatures in Berkshire County are listed below.

Table 8. USDA Disasters Events That Refer to Extreme Temperatures.

Year	Event	Event "Begin Dates"
2019	Cool/Cold, Below-normal Temperatures	4/1/2019
2016	Frost, Freeze	2/10/2016, 2/12/2016, 2/14/2016
2016	Drought, Wind/High Winds, Fire/Wildfire, Heat, Excessive Heat, High Temp., Insects	7/5/2016
2015	Frost, Freeze, Winter Storms, Ice Storms, Snow, Blizzard	1/1/2015
2014	Frost, Freeze	12/22/2014
2013	Frost, Freeze	5/13/2013
2013	Excessive rain, moisture, humidity, Heat, Excessive heat High temp. (incl. low humidity)	5/8/2013
2012	Frost, Freeze	3/1/2012
2012	Drought, Heat, Excessive heat High temp. (incl. low humidity)	6/2/2012

Extent

Extreme Cold: 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 National Weather Service (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 (Figure 6) designed to more accurately calculate how cold air feels on human skin.

Wind Chill Chart

Temperature (°F)

Wind (mph) \ Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

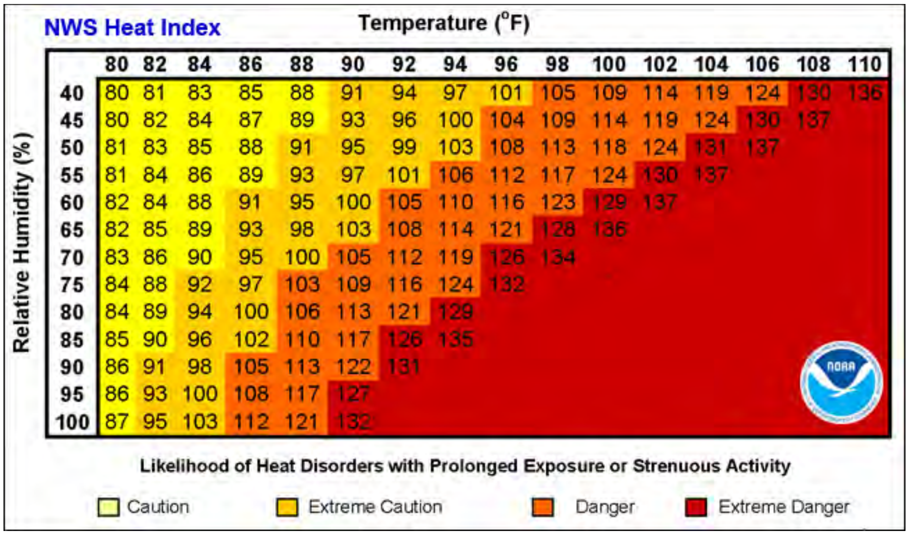
$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Figure 6. NWS Wind Chill Temperature Index and Frostbite Risk.

Extreme Heat: The NWS issues a Heat Advisory when the NWS Heat Indices are between 95 and 99 degrees for two or more hours or two consecutive days, or if they are between 100 and 104 degrees for two or more hours in a single day. 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. 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.



RH (%)	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	130	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										

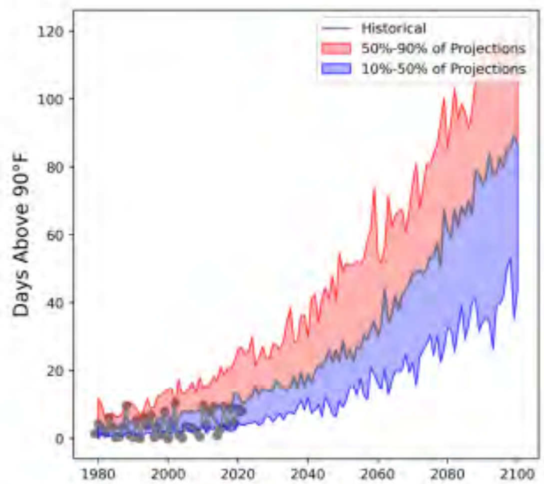
Figure 7. NWS Heat Index Chart.

Probability of Future Events

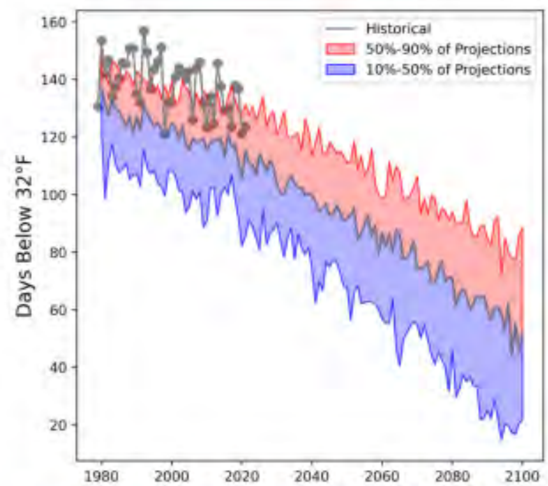
The ResilientMass Plan notes that Massachusetts averaged three declared cold weather events and two extreme cold weather events annually between January 2018 and October 2022. The years 2018 and 2019 were particularly notable, with 10 cold weather events in each year, including five extreme cold/wind chill events in 2018 and six in 2019. The ResilientMass Plan also notes that there was an average of 3.6 heat events and two excessive heat events between January 2018 and December 2022. Many practitioners believe that some heat wave related circulation patterns are occurring more frequently due to climate change.

There are a number of climatic phenomena that determine the number of extreme weather events in a specific year. However, there are significant long-term trends in the frequency of extreme hot and cold events. Since 2010, U.S. daily record high temperatures have occurred over eight times as often as record low. This is compared to a nearly 1:1 ratio in the 1950s. Models suggest that this ratio could climb to 20:1 by midcentury, if GHG emissions are not significantly reduced (C2ES, n.d.).

Various climate forecasts support the trends of an increased frequency of extreme hot weather events and a decreased frequency of extreme cold weather events. High, low, and average temperatures in Massachusetts are all likely to increase significantly over the next century as a result of climate change. The graphics below (from resilient MA, 2018) show the projected annual days with maximum temperature above 90 degrees and projected annual days with minimum temperature below 32 degrees.



Source: CMIP6 downscaled projections (Thrasher et al., 2022), warming scenario SSP 5-8.5, historical data from GridMET.



Source: CMIP6 downscaled projections (Thrasher et al., 2022), warming scenario SSP 5-8.5, historical data from GridMET.

Figure 8. Projected Annual Days with Temperatures above 90 Degrees (left) and Below 32 Degrees (right).

Vulnerability Assessment

Exposure

Extreme temperatures are not a hazard with a defined geographic boundary. The entire Town should be considered exposed to the hazard. Excessive heat can occur at any time during the year but is most dangerous during the summer between June and August when average temperatures are at their highest.

Built Environment Impacts

The impact of excessive heat is most prevalent in developed areas, where the Town lacks a tree canopy. Secondary impacts of excessive heat are severe strain on the electrical power system and potential brownouts or blackouts. Extreme heat can have a negative impact on transportation. Highways and roads are damaged by excessive heat as asphalt roads soften and concrete roads expand and can buckle, crack, or shatter. Moreover, concrete has been known to "explode," lifting chunks of concrete and putting those nearby at serious risk. Stress is also placed on automobile cooling systems, diesel trucks, and railroad locomotives which lead to an increase in mechanical failures. Steel rails are at risk of overheating and warping which can lead to train derailments.

Extreme cold weather poses a significant threat to utility production, which in turn threatens facilities and operations that rely on utilities, specifically climate stabilization. As temperatures drop and stay low, increased demand for heating places a strain on the heating system, which can lead to temporary outages. These outages can impact operations throughout the Town, which can result in interruptions and delays in services. Broken pipes may cause flooding in buildings, causing property damage and loss of utility service. Some of the secondary effects presented by extreme/excessive cold include dangerous conditions to livestock and pets.

Climate change will increase the probability of extreme temperatures which may impact utilities, transportation, and especially older structures. Future development should consider keeping more mature trees, less dark asphalt areas, and more natural areas.

Population Impacts

Extreme cold events are predicted to decrease in the future, while extreme heat days, as well as average temperatures are projected to increase. The projected increase in extreme heat and heat waves is the source of one of the key health concerns related to climate change. Prolonged exposure to high temperatures can cause heat-related illnesses, such as heat cramps, heat exhaustion, heat stroke, and death. Heat exhaustion is the most common heat-related illness and if untreated, it may progress to heat stroke. People who perform manual labor, particularly those who work outdoors, are at increased risk for heat-related illnesses. Prolonged heat exposure and the poor air quality and high humidity that often accompany heat waves can also exacerbate pre-existing conditions, including respiratory illnesses, cardiovascular disease, and mental illnesses.

The greatest danger from extreme cold is to people, as prolonged exposure can cause frostbite or hypothermia, and can become life threatening. Body temperatures that are too low affect the brain, making it difficult for the victim to think clearly or move well. This makes hypothermia particularly dangerous for those suffering from it, as they may not understand what is happening to them or what to do about it. Hypothermia is most likely at very cold temperatures but can occur at higher temperatures (above 40 degrees Fahrenheit) if the person exposed is also wet from rain, sweat, or submersion. Warning signs of hypothermia include shivering, exhaustion, confusion, fumbling hands, memory loss, slurred speech, or drowsiness. In infants, symptoms include bright red, cold skin and very low energy. A person with hypothermia should receive medical attention as soon as possible, as delays in medical treatment may result in death.

Older adults are often at elevated risk due to a high prevalence of pre-existing and chronic conditions. In Adams, 23.5% of the population is over age 64. People who live in older housing stock and in housing without air conditioning have increased vulnerability to heat-related illnesses. Power failures are more likely to occur during heat waves, affecting the ability of residents to remain cool during extreme heat. Individuals with pre-existing conditions and those who require electric medical equipment may be at increased risk during a power outage. Heat impacts are more likely to be felt by residents without air conditioning, by those who work outdoors, and those with underlying health conditions.

Extreme heat can pose severe and life-threatening problems for people. According to the NWS, it is one of the leading weather-related killers in the United States, resulting in hundreds of fatalities each year and even more heat-related illnesses. Extreme heat has a special impact on the most vulnerable segments of the population - the elderly, young children and infants, impoverished individuals, and persons who are in poor health. The high-risk population groups with specific physical, social, and economic factors that make them vulnerable include:

- Older persons (age > 65)
- Infants (age < 1)
- Homeless population
- Very low- and low-income persons
- People who are socially isolated
- People with mobility restrictions or mental impairments
- People taking certain medications (e.g., for high blood pressure, depression, insomnia)
- People engaged in vigorous outdoor exercise or work or those under the influence of drugs or alcohol.

Climate change will increase the rate of heat illness and need for cool spaces. Outdoor workers and vulnerable populations will need to be considered during extreme heat events.

Environment Impacts

Extreme heat can lead to water quality issues, wildlife concerns, and impact vegetative growth when combined with drought.

Problem Statements for Extreme Temperatures

Problem statements summarize risk and vulnerability and are included following each hazard profile. The problem statements were developed to bridge the gap between identified hazard and development of the mitigation actions. Problem statements are included in each hazard profile section.

Table 9. Problem Statements for Extreme Temperatures.

Assets	Problems Associated with Extreme Temperatures
People (including underserved communities and socially vulnerable populations)	• Extreme heat will be a significant public health threat to all residents, but especially for vulnerable populations living in older homes or homes without air conditioning. • The elderly and those with mobility issues may not be able to leave their homes and travel safely.

Assets	Problems Associated with Extreme Temperatures
	• People working in businesses without air conditioning may be at risk of heat illness. • First responders may also be impacted by extreme temperatures. • Pets may be adversely impacted by extreme heat.
Structures (including facilities, lifelines, and critical infrastructure)	• Older homes without insulation and single-pane glass are difficult to heat and cool and may not provide safe living conditions. • Businesses that require refrigerated trucks or refrigeration units may see business losses and increased utility costs. • The electric grid may become stressed and fail during extreme heat events.
Systems (including networks and capabilities)	• The Town currently relies on the Visitor Center for emergency heating and cooling. However, capacity is limited to 50 people, the existing HVAC system is not fully operational, and it lacks a generator. The town should focus on upgrading the system at the visitor center or designating a more reliable primary facility for extreme temperature refuge. • The Memorial School can fit more people and should be designated as a cooling center and warming center. It's already a shelter and has a generator. • Not all identified critical facilities in town have back up power capabilities. The town should identify all those in need of backup generators and prioritize installation based on the emergency function served. • Extreme heat mitigation and adaptation has not been fully integrated into existing local plans and regulations for new development, though progress is being made.
Natural, historic, and cultural resources	• Extreme heat may lead to, or exacerbate, impacts to natural systems related to wildfires and invasive species (refer to those sections). • Extreme heat may lead to water quality concerns.

Assets	Problems Associated with Extreme Temperatures
Activities that have value to the community	• Recreational activities may be adversely impacted by extreme heat.

Droughts

Droughts are typically defined as periods of deficient precipitation. How this deficiency is experienced can depend on factors such as land use, the existence of dams, and water supply withdrawals or diversions. Droughts can vary widely in duration, severity, and local impact.

Description

The National Drought Mitigation Center references five common, conceptual definitions of drought:

1. Meteorological drought is a measure of departure of precipitation from normal.
2. Hydrological drought is related to the effects of precipitation shortfalls on stream flows and on reservoir and groundwater levels.
3. Agricultural drought links various characteristics of meteorological and hydrological drought to agricultural impacts, and occurs when there is not enough water available for a particular crop to grow at a particular time.
4. Socioeconomic drought is associated with the supply and demand of economic goods with elements of meteorological, hydrological, and agricultural drought.
5. Ecological drought is an episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability and impacts ecosystem services.

Drought conditions can cause a shortage of water for human consumption and reduce local firefighting capabilities. Public water suppliers may struggle to meet system demands while maintaining adequate pressure for fire suppression and meeting water quality standards. The Massachusetts Department of Environmental Protection (DEP) requires all public water systems (PWSs) to maintain an emergency preparedness plan.

Hundreds of private wells are believed present in Adams. Private well owners can be vulnerable to droughts. With declining groundwater levels, well owners may experience dry wells or sediment in their water due to the more intense pumping required to pull water from the bedrock or overburden aquifer. Wells may also develop a concentration of pollutants, which may include nitrates and heavy metals depending on local geology.

The loss of clean water for consumption and for sanitation cause significant impacts depending on the affected population's ability to quickly drill a deeper or a new well or to relocate to unaffected areas. During a drought, dry soil and the increased prevalence of wildfires can increase the amount of irritants (such as pollen or smoke) in the air. Reduced air quality can have widespread deleterious health impacts but is particularly significant to the health of individuals with pre-existing respiratory health conditions like asthma (Centers for Disease Control [CDC]).

Lowered water levels can result in direct environmental health impacts, as the concentration of contaminants in swimmable bodies of water will increase when less water is present. Harmful algal blooms may occur, closing recreational areas.

One primary hazard in this plan that is commonly associated with drought is wildfire. A prolonged lack of precipitation dries out soil and vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. A drought may increase the probability of a wildfire occurring.

Location

Massachusetts Drought Management Plan (DMP, 2019) assesses drought conditions in seven regions: Western, Connecticut River Valley, Central, Northeast, Southeast, and Cape Cod, and Islands. A regional approach allows customization of drought actions and conservation measures to address situations in each region; and allows for the determination of a drought on a watershed basis. This approach recognizes that parts of Massachusetts can experience significantly different weather patterns due to topography, distance from coastal influence, as well as a combination of regional, national, and global weather patterns. Droughts have the potential to impact the entirety of Adams, which is located in the Western region.

Previous Occurrences

The Commonwealth of Massachusetts has never received a Presidential Disaster Declaration for a drought-related disaster. However, several substantial droughts have occurred over the past 100 years. Massachusetts experienced its most significant drought on record in the 1960s. The severity and duration of the drought caused significant impacts on both water supplies and agriculture.

Although short or relatively minor droughts occurred over the 50 years following the drought of the 1960s, the next long-term event began in March 2015 when Massachusetts began experiencing widespread abnormally dry conditions. In July 2016, based on a recommendation from the Drought Management Task Force (DMTF), the Secretary of the Executive Office of Energy and Environmental Affairs (EOEEA) declared a Drought Watch for Central and Northeast Massachusetts and a Drought Advisory for Southeast Massachusetts and the Connecticut River Valley. Drought warnings were issued in five out of six drought regions of the state. Many experts stated that this drought was the worst in more than 50 years. DMTF declared an end to the drought in May 2017 with a return to wetter-than-normal conditions. Water supplies for Adams were significantly impacted by the drought of 2015-2017. According to the previous edition of this plan, "during the drought event of 2016-17, the [Bassett] reservoir was almost dry and would have been useless if it were needed."

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index. The line items related to droughts in Berkshire County are listed below, corresponding to 2015-2016, 2020, and 2020.

Table 10. USDA Disasters Events That Refer to Drought.

Year	Event	Event "Begin Dates"
2020	Drought	6/1/2020, 8/18/2020, 9/22/2020, 9/29/2020
2017	Drought	3/3/2017
2016	Drought, Wind/High Winds, Fire/Wildfire, Heat, Excessive Heat, High Temp., Insects	7/5/2016
2016	Drought	4/26/2016
2015	Drought	4/1/2015, 6/1/2015
2012	Drought, Heat, Excessive heat High temp. (incl. low humidity)	6/2/2012

The drought of 2020, a so-called "flashy drought" that impacted southern New England, was sufficiently impactful in Berkshire County to be included in the USDA data table above. Flashy droughts are described below under *Extent*.

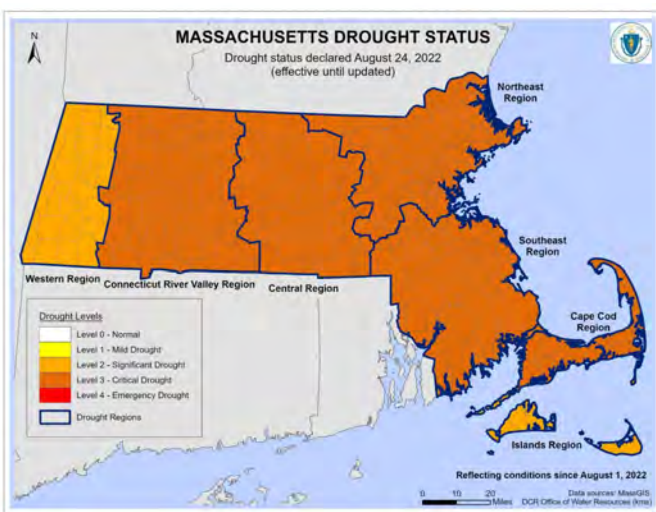
Applying the same ten-year lookback as the severe storms database review, USDA payments to Massachusetts agricultural sectors for drought impacts associated with events from 2012 through 2022 were reviewed. This timeframe includes the droughts of 2015-2017 and 2020. USDA reimbursements for droughts in Adams have summed to $60,000 in this timeframe.

The severity of a drought depends on the degree of moisture deficiency, duration, spatial extent, and location relative to resources or assets. The drought of the 1960s is the drought of record because duration, spatial extent, moisture deficiency, and impact all contributed to historic levels. In contrast, the severity of the 2016-2017 drought was due to impacts on natural resources (record low stream flows and groundwater levels), many water supplies, farms, and agriculture and to the swift onset of the drought.

Extent

Drought is defined by a combined look at several indices as detailed in the Massachusetts DMP (EOEEA and MEMA, 2019). The indices are:

The drought of 2022 is typical of a flashy drought. The NCEI Severe Storm Database reported on 8/16/22 that "The United States Drought Monitor indicated severe drought conditions across much of Berkshire County in Massachusetts starting on August 16, 2022. The previous 30 days had seen less than half of normal rainfall with below normal precipitation persisting since the start of June. A period of hot and dry weather, especially during the first several days of August, contributed to this rapid deterioration of drought conditions. Severe drought in this region continued into the month of September. The Massachusetts Drought Management Task Force issued a Level 2 (Significant Drought) Declaration for Berkshire County starting on August 24. Residents and businesses were urged to be extremely mindful of their overall water use. Mandatory water use restrictions were declared in the communities of Cheshire, Williamstown, Adams, Dalton and Hinsdale." The drought of 2022 was most severe in August, but alleviated by rainfall in September 2022.



- Precipitation: The Standard Precipitation Index, which is widely used, is based on monthly precipitation totals from Massachusetts Department of Conservation and Recreation's (DCR) Precipitation Program and the NWS.
- Streamflow: Is an early indicator of impacts to rivers, streams, wetlands, and other riparian habitats.
- Groundwater: This provides information on impacts over a longer period of time due to groundwater recharge rates.
- Lakes and Impoundments: Captures the effects on surface water including lakes, ponds, water supply, and flood control reservoirs.
- Fire Danger: The Keetch Byram Drought Index indicates fire potential and flammability of organic matter.
- Evapotranspiration: The Crop Moisture Index is used to assess short-term or current conditions of dryness or wetness relative to agricultural crops.

These indices are monitored weekly to generate a monthly hydrological conditions report and used to determine the onset, severity, and end of droughts. Five levels of increasing drought severity are defined in the DMP: *Normal, Mild, Significant, Critical,* and *Emergency*. The drought levels are associated with actions outlined in the DMP. Recommendations of drought levels are made by the DMTF to the Secretary of the EEA, who then declares the drought level for each region of the state.

Other entities may measure drought conditions by these or other criteria more relevant to their operations. For example, water utilities may calculate the days of supply remaining. Farmers may assess soil moisture and calculate the water deficit for specific plants to determine irrigation needs or decide to change their crop based on the deficit or harvest early for non-irrigated crops.

The five drought levels in the 2019 DMP provide a basic framework for taking actions to assess, communicate, and respond to drought conditions. Under the "Normal" condition, data are routinely collected, assessed, and distributed. When drought conditions are identified, the four drought levels escalate moving to heightened action, which may include increased data collection and assessment, interagency communication, public education and messaging, recommendations for water conservation measures, and a state of emergency issued by the Governor. At the "Emergency" level, mandatory water conservation measures may be enacted. These regionally declared drought levels and associated state actions are intended to communicate and provide guidance to the public and stakeholders across industries to enable them to respond early and effectively and to reduce impacts. Individual public water suppliers may have their own drought management plan, drought levels, and associated actions, which they may follow at all levels except at the Emergency level when mandatory actions may be required.

NOAA and others are advancing the science of early warning for droughts like the early warnings for floods and earthquakes to better project flashy, or fast-onset, droughts. Based on projected climate change, the distributions of precipitation events will continue to become more extreme, with periods of minimal rain alternating with extreme rain events. Therefore, developing ways to project and adapt to flash droughts may be critical for sectors such as agriculture and water supply.

The Massachusetts Water Resources Commission publishes the hydrologic condition report monthly, which includes the six drought indices and the National Climate Prediction Center's U.S. Monthly and Seasonal Drought Outlooks. The National Drought Mitigation Center produces a weekly Drought Monitor map. In accordance with the DMP, drought declarations are made monthly.

Probability of Future Events

Climate change will increase the probability of droughts. The Massachusetts Climate Change Assessment notes that the region will experience slight increases in the number of consecutive dry days and the number of days without rain from 2050 onward. By 2090 the number of consecutive dry days per year will increase to 33, compared to the annual statewide baseline of 31 days from 1986 to 2005. Table 11 summarizes this data and indicates the projected number of consecutive dry days according to the "high" and "low" limits of the Northeast Climate Adaptation Science Center (NE CASC) data. The Town of Adams is represented by the Berkshires and Hilltowns region.

Table 11. Number of Consecutive Dry Days (CDD) and Days without Rain (DWR) per Year.

Region	Baseline		2030		2050		2070		2090	
	CDD	DWR	CDD	DWR	CDD	DWR	CDD	DWR	CDD	DWR
Berkshire and Hilltowns	29	159	29	161	30	165	30	167	31	170
Greater Connecticut River Valley	31	171	31	172	32	175	32	178	33	181
Central	32	180	32	182	32	185	33	188	33	192
Eastern Island	32	186	32	181	32	185	33	188	33	193
Boston Harbor	31	192	31	185	32	192	32	194	33	198
North and South Shores	31	184	31	182	32	187	32	190	33	195
Cape, Islands, and South Coast	31	186	31	182	32	187	32	191	33	194
Statewide	**31**	**176**	**31**	**175**	**31**	**179**	**32**	**182**	**33**	**187**
CDD = Consecutive Dry Days per Year (ResilientMass, Steinschneider & Najibi (2022)) DWR = Days Without Rain per Year (MA Climate Assessment (Commonwealth of Massachusetts, 2022))										

These projections suggest that the days without precipitation are likely to increase across the Commonwealth, while the number of consecutive dry days will vary across the state while increasing over the coming decades.

Vulnerability Assessment

Exposure

Drought is a gradual phenomenon, and its condition occurs naturally in a broad geographic area. The entire Town would be exposed to drought conditions.

Built Environment Impacts

Major water users are more susceptible to drought, and these include water utilities and some commercial users located in the area served by the public water system as well as large users that utilize their own wells.

With an increased probability of drought and drought magnitude, water utilities such as the Adsams Fire District should consider reviewing or developing extreme drought scenarios.

Population Impacts

Populations considered most vulnerable to drought impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard. Senior and low-income populations are particularly susceptible. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Socioeconomic impacts of the drought may also include anxiety and depression about economic impact, health problems associated with poor water quality, fewer recreational activities, higher incidents of heat stroke, and even loss of human life.

With an increased probability of drought and increased drought magnitude, and the potential of increased water costs, vulnerable populations may be more severely impacted in the future.

Environment Impacts

Although agriculture is limited in the Town, there are some natural areas which may be adversely impacted by drought. Drought amplifies the risk of loss of biodiversity and affects animal and plant species. Economic impacts include higher food and lumber prices. Drought can shrink the food supplies of animals and plants dependent on water and damage their habitats. Sometimes the environmental damage caused by a drought is temporary, and other times it is irreversible.

Problem Statements for Drought

Table 12. Problem Statements for Drought.

Assets	Problems Associated with Drought
People (including underserved communities and socially vulnerable populations)	• Vulnerable communities may have difficulty accessing potable water during an emergency drought event. If the water sources are at emergency levels, having a plan to get vulnerable people water should be considered. If rates are increased to lower water demand, this may also adversely impact underserved and vulnerable communities.
Structures (including facilities, lifelines, and critical infrastructure)	• Water supply infrastructure may need to be shut down and water quality may become substandard. Businesses requiring water for daily operations may have their operations limited due to water restrictions.
Systems (including networks and capabilities)	• Outdoor water use restrictions and other water conservation measures during periods of extreme drought can be challenging to enforce, even when mandated through local declaration.
Natural, historic, and cultural resources	• Water quality may be adversely impacted by major droughts.

Assets	Problems Associated with Drought
Activities that have value to the community	• None applicable.

Earthquakes

An earthquake is the vibration of the Earth's surface that follows a release of energy in the Earth's crust. New England experiences intraplate earthquakes because it is located within the interior of the North American plate. Although damaging earthquakes are rare in Massachusetts, low-magnitude earthquakes occur regularly in the state.

Description

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse; disrupt gas, electric, and telephone lines; and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time without warning.

The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. Earthquakes are described based on their magnitude and intensity as explained below under *Extent*.

New England's earthquakes appear to be the result of the cracking of the crustal rocks due to compression as the North American Plate is being very slowly squeezed by the global plate movements. As a result, New England epicenters do not follow the major mapped faults of the region, nor are they confined to particular geologic structures or terrains. Because earthquakes have been detected all over New England, seismologists suspect that a strong earthquake could be centered anywhere in the region. Furthermore, the mapped geologic faults of New England currently do not provide any indications detailing specific locations where strong earthquakes are most likely to be centered.

In addition to earthquakes occurring within the Commonwealth, earthquakes in other parts of New England can impact widespread areas. Large earthquakes in Canada, which is more seismically active than New England, can affect buildings in Massachusetts. This is due in part to the fact that earthquakes in the eastern U.S. are felt over a larger area than those in the western U.S. The difference between seismic shaking in the East versus the West is primarily due to the geologic structure and rock properties that allow seismic waves to travel farther without weakening (United States Geological Survey [USGS], 2012).

In some places in New England, including locations in Massachusetts, small earthquakes seem to occur with some regularity. In articles appearing in 2016, John Ebel Ph.D., a Senior Research Scientist at the Weston Observatory, was quoted as saying "The Acton, Boxborough and Littleton areas are actually sporadically active… We tend to get a small earthquake once every three-to-five years." It is not clear why some localities experience such clustering of earthquakes, but clusters may indicate locations where there is an increased likelihood of future earthquake activity.

Location

Given the above discussion, the potential exists for earthquakes to occur within Adams or to occur elsewhere and be felt in Adams.

Previous Occurrences

According to the previous edition of this plan, no documented earthquakes have been centered in the Town of Adams. The largest earthquake since 1900 to strike Massachusetts was a magnitude 3.9 located east of the Quabbin Reservoir in 1994. Two recent earthquakes with epicenters close to the Berkshires included a magnitude 3.3 in the area around Westfield in 2000, and a magnitude 1.9 in the area around Northampton in 2012. To the west, a magnitude 3.1 struck in the Catskills region of New York in 2009.

To determine whether earthquakes have occurred more recently near or in Adams, all events listed by Weston Observatory were reviewed for all towns in Massachusetts since the date of last edition of this plan. Listed earthquakes above magnitude 2.0 include the following very minor earthquakes:

- 12/21/18 – 3 km WSW of Gardner, MA, 2.1/2.1 [Mn*/Mc**]
- 8/21/19 – 2 km SSE of Wareham, MA, 1.7/2.4
- 12/3/19 – 4 km SSE of Plymouth, MA, 1.6/2.2
- 11/8/20 – 11 km SW of New Bedford, MA, 3.8/3.4
- 11/22/20 – 12 km WSW of New Bedford, MA, 1.7/2.6
- 7/25/21 – 5 km W of Peabody, MA, 1.4/2.5
- 1/1/22 – 13 km N of Rockport, MA, 2.3/3.0
- 3/4/22 – 5 km WSW of Orange, MA, 2.2/2.7
- 3/19/22 – 36 km ENE of Rockport, MA, 1.4/2.2

*Mn is the Nuttli Magnitude (see *Extent* below)
**Mc is the Coda Duration Magnitude (see *Extent* below)

Extent

Magnitude is an estimate of the relative size or strength of an earthquake and is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitude of earthquake waves recorded on instruments that have a common calibration. The magnitude of an earthquake is thus represented by a single instrumentally determined value recorded by a seismograph, which records the varying amplitude of ground oscillations.

The Richter scale was developed in 1935 and was used exclusively until the 1970s. The scale set the magnitude of an earthquake based on the logarithm of the amplitude of recorded waves. Being logarithmic, each whole number increase in magnitude represents a tenfold increase in measured strength. Earthquakes with a magnitude of about 2.0 or less are usually called "microearthquakes" and are generally only recorded locally. Earthquakes with magnitudes of 4.5 or greater are strong enough to be recorded by seismographs all over the world.

As more seismograph stations were installed around the world following the 1930s, it became apparent that the method developed by Richter was valid only for certain frequency and distance ranges, particularly in the southwestern United States. New magnitude scales that are an extension of Richter's original idea were developed for other areas. In particular, the Moment magnitude scale (Mw) was developed in the 1970s to replace the Richter scale and has been in official use by the USGS since 2002.

According to USGS, these multiple methods are used to estimate the magnitude of an earthquake because no single method is capable of accurately estimating the size of all earthquakes. Some magnitude types are calculated to provide a consistent comparison to past earthquakes, and these scales are calibrated to the original Richter scale. However, differences in magnitude of up to 0.5 can be calculated for the same earthquake through different techniques. In general, Moment magnitude provides an estimate of earthquake size that is valid over the complete range of magnitudes and so is commonly used today.

Although Moment magnitude is the most common measure of earthquake size for medium and larger earthquakes, the USGS does not calculate Mw for earthquakes with a magnitude of less than 3.5 which is the more common situation for Massachusetts. Localized Richter scales or other scales are used to calculate magnitudes for smaller earthquakes.

Regionally, the Weston Observatory utilizes two scales to track the magnitude of earthquakes. These include the Nuttli magnitude (Mn) for North America east of the Rocky Mountains and is more appropriate for the relatively harder continental crust in Connecticut compared to California. Weston Observatory also utilizes the Coda Duration magnitude (Mc), which is based on the duration of shaking at a particular station. The advantages of the Coda Duration magnitude are that this method can quickly estimate the magnitude before the exact location of the earthquake is known.

The effect of an earthquake on the earth's surface is called the intensity. The Modified Mercalli Intensity Scale consists of a series of key responses such as people awakening, movement of furniture, damage to chimneys, and total destruction. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It is an arbitrary ranking based on observed effects.

Table 13. Modified Mercalli Intensity.

Modified Mercalli Intensity	Description
I	Not felt except by a very few under especially favorable conditions
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	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. Vibration similar to the passing of a truck. Duration estimated.
IV	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	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	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	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	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	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry), structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown in the air.

Source: USGS

A comparison of Richter magnitude to typical Modified Mercalli intensity is presented below.

Table 14. Modified Mercalli Intensity and Moment Magnitude.

Moment Magnitude	Typical Maximum Modified Mercalli Intensity
1.0 to 3.0	I
3.0 to 3.9	II to III
4.0 to 4.9	IV to V
5.0 to 5.9	VI to VII

Moment Magnitude	Typical Maximum Modified Mercalli Intensity
6.0 to 6.9	VII to IX
7.0 and above	VIII or higher

Source: USGS

Probability of Future Events

Earthquake location and magnitude probabilities are exceptionally difficult to predict in Massachusetts. Minor earthquakes are relatively common in New England, but damaging earthquakes are not. Therefore, USGS instead characterizes the probability of ground acceleration rather than estimating a probability of magnitude. The Seismic Hazard Map for the state of Massachusetts (USGS) shows a peak ground acceleration of 8% to 10% of gravity in Adams having a 2% probability of being exceeded in 50 years.

Vulnerability Assessment

Exposure

A major earthquake could cause severe damage to buildings in Adams, including older structures that were built before a 1975 law requiring new buildings to withstand earthquakes. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

Built Environment Impacts

Historic data for earthquake events indicate that between 1991 and 2022, no major (>5.0 magnitude) earthquakes were recorded in Berkshire County during this period, causing no damage to property. The entire built environment of Adams is vulnerable to earthquakes. Older, unreinforced masonry buildings are very susceptible to earthquakes.

To identify built environment impacts to the Town, FEMA's risk assessment software, Hazus, was implemented. The economic loss results of the 1500-year event are shown in Table 15 while the results for the 2500-year event are shown in Table 16. The town's Average Annual Loss (AAL) is modeled to be $6,446.

Table 15. Building Loss for a 1500-Year Scenario.

Loss Type	Residential ($Million)	Commercial ($Million)	Other Occupancy ($Million)	Total ($Million)
Building Loss	0.87	0.47	0.44	**1.78**
Content Loss	0.20	0.16	0.19	**0.55**
Business Inventory Loss	0.00	0.04	0.02	**0.06**
Business Income Loss	0.00	0.11	0.01	**0.12**
Business Relocation Loss	0.08	0.09	0.08	**0.25**
Rental Income Loss	0.09	0.07	0.00	**0.16**
Wage Loss	0.01	0.13	0.03	**0.17**
Total	**1.25**	**1.07**	**0.77**	**3.09**

Table 16. Building Loss for a 2500-Year Scenario.

Loss Type	Residential ($Million)	Commercial ($Million)	Other Occupancy ($Million)	Total ($Million)
Building Loss	1.82	0.95	0.91	**3.68**
Content Loss	0.48	0.39	0.45	**1.32**
Business Inventory Loss	0.00	0.09	0.05	**0.14**
Business Income Loss	0.01	0.20	0.01	**0.22**
Business Relocation Loss	0.15	0.16	0.14	**0.45**
Rental Income Loss	0.14	0.12	0.03	**0.29**
Wage Loss	0.02	0.23	0.05	**0.30**
Total	**2.62**	**2.14**	**1.64**	**6.40**

Population Impacts

Populations considered most vulnerable to earthquake impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations are particularly susceptible. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Hazus was used to model injuries and fatalities for the 1500- and 2500-year events. For the 1500-year event, there are no injuries requiring medical attention. For the 2500-year event there are up to 5 minor injuries not requiring medical attention with no injuries requiring medical attention.

Environment Impacts

The environment may be impacted by cascading impacts from the earthquake, such as a truck accident or train derailment caused by track or road damage, landslide, or dam breach. This could result in a hazardous material release.

Problem Statements for Earthquakes

Table 17. Problem Statements for Earthquakes.

Assets	Problems Associated with Earthquakes
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations located in unreinforced masonry structures may sustain injuries. • Elderly people may fall during an earthquake.
Structures (including facilities, lifelines, and critical infrastructure)	• Unreinforced masonry and utility lifelines impacted. • Utility systems may be impacted.
Systems (including networks and capabilities)	• None apparent or projected.
Natural, historic, and cultural resources	• Historical buildings constructed out of unreinforced masonry are susceptible and may be impacted.
Activities that have value to the community	• None apparent or projected.

Flooding from Precipitation and Dam Overtopping

Nationally, flooding causes more damage annually than any other severe weather event. Flooding in Massachusetts is often the direct result of frequent weather events such as coastal storms, nor'easters, tropical storms, hurricanes, heavy rains, and snowmelt. Increases in precipitation and extreme storm events will result in

The Town of Adams Community Resilience Building Workshop Summary of Findings (2019) lists "flooding" as one of the top hazards of concern.

increased inland flooding. Common types of flooding are described below.

Description

River and Stream Flooding: River and stream flooding often occurs after heavy rain. Areas of the state with high slopes and minimal soil cover (such as found in western Massachusetts) are particularly susceptible to flash flooding caused by rapid runoff that occurs in heavy precipitation events and in combination with spring snowmelt, which can contribute to riverine flooding. Frozen ground conditions can also contribute to low rainfall infiltration and high runoff events that may result in riverine flooding. Some of the worst riverine flooding in Massachusetts' history occurred because of strong nor'easters and tropical storms in which snowmelt was not a factor. Tropical storms can produce very high rainfall rates and volumes of rain that can generate high runoff when soil infiltration rates are exceeded.

Floodplains are the low, flat, and periodically flooded lands adjacent to rivers, lakes, and oceans. These areas are subject to geomorphic and hydrologic processes. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined. These areas form a complex physical and biological system that supports a variety of natural resources and flood storage.

Drainage-Related Flooding: Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and adjacent properties. They make use of a conveyance system that channels water away from a developed area to surrounding streams, bypassing natural processes of water infiltration into the ground, groundwater storage, and evapotranspiration. Flooding from overwhelmed drainage entails floods caused by increased water runoff due to development and drainage systems that are not capable of conveying high flows. Since drainage systems reduce the amount of time the surface water takes to reach surrounding streams, flooding can occur more quickly and reach greater depths than if there were no urban development at all. In almost any community with some degree of development, basement, roadway, and infrastructure flooding can result in significant damage due to poor or insufficient stormwater drainage.

Dam Overtopping: 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 one-third of all dam failures in the U.S. The two primary types of dam failure are catastrophic failure (characterized by the sudden, rapid, and uncontrolled release of impounded water) and design failure (which occurs as a result of minor overflow events). There are a number of ways in which climate change could alter the flow behavior of a river, causing conditions to deviate from what a dam was designed to handle. For example, more extreme precipitation events could increase the frequency of intentional discharges. Many other climate impacts, including shifts in seasonal and geographic rainfall patterns, could also cause the flow behavior of rivers to deviate from previous hydrographs. When flows are greater than expected, spillway overflow events (often referred to as "design failures") can occur. These overflows result in increased discharges downstream and increased flooding potential. Therefore, although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

Beaver Dams: Additional causes of flooding include beaver dams. Beaver dams obstruct the flow of water and cause water levels to rise. Significant downstream flooding can occur if beaver dams break.

Ice Jam: An ice jam is an accumulation of ice that acts as a natural dam and restricts the flow of a body of water. A freeze-up jam usually occurs in early winter to midwinter during extremely cold weather when supercooled water and ice formations extend to nearly the entire depth of the river channel. This type of jam can act as a dam and begin to back up the flowing water behind it. A breakup jam, forms as a result of the breakup of the ice cover at ice-out, causing large pieces of ice to move downstream, potentially piling up at culverts, around bridge abutments, and at curves in river channels. Breakup ice jams occur when warm temperatures and heavy rains cause rapid snowmelt. The melting snow, combined with the heavy rain, causes frozen rivers to swell. The rising water breaks the ice layers into large chunks, which float downstream and often pile up near narrow passages and obstructions (bridges and dams). Ice jams may build up to a thickness great enough to raise the water level and cause flooding upstream of the obstruction.

Secondary Hazards: The most problematic secondary hazards for flooding are fluvial erosion, riverbank erosion, and landslides affecting infrastructure and other assets located within floodplains. Without the space required along river corridors for natural physical adjustment, such changes in rivers after flood events can be more harmful than the actual flooding. The impacts from these secondary hazards are especially prevalent in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much damage, but scour the banks, edging buildings, and structures closer to the river channel or cause them to fall in. Landslides can occur following flood events when high flows oversaturate soils on steep slopes, causing them to fail. These secondary hazards also affect infrastructure.

Roadways and bridges are impacted when floods undermine or wash out supporting structures. Dams may fail or be damaged, compounding the flood hazard for downstream communities. Failure of wastewater treatment plants from overflow or overtopping of hazardous material tanks and the dislodging of hazardous waste containers can occur during floods as well, releasing untreated wastewater or hazardous materials directly into storm sewers, rivers, or the ocean. Flooding can also impact public water supplies and the power grid in similar ways, through inundation and/or erosion.

Location

Heavy rainfall events occur regularly in Massachusetts. As a result, inland flooding such as riverine and drainage-related flooding affect most of the communities in the Commonwealth, including Adams. A few dams are located in and upstream of Adams. Ice jams have occurred along the Hoosic River. Therefore, all flood-related hazards (riverine floods, stormwater flooding, dam overtopping, and ice jams) are relevant to the Town of Adams.

One important point to note relative to "location" is that the Hoosic River and parts of its tributaries flow through concrete flood control chutes located in the center of the Town. The concrete chutes were completed by the U.S. Army Corps in 1952-1959 in response to deadly, damaging flood events previous to and including 1938, 1948-49, and 1955. Homes and commercial properties are located along the chutes, and much of this is development that existed when the chutes were constructed.

Previous Occurrences

The previous edition of this plan includes narratives about previous flood events:

- Several residential areas regularly experience ponding and minor flooding, sometimes with damaging effects. Overtopping of concrete chutes that carry streams along the north Summer Street and Lime/Davis/Charles Street neighborhoods threaten residential homes during high flow events. Road and driveway crossings of the chutes can cause backups and more severe flooding when flood waters are not able to pass through the crossings.
- The Grant Street neighborhood floods often, due to an undersized storm drain system that cannot handle what seems to be more frequent severe storm events. The Town previously retained the services of an engineering firm to conduct a drainage assessment of this area but further assessment may be needed.
- The Burt and Pine Streets neighborhood experiences frequent flooding, also believed to occur due to undersized pipe systems. Residential basements flood in homes along northern Columbia Street and Howland Avenue, and commercial basements flood on East Hoosac Street.
- In late August 2011, Tropical Storm Irene tracked over the region bringing widespread flooding and damaging winds. Riverine and flash flooding resulted from an average of 3-6 inches of rain and upwards of 9", within a 12-hour period. Widespread road closures occurred throughout the region. In Williamstown this event was a 1% annual chance flood event, and in Adams it was approximately a 10% chance flood. Several days later in September 2011, the remnants of Tropical Storm Lee brought 4"-9" of heavy rainfall to the region. Due to the saturated soils from Tropical Storm Irene, this rainfall led to widespread minor to moderate flooding on rivers as well as small streams and creeks. Flooding due to Tropical Storm (T.S.) Irene was extensive across Adams, with bridges/culverts destroyed (complete destruction of East, Charles and Davis Street culverts), road closures, flooded buildings and evacuations of residents. Electricity and natural gas supplies were shut down to buildings where flooding was extensive. Incidence logs from the Town's first responders indicate that personnel from public works, police, fire and ambulance worked together to respond to damages spread across Adams.
- In September 2018, a rain event reported by the Albany National Weather Service dropped 2" of rain in three hours. This event overwhelmed stream banks and storm drain systems, and completely destroyed the Davis Street bridge and caused damages along Southwick Brook in the Lime Street area. According to the Adams Emergency Management Director, flood waters along this brook were at a level seen during T.S. Irene in 2011. The two stream crossings upstream of Davis Street largely survived the flood event, having been right-sized when reconstructed after T.S. Irene in 2011.

Ice jams are known to have occurred in and near Adams. According to the previous edition of this plan, the most recent such occurrence was in January 2018, when two inches of rain and an unusually warm weather of 50 F, which followed a period of prolonged and unusually cold weather, caused flooding from snow and ice melt across Berkshire County. Flooding occurred at various sites across Adams, with ice jams in the Southwick Brook concrete channels flooding Lime Street, similar flooding on North Summer Street and several feet of flooding in basements in the Pine/Burt Street neighborhood forcing a few homeowners to evacuate due to natural gas concerns. This same weather pattern caused an ice jam in Kitchen Brook in the neighboring town of Cheshire, which subsequently flooded and deposited large chunks of ice on Route 8, a major north-south arterial road in the county. The same event caused the Town of Stockbridge to declare a local disaster due to concerns that a massive buildup of ice and rising flood water could damage the Rt. 7 bridge over the Housatonic River and/or the natural gas main pipeline that serves as the only gas supply to the neighboring town of Great Barrington.

As noted earlier, this plan update relies primarily on a roughly ten-year lookback (2014 through 2023). The NOAA Storm Events database (https://www.ncdc.noaa.gov/stormevents/) for Berkshire County lists two flood events impacting the Adams area for the period 2014-2023.

Table 18. NCEI Severe Storm Database Entries Covering Floods in Adams.

Date	Description	Losses Reported
1/24/19	*Flood.* Steady rainfall occurred during as a secondary low pressure system developed over the Mid- Atlantic and tracked into southern New England. One to three inches of rainfall occurred over western Massachusetts. The combination of the rainfall along with the mild temperatures melting some of the snow resulted in isolated poor drainage flooding. Hubbard Avenue was closed at the railroad underpass due to flooding.	---
7/10/23	*Flood.* A strong upper-level system brought widespread rounds of showers and thunderstorms to western Massachusetts on July 9-10, 2023. The steadiest and heaviest rainfall occurred during the early morning hours on July 10 which resulted in areas of flooding. Rainfall totals were generally in the 1.50 to 4.00 inch range. Areas receiving flooding included the City of North Adams and the towns of Clarksburg, Becket, Sheffield, Washington and Great Barrington mainly consisting of closed and/or washed out roads and flooded homes/basements. A State of Emergency was issued for North Adams, Becket, Hinsdale, and Clarksburg due to the flooding.	$1.5 million in North Adams

Extent

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (flow) will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. The flood frequency equals 100 divided by the discharge probability. For example, the “100-year discharge” has a 1 percent chance of being equaled or exceeded in any given year. The “annual flood” is the greatest flood event expected to occur in a typical year. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-year or higher recurrence interval to occur in a short time period. The same flood can have different recurrence intervals at different points on a river.

The 1% annual chance flood is the standard used by most federal and state agencies. It is used by the National Flood Insurance Program (NFIP) to guide floodplain management and determine the need for flood insurance. The extent of flooding associated with a 1% annual probability of occurrence (the base flood or 100-year flood) is called the 100-year floodplain, which is used as the regulatory boundary by many agencies. Also referred to as the Special Flood Hazard Area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. The term “500-year flood” is the flood that has a 0.2% chance of being equaled or exceeded each year. Base flood elevations and the boundaries of the 1% annual chance (100-year) and the 0.2% annual chance (500-year) floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principal tools for identifying the extent and location of the flood hazard.

Both the 100-year and the 500-year floodplains are determined based on past events. As a result, the flood maps do not reflect projected changes in precipitation events.

Flooding in Massachusetts is forecast and classified by the National Weather Service (NWS) Northeast River Forecast Center as minor, moderate, or severe based upon the types of impacts that occur. Minor flooding is considered “disruptive” flooding that causes impacts such as road closures and flooding of recreational areas and farmland. Moderate flooding can involve land with structures becoming inundated. Major flooding is a widespread, life-threatening event. River forecasts are made at many locations in the state containing USGS river gauges with established flood elevations and levels that correspond to each of the degrees of flooding.

Due to the pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Flash flooding, which occurs when excessive water fills either normally dry creeks or riverbeds or dramatically increases the water surface elevation on currently flowing creeks and rivers, can be less predictable. However, potential hazard areas can be warned in advance of potential flash-flooding danger. Flooding is more likely to occur due to a rainstorm when the soil is already wet and/or streams are already running high from recent previous rains. NOAA’s Northeast River Forecast Center provides flood warnings for Massachusetts, relying on monitoring data from the USGS stream gauge network. Notice of potential flood conditions is generally available several days in advance. State agency staff also monitor river, weather, and forecast conditions throughout the year.

Notification of potential flooding is shared among state agency staff, including the Massachusetts Emergency Management Agency (MEMA) and the Office of Dam Safety. The NWS provides briefings to state and local emergency managers and provides notifications to the public via traditional media and social networking platforms.

Probability of Future Events

Although it can be complex to forecast, scientists expect that there will be an overall increase of precipitation on an annual basis across Massachusetts. It is expected that precipitation patterns will become more variable over time, with fewer days with precipitation, but heavier and more intense events when it does rain or snow. Most areas across the state are expected to have small increases in annual total precipitation, but a substantial change in seasonal precipitation patterns.

Climate change will increase the probability of flooding caused by intense precipitation. The National Climate Assessment and NCEI both project more fall, winter, and spring precipitation as well as more intense precipitation. As noted in the ResilientMass Plan, extreme river flow events are projected to increase, elevating the probability of damaging floods. In addition, smaller flood events are likely to occur more frequently. For example, the current 24-hour 10-year storm (about 3 inches) could double in frequency by 2050 in western and central Massachusetts and triple in frequency in coastal regions.

Vulnerability Assessment

Exposure

In Adams, the 1% annual chance floodplain (100-year floodplain) covers about 344.0 acres, or approximately 2.3 percent of the Town. In addition to the 100- year floodplains, stormwater has the potential to cause localized flooding.

Several roads experience flooding including Pine St., North Summer St., Fisk St., Forest Park Ave., Russell Field, Columbia St., Howland Ave., East Hoosac St., Friend St., Jordan St., Staple St. to Reed Field, and Lime St. The Quality St. Bridge and attached waterline are vulnerable to flooding as well as the DPW garage.

Approximately 196 buildings are located in the 100-year floodplain. Several buildings owned by the Housing Authority on North Summer St. and Columbia St., a substation, and the Visitor's Center are located in the 100-year floodplain. There are six structures listed on the National Register of Historic Places including Phillips Woolen Mill Building #1, #2-3, #4, #4A, #6, and Renfrew Mill #2 Office. According to EPA's Toxic Release Inventory (TRI) database, there are seven facilities which contain hazardous materials (Adams Specialty Printing, Berkshire Mills Complex II, Dollar General, Dukes Sand and Gravel, Grove Street Solar, Land Construction Corp., and Macdermid Graphic Arts) in the 100-year floodplain. Additionally, there are community concerns about runoff from the Specialist Minerals Mines site. Of the 196 buildings in the floodplain, 170 (87%) are part of an Environmental Justice (EJ) community. Table 19 shows the types of buildings exposed to the flood and their value. The number in paratheses shows the total number of buildings and building values for the town.

Table 19. Buildings in 100-Year Floodplain.

Building Type	Number of Buildings (Total in Town)	Building Value (Total in Town)
Single Family	115 (3,393)	$12,031,500 ($443,203,600)
Mobile Home	1 (24)	$23,400 ($720,100)
Multi-Family	34 (865)	$4,095,900 ($92,971,200)
Mixed-Use	7 (124)	$807,300 ($23,472,100)
Commercial	17 (191)	$1,855,200 ($39,881,600)
Educational	0 (5)	$0 ($21,421,700)
Government	11 (75)	$805,700 ($18,934,400)
Religious/Non-Profit	0 (39)	$0 ($45,307,200)
Industrial	8 (65)	$3,153,600 ($157,846,600)
Garage/Outbuilding	3 (49)	$17,700 ($777,840)
Vacant	0 (31)	$0 ($866,600)
Total	**196 (4,861)**	**$22,790,300 ($845,402,940)**

The population exposed to the 100-year floodplain is shown in Table 20. The column on the left shows the population in and around the floodplain (wherever the Census Block overlapped with the floodplain boundary) while the column on the right shows the total population numbers for the town. There is a large EJ community in the floodplain.

Table 20. Population Exposed to 100-Year Floodplain (2020 U.S. Census).

Demographics	Population in and Adjacent to Floodplain	Total Population
Population	4,124	8,166
Households	2,218	4,336
White	3,770 (91.4%)	7,432 (91.0%)
Black	53 (1.3%)	110 (1.4%)
American Indian	8 (0.2%)	12 (0.1%)
Asian	18 (0.4%)	41 (0.5%)
Pacific Islander	0 (0.0%)	0 (0.0%)
Other Race	23 (0.6%)	60 (0.7%)
Two or More Races	252 (6.1%)	511 (6.3%)
Hispanic or Latino:	114 (2.8%)	226 (2.8%)
Population under 18:	598 (8.7%)	1,268 (15.5%)
Population over 64:	987 (36.7%)	1,916 (23.5%)
Annual Income < $30K/year	717 (32.3%)	1,436 (33.1%)

Demographics	Population in and Adjacent to Floodplain	Total Population
Population in EJ Zone*:	3,422 (83.0%)	6,761 (82.8%)

**Massachusetts Office of Energy and Environmental Affairs, 2022*

Although dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control, they also pose a potential risk to lives and property. Dam failure is not a common occurrence, but dams do represent a potentially disastrous hazard. When a dam fails, the potential energy of the stored water behind the dam is instantly released, oftentimes with catastrophic consequences as the water rushes in a torrent downstream flooding an area known as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Three significant hazard dams and several dams which have not been assigned a hazard value – but no high hazard dams – are located in Adams. Figure 9. Adams Critical Facilities and 100-Year Floodplain. identifies the dams within the Town.

Table 21. Dams in Vicinity.

Name	Ownership	Hazard Type
Arnold Dam	Private	Significant
Fisk Brook Dam	Private	Significant
Greylock Greenhouse Dam	Public (DCR)	Significant
Anthony Dam	Private	N/A
Greylock Glen Pond Dam	Public (DCR)	N/A
Greylock Glen Pond #1 Dam	Public (DCR)	N/A
Hall Brook Dam	Private	N/A
Peck’s Brook Dam	Private	N/A
Plunkett Dam #2	Private	N/A
Plunkett Dam #3	Private	N/A
Town Infirmary Dam	Private	N/A

The 100-year Floodplain (FEMA) with the Town’s critical facilities is shown in Figure 9. A substation is in the 100-year floodplain. Train tracks do cross the 100-year floodplain and may be vulnerable to flooding.

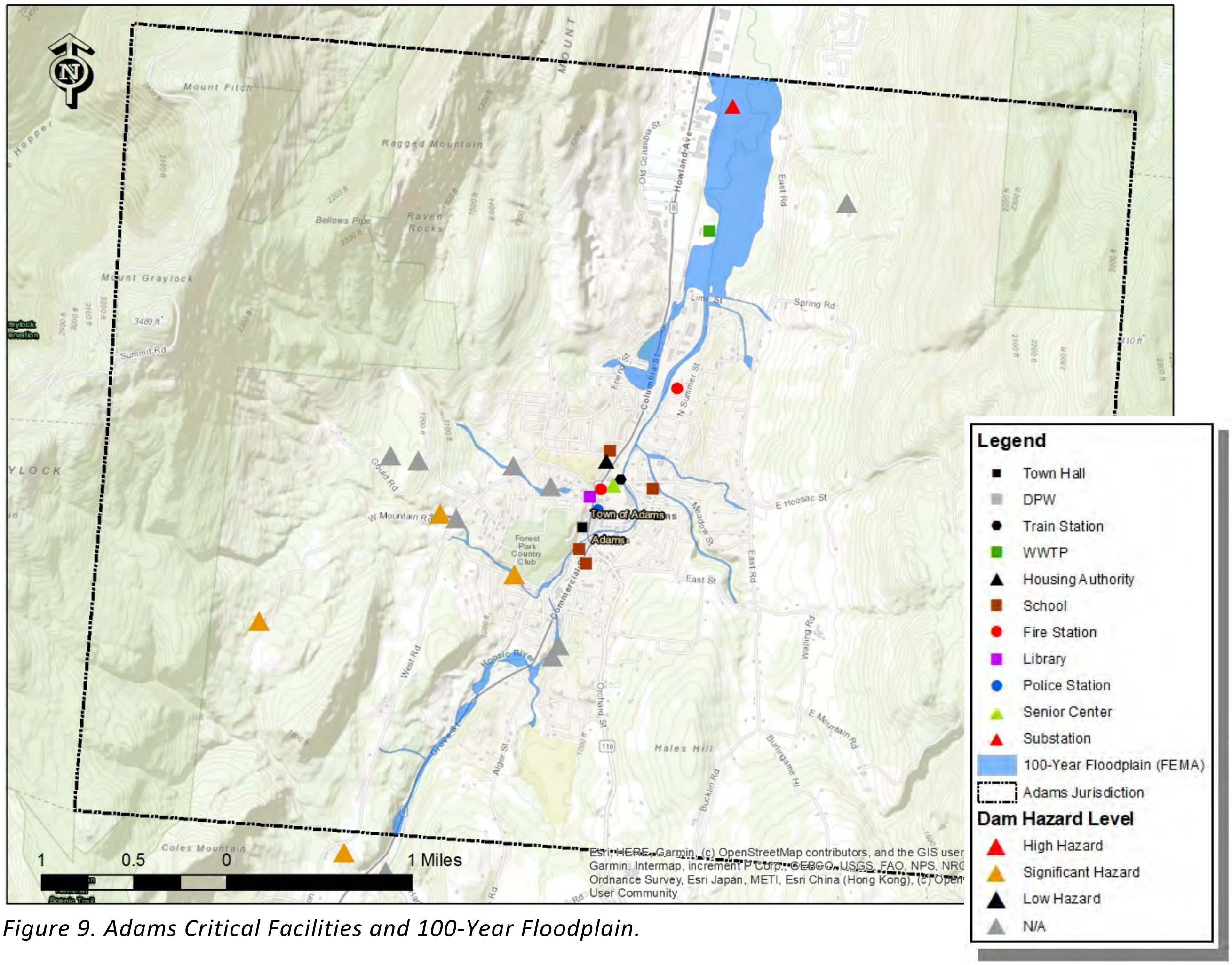


Figure 9. Adams Critical Facilities and 100-Year Floodplain.

Built Environment Impacts

To identify built environment impacts to the Town, FEMA's risk assessment software, Hazus, was implemented. Building footprint data and parcel data was used to update the model while the latest floodplain was also integrated into the software. The economic loss results of the 100-year event are shown in Table 22. The Town's Average Annual Loss (AAL) is calculated to be $174,400.

Table 22. Building Loss for the 100-Year Flood Scenario

Loss Type	Residential ($Million)	Commercial ($Million)	Other Occupancy ($Million)	Total ($Million)
Building Loss	0.78	0.13	0.01	**0.92**
Content Loss	0.74	0.63	0.04	**1.41**
Business Inventory Loss	0.00	0.08	0.00	**0.08**
Business Income Loss	0.00	4.22	0.39	**4.61**
Business Relocation Loss	1.54	1.20	0.25	**2.99**
Rental Income Loss	0.87	0.89	0.03	**1.79**
Wage Loss	0.01	3.70	1.93	**5.64**
Total	**3.94**	**10.85**	**2.65**	**17.44**

Climate change will increase the probability and magnitude of flood impacts to the built environment. Future floodplains may be larger than the current FEMA modeled floodplain and new development, including the Greylock Glen development should consider these projected conditions. These new developments may cause additional stormwater issues which should be considered too.

Population Impacts

The Town should be aware that senior and low-income segments of Adam's population may be more vulnerable to hazard events due to a number of factors. Senior and low-income populations may be physically or financially unable to react and respond to a hazard event and require additional assistance. Access to information about the hazard event may be lacking, as well as access to transportation in the case of an evacuation. The location and construction quality of housing can also pose a significant risk. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Using the Hazus software, the 100-year flood scenario results showed that there would be approximately 150 displaced households and 100 people seeking public shelter.

Climate change will increase the probability and magnitude of flood impacts to the population. Future floodplains may be larger than the current FEMA modeled floodplain and new development should consider these projected conditions. Vulnerable populations should be considered when development near the current floodplain is planned.

Environment Impacts

One of the major environmental impacts of a major flood would be the potential release of hazardous materials. According to EPA's Toxic Release Inventory (TRI) database, there are seven facilities which contain hazardous materials (Adams Specialty Printing, Berkshire Mills Complex II, Dollar General, Dukes Sand and Gravel, Grove Street Solar, Land Construction Corp., and Macdermid Graphic Arts) in the 100-year floodplain. Additionally, there is the Specialist Minerals Mines site, and rail and roadway in the 100-year floodplain which is a conduit for hazardous materials.

Climate change will increase the probability and magnitude of flood impacts which may include environmental impacts due to hazardous materials release. Facilities which contain hazardous materials should be considered when new development is planned.

Problem Statements for Flood

Table 23. Problem Statements Related to Flooding.

Assets	Problems Associated with Flood
People (including underserved communities and socially vulnerable populations)	• Older populations in the floodplain may have difficulty evacuating. • Housing Authority buildings (on North Summer St. and Columbia St.) are exposed to the floodplain and may house vulnerable populations. • Transportation facilities/locations and the Visitor's Center may be impacted by flooding and expose visitors unfamiliar with the area.

Structures (including facilities, lifelines, and critical infrastructure)	• Existing flood maps are outdated, therefore flood risk at certain locations may be higher than typically understood.
	• Some locations, including a substation, the Visitor's Center, and some housing authority buildings, are exposed to flooding. Potential exposed structures include:
	  ○ Electrical substation and undersized culverts, and Quality St. Bridge and water line.
	  ○ Visitor's Center and several residential and commercial structures.

Systems (including networks and capabilities)	• The Town has identified multiple stream crossings throughout Adams that are undersized and often flood. While some work and upgrades are underway, the town should work to prioritize those crossings that pose the greatest flood and washout risk.

Assets	Problems Associated with Flood
	• The Town has limited access to an extensive drainage system for maintenance and repairs due to a lack of easements. Some of these drainage systems often flood, however the Town cannot address these challenges given that infrastructure is on private property. • Road closures may interrupt community systems including Pine St., North Summer St., Fisk St., Forest Park Ave., Russell Field, Columbia St., Howland Ave., East Hoosac St., Friend St., Jordan St., Staple St. to Reed Field, and Lime St. • The Town is currently precluded from adopting higher regulatory standards to protect against flooding (must comply with State Building Code). • The FEMA floodplain maps (effective 1983) are very dated for the Town and the risk may be underestimated.
Natural, historic, and cultural resources	• There are six structures listed on the National Register of Historic Places including Phillips Woolen Mill Building #1, #2-3, #4, #4A, #6, and Renfrew Mill #2 Office. • The seven structures identified by EPA, the Specialist Minerals Mines site, and rail and roadway impacts may release hazardous materials during a flood event which would impact natural resources.
Activities that have value to the community	• Several road closures may disrupt community events.

Hurricanes and Tropical Storms

Flooding in Massachusetts is often the direct result of tropical storms and hurricanes. These powerful storms can also cause significant widespread damage due to high winds. The impacts from high winds are the primary concern of this section.

Description

Tropical cyclones (tropical depressions, tropical storms, and hurricanes) that affect New England form over the warm, moist waters of the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Tropical systems customarily come from a southerly direction and when they accelerate up the East Coast of the U.S., most take on a distinct appearance that is different from a typical hurricane. Although rain is often limited in the areas south and east of the track of the storm, these areas can incur the worst winds and storm surge. Dangerous flooding occurs most often to the north and west of the track of the storm. An additional threat associated with a tropical system making landfall is the possibility of tornado generation. Tornadoes would generally occur in the outer bands to the north and east of the storm, a few hours to as much as 15 hours prior to landfall.

Hurricane season runs from June 1 to November 30. In New England, these storms are most likely to occur in August, September, and the first half of October. The ResilientMass Plan notes that this is due in large part to the fact that it takes a considerable amount of time for the waters south of Long Island to warm to the temperature necessary to sustain the storms this far north. Also, as the region progresses into the fall months, the upper-level jet stream steering winds might flow from the Great Lakes southward to the Gulf States and then back northward up the eastern seaboard. This pattern is conducive for capturing a tropical system over the Bahamas and accelerating it northward.

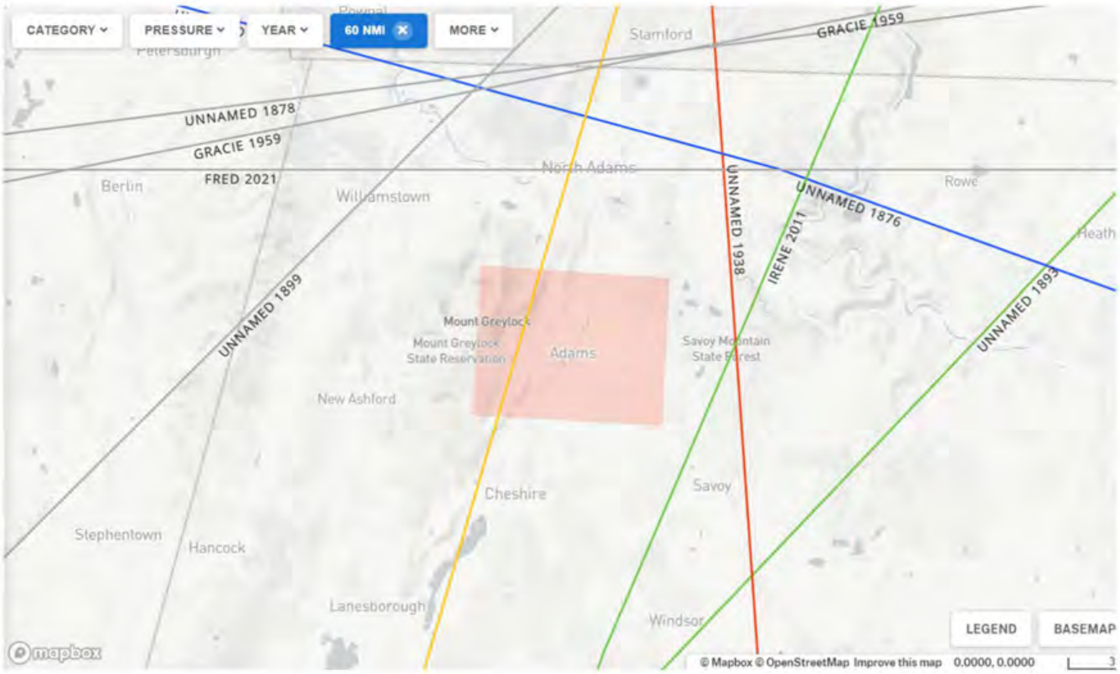
Location

Tropical storms and hurricanes can affect the entirety of Massachusetts, including the geographic extent of Adams.

Previous Occurrences

The ResilientMass Plan notes that hurricanes and tropical storms occur somewhat regularly in Massachusetts. Recent notable events include Tropical Storm Isaias (2020), Tropical Depression Henri (2021), and Tropical Storm Else (2021). Historical tropical system tracks near and through are depicted on the following page. This mapping is available from NOAA and updated continuously.

Historical Tropical Storm Tracks in the Town of Adams



Graphic courtesy of NOAA

A handful of tropical storms and hurricanes have passed near or through Adams since recordkeeping began. Unnamed storms crossed through or near the town in 1876, 1878, 1893, and 1899; none of these were believed to cause widespread damage in the town. The 1938 hurricane was one of the most destructive in the history of New England, with extensive wind damage throughout the region. Storms Gracie (1959) and Fred (2021) caused little widespread damage, but Tropical Storm Irene (2011) produced approximately 5 to 7 inches of rain in western Massachusetts and caused widespread flood damage in western New England.

Figure 10. Historical Tropical Storm Tracks In Adams.

As noted elsewhere, this Plan update relies primarily on a ten-year lookback (2014 through 2023) ending with the date of plan development. During that ten-year period, only one Massachusetts emergency declaration (Storm Lee of 2023) was associated with a tropical system, but it is not yet in the NCEI database of severe storms for Berkshire County. T.S. Isaias of 2020 is the sole tropical storm appearing in the inventory for Berkshire County for the last ten years:

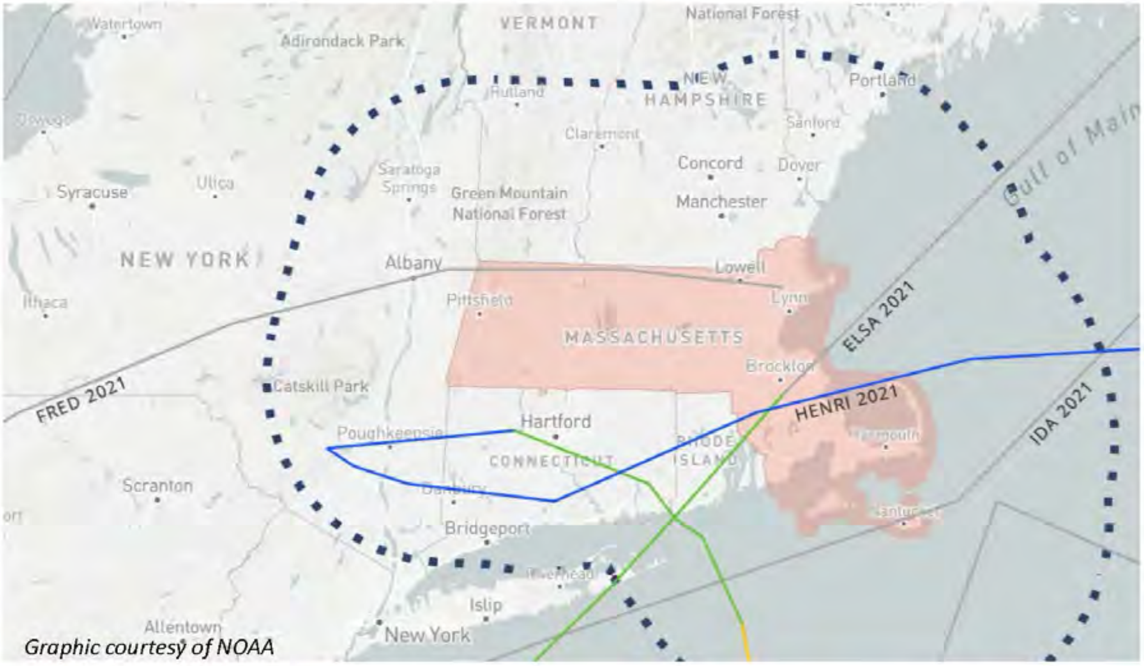
- August 4, 2020: Tropical Storm Isaias tracked northeast from the eastern Carolinas across the mid-Hudson Valley and into New England. The center of the storm passed close to Albany, NY on August 4th. This storm brought tropical storm force winds and moderate rainfall to western Massachusetts through the period. These winds caused widespread damage with numerous reports of downed trees and wires across Massachusetts. Power outages were also widespread with over 15,000 outages across Berkshire County and over 75,000 state-wide. Every town in the county had some power outages. The Town of Sandisfield was particularly hard-hit, with over 70% of the town losing power and 45 reports of trees down on wires. A Sandisfield resident was critically injured when a tree fell on her car. Trees were downed in the town of Pittsfield, Peru, Hinsdale and northwest of Dalton. Large tree limbs were also downed in the Town of Richmond.

Adams was moderately impacted by the series of tropical and post-tropical storm systems that impacted Massachusetts in 2021. These storms occurred in July, August, and September 2021 as follows:

- T.S. Elsa - July 9, 2021
- T.S. Fred - August 19, 2021
- T.S. Henri - August 22-23, 2021
- T.D. Ida - September 1, 2021

Although Adams experienced precipitation impacts from these events, the local planning team noted that flooding did not result from any of the four named storms in 2021.

Impacts of the 2021 Hurricane Season on Massachusetts



T.S. Elsa crossed eastern Massachusetts on July 9, delivering wind and flooding rains while transitioning to an extratropical storm later that day. Approximately 2 to 4 inches of rain were recorded in many towns. MBTA commuter rail trains were delayed on the Worcester line due to flooding, and Route 146 was flooded. About 11,000 Eversource customers in Massachusetts lost power.

Extratropical Storm Fred crossed northern Massachusetts lengthwise on August 19 and 20, delivering flooding rains to parts of southern New England. Flooding in Massachusetts was worst in the Worcester area. Approximately 2 to 4 inches of rain were recorded in many towns.

T.D. Henri crossed eastern Massachusetts on August 24, delivering flooding rains to parts of southern New England. Prior to crossing Massachusetts, the storm looped through Connecticut and New York on August 22-24. The path and slow movement of the storm contributed to widespread flooding in all three states, made worse due to the conditions caused by storm Fred only a few days before. Approximately 1 to 4.5 inches of rain were recorded in many towns. About 12,000 Eversource customers in Massachusetts lost power.

Extratropical Storm Ida passed south of New England and crossed Nantucket on September 2, delivering flooding rains to parts of southern New England. The precipitation from Ida was more intense than expected, and it caused widespread flooding. Approximately 2 to 6 inches of rain were recorded in many towns. About 4,000 people in Massachusetts lost power.

Figure 11. Tracks for Tropical Storms that Impacted Massachusetts 2021.

Even without the presence of a catastrophic hurricane striking Adams recently, less severe tropical storms and remnants such as those described above have created disruptions and necessitated public expenditures to deal with outages and debris.

Extent

Hurricanes are measured according to the Saffir-Simpson scale, which categorizes or rates hurricanes from 1 (minimal) to 5 (catastrophic) based on their intensity. This is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale, inherently leaving out any measure of precipitation and flooding.

Table 24. Saffir-Simpson Scale.

Saffir-Simpson Hurricane Wind Scale

	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	**Damaging winds will produce some damage:** Well-constructed framed homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap, and shallow-rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	**Very strong, damaging winds will cause widespread damage:** Well-constructed framed homes could sustain major roof and siding damage. Many shallow-rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	**Dangerous winds will cause extensive damage:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	**Extremely dangerous winds will cause devastating damage:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center, NOAA

Tropical storms and tropical depressions, while generally less dangerous than hurricanes, can be deadly. The winds of tropical depressions and tropical storms are usually not the greatest threat; rather, the rains, flooding, and severe weather associated with the tropical storms are what customarily cause more significant problems. Nevertheless, serious power outages can also be associated with these types of events.

The NWS issues a hurricane warning when sustained winds of 74 mph or higher are expected in a specified area in association with a tropical, subtropical, or post-tropical cyclone. A warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds. A hurricane watch is announced when sustained winds of 74 mph or higher are possible within the specified area in association with a tropical, subtropical, or post-tropical cyclone. A watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds (NWS, 2013).

Probability of Future Events

The ResilientMass Plan explains that Massachusetts experiences a tropical storm or hurricane about once every two years on average, with NOAA estimating the recurrence of any category hurricane between 13 to 30 years, and a Category 3 hurricane occurrence every 50 to 60 years.

Some researchers have suggested that the intensity of tropical cyclones has increased over the last 40 years, with some believing that there is a connection between this increase in intensity and climate change. While most climate simulations agree that greenhouse warming enhances the frequency and intensity of tropical storms, models of the climate system are still limited by resolution and computational ability. Given the history of major storms and the possibility of increased frequency and intensity of tropical storms due to climate change, it is prudent to expect that there will be hurricanes impacting Adams in the future that may be of greater frequency and intensity than in the past.

Vulnerability Assessment

Exposure

High winds and heavy rain and/or hail associated with hurricanes and tropical storms can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death. Other associated concerns are debris management issues including debris removal and identification of disposal sites. All assets in Adams should be considered exposed to high winds while specific areas are exposed to hurricane surge. Figure 12 shows the 100-year wind speeds identified in the American Society of Civil Engineers (ASCE) 7-98 publication.

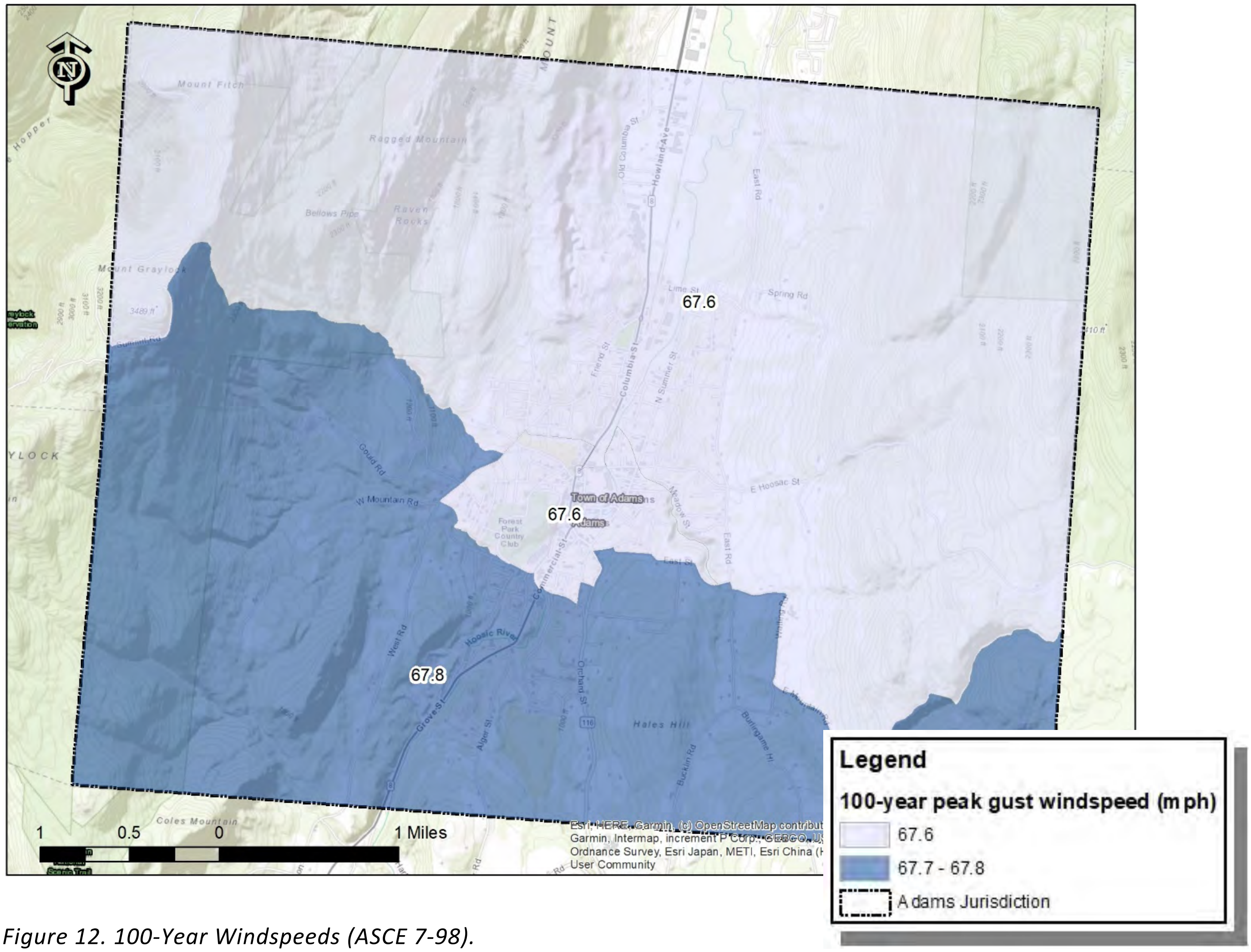


Figure 12. 100-Year Windspeeds (ASCE 7-98).

Built Environment Impacts

To identify built environment impacts to the town resulting from wind damage, FEMA's risk assessment software, Hazus, was implemented. The economic loss results of the 500-year event are shown in Table 25 while the results for the 1000-year event are shown in Table 26. The Town's Average Annual Loss (AAL) is calculated to be $89,941.

Buildings that are permanently open with bays or open sides are susceptible to wind damage since the building envelope can't be maintained. Family lumber has an open wall, there is a pavilion on Mill Street, and the Town gazebo also has open walls and may be more susceptible to high winds.

Table 25. Building Losses Due to Wind for a 500-Year Scenario.

Loss Type	Residential ($Million)	Commercial ($Million)	Other Occupancy ($Million)	Total ($Million)
Building Loss	5.58	0.23	0.20	**6.01**
Content Loss	1.71	0.02	0.04	**1.77**
Business Inventory Loss	0.00	0.00	0.00	**0.00**
Business Income Loss	0.00	0.00	0.00	**0.00**
Business Relocation Loss	0.18	0.01	0.00	**0.19**
Rental Income Loss	0.16	0.00	0.00	**0.16**
Wage Loss	0.00	0.00	0.00	**0.00**
Total	**7.63**	**0.26**	**0.24**	**8.13**

Table 26. Building Losses Due to Wind for a 1000-Year Scenario.

Loss Type	Residential ($Million)	Commercial ($Million)	Other Occupancy ($Million)	Total ($Million)
Building Loss	8.82	0.48	0.46	**9.76**
Content Loss	2.71	0.09	0.14	**2.94**
Business Inventory Loss	0.00	0.02	0.02	**0.04**
Business Income Loss	0.00	0.03	0.01	**0.04**
Business Relocation Loss	0.29	0.05	0.03	**0.37**
Rental Income Loss	0.27	0.02	0.00	**0.29**
Wage Loss	0.00	0.02	0.07	**0.09**
Total	**12.09**	**0.71**	**0.73**	**13.53**

Population Impacts

Populations considered most vulnerable to hurricane and tropical storm impacts in Adams are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. For high windspeeds, it's important to maintain the building envelope during the event. If a window or door fails, damage to the structure will be much greater. The senior and low-income populations in Adams are particularly susceptible to extreme winds and it should be noted that there may be overlap within the two categories. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

For the 500-year event, Hazus predicts that there will be no displaced households and nobody seeking public shelter from the high windspeeds. For the 1000-year event, Hazus predicts that there will be no displaced households and nobody seeking public shelter from the high wind speeds.

Environment Impacts

Hurricanes can cause damage to parks, and other, natural areas. Some areas of the town may be out of service until trees are removed.

Problem Statements for Hurricanes/Tropical Storms

Table 27. Problem Statements for Hurricanes/Tropical Storms.

Assets	Problems Associated with Hurricanes and Tropical Storms
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations may need to be evacuated and could be displaced from their homes.
Structures (including facilities, lifelines, and critical infrastructure)	• Wind may cause trees to fall into structures and infrastructure, and roadways. • Wind damage to wind-susceptible buildings such as carports, greenhouses, pavilions, gazebos, and open-walled buildings. Additional damage to commercial buildings with HVAC located on roofs. • The electric grid may go down during a high wind event.
Systems (including networks and capabilities)	• First responders may have difficulty reaching people if roads are closed due to tree debris.
Natural, historic, and cultural resources	• Historic buildings may experience damage during high wind events, especially the roofing and windows. Water entering these buildings could impact important historic and cultural artifacts.

Assets	Problems Associated with Hurricanes and Tropical Storms
Activities that have value to the community	• A severe hurricane wind and rain event could negatively impact outdoor activities in the Town.

Invasive Species

The ResilientMass Plan defines invasive species as non-native species that cause or are likely to cause harm to ecosystems, economies, and/or public health (USDA). The focus of this section is on invasive terrestrial plants, as this is the most studied and managed type of invasive; information for invasive aquatic flora and fauna is also provided when relevant.

Description

The Massachusetts Invasive Plant Advisory Group (MIPAG), a collaborative representing organizations and professionals concerned with the conservation of the Massachusetts landscape, is charged by EOEEA to provide recommendations to the Commonwealth to manage invasive species. MIPAG defines invasive plants as “non-native species that have spread into native or minimally managed plant systems in Massachusetts [causing] economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.” These species have biological traits that provide them with competitive advantages over native species, particularly because in a new habitat they are not restricted by the biological controls of their native habitat. As a result, these invasive species can monopolize natural communities, displacing many native species and causing widespread economic and environmental damage.

Some examples of invasive insect species include:

- Nantucket Pine Tip Moth (native pest) is a moth with heads, bodies, and appendages covered with gray scales with mottled rusty-red markings. Larvae cause damage to young trees (up to five years old) by feeding inside growing shoots, buds, and conelets. The preferred host is the loblolly pine.
- Bark Beetles (native pest) include more than 600 species of beetles which serve in important ecological roles in small numbers where they live in dead, weakened, and dying host conifer trees.
- Forest Tent Caterpillar (native pest) has the biggest footprint of any indigenous tent caterpillar in North America (Furniss and Carolin 1977) and is a major defoliator of a variety of deciduous hardwood trees. The caterpillars spin silken mats on the trunks and large branches of trees where they molt and feed. Forest Tent Caterpillars can reach outbreak proportions causing massive defoliation of host trees and becoming a nuisance to people.
- Pine Reproduction Weevils (native pest) is a very dark, elongate, oval insect up to 1/2 inch long with indistinct to distinct gray or pale orange spots of scales on the wings and thorax. They feed

at night on the conifer seedlings or near the tips of branches of larger plants. Females lay their eggs on the roots of these trees. The weevils breed in all species of pines, hemlocks, junipers, spruces, firs, and cedars.

- Hardwood Borers (native pest) usually attack hardwoods experiencing some kind of stress although the clear-wing moths attack healthy trees. These insects attack the tree year after year and may eventually weaken it enough that it is prone to wind breakage. Some borers develop in the root system damaging young trees.
- Hemlock Wooly and Balsam Wooly Adelgid (non-native pest) is a very small, invasive, aphid-like insect that attacks North American hemlocks (Hemlock Wooly) and firs (Balsam Wooly). They can be identified by the white wooly masses that form on the underside of branches at the base of the tree's needles. They stay at this location for the rest of their lives. Their feeding disrupts the flow of nutrients to the tree twigs and needles leading to a decline in tree health and mortality in 4 to 10 years.
- Gypsy Moth (non-native pest) is an insect which feeds on a large variety of tree leaves from oak, maple, apple, crabapple, hickory, basswood, aspen, willow, birch, pine, spruce, hemlock, and others. It does prefer oak tree leaves, however. Periodically, large populations can cause defoliation damaging and killing trees they are feeding on.
- Spotted Lanternfly (non-native pest) is an invasive insect first detected in the U.S. in 2014. It feeds on a variety of fruit, ornamental, and wood trees and could seriously impact the grape, orchard, and logging industries.

Location

The entire Commonwealth is vulnerable to invasive species. Types of species can vary by location, elevation, ecosystem, and habitat type, as well as land and water use. Furthermore, the ability of invasive species to travel distances (either via natural mechanisms or accidental human interference) allows these species to propagate rapidly over a large geographic area. Similarly, in open freshwater and marine ecosystems, invasive species can quickly spread once introduced, as there are generally no physical barriers to prevent establishment, outside of physiological tolerances, and multiple opportunities for transport to new locations (by boats, for example). The entire geographic area of Adams is believed at risk for invasive species propagation.

Previous Occurrences

Invasive species do not represent a singular event but rather an ongoing or emerging problem, so it is difficult to measure the frequency of occurrences. A comprehensive list of invasives can be found at https://www.massnrc.org/mipag/invasive.htm. Invasives of current concern to forest health (https://www.mass.gov/service-details/current-forest-health-threats) in Berkshire County are reportedly:

- Gypsy Moth
- Winter Moth

- Hemlock Woolly Adelgid
- Southern Pine Beetle
- Emerald Ash Borer
- White Pine Needlecast

The annual budget to address invasive species in Massachusetts has fluctuated over time but, in general, appears to have decreased. This likely implies a lack of resources rather than a decrease in risk. The following figures are from https://budget.digital.mass.gov/summary/fy22/enacted/energy-and-environmental-affairs/environmental-affairs/20000100.

Table 28. Statewide Budgets for Addressing Invasive Species.

FY Year	Budget
2022	$277,838
2021	$146,348
2020	$4,150,000
2019	$3,831,135
2018	$4,347,000
2017	$6,046,870

The Open Space and Recreation Plan (2019-2024) notes that “The invasive species found in Adams are likely representative of invasive species commonly found throughout inland areas of Massachusetts.” The previous edition of this hazard mitigation plan notes the following:

- The presence of the Emerald Ash Borer, first found in Massachusetts in the neighboring town of Dalton in 2012, has quickly spread throughout central Berkshire County. This rapidly-spreading invasive insect quickly kills its host trees within a few years of settling in an area, leading to massive die-offs of all ash trees within an area. This will increase the amount of dead limbs, brush and standing dead trees throughout forests in the county. UMass Extension states that, as a component of Massachusetts forests, the highest percentages of ash are located in Berkshire County.
- Other invasive insects such as the Hemlock Wooly Adelgid threaten healthy hemlock stands and the Asian Longhorn Beetle threatens ash, maples, elms, poplar and willow.

Over the course of the meetings held during the development of this plan, Town staff confirmed that the Emerald Ash Borer has caused significant damage and killed many trees in Adams.

Extent

MIPAG recognizes 74 plant species as "Invasive," "Likely Invasive," or "Potentially Invasive." The criteria for an “Invasive” species are listed below; the other assigned categories are associated with lower scores on the criteria checklist. The criteria for invasive animal species are less well-defined, but many of the same characteristics (including a non-Massachusetts origin and the ability to out-compete native species) are similar. In order to be considered “Invasive” by MIPAG, a plant species must meet the following complex set of criteria:

1. Be nonindigenous to Massachusetts.
2. Have the biologic potential for rapid and widespread dispersion and establishment in minimally managed habitats.
3. Have the biologic potential for dispersing over spatial gaps away from the site of introduction.
4. Have the biologic potential for existing in high numbers away from intensively managed artificial habitats.
5. Be naturalized in Massachusetts (persists without cultivation in Massachusetts).

If a species meets criteria 1–4 and criterion 5, it may be considered “invasive” or “likely invasive” in Massachusetts. If it does not meet criterion 5, it may be considered “potentially invasive” if it meets criteria 13–15 below.

6. The species is widespread in Massachusetts, or common in a region or habitat type(s) in the state.
7. The species has many occurrences in Massachusetts that have high numbers of individuals in minimally managed habitats.
8. The species is able to outcompete other species in the same natural plant community.
9. The species has the potential for rapid growth, for high seed or propagule production and dissemination, and for establishment in natural plant communities.

If a species meets the initial five criteria and criteria 6–9 at this time, it may be considered a “likely invasive” species in Massachusetts if it also meets at least one of the following three criteria:

10. The species has at least one occurrence in Massachusetts that has high numbers of individuals forming dense stands in minimally managed habitats.
11. The species has the potential, based on its biology, colonization history outside its native range, and likelihood of range expansion or change in biologic potential from climate change predictions, to become invasive in Massachusetts.
12. The species is acknowledged to be invasive in nearby states, but its status in Massachusetts is unknown or unclear. This may result from lack of field experience with the species or from difficulty in species determination or taxonomy.

If the species meets the basic criteria for invasiveness (criteria 1–4) but is not naturalized in Massachusetts (criterion 5), the species may be considered “potentially invasive” in Massachusetts if it meets the following three criteria (criteria 13–15):

13. The species, if it becomes naturalized in Massachusetts, based on its biology and biologic potential, would pose an imminent threat to the biodiversity of Massachusetts and
14. Its naturalization in Massachusetts is anticipated, and
15. The species has a documented history of invasiveness in other areas outside its native range including expansion of range and/or change in biological potential from climate change predictions

The MIPAG has developed a list of Early Detection plant species according to an established set of criteria that includes MIPAG classification as an *invasive, likely invasive,* or *potentially invasive* ecological threat and one of these three criteria: *limited prevalence in Massachusetts, partial containment potential,* or *public health threat.* The Early Detection table includes the documented distribution of a species by county.

Table 29. Early Detection Information for Addressing Invasive Species.

Species	Common Name	Current County of Distribution (November 2010)	Notes
Arthraxon hispidus	Hairy joint grass; jointhead; small carpetgrass	Franklin (historically)	This species is not currently known in Massachusetts; it was last collected in Deerfield in 1973. This is an annual grass that co-occurs with Japanese stilt grass further south.
Butomus umbellatus	Flowering rush	Essex, Middlesex	*Butomus umbellatus* is an aquatic perennial herb which reproduces by seed dispersal or vegetatively by bulbils
Carex kobomugi	Japanese sedge; Asiatic sand sedge	Barnstable (historically)	Native to northeastern Asia, Carex kobomugi is an invasive plant that invades coastal sand dunes and can outcompete native dune-binding grasses. This species was last collected in 1973.

Species	Common Name	Current County of Distribution (November 2010)	Notes
Egeria densa	Brazilian waterweed; Brazilian elodea	Essex, Middlesex, Norfolk, Plymouth, Worcester	This species is often confused with Hydrilla and native *Elodea* spp. but has larger, nickel-sized flowers. This is a submerged aquatic species whose rapid growth often leads to dense mats on the water surface, which crowds out native plants and damages fish and aquatic habitat. The mats can also impede boat traffic.
Glyceria maxima	Tall mannagrass; reed mannagrass	Essex	This perennial grass invades low shrub-swamps and other wetland
Heracleum mantegazzianum	Giant hogweed	Berkshire, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Suffolk, Worcester	Giant hogweed is a federal noxious weed that is currently being eradicated under the U.S. Department of Agriculture's authority. This is a perennial herb that can cause painful burns and permanent scarring to humans if they touch the plant.
Hydrilla verticillata	Hydrilla; water-thyme; Florida elodea	Barnstable, Plymouth, Worcester	Hydrilla is an invasive non-native submerged plant. This plant grows and reproduces rapidly, displacing native species, hampering recreational uses, and slowing water flow. Hydrilla, once established, can replace native vegetation and affect fish populations.
Myriophyllum aquaticum	Parrot-feather; water-feather; Brazilian watermilfoil	Norfolk	Parrot-feather is a perennial aquatic plant native to South America. This plant typically grows in freshwater, with a preference for areas with high nutrient contents. Parrot-feather has been introduced worldwide for use in indoor and outdoor aquaria.

Species	Common Name	Current County of Distribution (November 2010)	Notes
Nymphoides peltata	Yellow floating heart	Hampden, Middlesex, Worcester	Yellow floating heart is native to Asia and now is found in over 15 states in the U.S. This plant forms dense mats on the water surface, restricting light penetration into the water and decreasing air exchange between the water's surface and the atmosphere. Algae can be shaded out by this plant, resulting in food chain disruptions for an entire lake.
Persicaria perfoliata syn.: Polygonum perfoliatum	Mile-a-minute vine or weed; Asiatic tearthumb	Barnstable, Essex, Franklin, Norfolk, Plymouth, Suffolk	Mile-a-minute vine is a barbed vine that can grow up to 6 inches a day. This vine smothers other herbaceous plants, shrubs, and even trees by growing over them and blocking their access to sunlight.
Peuraria montana ssp. lobata	Kudzu; Japanese arrowroot	Barnstable, Bristol, Essex, Middlesex, Plymouth, County	Kudzu is native to Japan and southeast China and was introduced to the U.S. during the Philadelphia Centennial Exposition in 1876. Once established, kudzu can grow at a rate of a foot per day, with mature vines as long as 100 feet.
Senecio jacobaea	Tansy ragwort; stinking Willie; stinking Billy	Essex County Suffolk County Worcester County	This biennial herb is a weedy plant that infests woodlands, pastures, and hayfields. This plant is toxic to all classes of livestock but most toxic to cattle and horses. The plant can cause chronic liver disease, and affected animals usually die within a few weeks after ingesting it

Species	Common Name	Current County of Distribution (November 2010)	Notes
Trapa natans	Water chestnut	Berkshire, Bristol, Essex, Franklin, Hamden, Hampshire, Middlesex, Suffolk, Worcester	Water chestnut is an annual aquatic species with both floating and submerged leaves.

Probability of Future Events

Once established, invasive species often escape notice for years or decades. Introduced species that initially escaped many decades ago are only now being recognized as invasives. Because these species can occur anywhere (on public or private property), new invasive species often escape notice until they are widespread, and eradication is impractical. As a result, early and coordinated action between public and private landholders is critical to preventing widespread damage from an invasive species.

The USDA Animal and Plant Health Inspection Service (APHIS) manages the Plant Protection and Quarantine (PPQ) Program which safeguards U.S. agriculture and natural resources from the introduction, establishment, and spread of plant pests and noxious weeds. PPQ is the lead federal agency for plant health emergencies and works closely with federal, state, and local agencies; universities; industries; and private entities in developing and implementing science-based framework designed to protect against invasive pests and diseases.

Massachusetts has a variety of laws and regulations in place that attempt to mitigate the impacts of these species. The Department of Agricultural Resources (DAR) maintains a list of prohibited plants for the state, which includes federally noxious weeds as well as invasive plants recommended by MIPAG and approved for listing by DAR. Species on the DAR list are regulated with prohibitions on importation, propagation, purchase, and sale 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.

In 2002, 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, DCR, CZM, and Massachusetts Institute of Technology Sea Grant College Program are 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 on the management of aquatic invasive species. The Commonwealth also has several resources pertaining to terrestrial invasive species, such as the Massachusetts Introduced Pest Outreach Project, although a strategic management plan has not yet been prepared for these species. All these efforts are aimed at reducing the probability of future occurrences.

Notwithstanding the above efforts, the presence of invasive species is ongoing, and it is difficult to quantify the future frequency of these occurrences. Increased rates of global trade and travel have created many new pathways for the dispersion of exotic species. As a result, the frequency with which these threats have been introduced has increased significantly. Increased international trade in ornamental plants is particularly concerning because many of the invasive plant species in the U.S. were originally imported as ornamentals. Furthermore, they are expected to be an increasing problem due to a changing climate and projected increases in non-native plant and animal infestations. For this reason and based on the fact invasive species are already an ongoing issue for the region, this hazard has been assigned a probability of highly likely.

Vulnerability Assessment

Exposure

The entire Town of Adams has the potential to be exposed to invasive pests. Climate change will make the area more attractive to pests who have not been found there traditionally.

Built Environment Impacts

Although the built environment is not as susceptible to pests as the natural environment, it can help spread the invasive species. This includes trains and vehicles that could move the species from one location to another. Trees, which are damaged or killed by invasive pests, can become hazards to people, property, utility lines, and roadways when they fall. Many dead trees in one area can also become fuel for wildfires interconnecting the two hazards.

Population Impacts

The direct population impacts are minimal. However, the indirect impacts could destroy livelihoods.

Environment Impacts

Most of the natural features in the Town have some susceptible pests including the parks and other forested areas. Trees that have been damaged by other events such as fire, wind, flooding, and animal browsing are more susceptible to diseases and pests. Certain species of trees are more susceptible based on the need of the damaging organism. Climate change will increase the probability of invasive pests which will pose increased environmental impacts in the future.

Problem Statements for Invasive Species

Table 30. Problem Statements for Invasive Species.

Assets	Problems Associated with Invasive Species
People (including underserved communities and socially vulnerable populations)	• None apparent or projected.
Structures (including facilities, lifelines, and critical infrastructure)	• None apparent or projected.
Systems (including networks and capabilities)	• Additional DPW resources may be required in critical areas.
Natural, historic, and cultural resources	• Invasive species are problematic throughout the Town and have been verified in Greylock Glen, Ragged Mountain, and along the train tracks. • Emerald Ash Borer has damaged or killed many trees in Adams. • Invasive species have weakened forest systems in Adams, increasing vulnerability to wildfires.
Activities that have value to the community	• Recreational activities may be adversely impacted, depending on location, and especially in parks and natural areas such as Mt. Greylock and sections of the Appalachian Trail.

Landslides

The term “landslide” includes a wide range of ground movements such as rock falls, deep failure of slopes, and shallow debris flows. The most common types of landslides in Massachusetts include translational debris slides, rotational slides, and debris flows. Most of these events are caused by a combination of unfavorable geologic conditions (silty clay or clay layers contained in glaciomarine, glaciolacustrine, or thick till deposits), steep slopes, and/or excessive wetness leading to excess pore pressures in the subsurface.

Description

Historical landslide data for the Commonwealth suggests that most landslides are preceded by two or more months of higher-than-normal precipitation, followed by a single, high-intensity rainfall of several inches or more (Mabee and Duncan, 2013). This precipitation can cause slopes to become saturated. Landslides associated with slope saturation occur predominantly in areas with steep slopes underlain by glacial till or bedrock. Bedrock is relatively impermeable relative to the unconsolidated material that overlies it. Similarly, glacial till is less permeable than the soil that forms above it. Thus, there is a permeability contrast between the overlying soil and the underlying, and less permeable, unweathered till and/or bedrock. Water accumulates on this less permeable layer, increasing the pore pressure at the interface, leading to a failure or slide.

Occasionally, landslides occur as a result of geologic conditions and/or slope saturation. Adverse geologic conditions exist wherever there are lacustrine or marine clays, as clays have relatively low strength. These clays often formed in the deepest parts of the glacial lakes that existed in Massachusetts following the last glaciation. These lakes include Bascom, Hitchcock, Nashua, Sudbury, Concord, and Merrimack, among many other unnamed glacial lakes. When oversteepened or exposed in excavations, these vulnerable areas often produce classic rotational landslides.

Landslides can also be caused by external forces, including both undercutting (due to flooding or wave action) and construction. Undercutting of slopes during flooding or coastal storm events is a major cause of property damage. Streams and waves erode the base of the slopes, causing them to oversteepen and eventually collapse.

USGS provides the following graphic to depict different types of landslides. The images on the left side represent starting conditions whereas the images on the right represent conditions at the end of the slide event. Numbers 1, 2, 3, and 8 are considered most frequent in Massachusetts.

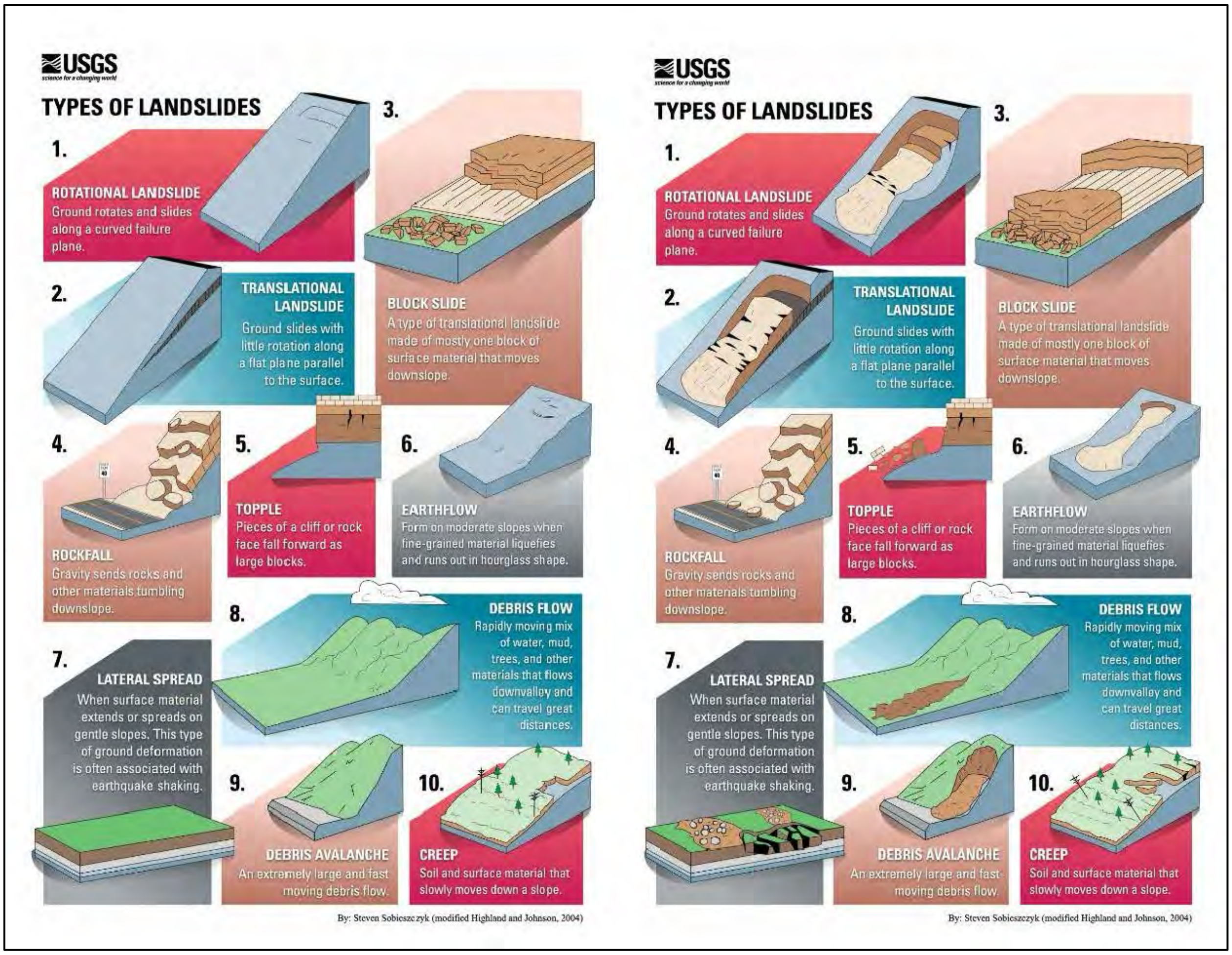


Figure 13. Types of Landslides.

Location

In 2013, the Massachusetts Geological Survey and University of Massachusetts Amherst published a Slope Stability Map of Massachusetts (Figure 14). This project, funded by the FEMA Hazard Mitigation Grant Program, was designed to provide statewide mapping and identification of landslide hazards that can be used for community level planning as well as prioritizing high-risk areas for mitigation. The maps produced from this project should be viewed as a first-order approximation of potential landslide hazards across the state.

The Slope Stability Map (below) categorizes areas of Massachusetts into stability zones, and the categorization is correlated to the probability of instability in each zone. The probability of instability metric indicates how likely each area is to be unstable, based on the parameters used in the analysis. According to the map, these unstable areas are located throughout the Commonwealth. Landslide risk is therefore assumed present in Adams.

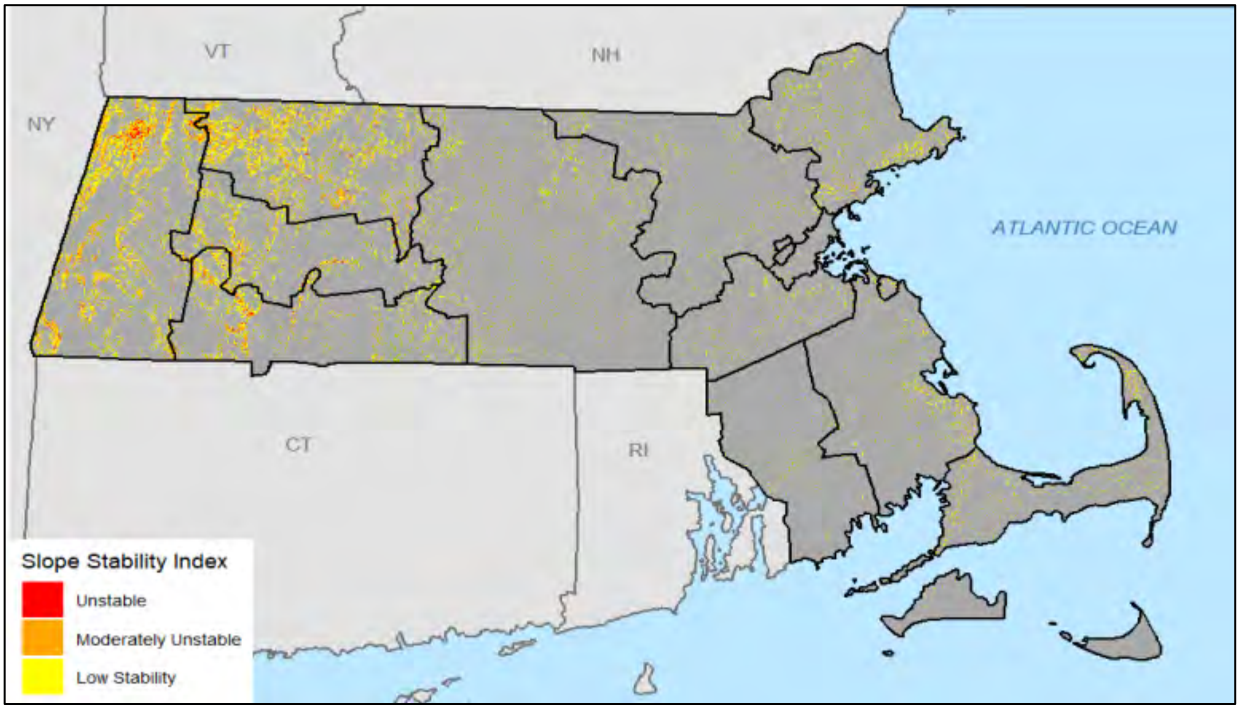


Figure 14. Slope Stability Map of Massachusetts (Created by ERG using data from Mabee & Duncan (2013)).

Previous Occurrences

Nationwide, landslides constitute a major geologic hazard because they are widespread, occur in all 50 states, and cause approximately $1 billion to $2 billion in damages and more than 25 fatalities on average each year. In Massachusetts, landslides tend to be more isolated in size and pose threats to highways and structures that support fisheries, tourism, and general transportation. According to the U.S. Landslide Inventory, there were 14 landslide incidents between 2008 and 2017. During this timeframe the Massachusetts Geological Survey reported three landslides or mudflows that resulted in infrastructural damage.

Landslides commonly occur shortly after other major natural disasters, such as earthquakes and floods, which can exacerbate relief and reconstruction efforts. Many landslide events may have occurred in remote areas, causing their existence or impact to go unnoticed. Expanded development and other land uses may contribute to the increased number of landslide incidences and/or the increased number of reported events in the recent record.

The NCEI severe storm database reported a “debris flow” near Adams. This is a relatively rare use of the database, as landslides are rarely reported to NCEI. According to the entry, on December 25, 2020, “an area of low pressure tracking from the Great Lakes to Hudson Bay advected in an unseasonably warm air mass into the region” and “Rain gradually overspread the region from west to east during the day on December 24 with the steadiest, heaviest rainfall during the overnight hours and early morning hours of December 25. Rain showers continued through the day on December 25 and changed to snow showers during the evening and overnight hours of December 25-26 as colder air returned. The region still dealt with nearly the entire snowpack from the blockbuster winter storm from December 16-17. While the snow compacted over time, very little water was lost from the snow. Observations concluded that between 1.5 to 2.5 inches of water was in the snowpack prior to this event and most if not all of this snow melted. Rainfall totals across western Massachusetts ranged from 1.00 to 2.50 inches. These amounts do not include the additional 1.50 to 2.50 inches of water that melted from the snowpack. The combination of warm air, rainfall and melting snowpack likely led to a debris flow outside the west portal of the Hoosac Tunnel near North Adams. Eight inches of mud and stone had to be cleared from the rails, resulting in two freight trains being delayed."

The Community Resilience Building Summary Report for Adams implies that landslides have been a potential challenge at the Specialty Minerals sites in the northern part of the town. The report mentions a high priority action to "Renew engagement effort with Specialty Minerals – assess hydrology, landslides, air and water quality, and other negative impacts."

Extent

Variables that contribute to the extent of potential landslide activity in any area include soil properties, topographic position and slope, and historical incidence. Predicting a landslide is difficult, even under ideal conditions. As a result, estimations of the potential severity of landslides are informed by previous occurrences as well as an examination of landslide susceptibility. Information about previous landslides, such as the information and images from landslides after Tropical Storm Irene can provide insight as to both where landslides may occur and what types of damage may result. It is important to note, however, that landslide susceptibility identifies only areas potentially affected and does not imply a time frame when a landslide might occur. The distribution of susceptibility across the Commonwealth is depicted on the Slope Stability Map (Figure 14), with areas of higher slope instability considered to also be more susceptible to the landslide hazard.

Characterizing the warning time before landslides can be challenging. Mass movements can occur suddenly or slowly. The velocity of movement may range from a slow creep of inches per year to many feet per second, depending on slope angle, material, and water content. Some methods used to monitor mass movements can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to determine the areas that are at risk during general time periods. Assessing the geology, vegetation, and amount of predicted precipitation for an area can help in these predictions. However, there is no practical warning system for individual landslides. The current standard operating procedure is to monitor situations on a case-by-case basis and respond after the event has occurred. Generally accepted warning signs for landslide activity include the following:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements, or sidewalks
- Soil moving away from foundations
- Ancillary structures, such as decks and patios, tilting and/or moving relative to the main house

- Tilting or cracking of concrete floors and foundations
- Broken waterlines and other underground utilities
- Leaning telephone poles, trees, retaining walls, or fences
- Offset fence lines
- Sunken or down-dropped road beds
- Rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content)
- Sudden decrease in creek water levels even though rain is still falling or has just recently stopped
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together

Probability of Future Events

The probability of future occurrences is generally defined by the number of events over a specified period of time. The ResilientMass Plan notes that between 2008 and 2017, there were at least 14 reported landslide occurrences. However, because many landslides are minor and occur unobserved in remote areas, the true number of landslide events is probably higher. Generally speaking, landslides are most likely to occur during periods of higher than average or extreme precipitation, particularly in areas that have experienced disturbance from wildfire, drought, invasive species, recent development, or vegetation or tree removal. For these reasons, the probability of future occurrence is believed moderate to high.

Vulnerability Assessment

Exposure

While landslides are rare, their impacts can be devastating, including loss of property, disruption to infrastructure, and injury and death. Continued development, particularly on steep slopes or unstable soils, increases the chances that landslides will be a danger. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

To help identify potential landslide areas for the town, the slope stability index developed by the Massachusetts Geological Survey was used. The unstable and moderately unstable regions were queried out of the data and overlaid with the critical facilities and other buildings. There were no critical facilities found in the unstable or moderately unstable area, although significant recreational resources may be found in these area.

The other building data was overlaid with the unstable and moderately unstable areas. There were 79 buildings found in the moderately unstable area and no buildings found in the unstable areas. Table 31 shows the result of this analysis.

Table 31. Buildings in Moderately Unstable Area.

Building Type	Number of Buildings (Total in Town)	Building Value (Total in Town)
Single Family	34 (3,393)	$4,060,500 ($443,203,600)
Mobile Home	0 (24)	$0 ($720,100)
Multi-Family	18 (865)	$1,625,200 ($92,971,200)
Mixed-Use	15 (124)	$3,073,500 ($23,472,100)
Commercial	4 (191)	$386,000 ($39,881,600)
Educational	0 (5)	$0 ($21,421,700)
Government	1 (75)	$48,100 ($18,934,400)
Religious/Non-Profit	4 (39)	$630,000 ($45,307,200)
Industrial	0 (65)	$0 ($157,846,600)
Garage/Outbuilding	2 (49)	$16,500 ($777,840)
Vacant	1 (31)	$27,950 ($866,600)
Total	**79 (4,861)**	**$9,867,750 ($845,402,940)**

Sixty-four of the structures in the moderately unstable areas also have environmental justice concerns.

Figure 15 shows the landslide susceptibility map for the town. The red and pink areas are more susceptible to landslides.

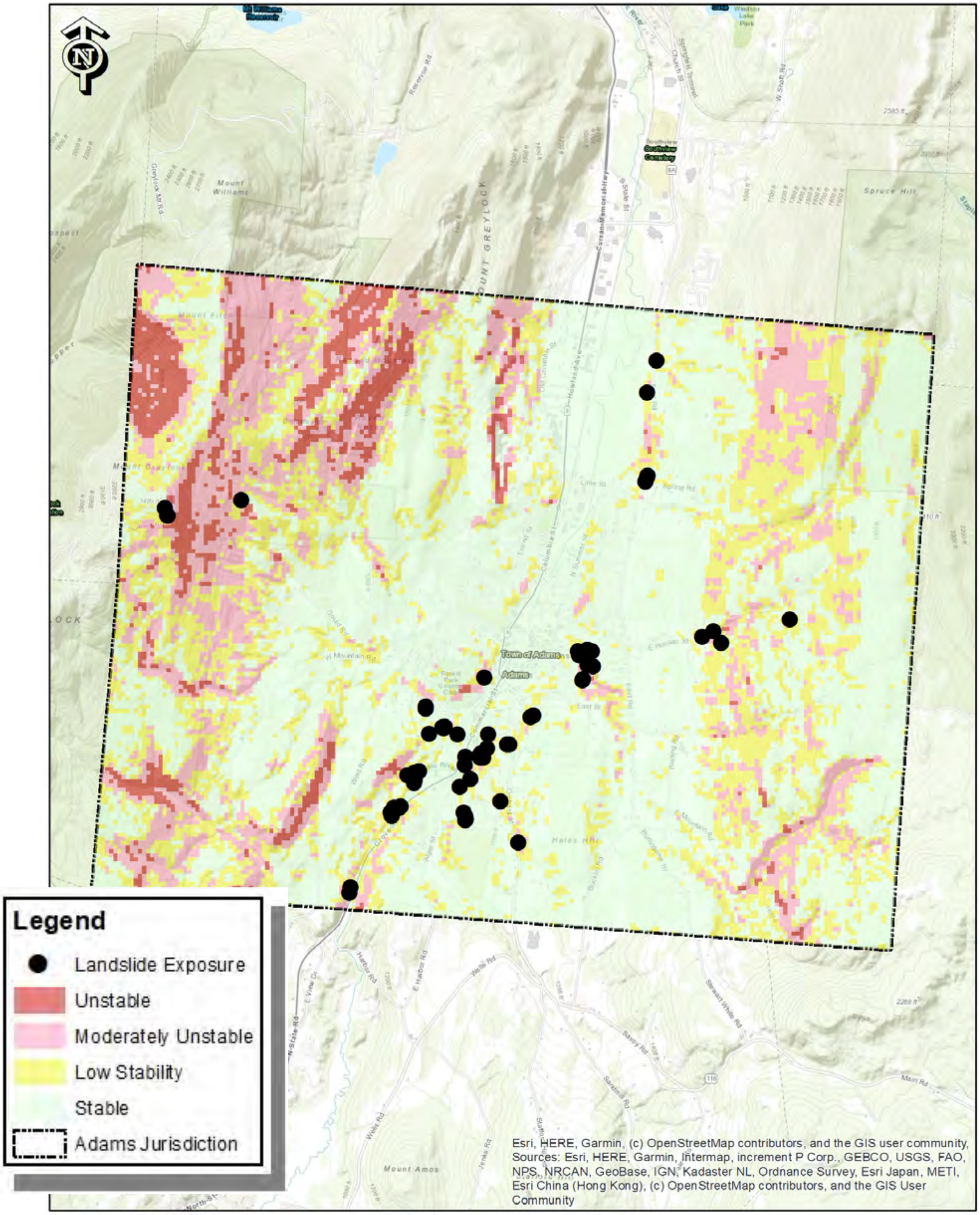


Figure 15. Landslide Susceptibility Map.

Built Environment Impacts

There have been some previous landslides which have damaged structures in the Town. Homes on East Road across from the Susan B. Anthony House were damaged and there has been a landslide on Meadow Street. Assuming a total loss for a building due to a 100-year landslide event. The average value of a building in the moderately susceptible zone is $124,908. This would result in an AAL of $1,249.

Population Impacts

Populations considered most vulnerable to landslide impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. The Town should be aware of the potential needs of residents within the elderly and low income population segments, as well as numerous tourists present in Adams, in the event of a hazard occurrence.

Environment Impacts

There are few unstable and moderately unstable areas around the transportation routes (roads and train tracks) used to move hazardous materials.

Problem Statements for Landslides

Table 32. Problem Statements for Landslides.

Assets	Problems Associated with Landslides
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations in isolated areas may be cut off if a landslide impacts specific roads.
Structures (including facilities, lifelines, and critical infrastructure)	• Some residential, commercial, and other structures reside adjacent to moderately unstable areas and could be impacted.
Systems (including networks and capabilities)	• Roads and rail may be impacted and could cause a hazardous material spill.

Assets	Problems Associated with Landslides
Natural, historic, and cultural resources	• Some historical properties reside in or adjacent to the unstable or moderately unstable areas.
Activities that have value to the community	• The Community Resilience Building Summary Report for Adams implies that landslides have been a potential challenge at the Specialty Minerals sites in the northern part of the town.

Other Severe Weather

Several frequent natural hazards in Massachusetts – particularly strong winds and extreme precipitation events – occur outside of notable storm events. This section discusses the nature and impacts of these hazards, as well as ways in which they are likely to respond to climate change. Winter storms and tornadoes are addressed in later sections.

> The Town of Adams Community Resilience Building Workshop Summary of Findings (2019) lists "wind" and "extreme weather" two of the top hazards of concern.

Description

Thunderstorms: A thunderstorm is a storm originating in a cumulonimbus cloud. Cumulonimbus clouds produce lightning, which locally heats the air to 50,000 degrees Celsius, which in turn produces an audible shock wave known as thunder. Frequently during thunderstorm events, heavy rain and gusty winds are present. Less frequently, hail is present, which can become very large in size. Tornadoes can also be generated during these events. An average thunderstorm is 15 miles across and lasts 30 minutes, but severe thunderstorms can be much larger and longer.

Three basic components are required for a thunderstorm to form: moisture, rising unstable air, and a lifting mechanism. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise, it will continue to rise as long as it weighs less and stays warmer than the air around it. As the warm surface air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool, releasing the heat, and the vapor condenses into a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice, and some of it turns into water droplets. Both have electrical charges. When a sufficient charge builds up, the energy is discharged in a bolt of lightning, which causes the sound waves we hear as thunder.

Downbursts: A downburst is a severe localized wind blasting down from a thunderstorm. They are more common than tornadoes. Depending on the size and location of downburst events, the destruction to property may be significant. Downbursts fall into two categories:

1. Microbursts affect an area less than 2.5 miles in diameter, last 5 to 15 minutes, and can cause damaging winds up to 168 mph.
2. Macrobursts affect an area at least 2.5 miles in diameter, last 5 to 30 minutes, and can cause damaging winds up to 134 mph.

An organized, fast-moving line of microbursts traveling across large areas is known as a “derecho.” These occasionally occur in Massachusetts. Downburst activity is, on occasion, mistaken for tornado activity. Both storms have very damaging winds (downburst wind speeds can exceed 165 mph) and are very loud. These "straight line" winds are distinguishable from tornadic activity by the pattern of destruction and debris such that the best way to determine the damage source is to fly over the area.

Hail: Hailstones are chunks of ice that grow as updrafts in thunderstorms keep them in the atmosphere. Most hailstones are smaller in diameter than a dime, but stones weighing more than 1.5 pounds have been recorded. NOAA has estimates of the velocity of falling hail ranging from 9 meters per second (m/s) (20 mph) for a 1-centimeter (cm)-diameter hailstone to 48 m/s (107 mph) for an 8 cm, 0.7 kilogram stone.

Lightning: Lightning is a discharge of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. According to NOAA, the creation of lightning during a storm is a complicated process that is not fully understood. In the initial stages of development, air acts as an insulator between the positive and negative charges. However, when the potential between the positive and negative charges becomes too great, a discharge of electricity (lightning) occurs. In-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom. Cloud-to-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom of a second cloud. Cloud-to-ground lightning is the most dangerous. In summertime, most cloud-to-ground lightning occurs between the negative charges near the bottom of the cloud and positive charges on the ground.

Location

High wind events, thunderstorms, lightning, and hail can affect the entirety of Massachusetts, including the geographic extent of Adams.

Previous Occurrences

The NOAA Storm Events database (https://www.ncdc.noaa.gov/stormevents/) for Berkshire County lists numerous severe storms affecting the area of Adams from 2014 through 2023. The individual damage figures for these events appear nominal but given the frequency of events, the overall losses from severe storms are striking. Some of these events were truly associated with winter storms, but the lack of snowfall contributed to them being classified as high wind events by NOAA.

Table 33. NCEI Severe Storm Database Entries Covering Other Severe Storms in Adams.

Date	Description	Losses Reported
3/29/14	*Strong Wind:* Two communications tower located on top of Florida Mountain were damaged due to gusty east to southeasterly winds during the overnight hours between Saturday, March 29th and Sunday, March 30th. The combinations of strong winds and heavy rainfall in excess of one inch led to the collapse of two radio towers. The loss of these two towers led to an interruption of cell and internet service over the region until a temporary tower was set up by the evening of Sunday, March 30th. Winds peaked at North Adams airport at 51 mph, with other nearby stations overnight reporting gusts between 26 mph and 40 mph.	$100,000
6/12/15	A tree was reported down on Commercial Street in Adams due to thunderstorm winds.	---
9/11/16	A tree and wires were downed in Adams due to thunderstorm winds.	---
2/25/17	The roof of the Bounti-Fare Restaurant was damaged by high winds.	---
2/24/19	Gusts were measured as high as 69 mph near Adams, MA. Numerous power outages and downed trees occurred as a result of the winds.	
10/7/20	A high-end severe weather event unfolded across the Northeast. A line of thunderstorms originated across New York state and moved eastward into New England during the afternoon hours, producing widespread damage. This event was classified as a serial derecho based on the 320 mile long damage swath and distribution of significant wind gusts (75 mph and above). The fact that trees across the region were fully leafed exacerbated the resulting wind damage and produced widespread power outages. There were over 2,500 power outages across western Massachusetts. In Adams, a tree was downed on a car.	$5,000 reported among several towns.
3/7/22	A line of severe thunderstorms with damaging winds pushed through western Massachusetts during the evening hours of March 7, 2022 resulting in numerous reports of downed trees and powerlines.	---

	Around 1,900 customers lost power. A trained spotter reported two broken trees and wires were reported down in Adams.	

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index. The line items for events related to severe winds and hail in Berkshire County are listed below.

Table 34. USDA Disasters Events That Refer to Severe Storms.

Year	Event	Event "Begin Dates"
2016	Drought, Wind/High Winds, Fire/Wildfire, Heat, Excessive Heat, High Temp., Insects	7/5/2016
2014	Flood, Flash Flood, Hail, Wind, High Wind, Excessive rain, moisture, humidity	4/1/2014
2013	Flood, Flash flooding, Excessive rain, moisture, humidity, Hail, Wind High Winds	5/1/2013
2012	Excessive rain, moisture, humidity, Wind, high winds	8/10/2012

Extent

The strength of thunderstorms is typically measured in terms of its effects, namely the speed of the wind, the presence of significant lightning, and the size of hail. High winds are defined by the NWS as sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration (NCDC, 2018). A thunderstorm is classified as "severe" when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado (NWS, 2013).

Probability of Future Events

According to the NWS, an average of 100,000 thunderstorms per year occur in the United States. The ResilientMass Plan notes that over the 15-year period between January 1, 2008, and December 31, 2022, a total of 911 high wind events occurred in Massachusetts on 198 days, and an annual average of 61 events occurred per year. Southern New England typically experienced 10 to 15 days a year with severe thunderstorms, with Massachusetts experiencing between nine and 27 thunderstorm days per year. Climate models show projections that the frequency and intensity of severe thunderstorms (which include tornadoes, hail, and winds) will increase (USGCRP, 2017). Furthermore, the ResilientMass Plan reports that, according to the Localized Constructed Analog's climate change models, thunderstorm event frequency is expected to slightly increase as a result of climate change.

NOAA reports that there are ten downburst reports for every tornado report in the United States. This implies that there are approximately 10,000 downbursts reported in the United States each year and further implies that downbursts occur in approximately 10% of all thunderstorms in the United States annually. This figure suggests that downbursts are a relatively uncommon yet persistent hazard.

An average of 21 people per year died from lightning strikes in the United States from 2013 to 2023. Most lightning deaths and injuries occur outdoors, with 45% of lightning casualties occurring in open fields and ballparks, 23% under trees, and 14% involving water activities. The ResilientMass Plan notes that 8 fatalities and 148 injuries have occurred in Massachusetts as a result of lightning events between 1990 and 2022 (NOAA, 2022). Given that thunderstorm event frequency is expected to slightly increase as a result of climate change, it is likely that risks associated with lightning may increase.

According to NOAA's National Weather Service, hail caused two deaths and an average of 27 injuries per year in the United States from 2004 to 2013. Given that thunderstorm event frequency is expected to slightly increase as a result of climate change, it is likely that risks associated with hail may increase.

Vulnerability Assessment

Exposure

The entire built environment of Adams is vulnerable to the high winds and/or flooding from a severe weather event.

Built Environment Impacts

Severe thunderstorms, and their associated hail and lightning events, brought about property damage in Adams and adjacent towns in previous years. From 2014 until 2022, there was $313,000 in property damage to Adams and adjacent towns. This equates to an AAL of $34,778.

Population Impacts

Some traffic accidents associated with storm events include injuries and deaths. However, the number of injuries and deaths reported for accidents is generally low. Populations considered most vulnerable to tornado, microburst and thunderstorm impacts in Adams are identified based on a number of factors including their physical and financial ability to react or respond during a hazard. Senior and low-income populations in Adams are particularly susceptible to storms. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Environment Impacts

Thunderstorms and microbursts can cause damage to parks and other natural areas. Some areas of the town may be out of service until trees are removed.

Problem Statements for Other Severe Weather

Table 35. Problem Statements for Other Severe Weather.

Assets	Problems Associated with Other Severe Weather
People (including underserved communities and socially vulnerable populations)	• People in Adams have been frequently disrupted by severe weather events and other more frequent wind and thunderstorm events. Vulnerable populations may be isolated if roads are closed.
Structures (including facilities, lifelines, and critical infrastructure)	• The individual damages for frequent severe weather events appear nominal, but given the frequency of events in and around Adams, the impacts occur often and can occur anywhere in the Town.
Systems (including networks and capabilities)	• First responders may have difficulty reaching people if roads are closed due to tree debris.
Natural, historic, and cultural resources	• These can be adversely impacted depending on the specific locations of damage.
Activities that have value to the community	• These can be adversely impacted depending on the specific locations of damage.

Severe Winter Storms

Severe winter storms include ice storms, nor'easters, heavy snow, blowing snow, and other extreme forms of winter precipitation. These are often accompanied by very low temperatures which were previously addressed.

> The Town of Adams Community Resilience Building Workshop Summary of Findings (2019) lists "snow and ice" (winter storms) as a top hazard of concern.

Description

Blizzard: A blizzard is a winter snowstorm with sustained or frequent wind gusts to 35 mph or more, accompanied by blowing snow that reduces visibility to or below a quarter of a mile (NWS, 2018). These conditions must be the predominant condition over a 3-hour period. Extremely cold temperatures are often associated with blizzard conditions but are not a formal part of the definition. However, the hazard created by the combination of snow, wind, and low visibility increases significantly with temperatures below 20ºF. 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.

Storm systems powerful enough to cause blizzards usually form when the jet stream dips far to the south, allowing cold air from the north to clash with warm air from the south. Blizzard conditions often develop on the northwest side of an intense storm system. The difference between the lower pressure in the storm and the higher pressure to the west creates a tight pressure gradient, resulting in strong winds and extreme conditions due to the blowing snow. Blowing snow is wind-driven snow that reduces visibility to 6 miles or less, causing significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Ice Storms: Ice storm conditions are defined by liquid rain falling and freezing on contact with cold objects, creating ice buildups of one-fourth of an inch or more. These can cause severe damage to vegetation, utilities, and structures. An ice storm warning, which is now included in the criteria for a winter storm warning, is issued when a half inch or more of accretion of freezing rain is expected. This may lead to dangerous walking or driving conditions and the pulling down of power lines and trees. Ice pellets are another form of freezing precipitation, formed when snowflakes melt into raindrops as they pass through a thin layer of warmer air. The raindrops then refreeze into particles of ice when they fall into a layer of subfreezing air near the surface of the earth. Finally, sleet occurs when raindrops fall into subfreezing air thick enough that the raindrops refreeze into ice before hitting the ground. The difference between sleet and hail is that sleet is a wintertime phenomenon whereas hail falls from convective clouds (usually thunderstorms), often during the warm spring and summer months.

Nor’easters: A nor’easter is a storm that occurs along the East Coast of North America. A nor’easter is characterized by a large counterclockwise wind circulation around a low-pressure center that often results in heavy snow, high winds, and rain. A nor’easter gets its name from its continuously strong northeasterly winds blowing in from the ocean ahead of the storm and over the coastal areas.

Nor’easters are among winter’s most ferocious storms. These winter weather events are notorious for producing heavy snow, rain, and oversized waves that crash onto Atlantic beaches, often causing beach erosion and structural damage. These storms occur most often in late fall and early winter. The storm radius is often as much as 100 miles, and nor’easters often sit stationary for several days, affecting multiple tide cycles and causing extended heavy precipitation. Sustained wind speeds of 20 to 40 mph are common during a nor’easter, with short-term wind speeds gusting up to 50 to 60 mph.

Location

Although the entire Commonwealth may be considered at risk to the hazard of severe winter storms, higher snow accumulations appear to be prevalent at higher elevations in Western and Central Massachusetts, and along the coast where snowfall can be enhanced by additional ocean moisture. Ice storms occur most frequently in the higher-elevation portions of Western and Central Massachusetts. Coastal communities of the Commonwealth are more susceptible to the impacts of a Nor’easter, which can bring heavy snow. Overall, winter storms can affect the entirely of Massachusetts, including the geographic extent of Adams.

Previous Occurrences

Winter storms occur somewhat regularly in Massachusetts. Five of the disasters declared in Massachusetts from 2012 through 2022 were associated with winter storms, although only one covered Berkshire County and therefore the Town of Adams:

- Massachusetts Severe Winter Storm, Snowstorm, and Flooding (DR-4110-MA)
  Incident Period: February 8, 2013 – February 9, 2013
  Public Assistance (PA) reimbursements eligible for entire state

DR-4110 was likewise subject to a concurrent emergency declaration in Massachusetts. The PA assistance reimbursements associated with DR-4110 for the Town totaled approximately $54,000. This indicates that severe winter storms comprise a notable expenditure for Adams.

The NOAA Storm Events database (https://www.ncdc.noaa.gov/stormevents/) for Berkshire County lists numerous severe winter storm events impacting Adams for the period 2014-2023. A selection of events is provided below.

Table 36. NCEI Severe Storm Database Entries Covering Winter Storms in Adams.

Date	Description
12/14/13	Snow fell at rates in excess of one inch per hour over much of the region. During the overnight hours, some sleet mixed in with the snow, especially across southern parts of Berkshire County. By the end of the storm, snowfall amounts ranged from nearly around 6 inches in Pittsfield to about 11 inches in Adams.
1/1/14	A long lasting snowstorm occurring across all of western Massachusetts between the evening of New Years Day and the morning of January 3rd, 2014. By the morning hours of Friday, January 3rd, snowfall amounts ranged from 4 inches in the southern Berkshires to 10 inches in the northern Berkshires. In addition, temperatures remained very cold and with a cold northwest wind, wind chill values were below zero.
2/5/14	A widespread snowfall occurred across all of western Massachusetts on Wednesday, February 5th. By the time the storm finished, the entire region received a widespread 6 to 12 inches of snow. The heaviest amounts occurred across the high terrain of the Berkshires.
2/13/14	An exceptional winter storm impacted all of western Massachusetts between Thursday, February 13th and the morning of Friday, February 14th. By the time snow ended, 9 to 21 inches of snow was reported in Berkshire County. The highest amounts were across the high terrain of the Berkshires. Very strong winds, gusting as high as 40 mph, occurred as

Date	Description
	the storm pulled away. This led to significant blowing and drifting of the snowfall through the entire day on February 14th.
2/1/15	Most areas in the Berkshires received around a foot of snowfall.
2/7/15	A three day period of snowfall impacted all of western Massachusetts between February 7th and 9th, 2015. By the time all of the snow ended, amounts ranged between 6 and 16 inches across the area, with the heaviest amounts in the higher terrain of the northern Berkshires.
2/12/17	Two low pressure systems approached the northeastern US on Sunday, February 12. The snow was heavy at times during the morning and early afternoon, with accumulation rates of 1 to locally 2 inches per hour at times. In total, 7 to 12 inches of snowfall occurred through most of western Massachusetts, with lesser totals over southern portions where sleet occurred.
3/7/18	A weakening low pressure system brought some light snow to western Massachusetts during the early to mid-morning hours of March 7th, 2018. Meanwhile, a Nor'easter strengthened rapidly along the Atlantic Coast, which resulted in increasing snow intensity during the afternoon and evening hours. Heavy snow bands rotated northwestward and stalled across the area, resulting in one to two and a half feet of accumulation in most areas by the morning of March 8th. The snow led to very difficult travel conditions and resulted in numerous school closures.
2/12/19	A winter storm brought widespread wintry precipitation to Massachusetts on Tuesday, February 12th through Wednesday, February 13th, 2019. Precipitation started out as snow but then quickly transitioned to a period of sleet and then freezing rain throughout the event. This mix of wintry precipitation resulted in hundreds of closings and delays. Strong winds followed, especially across the Berkshires, which led to power outages across the region.
3/23/20	A late season snowfall impacted western Massachusetts. This was brought on by an anomalously cold air mass interacting with a coastal low pressure system. Snowfall totals ranged from one inch in southeast Berkshire County up to almost nine inches in northeast Berkshire County.
1/6/22	A winter storm dumped anywhere from a few inches over the lower elevations in the eastern parts of the Berkshires to 16 inches of snow over the higher terrain over the western parts of the Berkshires in western Massachusetts January 16-17. This resulted in snow emergencies over parts of the area. It was also windy with gusts between 30-45 mph.

Date	Description
12/11/22	A low pressure system brought widespread accumulating snowfall across western Massachusetts on December 11, 2022 before tapering off during the early morning hours on December 12, 2022. Bands of moderate to heavy snow developed during the late afternoon and evening hours bringing a widespread 6 to 10 inches of accumulation to the area.
12/15/22	A high-impact, long-duration winter storm affected the region from December 15-17, 2022. This was an elevation-dependent storm with heavy snowfall for the higher elevations and a mix of rain and snow in the valleys. Snowfall totals of 10-20 inches were common across areas above 1000 feet with mainly 6 inches or less below. This was a heavy, wet snow and the weight of the snow caused downed trees and power lines resulting in scattered power outages.
3/13/23	A powerful Nor'Easter resulted in widespread heavy wet snow and gusty northwest winds between 35-50 mph across western Massachusetts March 13-March 15, 2023. Anywhere from 15 to 30 inches of snow with locally higher amounts in excess of 30 inches fell over the higher terrain of the Berkshires. Valley locations received lesser amounts with totals generally ranging between 7 to 15 inches. Numerous downed trees and powerlines resulted in widespread power outages. Some locations were without power for at least 1 or 2 days. Portions of some communities were inaccessible due to the snow. Several warming stations opened to assist those without power. Overall, this event led to the closing of many school districts, and resulted in chain up laws and bans of empty tractor trailers and/or tandems on some area interstates. A State of Emergency was issued for several jurisdictions as a result of the storm.

Extent

Snowfall is a component of multiple hazards, including nor'easters and severe winter storms. Two scores, the *Regional Snowfall Index (RSI) and the NESIS*, are described in this section.

Since 2005, the RSI has become the descriptor of choice for measuring winter events that impact the eastern two-thirds of the U.S. The RSI ranks snowstorm impacts on a scale system from 1 to 5. The RSI is like the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes, except that it includes an additional variable: population. The RSI is based on the spatial extent of the storm, the amount of snowfall, and population (NOAA, n.d.).

The RSI is a regional index. Each of the six climate regions (identified by the NOAA National Centers for Environmental Information) in the eastern two-thirds of the nation has a separate index. The RSI incorporated region-specific parameters and thresholds for calculating the index. The RSI is important because, with it, a storm event and its societal impacts can be assessed within the context of a region's historical events. Snowfall thresholds in Massachusetts (in the Northeast region) are 4, 10, 20, and 30 inches of snowfall, while thresholds in the Southeast U.S. are 2, 5, 10, and 15 inches.

Table 37. RSI Scale.

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

Source: NOAA

Prior to the use of the RSI, the Northeast Snowfall Impact Scale, developed by Paul Kocin of The Weather Channel and Louis Uccellini of the NWS, was used to characterize, and rank high- impact northeast snowstorms with large areas of 10-inch snowfall accumulations and greater. In contrast to the RSI, which is a regional index, NESIS is a quasi-national index that is calibrated to Northeast snowstorms. NESIS has five categories. The RSI and NESIS approaches do not include separate scales for ice storms; in general, ice storm extent is expressed on a case-by-case basis, and forecasts will provide the information needed to determine how to prepare and respond.

Meteorologists can often predict the likelihood of a severe storm or nor'easter. This can give several days of warning time. The NOAA's NWS monitors potential events and provides extensive forecasts and information several days in advance of a winter storm to help the state to prepare for the incident.

Probability of Future Events

The ResilientMass Plan notes that Massachusetts experiences high-impact snowstorms at approximately the rate of three per year over the past 50 years, although there is significant interannual variability in the frequency and severity of winter storms. The Town of Adams should assume that winter storms are likely, even if the impacts of climate change will shift the timing to a shorter winter season. Heavy wet snowfall may be more common in the future. The overall probability of winter storms of all kinds, including blizzards and ice storms, is believed high.

Vulnerability Assessment

Exposure

Heavy snowfall coupled with low temperatures often results in increases in traffic accidents; disruptions in transportation, commerce, government, and education; utility outages due to falling trees, branches, and other objects; personal injuries associated with slippery surfaces and freezing temperatures; and numerous other problems. Specific damages associated with severe winter storm (snow) events include:

- Injuries and fatalities associated with accidents, low temperatures, power loss, falling objects and accidents associated with frozen and slippery surfaces and snow accumulation
- Increases in the frequency and impact of traffic accidents, resulting in personal injuries
- Ice-related damage to trees, building and infrastructure inventory, and utilities (power lines, bridges, substations, etc.)
- Roads damaged through freeze and thaw processes
- Stress on the local shelters and emergency response infrastructure
- Lost productivity that occurs when people cannot go to work, school, or stores due to inclement conditions

The entire town should be considered exposed to the severe winter storm hazard.

Built Environment Impacts

The entire built environment of Adams is vulnerable to a severe winter storm. New England's climate offers no immunity to the potential damaging effects of severe winter storms. Some minimum damage is anticipated annually, with potential extensive damage occurring about once every 10 years.

Since Hazus doesn't support severe winter storms and there aren't other readily available severe winter storm models, historical data was used to determine potential losses and probabilities. From 2013 until 2022, there was $200,000 in storm damage to Adams. This equates to an AAL of $20,000.

Population Impacts

As discussed above, some traffic accidents associated with storm events include injuries and in limited cases, deaths. However, the number of injuries and deaths reported for accidents is generally low. Populations considered most vulnerable to severe winter storm impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations in Adams are particularly susceptible and the Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Environment Impacts

Severe winter storms can cause damage to parks and other natural areas. Some areas of the Town may be out of service until roads are cleared and trees are removed.

Problem Statements for Severe Winter Storms

Table 38. Problem Statements for Severe Winter Storms.

Assets	Problems Associated with Severe Winter Storms
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations may be stranded during a winter storm event and may not be able to travel to emergency services.
Structures (including facilities, lifelines, and critical infrastructure)	• Roof ice dams may cause damage to structures. • Severe winter storms comprised a substantial expenditure for Adams over the course of the last decade. • The electrical grid and roadways are susceptible to failure and loss of use during storms.
Systems (including networks and capabilities)	• First responders may have difficulty reaching people if roads are closed due to road closures.
Natural, historic, and cultural resources	• Severe storms may damage trees in natural areas, and historical and cultural sites.
Activities that have value to the community	• Outdoor activities may be adversely impacted by severe winter storms.

Tornadoes

Tornadoes are a relatively infrequent occurrence but can be very destructive when they occur. While small tornadoes in outlying areas cause little to no damage, larger tornadoes in populated sections of Massachusetts have historically caused significant damage, injury, and death through the destruction of trees, buildings, vehicles, and power lines.

Description

A tornado is a narrow rotating column of air that extends from the base of a cumulonimbus cloud to the ground. The observable aspect of a tornado is the rotating column of water droplets, dust, and debris caught in the column. Tornadoes are the most violent of all atmospheric storms.

Tornadoes can form from individual cells within severe thunderstorm squall lines. They can also form from an isolated supercell thunderstorm. They can be spawned by tropical cyclones or the remnants thereof, and weak tornadoes can even occur from little more than a rain shower if air is converging and spinning upward.

Most tornadoes occur in the late afternoon and evening hours when the heating is the greatest. The most common months for tornadoes to occur are June, July, and August, although the Great Barrington tornado occurred in May 1995 and caused extensive damage.

A waterspout is a rapidly rotating column of air extending from the cloud base (typically a cumulonimbus thunderstorm) to a water surface, such as a bay or the ocean. They can be formed in the same way as regular tornadoes or can form on a clear day with the right amount of instability and wind shear. Tornadic waterspouts can have wind speeds of 60 to 100 mph, but since they do not move very far, they can often be navigated around. They can become a threat to land if they drift onshore.

Location

The U.S. experiences an average of 1,230 tornadoes per year from 1991 to 2020, more than any other country (NOAA, n.d.). Because Massachusetts experiences fewer tornadoes than other parts of the country, residents may be less prepared to react to a tornado. The ResilientMass Plan notes that Massachusetts is located within the FEMA Wind Zone II, with Zone IV typically experiencing the greatest number and strongest tornadoes. According to the FEMA National Risk Index most of the state has a “relatively low” risk of strong wind, with the exception of Worcester County which has a “relatively moderate” risk. The ResilientMass Plan notes that the area at greatest risk for a tornado touchdown runs from central to northeastern Massachusetts. Adams is outside of this area.

Previous Occurrences

The most devastating tornado to occur in New England was the Worcester Tornado of July 9, 1953, a category F4 tornado. The tornado passed through Barre, Rutland, Holden, Worcester, Shrewsbury, Westborough, and Southborough causing 90 deaths and over 1,300 injured. Damage estimates were placed at more than $52 million. The National Storm Prediction Center has ranked this as one of the deadliest tornadoes in the nation's history.

The most recent severe tornado to impact Massachusetts occurred June 1, 2011, affecting communities in Hampden and Worcester Counties. The EF3 tornado touched down in Westfield and traveled through West Springfield, Springfield, Wilbraham, Monson, Brimfield, and Sturbridge. The tornado caused extensive property damage and resulted in a FEMA disaster declaration.

The previous edition of this plan noted that 18 tornadoes have occurred in Berkshire County between 1950 and 2016. The NOAA Storm Events database (https://www.ncdc.noaa.gov/stormevents/) for Berkshire County lists two tornadoes for the period 2014-2023. Adding the single tornado in Dalton to the 18 tornadoes between 1950 and 2016, a total of 19 have occurred in Berkshire County since 1950.

Table 39. NCEI Severe Storm Database Entries Covering Tornadoes in Berkshire County.

Date	Description	Losses Reported
7/27/14	A NWS Storm Survey determined that an EF1 tornado occurred in the Greenridge section of Dalton. The tornado began in Greenridge park on South Street and moved southeast up a hill for one-quarter of a mile, before lifting behind residences on Lindsay Drive. The tornado downed a path of trees through a forest, clearing an area that was 10 to 20 yards wide.	--
8/2/20	A NWS survey team concluded that a weak, narrow, but relatively long tornado occurred during the evening on Sunday, August 2 in western Massachusetts. It began in the southeast part of Sandisfield just west of south Main Street in Berkshire County just before crossing into Hampden County. The tornado continued for a total path length of 7.8 miles with a maximum path width of 100 yards. In Sandisfield, some tree damage was observed on Carpenter Lane and on South Main street at and just north of the Mile 4 marker. A home there had its upper window blown in, shingles ripped off, and the portico was lifted upward, enabling the supporting post to be shifted outward. Some corn stalks were flattened and a neighbor's fence was blown down. The EF-scale rating was EF-0, with estimated maximum wind speeds of 80 mph.	$9,000

Notwithstanding the many previous occurrences in Massachusetts, only one has touched down in Adams (an EF-2 in March 1966).

Extent

The NWS rates tornadoes using the Enhanced Fujita scale (EF scale), which does not directly measure wind speed but rather the amount of damage created. This scale derives 3-second gusts estimated at the point of damage based on the assignment of 1 out of 8 degrees of damage to a range of different structure types. These estimates vary with height and exposure. This method is considerably more sophisticated than the original Fujita scale, and it allows surveyors to create more precise assessments of tornado severity.

Table 40. Enhanced Fujita Scale.

EF Rating	Wind Speeds	Expected Damage		
EF-0	65-85 mph	'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.		
EF-1	86-110 mph	'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.		
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.		
EF-3	136-165 mph	'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.		
EF-4	166-200 mph	'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.		
EF-5	> 200 mph	'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.		

Source: National Weather Service

Tornado watches and warnings are issued by the local NWS office. 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. The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.

Probability of Future Events

According to the ResilientMass Plan, the Commonwealth experienced 190 tornadoes from 1950 to 2021, or an average annual occurrence of 2.6 tornado events per year. From 1995 to 2021, the average frequency of these events has been 2.06 events per year (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 highlighted in the National Climate Assessment, tornado activity in the U.S. has become more variable, and increasingly so in the last two decades. While the number of days per year that tornadoes occur has decreased, the number of tornadoes on these days has increased. Climate models show projections that the frequency and intensity of severe thunderstorms (which include tornadoes, hail, and winds) will increase (USGCRP, 2017). Overall, it is unclear if tornado frequency will increase with climate change given the difficulty to draw conclusions based on thunderstorm statistics and the difficulty in identifying long-term trends.

Vulnerability Assessment

Exposure

High winds, heavy rain, lightning and/or hail associated with tornadoes, thunderstorms and microbursts can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death. The entire Town should be considered exposed to the tornado hazard.

Built Environment Impacts

Since Hazus doesn't support tornadoes and there aren't other readily available tornado models, historical data will be used to determine potential losses and probabilities. From 1955 until 2023, there was no property damage to Adams due to tornadoes. However, there were nineteen events in Berkshire County which produced $28.454M in property damage, seven deaths, and sixty injuries. The county's average annual loss would be $412K.

Population Impacts

Populations considered most vulnerable to tornado impacts in Adams are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However, the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Environment Impacts

Tornadoes can cause damage to parks, and other, natural areas. Some areas of the town may be out of service until trees are removed.

Problem Statements for Tornadoes

Table 41. Problem Statements for Tornadoes.

Assets	Problems Associated with Tornadoes
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations may need support seeking protected shelter. Those without cell phones may not get weather alerts. • People without basements are susceptible to tornado impacts.

Assets	Problems Associated with Tornadoes
Structures (including facilities, lifelines, and critical infrastructure)	• Structures and critical infrastructure can all be impacted by tornadoes. • Roadways may be blocked due to downed trees and other debris.
Systems (including networks and capabilities)	• The electric grid may be impacted by winds and downed trees.
Natural, historic, and cultural resources	• Historic and cultural resources may be impacted by tornado winds. • Winds may damage trees and cause natural areas to close for cleanup.
Activities that have value to the community	• Outdoor events could be impacted by potential tornado activity.

Wildfires/Brushfires

A wildfire can be defined as any non-structure fire that occurs in vegetative wildland that contains grass, shrub, leaf litter, and forested tree fuels. Wildfires in Massachusetts are caused by natural events, human activity, or prescribed fire. Wildfires often begin unnoticed but spread quickly, igniting brush, trees, and potentially homes.

> The Town of Adams Community Resilience Building Workshop Summary of Findings (2019) lists "wildfires" as a top hazard of concern.

Description

The wildfire season in Massachusetts usually begins in late March and typically culminates in early June, corresponding with the driest live fuel moisture periods of the year. April is historically the month in which wildfire risk is the highest. Drought, snowpack level, and local weather conditions can impact the length of the fire season.

According to the National Fire Protection Agency, several elements (known as the fire tetrahedron) must be present in order to have any type of fire:

- Fuel: Without fuel, a fire will stop. Fuel can be removed naturally (when the fire has consumed all burnable fuel) or manually by mechanically or chemically removing fuel from the fire. In structure fires, removal of fuel is not typically a viable method of fire suppression. Fuel separation is important in wildfire suppression and is the basis for controlling prescribed burns and suppressing other wildfires. The type of fuel present in an area can help determine overall susceptibility to wildfires. According to the Forest Encyclopedia Network, four types of fuel are present in wildfires:

  - Ground Fuels: organic soils, forest floor duff, stumps, dead roots, buried fuels
  - Surface Fuels: the litter layer, downed woody materials, dead and live plants to 2 meters tall
  - Ladder Fuels: vine and draped foliage fuels
  - Canopy Fuels: tree crowns

- Heat: Without sufficient heat, a fire cannot begin or continue. Heat can be removed through the application of a substance, such as water, powder, or certain gasses, that reduces the amount of heat available to the fire. Scraping embers from a burning structure also removes the heat source.
- Oxygen: Without oxygen, a fire cannot begin or continue. In most wildland fires, this is commonly the most abundant element of the fire triangle and is therefore not a major factor in suppressing wildfires.
- Uninhibited Chain Reaction: The chain reaction is the feedback of heat to the fuel to produce the gaseous fuel used in the flame. In other words, the chain reaction provides the sustained heat necessary to maintain the fire. Fire suppression techniques, such as dry chemical extinguishers, break up the uninhibited chain reaction of combustion to stop a fire.

Location

The ResilientMass Plan identified areas in Barnstable, Essex, and Plymouth counties with the highest wildfire potential in the state. The ecosystems that are most susceptible to the wildfire hazard Include pine barrens in the Connecticut River Valley, marshes inundated with *Phragmites*, pine barrens and maritime grasslands in Martha's Vineyard, Nantucket, and Cuttyhunk, and the Myles Standish State Forest. Other portions of the Commonwealth are also susceptible to wildfire, particularly at the urban-wildland interface. Notwithstanding the location of Adams in western Massachusetts, the presence of wildland interface and vast rural areas such as Mt. Greylock makes Adams a location with wildfire risk.

Previous Occurrences

Several notable wildfires have occurred in Massachusetts history, although none has ever resulted in a FEMA disaster declaration. Smaller fires such as brush fires are somewhat easier to characterize. According to statewide data sets (https://www.mass.gov/service-details/fire-data-and-statistics), the number of brush fire events per year from 2012 through 2019 ranged from about 3,000 in 2019 to almost 8,000 in the drought year of 2016.

Table 42. Statewide Brush Fire Counts.

Year	Total # of Events	Injuries/deaths (civilians and fire service)	Losses
2019	2,974	12/0	$136,357
2018	3,253	1/5	$493,145
2017	4,206	20/0	$215,156
2016	7,834	40/0	$1,526,654
2015	6,962	35/0	$323,211
2014	4,627	25/0	$209,857
2013	4,968	31/3	$297,854
2012	5,857	38/0	$705,457

According to this statewide data set, fire event counts back to 2012 were as follows for Adams:

Table 43. Outdoor and Total Fire Event Figures for Adams.

Year	Total Outdoor Fires	Total Fire Events	Reported Losses for Outdoor Fires
2012	13	39	$86,299
2013	9	31	$293,569
2014	5	29	$67,915
2015	2	20	$30,232
2016	5	32	$189,531
2017	7	40	$146,307
2018	8	35	$589,366
2019	4	27	$175,456
2020	4	31	Not available
2021	4	36	Not available

Applying the fraction of outdoor fire incidents that are typically brush fires in Massachusetts (52%) and the fraction of fire losses that are typically from brush fires in Massachusetts (0.2%), an alternate set of figures for brush fires in Adams is presented below. The right hand side of the table lists the figures presented in the previous edition of this plan, for comparison.

Table 44. Estimated Brush Fire Event Figures for Adams.

Year	Estimated Brush Fires	Estimated Brush Fire Losses	Wildfires Listed in 2019 Hazard Mitigation Plan for Adams
2012	7	$492	8
2013	5	$1,921	6
2014	3	$748	2
2015	1	$574	1
2016	3	$2,305	3
2017	4	$1,588	--
2018	4	$4,899	--
2019	2	$2,250	--
2020	2	$599*	--
2021	2	$197*	--

*Estimated from Countywide figures

The above estimates compare reasonably well to the figures reported in the previous edition of this plan. Overall, Adams experiences a small number of brush fires and wildfires each year. The previous edition of this plan additionally noted that the average acreage burned per year in Adams is 1.1 acres.

USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index. The single line item related to wildfires in Berkshire County is listed below; this line corresponds to the drought of 2016.

Table 45. USDA Disasters Events That Refer to Wildfires.

Year	Event	Event "Begin Dates"
2016	Drought, Wind/High Winds, Fire/Wildfire, Heat, Excessive Heat, High Temp., Insects	7/5/2016

During the meetings that were convened for this plan update, Town staff noted that Adams has not experienced damaging wildfires. However, they believe this means that significant dead wood and vegetation is available for a wildfire.

Extent

Unfragmented and heavily forested areas of the state are vulnerable to wildfires, particularly during droughts. The greatest potential for significant damage to life and property from fire exists in areas designated as wildland-urban interface areas. A wildland-urban interface area defines the conditions where highly flammable vegetation is adjacent to developed areas.

Fires can be classified by physical parameters such as their fireline intensity, or Byram's intensity, which is the rate of energy per unit length of the fire front (BTU [British thermal unit] per foot of fireline per second) (NPS, n.d.). Following a fire event, the severity of the fire can be measured by the extent of mortality and survival of plant and animal life aboveground and belowground and by the loss of organic matter (NPS, n.d.).

The National Wildfire Coordinating Group defines seven classes of wildfires:

- Class A: 0.25 acre or less
- Class B: more than 0.25 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

Early detection of wildfires is a key part of the overall efforts of the Massachusetts Bureau of Forest Fire Control. Early detection is achieved by trained Bureau observers who staff 22 of the 42 operating fire towers statewide. During periods of high fire danger, the Bureau conducts county-based fire patrols in forested areas. These patrols assist cities and towns in prevention efforts and allow for the quick deployment of mobile equipment for suppression of fires during their initial stage. If a fire breaks out and spreads rapidly, residents may need to evacuate within days or hours. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

Probability of Future Events

It is difficult to predict the likelihood of wildfires in a probabilistic manner because a number of factors affect fire potential and because some conditions (e.g., ongoing land use development patterns, location, and fuel sources) exert changing pressure on the wildland-urban interface zone. The Massachusetts Climate Change Assessment report suggests that wildfire risk will increase over time in association with extreme heat events and changing precipitation and droughts. The following discussion helps characterize the risk further for Adams.

Vulnerability Assessment

Exposure

To help identify potential wildfire areas for Adams, the U.S. Forest Service's Wildfire Risk to Communities spatial data was downloaded. This data was developed in 2020 using the vegetation and wildland fuels from the LANDFIRE 2014 model with the burn probability coming from the Forest Service Fire Simulation System (FSim). To create a product with a finer resolution, the data was upsampled to the native 30m resolution of the LANDFIRE fuel and vegetation data spreading the values of the modeled burn probability into developed areas represented in LANDFIRE fuels as non-burnable. The areas with a 0.02% annual probability of burning were identified and overlaid with the critical facilities and other buildings. There were no critical facilities found in the 0.02% burn probability areas and ten buildings including single family homes and utilities found there. Table 46 shows the result of this analysis.

Table 46. Buildings in 0.02% Annual Chance Area.

Building Type	Number of Buildings (Total in Town)	Building Value (Total in Town)
Single Family	9 (3,393)	$1,417,200 ($443,203,600)
Mobile Home	0 (24)	$0 ($720,100)
Multi-Family	0 (865)	$0 ($92,971,200)
Mixed-Use	0 (124)	$0 ($23,472,100)
Commercial	1 (191)	$150,900 ($39,881,600)
Educational	0 (5)	$0 ($21,421,700)
Government	0 (75)	$0 ($18,934,400)
Religious/Non-Profit	0 (39)	$0 ($45,307,200)
Industrial	0 (65)	$0 ($157,846,600)
Garage/Outbuilding	0 (49)	$0 ($777,840)
Vacant	0 (31)	$0 ($866,600)
Total	**10 (4,861)**	**$1,568,100 ($845,402,940)**

The population exposed to the 0.02% probability area is shown in Table 47. The column in the left shows the population in and around the 0.02% probability wildfire area (wherever the Census Block overlapped with the wildfire area) while the column on the right shows the total population numbers for the Town. There is an older population exposed to the wildfire hazard with a large environmental justice community than the Town average.

Table 47. Population Exposed to 0.02% Annual Chance Wildfire (2020 U.S. Census).

Demographics	Population in and Adjacent to 0.02% Wildfire Area	Total Population
Population	335	8,166
Households	168	4,336
White	319 (95.2%)	7,432 (91.0%)
Black	3 (0.9%)	110 (1.4%)
American Indian	0 (0.0%)	12 (0.1%)
Asian	2 (0.6%)	41 (0.5%)
Pacific Islander	0 (0.0%)	0 (0.0%)
Other Race	2 (0.6%)	60 (0.7%)
Two or More Races	9 (2.7%)	511 (6.3%)
Hispanic or Latino:	2 (0.6%)	226 (2.8%)
Population under 18:	61 (18.2%)	1,268 (15.5%)
Population over 64:	93 (27.8%)	1,916 (23.5%)
Annual Income < $30K/year	35 (10.4%)	1,436 (33.1%)
Population in EJ Zone*:	312 (93.1%)	6,761 (82.8%)

**Massachusetts Office of Energy and Environmental Affairs, 2022*

Figure 16 shows the burn probability map from the USFS overlaid on the Town.

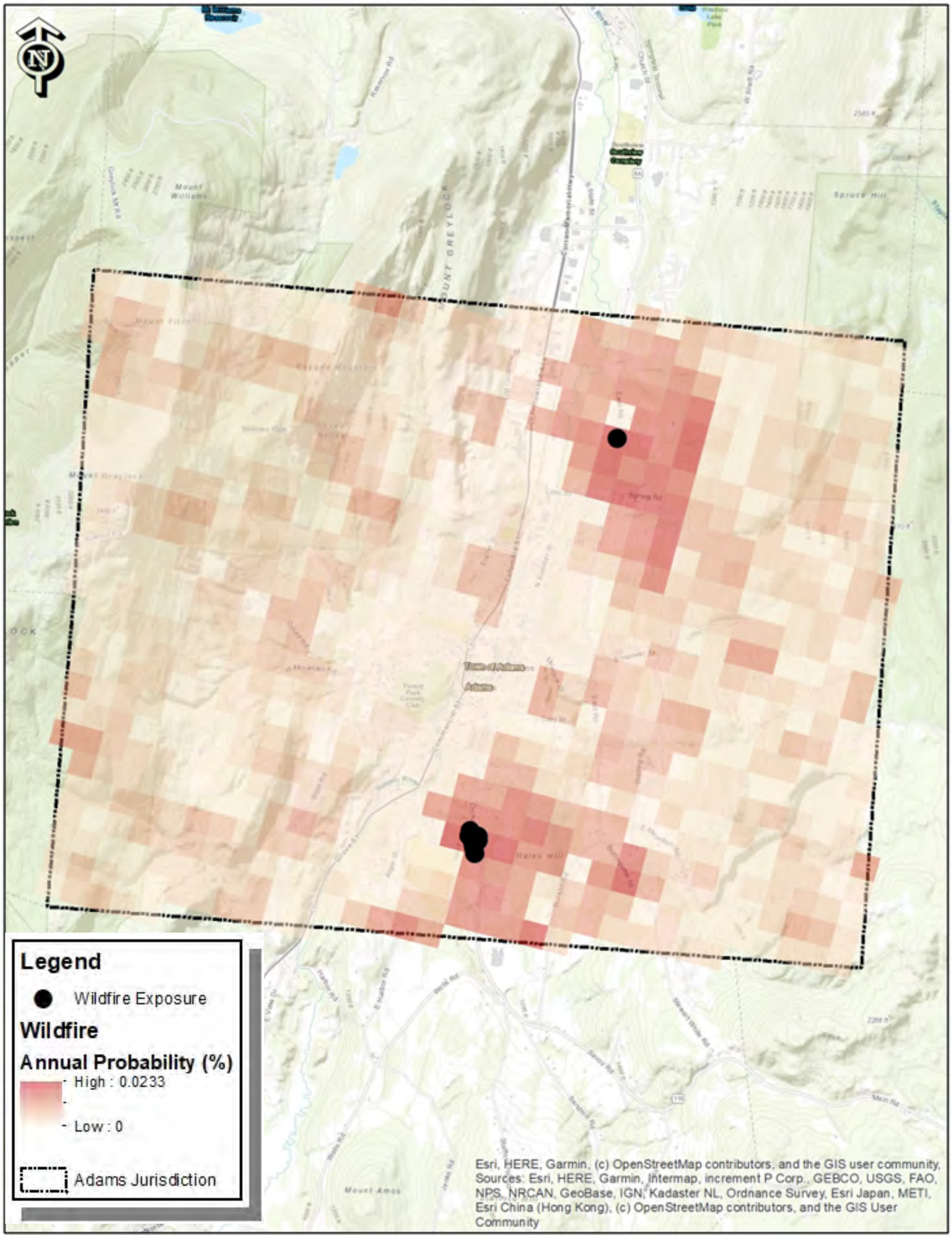


Figure 16. Wildfire Burn Probability Map.

Built Environment Impacts

A major out-of-control wildfire can damage property, utilities and forested land; create smoke that can cause breathing problems; and injure or kill people. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

No property damage, injuries or deaths have been recorded for the reported major wildfires in Adams between 2004 and 2022. Using the wildfire probabilities and building values, a loss estimate was produced for the 0.02% scenario. The losses are $1,568,100 for the 0.02% event and the AAL will be $784.

Climate change will increase the probability of brushfires which could lead to additional property damage. Future development in forested and other high-fuel areas also could lead to additional increases in the probability of brushfires.

Population Impacts

Populations considered most vulnerable to wildfire impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations in Adams are particularly susceptible to wildfires. The Town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

With the increased probability of brushfires outside of the Town in the future due to climate change, populations may be impacted more often due to air quality issues.

Environment Impacts

Many of the natural features in the town are susceptible to wildfire including the trees and parks.

Problem Statements for Wildfires

Table 48. Problem Statements for Wildfires.

Assets	Problems Associated with Wildfires
People (including underserved communities and socially vulnerable populations)	• Populations with severe asthma may be adversely impacted by wildfires in the vicinity.

Assets	Problems Associated with Wildfires
Structures (including facilities, lifelines, and critical infrastructure)	• Several residential structures are found in the higher probability burn areas. Structures without defensible zones are more susceptible to wildfires and brush fires.
Systems (including networks and capabilities)	• Wildfires often cause roads to be closed requiring detours impacting emergency services.
Natural, historic, and cultural resources	• Wildfires may adversely impact forested and other vegetated areas of Adams.
Activities that have value to the community	• Recreational activities may be adversely impacted by wildfires, depending on location.

National Flood Insurance Repetitive Loss Properties

B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))

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.*

According to FEMA, repetitive loss properties are those for which two or more losses of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. Severe repetitive loss properties are residential properties that have at least four NFIP payments over $5,000 each and the cumulative amount of such claims exceeds $20,000, or at least two separate claims payments with the cumulative amount exceeding the market value of the building.

- According to data provided by MEMA, one repetitive loss property has experienced two loss events, with $5,802.81 total building payments and $0 total content payments. The property is a single family home.

A summary of the Town's participation and compliance with the NFIP, including current policy and historical claims statistics, is provided in Table 7 of Chapter 5 (Capability Assessment).

> ***SEVERE REPETITIVE LOSS*** *structure 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.*

Hazard Ranking

Ranking hazards helps the town set goals and mitigation priorities. To compare the risk of different hazards, and prioritize which are more significant, requires a scoring system for equalizing the units of analysis. As not all hazards assessed in this plan have precisely quantifiable probability or impact data, a scoring system based on multi-criteria decision analysis (MCDA) methodology was developed to rank all the hazards. This multi-criteria ranking analysis approach prioritizes hazard risk based on a blend of quantitative factors from the available data, such as historical data, local knowledge, public survey, and Hazus assessment. This hazard ranking analysis assigns varying degrees of risk to five categories for each of the hazards, including: probability (how often it can occur), impact (economic, social, and environmental loss), spatial extent (the size of the area affected), warning time (how long does a community have to prepare for the event), and duration. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor derived from a review of best practice plans. Some of these hazard characteristics, like probability and impact, are more important than others and are weighted more heavily.

To calculate a rank score value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories represents the final rank score, as demonstrated in the following equation:

> *Hazard Score Value = [(Probability x 30%) + (Impact x 30%) + (Spatial Extent x 20%) + (Warning Time x 10%) + (Duration x 10%)]*

Table 49 provides the hazard characteristic, level description, level criteria, level index value, and weighting value.

Table 49. Hazard Ranking Criteria.

Hazard Characteristic	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	

Hazard Characteristic	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption to quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in the affected areas damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected areas damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	Long	More than 24 hours	1	10%
	Moderate	12 to 24 hours	2	
	Short	6 to 12 hours	3	
	Very short or no warning	less than 6 hours	4	
Duration	Very short	Less than 6 hours	1	10%
	Short	Less than 24 hours	2	
	Moderate	Less than one week	3	
	Long	More than one week	4	

Table 50 provides the final hazard ranking for Adams. Each hazard characteristic is assigned a value between 1 (lowest value) and 4 (highest value). When the risk values were calculated, if the value was greater than 2.8, it was assigned as a high risk hazard. If the value was greater than 2 and less than or equal to 3, it was assigned as a moderate risk. If the value was less than or equal to 2, it was assigned as a low risk hazard. The flood, severe winter storms, and average and extreme temperatures hazards were ranked highest. The hurricanes/tropical storms, invasive species, droughts, landslides, tornadoes, and wildfires/brushfires were all ranked as moderate. The earthquake hazard is ranked as low.

Table 50. Final Hazard Ranking of Hazards for Adams.

Hazards	Probability	Impact	Spatial Extent	Warning Time	Duration	Value	Rank
Flooding from Precipitation and Dam Overtopping	4	3	2	3	2	3	High
Severe Winter Storms	4	2	4	1	3	3	High
Average and Extreme Temperatures	4	2	4	1	2	2.9	High
Hurricanes and Tropical Storms	3	2	4	1	2	2.6	Mod.
Invasive Species	3	2	2	3	4	2.6	Mod.
Other Severe Weather	3	2	4	2	1	2.6	Mod.
Droughts	2	2	4	1	4	2.5	Mod.
Landslides	2	3	2	4	1	2.4	Mod.
Tornadoes	2	4	1	3	1	2.4	Mod.
Wildfires/Brushfires	2	2	3	3	3	2.4	Mod.
Earthquakes	1	1	4	4	1	1.9	Low

The following table summarizes changes in population patterns and land use and development and how those impact hazards.

Table 51. Impacts from Population and Land Use.

Hazards	Changes in Population Patterns	Changes in Land Use and Development
Flooding Including Dam Failures and Ice Jams	There is a growing elderly population exposed to the floodplain: • Along Summer St. (also growing low income population) • North of East St. and east of Park St. (also growing low income population)	Existing codes and regulations in the SFHA will help to keep flood impacts low. New development areas may produce additional flooding due to the addition of impervious surfaces.

Hazards	Changes in Population Patterns	Changes in Land Use and Development
	• West of Orchard St.	
Droughts	The Town's elderly population has increased from 18.4% in 2010 to 23.5% in 2020. The number of people living below the poverty line has increased from 8.7% in 2010 to 13.2% in 2020.	All new developments will create more demand for limited water resources.
Landslides	There is a growing elderly and low-income population south and west of Tophet Brook.	Existing land use regulations will help to keep development out of landslide-prone areas.
Extreme Temperatures	The Town's elderly population has increased from 18.4% in 2010 to 23.5% in 2020. The number of people living below the poverty line has increased from 8.7% in 2010 to 13.2% in 2020.	All new developments will exacerbate heat island effect if the development includes tree removal and adding black surfaces such as asphalt and roofs.
Wildfires	There is a growing elderly population west of Hales Hill with a moderate wildfire susceptibility.	Development in or adjacent to a forested or brushland area can lead to a higher risk of wildfire.
Infectious Diseases	The Town's elderly population has increased from 18.4% in 2010 to 23.5% in 2020. The number of people living below the poverty line has increased from 8.7% in 2010 to 13.2% in 2020.	Shouldn't be impacted by changes in land use and development.
Invasive Species	Shouldn't be impacted by population changes.	Shouldn't be impacted by changes in land use and development.
Hurricanes and Tropical Storms	The Town's elderly population has increased from 18.4% in 2010 to 23.5% in 2020. The number of people living	Shouldn't be impacted by changes in land use and development.

Hazards	Changes in Population Patterns	Changes in Land Use and Development
	below the poverty line has increased from 8.7% in 2010 to 13.2% in 2020.	
Severe Winter Storms	The Town's elderly population has increased from 18.4% in 2010 to 23.5% in 2020. The number of people living below the poverty line has increased from 8.7% in 2010 to 13.2% in 2020.	Shouldn't be impacted by changes in land use and development.
Tornadoes	The Town's elderly population has increased from 18.4% in 2010 to 23.5% in 2020. The number of people living below the poverty line has increased from 8.7% in 2010 to 13.2% in 2020.	Shouldn't be impacted by changes in land use and development.
Other Severe Weather	The Town's elderly population has increased from 18.4% in 2010 to 23.5% in 2020. The number of people living below the poverty line has increased from 8.7% in 2010 to 13.2% in 2020.	Shouldn't be impacted by changes in land use and development.
Earthquakes	Not considered.	Not considered.

Problem Statements Summary

The following problem statements reflect a summary of the problem statements included at the end of each hazard profile. They were designed to briefly summarize the key hazard risks and vulnerabilities to the community based on potential impacts and losses from future events. They are among the issues of greatest concern and were used to assist in the identification and analysis of potential mitigation actions for Chapter 6 (Mitigation Strategy). These problem statements will be reviewed and revised as needed during plan updates to reflect the most current information resulting from the risk assessment.

Table 52. Problem Statements Summary.

Hazard	Problem Summary
Flood	• Existing flood maps are outdated, therefore flood risk at certain locations may be higher than typically understood. • Housing Authority buildings (on North Summer St. and Columbia St.) are exposed to the floodplain and may house vulnerable populations. • Electrical substation and undersized culverts, and Quality St. Bridge and water line are susceptible to flooding. • Visitor's Center and several residential and commercial structures are exposed to flooding. • The Town has identified multiple stream crossings throughout Adams that are undersized and often flood. While some work and upgrades are underway, the Town should work to prioritize those crossings that pose the greatest flood and washout risk. • Due to a lack of easements, the Town has limited access to an extensive drainage system for maintenance and repairs. Some of these drainage systems often flood, however the Town cannot address these challenges given that infrastructure is on private property. • Road closures may interrupt community systems including Pine St., North Summer St., Fisk St., Forest Park Ave., Russell Field, Columbia St., Howland Ave., East Hoosac St., Friend St., Jordan St., Staple St. to Reed Field, and Lime St. • There are six structures listed on the National Register of Historic Places including Phillips Woolen Mill Building #1, #2-3, #4, #4A, #6, and Renfrew Mill #2 Office. • The seven structures identified by EPA, the Specialist Minerals Mines site, and rail and roadway impacts may release hazardous materials during a flood event which would impact natural resources.
Severe Winter Storms	• Vulnerable populations may be stranded during a winter storm event and may not be able to travel to emergency services. • The electrical grid and roadways are susceptible to failure and loss of use during storms.

Hazard	Problem Summary
	• First responders may have difficulty reaching people if roads are closed due to road closures.
Average and Extreme Temperatures	• The Town currently relies on the Visitor Center for emergency heating and cooling. However, capacity is limited to 50 people, the existing HVAC system is not fully operational, and it lacks a generator. The town should focus on upgrading the system at the visitor center or designating a more reliable primary facility for extreme temperature refuge. • The Memorial School can fit more people and should be designated as a cooling center and warming center. It's already a shelter and has a generator. • Not all identified critical facilities in Adams have back up power capabilities. The Town should identify all those in need of backup generators and prioritize installation based on the emergency function served. • Extreme heat will be a significant public health threat to all residents, but especially for vulnerable populations living in older homes or homes without air conditioning. • The electric grid may become stressed and fail during extreme heat events. • The elderly and those with mobility issues may not be able to leave their homes and travel safely. • People working in businesses without air conditioning may be at risk of heat illness.
Hurricanes/Tropical Storms	• Wind may cause trees to fall into structures and infrastructure, and roadways. • Wind damage to wind-susceptible buildings such as carports, greenhouses, and open-walled buildings. Additional damage to commercial buildings with HVAC located on roofs. • The electric grid may go down during a high wind event.

Hazard	Problem Summary
Invasive Species	• Emerald Ash Borer has damaged or killed many trees in Adams. • Invasive species are problematic throughout the Town and have been verified in Greylock Glen, Ragged Mountain, and along the train tracks. • Additional DPW resources may be required in critical areas.
Other Severe Weather	• First responders may have difficulty reaching people if roads are closed due to tree debris. • Storm damage to wind-susceptible buildings such as carports, greenhouses, and open-walled buildings. Additional damage to commercial buildings with HVAC located on roofs. • The electric grid may go down during a high wind event.
Droughts	• Vulnerable communities may have difficulty accessing potable water during an emergency drought event. • Water supply infrastructure may need to be shut down and water quality may become substandard. Businesses requiring water for daily operations may have their operations limited due to water restrictions. • Outdoor water use restrictions and other water conservation measures during periods of extreme drought can be challenging to enforce, even when mandated through local declaration.
Landslides	• Vulnerable populations in isolated areas may be cut off if a landslide impacts specific roads. • Some historical, residential, commercial, and other structures reside adjacent to moderately unstable areas and could be impacted. • Roads and rail may be impacted and could cause a hazardous material spill. • The Community Resilience Building Summary Report for Adams implies that landslides have been a potential challenge at the Specialty Minerals sites in the northern part of the town.

Hazard	Problem Summary
Tornadoes	• Vulnerable populations may need support seeking protected shelter. Those without cell phones may not get weather alerts. • Structures and critical infrastructure can all be impacted by tornadoes. • Roadways may be blocked due to downed trees and other debris. • The electric grid may be impacted by winds and downed trees.
Wildfires/Brushfires	• Populations with severe asthma may be adversely impacted by wildfires in the vicinity. • Several residential structures are found in the higher probability burn areas. Structures without defensible zones are more susceptible to wildfires and brush fires. • Wildfires often cause roads to be closed requiring detours impacting emergency services.
Earthquakes	• Elderly people can fall during event. • Unreinforced masonry and utility lifelines impacted.

Chapter 5: Capability Assessment

Overview

The capability assessment is an evaluation of the existing tools and resources available to the Town of Adams for increasing its resilience to hazards, with the primary purpose of identifying opportunities to improve or enhance these capabilities. Coupled with the risk assessment, the capability assessment serves as the foundation for designing an actionable and effective hazard mitigation strategy.

As in any planning process, it is important to establish which goals or actions are feasible based on the organizational capacity of those agencies or departments tasked with plan implementation. This capability assessment helps determine which types of mitigation actions are practical and likely to be completed over time based on Adams's existing authorities, policies, programs, and resources available to support them. It also helps identify any critical capability gaps or limitations to address through corrective actions, as well the key strengths or positive measures in place that should continue to be supported or expanded upon to improve local mitigation capabilities.

This capability assessment was completed to not only help establish the goals and actions for the Town of Adams's hazard mitigation plan, but to also help ensure that those goals and actions are realistically achievable under current local conditions. As highlighted in FEMA's 2022 Local Mitigation Planning Policy Guide, *"describing the current capabilities provides a rationale for which mitigation projects can be undertaken to address the vulnerabilities identified in the Risk Assessment."* [47]

The capability assessment for the Town of Adams includes a comprehensive examination of several components as summarized in Table 53. It was prepared using the latest guidance and worksheets provided in FEMA's 2023 Local Mitigation Planning Handbook.[48]

Table 53. Capability Assessment Components.

Components	Description
Planning and Regulatory Capabilities	Local plans, policies, codes, and ordinances that are relevant to reducing the potential impacts of hazards.
Administrative and Technical Capabilities	Local human resources and their skills/tools that can be used to support mitigation activities.
Financial Capabilities	Fiscal resources the community has access to for helping to fund hazard mitigation projects.

[47] Local Mitigation Planning Policy Guide. FEMA. April 2022. P. 25.

[48] Local Mitigation Planning Handbook. FEMA. May 2023. PP. 79-92 and Worksheets 4-5.

Education and Outreach Capabilities	Local programs and methods already in place that can be used to support mitigation activities.
NFIP Participation and Compliance	Summary of information relevant to the community's participation in the NFIP and continued compliance with NFIP requirements.

Review and Incorporation of Existing Plans, Studies, and Reports

A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))

The first step in completing the updated capability assessment was to gather and review any relevant local plans, studies, or reports completed or updated since the previous hazard mitigation plan was adopted in 2019. This information was used to help gain a current understanding of the Town's current ability to mitigate risk, and how local capabilities may have changed over the past five years. The 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (the "ResilientMass" Plan), as well as other plans adopted by the Town of Adams in the recent past, were reviewed for consistency as well as opportunities for plan integration. The goal of this review was to support updates to this plan that easily align with and possibly incorporate key aspects of relevant plans at the state and local level.

Table 54 provides a summary of the most relevant plans, studies, reports, or sources of other technical information consulted as part of this process and how they were incorporated into this plan update.

Table 54. Relevant Plans, Studies, and Reports for Incorporation.

Plan / Study / Report	Summary Description / Incorporation
ResilientMass Plan: The Massachusetts State Hazard Mitigation and Climate Adaptation Plan (2023)	The 2023 ResilientMass Plan is an update to the Commonwealth's innovative State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) that was developed in a highly collaborative manner to fully integrate a hazard mitigation plan and a climate change adaptation plan. The ResilientMass Plan identifies strategies and specific, measurable actions that state agencies can take—individually or through interagency partnerships—to address risks to the human health and safety, communities, critical assets and infrastructure, natural resources, governance, and economy of the Commonwealth. The ResilientMass Plan aims to ensure the Commonwealth is prepared to withstand, rapidly recover from, adapt to, and mitigate natural hazard events.

Plan / Study / Report	Summary Description / Incorporation
	Through the ResilientMass Plan, the Commonwealth is advancing its mission to increase its capacity for addressing natural and other hazards and climate impacts through preparation, mitigation, adaptation, and risk reduction. The ResilientMass Plan includes six (6) overarching goals which were developed through a collaborative process involving the interagency ResilientMass Action Team (RMAT) and local, regional, and community partners. It also integrates the findings of the 2022 Climate Assessment with additional analysis on all current hazards that may impact the Commonwealth, as well as future risks that will increase the likelihood, frequency, and duration of hazards. Of perhaps most relevance to local communities, the ResilientMass Plan identifies the most urgent priority impacts of these risks to various regions across the Commonwealth. The ResilientMass Plan was incorporated as a key source of information for this plan update. This included the integration and consideration of the latest climate data and information for 15 hazards impacting the Commonwealth now and, in the future, with particular emphasis on those unique impacts determined for the Berkshires and Hilltowns region. In addition, the goals and actions included in Chapter 7 (State Strategy, Actions, and Implementation Plan) were reviewed and considered as part of the update process for Adams's Hazard Mitigation Plan to help ensure the Town's own goals and objectives are in alignment with and can be mutually supportive of the Commonwealth's overall strategy. As can be seen in Chapter 6 of this plan. several of the goals and actions identified for Adams's updated plan address the key themes identified in the ResilientMass Plan.
Town of Adams Municipal Vulnerability Preparedness (MVP) / Community Resilience Building (CRB) Summary of Findings Report (2018)	The Commonwealth's Municipal Vulnerability Preparedness (MVP) program provides support for cities and towns in Massachusetts to plan for resiliency and implement key climate change adaptation actions for resiliency. In 2017, Adams was awarded an MVP Planning Grant to assess its vulnerability to and prepare for climate change impacts, build community resilience, and receive designation from the Executive Office of Energy and Environmental Affairs (EEA) as an MVP Community. Communities with this designation become eligible for MVP Action Grant funding and other opportunities to support the implementation of priority climate adaptation actions. In completing the MVP planning process, the Town of Adams followed the Community Resilience Building (CRB) framework with technical assistance provided by the Berkshire Regional Planning Commission, a state-certified MVP Provider. The CRB methodology is an "anywhere at any scale" format

<table>
<tr><th>Plan / Study / Report</th><th>Summary Description / Incorporation</th></tr>
<tr><td></td><td>that draws on stakeholders' wealth of information and experience to foster dialogue about a community's strengths and vulnerabilities. A day long CRB Workshop was held on May 11, 2018, with the following central objectives:
1. Define top local natural and climate-related hazards of concern.
2. Identify and map vulnerabilities and strengths to develop infrastructure, societal, and environmental risk profiles for the community.
3. Develop and prioritize actions that reduce vulnerabilities and reinforce strengths for the community – local organizations, academic institutions, businesses, private citizens, neighborhoods, and community groups.
4. Identify opportunities to advance actions that further reduce the impact of hazards and increase resilience in the community.

The resulting Summary of Findings Report and supporting materials served as a primary source of information and community-based input for incorporation into the update of this plan. These inputs include the identification of top climate-influenced hazard categories (flooding, snow and ice, wildfire, wind, and extreme weather) and vulnerable areas or community assets (infrastructural, societal, and environmental), current community concerns and challenges presented by these hazards, current strengths and assets, and specific, prioritized recommendations to improve resilience in Adams.</td></tr>
<tr><td>Open Space and Recreation Plan (2019)</td><td>The Town's Open Space and Recreation Plan (OSRP) addresses various choices regarding future management of the community's natural resources, expansion and improvement of its recreational facilities, and development opportunities that will contribute to the revitalization of Adams' economy. The Plan offers a series of recommendations and necessary targeted actions towards achieving these goals and outlines a long-term vision and an action plan to inform future decision-making by Town officials.

The OSRP served as a key source of information related to Adam's natural and built environment, with specific content regarding natural hazards and mitigation activities being incorporated into this updated plan. This includes details on environmental challenges such as chronic flooding, stormwater management and erosion control, landslides, and invasive species for the risk assessment, and information on existing goals and recommended or planned activities that will help the community to mitigate hazards or adapt to climate change for the mitigation strategy.</td></tr>
</table>

Plan / Study / Report	Summary Description / Incorporation
Strategic Plan (2017)	The Town's Strategic Plan sets out the Selectboard's strategic direction and specific actions to move toward meeting broad goals for Town government. Based on a strategic planning process completed throughout 2016 and early 2017, the plan is intended to serve as a guide for the Selectboard in their day-to-day decision-making. It includes a vision for Adams, a mission statement, and whole series of goals, strategies and actions organized under the following topics: Economic Development; Downtown; Housing; Open Space, Recreation & Natural Environment; Arts, Culture, and Community Character; and Responsive and Effective Local Government. The Strategic Plan was reviewed and identified as an important planning document for incorporation into the hazard mitigation plan update process. Several specific actions were identified as relevant for integration with mitigation strategy updates, including those relating to stormwater management, climate adaptation for local roadways and bridges, protecting the health and safety of town residents and visitors, and public education on issues related to climate change. It is also notable that one of the actions identified in the Town's Strategic Plan is to maintain the Hazard Mitigation Plan "consistent with FEMA/MEMA review and approval, to reduce the community's risk from natural hazards and disasters."
FEMA Flood Insurance Study for Berkshire County (1983)	Last published by FEMA on February 1, 1983, this report constitutes the currently effective Flood Insurance Study (FIS) report for Berkshire County. The FIS provides information on the existence and severity of flood hazards for the study area, which includes the Town of Adams. The studies described in this report provide flood hazard data that are used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management. Although considered very outdated, the FIS and accompanying Flood Insurance Rate Maps (FIRMs) include relevant data and information on flood hazards for Adams, including but not limited to descriptions of principal flood problems, flooding sources, FEMA flood zone designations, base flood elevations, and discharge rates of flooding sources. This data and information were reviewed and incorporated into the plan update process by informing the risk assessment, especially as it relates to the hazard profile and vulnerability assessment that was prepared for the flood hazard.

In addition to the above plans which were determined to be most relevant for incorporation into the hazard mitigation plan update, the following plans, studies, reports, and other technical documents were reviewed to gain a clearer understanding of local capabilities and their existing or potential effects on hazard risk reduction. More information on some of these documents is provided in Table 55 in the next section.

- ***Annual Town Report (2022) –*** The Annual Town Report contains updated facts about Adams and a series of reports and information from Town's various departments, boards, commissions, and other officials.
- ***Adams Fire District Report (2022)*** – The Fire District Report provides a summary of activities and financial statements for the District, including but not limited to a listing of projects undertaken and incidents responded to by the Adams Fire Department/Alert Hose Co. in 2022.
- ***Local Rapid Recovery Plan (2021)*** – The Local Rapid Recovery Plan (LRRP) was prepared for Downtown Adams as part of the Massachusetts Rapid Recovery Plan (RRP) Program. The RRP was intended to provide every municipality in Massachusetts the opportunity to develop actionable, project-based recovery plans tailored to the unique economic challenges and COVID-19 related impacts to downtowns, town centers, and commercial areas across the Commonwealth. The Adams LRRP examines market and physical conditions, as well as feedback from the business community, to identify strategic projects that support a sustainable and equitable recovery from the COVID-19 pandemic.
- ***Stormwater Management Program (2019)*** – The Town's Stormwater Management Plan (SWMP) is maintained in compliance with MS4 permit requirements as administered by the U.S. Environmental Protection Agency and Massachusetts Department of Environmental Protection (MassDEP). The SWMP describes and details the activities and measures that will be implemented to meet the terms and conditions of the MS4 permit. It is focused on reducing pollutants in stormwater runoff versus mitigating flood hazards. The main elements of the Town's stormwater management program are (1) a public education program in order to affect public behavior causing stormwater pollution, (2) an opportunity for the public to participate and provide comments on the stormwater program, (3) a program to effectively find and eliminate illicit discharges within the MS4 (4) a program to effectively control construction site stormwater discharges to the MS4, (5) a program to ensure that stormwater from development projects entering the MS4 is adequately controlled by the construction of stormwater controls, and (6) a good housekeeping program to ensure that stormwater pollution sources on municipal properties and from municipal operations are minimized.
- ***Community Development Strategy (2018)*** – The overall goal of the Town of Adams' Community Development Strategy is to maintain a healthy and sustainable community by fostering a diverse economic and social base. This document identifies the key planning documents to address these needs along with an action plan for four critical community issues, including downtown revitalization, housing, community facilities, and economic development. It also includes a series of priority projects (as determined for FY-2018) for the Town to implement to meet the goals of the Community Development Strategy.

- ***Housing Needs Assessment (2019)*** – The Town's Housing Needs Assessment summarizes the living conditions and existing housing stock in the Town. The plan sets out strategies for increasing and rehabilitating existing housing stock while demolishing stock that is beyond repair. This plan does not address natural hazards, but it does include strategies to maintain existing residential structures in town and demolish dangerous structures, thus mitigating and eliminating hazards that arise from them.

Planning and Regulatory Capabilities

C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

Table 55 is based off Worksheet 4 from FEMA's Local Mitigation Planning Handbook. It was used by the HMPC to document and review the current planning and regulatory capabilities of the Town including local plans, policies, codes, and ordinances that are relevant to reducing the potential impacts of hazards. Some additional information on how effectively these plans and regulatory tools are being used for hazard mitigation purposes can be found under the Safe Growth Survey and NFIP Participation and Compliance sections of this chapter.

Table 55. Planning and Regulatory Findings.

Planning/Regulatory Tool	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Plans		
Master/Comprehensive Plan	No	The Town no longer has a current Master Plan, however in 2017 the Selectboard adopted a community-driven "Strategic Plan" in its place which covers many of the same elements found in a Master Plan. This document is considered an effective planning tool for supporting the Town's long-term and day-to-day decision-making. More details on the Strategic Plan, including specific actions to reduce the impacts of natural and climate-related hazards are provided in Table 54. The Town's Community Development Department has also been focused on implementing actions from its 2018 Community Development Strategy as described in the section following Table 2. The Town has been in discussions on re-doing a

Planning/Regulatory Tool	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
		complete Master Plan update in the future, in coordination with the Berkshire Regional Planning Commission (BRPC), but currently there is no set timeframe for this.
Open Space & Recreation Plan	Yes	The Town's Open Space & Recreation Plan (OSRP) provides goals for developing, sustaining, and protecting the natural resources and open space within Adams. The plan also emphasizes the protection of farmland and other natural resource areas. The most recent plan is from 2019-2024. The plan can aid mitigation actions, as the protection of natural areas can prevent future natural hazards such as stream/channel alterations, removal of vegetation, causing an increased likelihood of landslides and, responsible management of natural areas can help prevent pollutants from entering the water supply. See Table 54 for more details on the OSRP.
Climate Adaptation Plan	No	Although technically not a full climate adaptation plan per se, the Town's 2018 MVP Summary of Findings Report does include a basic assessment of key strengths and vulnerabilities and identifies a series of recommended actions to reduce the impacts of Adam's top climate-influenced hazards (flooding, snow and ice, wildfire, wind, and extreme weather). See Table 2 for more details on the MVP report. Effective in terms of identifying and prioritizing actions to build community resilience for specific hazards through continued coordination and integration with this hazard mitigation plan.
Floodplain Management Plan	No	No stand-alone plan, but floodplain management is addressed as a key component of this Hazard Mitigation Plan.
Stormwater Management Plan		Updated in 2019, the Town's Stormwater Management Plan (SWMP) is effective in terms of MS4 permit compliance (i.e., reducing pollutants in stormwater runoff) but could be enhanced to address flood risk and

Planning/Regulatory Tool	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
		flood risk reduction more specifically, particularly as it relates to projected increases in the frequency and severity of heavy precipitation events due to climate change. More details on the SWMP are provided in the previous section following Table 2.
Capital Improvements Plan	Yes	The Capital Improvements Plan (CIP) is a collection of priority projects and action requests by Town Departments. Each Department Head lists their priority initiatives and resource requests for capital spending, then submits the list to the Town Administrator, who ranks the requests before bringing them before the Selectboard and the Adams Finance Committee. The CIP is a good tool for hazard mitigation as it brings to light many different hazards the Town faces as it considers investments in capital projects.
Housing Production Plan	No	The Town does not have a Housing Production Plan, but it does have a Housing Needs Assessment from 2019. More details on the Housing Needs Assessment are provided in the previous section following Table 2.
Transportation Plan	No	N/A
Economic Development Plan	Yes	The Town does have an Economic Development Plan, but it is very out of date (2013). The Economic Development plan explores different opportunities and strategies for the town to grow through a variety of economic development initiatives, including increased staffing for the Town to support such initiatives. However, the HMPC reports the Town is capitalizing on tourism and visits to the Berkshires.
Historic Preservation Plan	No	The Town has not prepared a Historic Preservation Plan; however, it does maintain a chapter on “Arts, Culture, and Community Character” as part of its Strategic Plan as described above. In addition, the Town’s Historical Commission was established for the preservation, protection, and development of the historical and archeological assets of the Town.

Planning/Regulatory Tool	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Emergency Operations Plan	No	The Town is not sure if they have a Comprehensive Emergency Management Plan (CEMP). It was worked on in 2019 but a copy could not be found. This plan outlines the Town's planned response in the event of a disaster and specifies the tasks and duties of each responding official. It also lays out the structure for the Emergency Operations Center (EOC). The CEMP's primary focus is on emergency preparedness and response, and it is not considered an effective plan for long-term risk reduction to natural hazards.
Continuity of Operations Plan	No	N/A
Community Wildfire Protection Plan	No	N/A
Other special plans?	Yes	Local Rapid Recovery Plan (LRRP) for Downtown Adams. More details on the LRRP are provided in the previous section following Table 2.
Building Code, Permitting, and Inspections		
Building Code	Yes	Version/Year: MA State Building Code (780 CMR), Ninth Edition, 2017
ISO Building Code Effectiveness Grading Schedule (BCEGS®) Classification		
ISO Public Protection Classification (PPC©)		
Special Permit / Site Plan Review Requirements	Yes	Site Plan Review is done via formal hearing and a decision by the Planning Board. The hearing prevents any irresponsible or hazardous development from taking place in Adams.
Zoning, Land Use, and Development Regulations		
Zoning Bylaw	Yes	The Zoning Bylaw (Chapter 125) regulates where different kinds of activities and development can occur within the Town of Adams. The Bylaw allows the Zoning

Planning/Regulatory Tool	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
		Board of Appeals and the Planning Board to limit, place conditions on, or prevent development all together in accordance with the bylaw. This provides a process where activities that are potentially hazardous are deliberated on by the Boards and the public before development is permitted. This can prevent or restrict activities that could create hazards in Adams.
Subdivision Regulations	Yes	The Subdivision Regulations (Chapter 109) lay out the process for an applicant to subdivide a large parcel of land into multiple smaller parcels. The regulations can reduce risk by ensuring that all subdivisions are done to a certain standard and approved by multiple Town Boards and Departments before the Planning Board decides on the case. There are design standards, stormwater requirements, environmental requirements, that all reduce the risk of creating hazards during the subdivision process.
Floodplain Regulations	Yes	The Zoning Bylaw's Floodplain District (§125-18) regulates development within the Town's mapped special flood hazard areas. The Bylaw also stipulates that any decision made by the Zoning Board of Appeals must also have weigh-in from the Board of Health, Conservation Commission, and the Building Inspector. The permitting process prevents irresponsible development in flood-prone areas, lowering the risk of hazards being created or exacerbated by development.
Wetlands Protection Regulations	Yes	The Town does not have its own Municipal Wetlands Bylaw but is subject to the State's Wetland Protection Act (WPA). The Conservation Commission presides over cases involving activities proposed in protected areas such as within the FEMA flood zone, in riverfront areas, wetland areas, and in Bordering Vegetated Wetlands (BVW). The Commission's approval process and the Massachusetts Department of Environmental Protection (DEP) prevent reckless development in hazard prone areas, helping to mitigate the risk of hazards.

Planning/Regulatory Tool	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Stormwater Management Regulations	No	The Town has been working on developing a Stormwater Bylaw that is currently in draft form. It is anticipated to be completed and presented for adoption in Spring 2024.

Massachusetts State Building Code

All municipalities in the state must adopt and enforce the current Massachusetts State Building Code (MSBC). The MSBC consists of a series of international model codes and any state-specific amendments adopted by the Board of Building Regulations and Standards (BBRS). The BBRS regularly updates the state building codes as new information and technology becomes available and change is warranted.

The MSBC is separated into two distinct volumes: The Residential volume regulates all one- and two-family structures and townhouses that are three stories or less, as well as their accessory structures. The Base volume regulates all structures that are not covered by the Residential regulations.

The current version of the MSBC is the Ninth Edition, which became effective on October 20, 2017. The Town of Adams began enforcing the Ninth Edition for all applicable projects as required by January 1, 2018. The Ninth Edition code is based on modified versions of the following 2015 codes as published by the International Code Council (ICC).*
The International Building Code (IBC)

- International Residential Code (IRC)
- International Existing Building Code (IEBC)
- International Mechanical Code (IMC)
- International Energy Conservation Code (IECC)
- International Swimming Pool and Spa Code (ISPSC)
- Portions of the International Fire Code (IFC)

** Although the Ninth Edition of the code is still in effect, members of the BBRS have voted that the next edition of the MSBC will be based on modified versions of the 2021 International Codes. The content of these codes is still under review by the BBRS, but it is anticipated that the Tenth Edition of the code will be available for use in 2024.*

The Commonwealth of Massachusetts requires mandatory enforcement of the MSBC and does not allow local amendments to the residential code. In addition, the Commonwealth adopts a plumbing and electrical code. The Commonwealth also has a program in place for code official certification, which includes taking code classes prior to examination and certification, requires continuing education, and allows consumers to file complaints against inspectors. Massachusetts also requires licensing of general, plumbing, electrical, and roofing contractors; requires licensing candidates to pass an examination prior to licensing; and requires continuing education.

Massachusetts continues to perform well in terms of objective assessments of the MSBC. For example, in its most recent “Rating the States” report, the Insurance Institute for Business and Home Safety (IBHS) ranked Massachusetts 9th (scoring 78 out of a possible 100 points on the IBHS scale). Now in its fourth edition, IBHS’s 2021 report evaluates the 18 states along the Atlantic and Gulf coasts, all vulnerable to catastrophic hurricanes, based on building code adoption, enforcement, and contractor licensing.

Lastly, as noted in the table above, the MSBC contains a series of requirements for flood-resistant design and construction that are in accordance with the ASCE 24 standard, which incorporates—and in certain areas exceeds—FEMA’s NFIP construction standards. Highlights of ASCE 24 that complement the NFIP minimum requirements include requirements for building performance; flood-damage-resistant materials, utilities and service equipment, and siting considerations. Specific requirements for design flood elevations and the use of flood-resistant materials may be found in the ASCE Tables included in 780 CMR Section 1612.4. For example, a higher regulatory standard that affects development and redevelopment in the Town’s mapped special flood hazard areas include a requirement that new or substantially improved buildings must be elevated so that the lowest floor surface is at least 1 foot above the FEMA base flood elevation.

Safe Growth Survey

As part of the assessment for planning and regulatory capabilities, the Town Planner completed a *Safe Growth Survey*. This unique survey instrument was drawn from the Safe Growth Audit concept developed for the American Planning Association (APA) to help communities evaluate the extent to which they are positioned to grow safely relative to natural hazards. The survey covered six topic areas including the following:

- Land Use
- Transportation
- Environmental Management
- Public Safety, Zoning Ordinance
- Subdivision Regulations
- Capital Improvement Program and Infrastructure Policies

While somewhat of a subjective exercise, the Safe Growth Survey was used to provide some measure of how adequately existing planning mechanisms and tools for the Town of Adams were being used to address the notion of safe growth. In addition, the survey instrument was aimed at further integrating the subject of hazard risk management into the dialogue of local community planning and to possibly consider and identify new actions as it relates to those local planning policies or programs already in place or under development. It is anticipated that the Safe Growth Survey will be used again during plan updates to help measure progress over time and to continue identifying possible mitigation actions as it relates to future growth and community development practices, and how such actions may better be incorporated into local planning mechanisms.

The results of the Safe Growth Survey are summarized in Table 56. This includes describing how strongly the Town's planning staff agrees or disagrees with 25 statements as they relate to Adams's current plans, policies, and programs for guiding future community growth and development, according to the following scale:

1=Strongly Disagree 2=Somewhat Disagree 3=Neutral 4=Somewhat Agree 5=Strongly Agree

Table 56. Safe Growth Survey Results.

MASTER/COMPREHENSIVE PLAN	
Land Use	
1. The master/comprehensive plan includes a future land use map that clearly identifies natural hazard areas.	1 2 $\boxed{3}$ 4 5
2. Current land use policies discourage development and/or redevelopment within natural hazard areas.	1 2 3 4 $\boxed{5}$
3. The master/comprehensive plan provides adequate space for expected future growth in areas located outside of natural hazard areas.	1 2 $\boxed{3}$ 4 5
Transportation	
4. The transportation element limits access to natural hazard areas.	1 $\boxed{2}$ 3 4 5
5. Transportation policy is used to guide future growth and development to safe locations.	1 2 3 $\boxed{4}$ 5
6. Transportation systems are designed to function under disaster conditions (e.g., evacuation, mobility for fire/rescue apparatus, etc.).	1 2 3 $\boxed{4}$ 5

Environmental Management	
7. Environmental features that serve to protect development from hazards (e.g., wetlands, riparian buffers, etc.) are identified and mapped.	1 2 3 $\boxed{4}$ 5
8. Environmental policies encourage the preservation and restoration of protective ecosystems.	1 2 3 4 $\boxed{5}$
9. Environmental policies provide incentives to development that is located outside of protective ecosystems.	1 2 3 $\boxed{4}$ 5
Public Safety	
10. The goals and policies of the master/comprehensive plan are related to and consistent with those in the hazard mitigation plan.	1 2 $\boxed{3}$ 4 5
11. Public safety is explicitly included in the master/comprehensive plan's growth and development policies.	1 2 $\boxed{3}$ 4 5
12. The monitoring and implementation section of the master/comprehensive plan covers safe growth objectives.	1 2 $\boxed{3}$ 4 5
ZONING BYLAWS	
13. The zoning bylaws conform to the master/comprehensive plan in terms of discouraging development and/or redevelopment within natural hazard areas.	1 2 3 $\boxed{4}$ 5
14. The bylaws contain natural hazard overlay zones that set conditions for land use within such zones.	1 2 $\boxed{3}$ 4 5
15. The bylaws require or encourage resilient development through density bonuses, flexibility with setback requirements, or other incentives for projects outside of natural hazard areas.	1 2 $\boxed{3}$ 4 5

16. The bylaws prohibit development within, or filling of, wetlands, floodways, and floodplains.	1 2 3 $\boxed{4}$ 5
SUBDIVISION REGULATIONS	
17. The subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas.	1 2 3 $\boxed{4}$ 5
18. The regulations provide for conservation subdivisions or cluster subdivisions to conserve environmental resources.	1 2 3 4 $\boxed{5}$
19. The regulations allow density transfers where natural hazard areas exist.	1 2 3 $\boxed{4}$ 5
CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES	
20. The capital improvement program limits expenditures on projects that would encourage development and/or redevelopment in areas vulnerable to natural hazards.	1 2 3 $\boxed{4}$ 5
21. Infrastructure policies limit the extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards.	1 2 3 $\boxed{4}$ 5
22. The capital improvements program provides funding for hazard mitigation projects identified in the hazard mitigation plan.	1 2 3 $\boxed{4}$ 5
OTHER	
23. Economic development and/or redevelopment strategies include provisions for mitigating natural hazards or otherwise enhancing social and economic resiliency to hazards.	1 2 3 $\boxed{4}$ 5
24. Local plans, policies, or regulations promote the use of green infrastructure, low impact development, or other nature-based solutions for managing stormwater and other climate hazards.	1 2 3 4 $\boxed{5}$

25. The community considers and addresses potential impacts of its plans, policies, or regulations on Environmental Justice (EJ) neighborhoods or other socially vulnerable populations.	1 2 3 4 $\boxed{5}$

Administrative and Technical Capabilities

Table 57 is based off Worksheet 4 from FEMA's Local Mitigation Planning Handbook. It was used by the HMPC to document and review the current administrative and technical capabilities of the Town. These include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Table 57. Administrative and Technical Findings.

Administrative/Technical Resource	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Local Boards/Committees		
Planning Board	Yes	The Planning Board serves to help ensure that growth and land use changes within Adams occur in an orderly and planned manner. It oversees the administration of the Town's Zoning Bylaw, Site Plan Reviews, Subdivision Regulations, and serves as the Special Permit Granting Authority for land use issues. The Board consists of five elected members who each serve for a five-year term. The Planning Board meets regularly and decides on cases within its jurisdiction. The Board coordinates well with Town Staff and with the other Boards.
Conservation Commission	Yes	The Conservation Commission is charged with local review and approval of activities in or near streams, wetlands, and riverfront areas. This includes activities on land subject to flooding, land under water, or within 200 feet of rivers. The Commission spends most of its time reviewing and approving applications under the State's WPA (Wetlands Protection Act). These are areas important to providing flood control and preventing storm damage, protecting quality water supplies, preventing pollution, and protecting wildlife habitats. The Board coordinates well with Town Staff and with the other Boards.

Administrative/Technical Resource	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Capital Planning Committee	Yes	The Capital Improvement Planning Committee studies all proposed capital projects and improvements involving major tangible assets and projects. The Committee considers the relative need, impact, timing, cost and funding methodology of these expenditures, and the effect each will have on the financial position of the Town. The Committee serves in an advisory capacity to the Town Administrator and Selectboard and is appointed by the Town Administrator. Effective resource in terms of evaluating, prioritizing, and making recommendations for cost-effective investments in community sustainability and resilience.
Climate Action Committee	No	N/A
Other relevant boards/committees?	Yes	The Adams Council on Aging (COA) is a Town department, organized to develop a comprehensive network of in-home and community-based services and supportive programs for people sixty years of age and over in the community. Very supportive and effective in terms of assisting with educational outreach programs and other engagement activities that can help lead to increased awareness of natural hazard risks and the mitigation measures available to reduce their impacts. The Adams Board of Health (BOH) conducts disease surveillance, air quality monitoring and outreach.
Staff		
Community Planner	Yes	The Town Planner has received Hazard Mitigation training through FEMA certifications and is able to coordinate with other departments on hazards and hazard mitigation.
Chief Building Official	Yes	The Building Inspector has a wealth of knowledge on the building code, town zoning bylaws, and where significant hazards exist in the community.

Administrative/Technical Resource	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Civil Engineer	No	N/A – The Town is not of sufficient size and level of development that necessitates having a civil engineer on staff; rather it hires engineering services as needed.
Emergency Manager	Yes	The Town has an Emergency Management Director who has training in hazard mitigation and in emergency management.
Floodplain Administrator	Yes	Although not a formally designated position, the duties of floodplain management and implementation of the commitments and requirements of the NFIP are shared through auxiliary functions performed by the Town Planner and Building Commissioner.
Sustainability/Climate Coordinator	No	N/A
GIS Coordinator	No	The Town uses the Berkshire Regional Planning Commission (BRPC) for its GIS needs.
Public Information Officer/Specialist	No	N/A
Other relevant staff resources?	Yes	The Town's Forest Warden is charged with the prevention and suppression of all outdoor fires within the planning areas, as well as the enforcement of outdoor burning regulations and the issuance of outdoor burning permits.
Technical		
Grant writing	Yes	The Community Development Department pursues and writes grants and has been successful in securing funding from several grant programs. The Town has used Hazard Mitigation Assistance (HMA) grants through MEMA and FEMA to address hazards in Adams and to assist in the hazard mitigation planning process.

Administrative/Technical Resource	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
GIS mapping and analysis	Yes	The Town utilizes the Berkshire Regional Planning Commission (BRPC) for its GIS and mapping services. BRPC has assisted the Town with many maps depicting hazards, water sources, critical facilities, etc. over the years.
Hazard data and information	Yes	The Community Development Department as well as the DPW keeps information on hazards, though this database should be expanded and organized better.
Maintenance programs to reduce risk *(e.g., tree trimming, drainage clearance)*	Yes	The Adams DPW performs routine maintenance and has been very effective in the past despite having a small staff.
Acquisition of land for open space, recreation, and other public use	Yes	The Town has acquired several parcels of land for use in recreation (parks, resorts etc.). These initiatives have prevented open spaces from being misused and becoming hazardous.
Warning systems/services *(e.g., Reverse 911, outdoor warning signs)*	Yes	Reverse 911 is in effect in the Town.
Mutual Aid Agreements	Yes	The Town's first responder community is well trained and has active mutual aid agreements with neighboring communities through its Fire and Police Departments.

Financial Capabilities

Table 58 is based off Worksheet 4 from FEMA's Local Mitigation Planning Handbook. It was used by the HMPC to identify and review the Town's eligibility and access to funding sources that can be used to support the implementation of hazard mitigation projects.

Table 58. Financial Findings.

Financial Tool/Source	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
General funds	Yes	General funds have been and will continue to be used for hazard mitigation activities.

Financial Tool/Source	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Capital Improvement Program (CIP) funding	Yes	The Capital Improvement Program can help to identify and possibly fund initiatives or projects that can help to mitigate hazards in Town.
Special purpose taxes	No	N/A
Fees for water, sewer, gas, or electric services	No	The Town is exploring sewer use fees that could allow the Town to reappropriate funds towards hazard mitigation efforts.
Stormwater utility fee	No	N/A – The Town has investigated a stormwater utility fee system as part of its responsibilities as a National Pollutant Discharge Elimination System (NPDES) community, but to date has not actively pursued.
Development impact fees	No	N/A
General obligation bonds and/or special purpose bonds	Yes	The Town received a bond in response to storm damage from a microburst in 2018. The money has been used on several projects including the replacements of culverts in the Davis Street area.
FEMA Hazard Mitigation Assistance (HMA) funds	Yes	FEMA's current HMA grant programs (BRIC, FMA, HMGP) remain a good source of external funding for implementing eligible and cost-effective mitigation projects in coordination with MEMA. The Town has received grant funding from FEMA to rebuild the Jordan Street culvert and are currently working with FEMA on the design and the process for utilizing the funds.
HUD Community Development Block Grant (CDBG) funds	Yes	The Town is eligible for HUD CDBG and CDBG-DR funding that can be used to support the implementation of hazard mitigation actions. The Town has had great success in pursuing CDBG grants in the past to design and implement a variety of infrastructure projects, including those that address natural hazard impacts. CDBG funding has also been used by the Town in the past for housing rehabilitation projects and prioritizes the elimination of hazards in its criteria for selecting projects to implement.

Financial Tool/Source	In Place? (Yes/No)	General Description / Effectiveness for Hazard Risk Reduction
Other federal funding programs	Yes	NOAA, EPA, USACE, and other federal agencies do make grant funding available for a variety of resilience-themed projects and initiatives that the Town may be eligible to pursue in the future. This includes both pre- and post-disaster funding programs that can be very effective in supporting the implementation of cost-effective hazard mitigation projects, many of which are described in FEMA's Mitigation Resource Guide.[49]
Massachusetts Municipal Vulnerability Preparedness (MVP) Action Grant funds	Yes	The MVP Action Grant offers financial resources to communities that are seeking to advance priority climate adaptation actions to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts. As a designated "MVP Community" the Town is eligible to apply for grants on its own, or as part of a regional partnership of multiple municipalities provided that the lead applicant is MVP-designated. The Town has used MVP Funding for multiple hazard mitigation projects in Town including the replacement of the stormwater system on Grant Street. MVP funding is a valuable tool for the Town and will continue to be pursued and utilized in the future.
Massachusetts Community Preservation Act (CPA) funds	No	Not adopted by the Town, but this could be a potential source of funding to support open space preservation and similar mitigation measures if Adams becomes a CPA community in the future.
Other state funding programs	Yes	The Commonwealth makes a variety of funding programs available on a routine basis to support local risk reduction projects. Some of the most applicable opportunities for the Town include MVP Action Grants and other annual grant programs through EEA, such as the Culvert Replacement Municipal Assistance Grant Program. Others may include Community Compact grants, Green Communities grants, etc. depending on the scope and scale of specific projects.

[49] Mitigation Resource Guide. FEMA. March 2021.

Financial Tool/Source	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Private or non-profit grants, loans or funding	No	N/A

Education and Outreach Capabilities

Table 59 is based off Worksheet 4 from FEMA's Local Mitigation Planning Handbook. It was used by the HMPC to identify and review existing education and outreach programs that can be used or expanded upon to support local mitigation activities.

Table 59. Education and Outreach Findings.

Education & Outreach Program/Method	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Community newsletter(s)	No	There are various newsletters that are present in the community, but the Town does not produce an official newsletter.
Web-based / social media	Yes	The Town has an official Facebook account that is useful for getting the word out to citizens on a variety of subjects. Notices regarding public meetings during the development of this plan were posted to Facebook.
Public Access TV, radio, etc.	Yes	The Town does use local Public Access TV for its Selectboard meetings.
Community gatherings, festivals, celebrations, or other events	Yes	There are several gatherings and festivals in Town throughout the year such as Ramblefest and Thunderfest. These festivals are well attended and could be used as a good platform to disseminate information about hazard mitigation initiatives and announcements.
Hazard awareness campaigns *(e.g., Severe Weather Awareness Week)*	No	N/A

Education & Outreach Program/Method	In Place? *(Yes/No)*	General Description / Effectiveness for Hazard Risk Reduction
Organizations that represent, advocate for, or interact with underserved or vulnerable populations	Yes	There are numerous non-profit agencies in the area that represent underserved populations. Some examples are ProAdams and the Northern Berkshire Community Coalition (NBCC). Also, the Council on Aging/Adams Visitor's Center is a community hub that provides social connections and resources to residents, and in addition, has also acted as a cooling center when needed. Each of these agencies were invited to public meetings and to review the draft Plan.
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, etc.	Yes	Same as above.
Ongoing public education or information program *(e.g., responsible water use, fire safety, household preparedness)*	No	The Adams Fire District does provide a range of safety tips on its website, but there is currently no formal public education or outreach program administered for the Town of Adams.
Natural disaster or safety-related school programs	No	N/A
StormReady® certification	No	N/A
Firewise USA® certification	No	N/A
Public-private partnership initiatives addressing disaster-related issues	No	N/A

National Flood Insurance Program (NFIP) Participation and Compliance

C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))

The National Flood Insurance Program (NFIP) is a program created by the United States Congress in 1968. The NFIP has two purposes: to share the risk of flood losses through flood insurance and to reduce flood damages by restricting floodplain development. The program enables property owners in participating communities to purchase insurance protection, administered by the government, against losses from flooding, and requires flood insurance for all federally backed loans or lines of credit that are secured by existing buildings, manufactured homes, or buildings under construction, that are in FEMA-mapped special flood hazard areas in a community that participates in the NFIP. The availability of NFIP policy coverage is limited to communities that adopt adequate land use and control measures with effective enforcement provisions to reduce flood damages by restricting development in areas exposed to flooding. There are now more than 20,000 participating communities across the United States and its territories.

The Town of Adams has participated in the NFIP since 1983. As summarized in Table 60, the HMPC used Worksheet 5 from FEMA's *Local Mitigation Planning Handbook* to collect information regarding the Town's participation in and compliance with the NFIP. This worksheet, in addition to a separate *NFIP Survey* for the Town Planner, helped the HMPC to identify areas for improvement and other ideas that could be potential mitigation actions.

Table 60. NFIP Participation and Compliance Findings.

NFIP Topic	Source of Information	Comments
Insurance Summary		
How many NFIP policies are in the community? What is the total premium and coverage?	FEMA NFIP Services, Flood Insurance Data and Analytics; State NFIP Coordinator	As of December 31, 2023, a total of 19 NFIP policies are in force. The total premium is \$25,269 for a total of \$1,999,000 in coverage. The average premium paid per policy is \$1,330.
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	FEMA NFIP Services, Flood Insurance Data and Analytics (HUDEX report)	There has been a total of 21 claims paid since 1983, totaling \$119,704 in losses. The average claim amount paid is \$5,700. There have been no claims paid for substantial damage.
How many structures are exposed to flood risk within the community?	GIS analysis (FEMA FIRMs + building footprint data)	It is estimated that 196 structures are at risk to the 1-percent annual chance flood (exposed to high risk of flooding).
Are there any repetitive or severe repetitive loss structures in the community?	MEMA / FEMA	Yes – one repetitive loss property (single family), which has experienced two insured losses that

NFIP Topic	Source of Information	Comments
		total $5,803 in NFIP claims payments. See Chapter 4 for more details.
Describe any areas of flood risk with limited NFIP policy coverage	HMPC	No address-specific data has been made available by FEMA, but it is generally assumed that owners of property located in special flood hazard areas are underinsured when it comes to flood insurance coverage (based on only 19 current policies under the NFIP in comparison to 196 structures estimated to be exposed to high flood risk).
Staff Resources		
Who is responsible for floodplain management in the community? Do they serve any roles other than Community Floodplain Administrator (FPA)?	Town Planner	The duties of floodplain management and implementation of the commitments and requirements of the NFIP are shared through auxiliary functions performed by the Town Planner and Building Commissioner.
Is the Community FPA or NFIP Coordinator a Certified Floodplain Manager?	Town Planner	No, however this is being explored for future implementation (recommended capability improvement / mitigation action).
Is floodplain management an auxiliary function?	Town Planner	Yes, for the Town Planner and Building Commissioner.
Explain NFIP administration services (e.g., permit review, GIS, inspections, engineering capability).	Town Planner	All developments in the Town's Floodplain District, including structural and non-structural activities, are reviewed for compliance with the Town's Zoning Bylaw and State Building Code. The Town complies with the NFIP by enforcing these floodplain regulations and providing information to property owners and builders regarding floodplains and building requirements. The Town offers FIRMs and other relevant information for those interested in learning more about flood risk, mitigation options, and the purchase of flood insurance.

NFIP Topic	Source of Information	Comments
What are the barriers to running an effective NFIP program in the community, if any?	Town Planner	The Town does not currently have a trained and dedicated Floodplain Administrator, which makes it more challenging to run an effective program. However, future training and potential CFM certification for the Town Planner position is expected to help address this issue.
Compliance History		
Is the community in good standing with the NFIP?	Town Planner, State NFIP Coordinator, FEMA	Yes
Are there any outstanding compliance issues (i.e., current violations)?	Town Planner	No
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC)?	State NFIP Coordinator, FEMA (CIS)	Last CAC was 4/23/2020 Last CAV was 8/30/2001
Is a CAV or CAC scheduled or needed?	Town Planner	No
Regulation		
When did the community enter the NFIP?	State NFIP Coordinator, FEMA (CIS)	8/1/1983 (Regular Entry) 11/11/1974 (Emergency Entry)
Are the FIRMs digital or paper?	Town Planner	Digital
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Town Planner	Floodplain regulations are administered through the enforcement of the Town's Zoning Bylaws which follow all current FEMA/NFIP minimum requirements. These regulations will be routinely updated as necessary to maintain compliance with existing NFIP and State minimum standards for floodplain management. As described earlier in this chapter, higher regulatory standards are

NFIP Topic	Source of Information	Comments
		also met through the Town's enforcement of the Massachusetts State Building Code (CMR 780). Other floodplain development requirements are included in the Town's administration of the Commonwealth's Wetlands Protection Act Regulations (310 CMR 10).
How does the community enforce local floodplain regulations and monitor compliance? Explain the permitting process.	Town Planner	The Adams Zoning Board of Appeals may grant Special Permits for development within the Floodplain District. Within ten days of receiving a request, the Building Inspector, Conservation Commission, and the Board of Health must be notified, and final action must not be taken until reports have been received from these boards, or until 35 days has elapsed.
Community Rating System (CRS)		
Does the community participate in CRS? If so, what is the community's CRS Class?	Town Planner	No
What categories and activities provide CRS points and how can the class be improved?	N/A	N/A
Does the plan include CRS planning requirements	Yes	Yes, many of the planning requirements under CRS Activity 510 are included in the plan update.

Table 61 provides some additional information in response to the updated requirements included in FEMA's 2022 Local Mitigation Planning Policy Guide (Element C2-a):[50]

Table 61. Additional NFIP Participation and Compliance Information.

Required Information	Response
Adoption of NFIP minimum floodplain management criteria via local regulation.	Adopted under the Town's Zoning Bylaw (Chapter 125) at §125-18 (Floodplain District).

[50] Local Mitigation Planning Policy Guide. FEMA. April 2022. P. 26.

Required Information	Response
Adoption of the latest effective Flood Insurance Rate Map (FIRM), if applicable.	Adopted under the Town's Zoning Bylaw (Chapter 125) at §125-18 (Floodplain District). Section B establishes the general boundaries of the Floodplain District to include Zones A and A1-30 as shown on the Adams Flood Insurance Rate Map (FIRM) dated August 1, 1983.
Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs.	See explanation of the Town's permitting process provided in Table 60.
Appointment of a designee or agency to implement the addressed commitments and requirements of the NFIP.	Currently the Town Planner and Building Commissioner are tasked with implementing the commitments and requirements of the NFIP, making sure Adams remains in compliance with all relevant codes and standards for floodplain management.
Description of how participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event.	The Town implements the SI/SD provisions of its floodplain management regulations as required per the NFIP (CFR Title 44, Parts 59 through 65) and Massachusetts State Building Code (780 CMR). The Town will also coordinate with State Flood Hazard Management Program staff to assure that proper practices are followed and that a post-disaster plan will be in place to implement all SI/SD provisions.

Summary and Conclusions

The Town of Adams is a picturesque valley town with moderate to strong capabilities and resources to support the implementation of hazard mitigation actions. This chapter provides documentation on the existing local authorities, policies, programs, and resources to support hazard mitigation.

The Town of Adams is well served by the most available and locally controlled tools to mitigate the consequences of natural hazards such as long-term planning, zoning regulations, natural resource protection, and infrastructure maintenance/improvements. The Town has few formal planning documents, but those that are in place are considered supportive of natural hazard risk reduction. For example, in 2017 the Town completed a Strategic Plan that outlines some specific risk reduction actions including those relating to stormwater management and other climate adaptation measures for local infrastructure. In 2018 the Town prepared its Municipal Vulnerability Preparedness (MVP) plan to identify, prioritize, and begin implementing key climate adaptation actions for building long-term community resiliency. In 2019 the Town updated its state-approved Open Space and Recreation Plan, a plan documenting the Town's natural resources and offering recommendations to protect and enhance those resources while also addressing environmental challenges such as chronic flooding, stormwater management, landslides, and invasive species. The Town has also adopted zoning bylaws and regulations that support risk reduction, including but not limited to floodplain management regulations in compliance with state and federal standards and more recently the creation of a Stormwater Bylaw to help further address stormwater runoff and drainage issues associated with heavy precipitation events.

Adams also benefits from relatively strong administrative and technical capabilities. Adams remains a tight-knit community where Town departments and residents work well together and seek input from each other when opportunities or problems arise. Department heads and elected officials work exceedingly well together and show mutual commitment to problem solving, innovative projects, and work that increases the resiliency of the community. Town staff are supported by numerous local boards and committees, such as the Planning Board, Conservation Commission, Capital Planning Committee, and Council on Aging. General planning assistance continues to also be provided by the Berkshire Regional Planning Commission (BRPC), including but not limited to technical planning and data analysis, such as GIS modeling and mapping support. The Town is not of sufficient size and level of development that necessitates having a civil engineer on staff, but it does hire engineering service providers as needed. The Adams Department of Public Works performs routine maintenance and improvement of critical infrastructure throughout the community and has been very effective in the past despite having a small staff.

The Town's financial capabilities to implement hazard mitigation projects are somewhat more limited, though the Town has been successful in recent years with using the annual town budgeting and capital planning process to support local investments in stormwater drainage improvements and other related work. Staff from various Town departments have also captured external grant funding for their own programs and projects. The Community Development Department serves as the Town's main planning agency, aiding in capital improvements plan development, and providing extensive grant writing support to all departments. The Town has had great success in pursuing Community Development Block Grants to design and implement a variety of infrastructure projects, including those that address natural hazard impacts. It has investigated a stormwater utility fee system as part of its responsibilities as a NPDES Phase II community, however the creation of such an enterprise fund is not likely to occur soon.

The Town's capabilities to implement or encourage low-cost mitigation measures across the community are aided by its dedicated staff and volunteers noted above, in addition to several effective methods for conducting local outreach and educational activities with community residents and other stakeholders. This includes a well maintained website, the use of social media, and many community events that are held throughout the year. It also benefits from several local organizations that routinely engage with the community's more vulnerable residents, such as the Council on Aging, ProAdams, and the Northern Berkshire Community Coalition.

Although the Town of Adams has relatively strong capabilities and is well-positioned to mitigate the natural hazard risks faced by the community, it can expand and improve on the capabilities described in this chapter. Some general and specific opportunities to address existing gaps or limitations in local capabilities to reduce risk have been identified for each capability type and are further described below. Each of these opportunities were then considered by the HMPC during the plan update process as potential new mitigation actions to be included in the Mitigation Strategy.

Opportunities to Expand and Improve on Capabilities to Reduce Risk

Planning and Regulatory Capabilities

- Continue supporting the studies needed to inventory and assess all flood control structures and related stormwater systems for the Town to better identify, evaluate, and prioritize needed maintenance, repairs, and upgrades required to reduce the risk of flooding and adapt to projected increases in heavy precipitation events due to climate change. This includes identifying current ownership and maintenance/repair responsibilities for those structures and systems within and upstream of Town boundaries that can affect flood risk for the entire planning area, including the flood chutes, riverbank walls, and other appurtenant structures.
- Prepare updated Master Plan with resilience considerations/solutions that build off this Hazard Mitigation Plan in addition to other key community plans (including the Strategic Plan, Open Space and Recreation Plan, MVP Plan, and Community Development Strategy).
- Adopt the State's latest (2020) Model Floodplain Bylaw.
- Finalize and adopt a Stormwater Management Bylaw that supports flood risk reduction and the use of BMPs, LID, and other nature-based solutions.
- Prepare a Continuity of Operations Plan (COOP).

Administrative and Technical Capabilities

- Build staff capacity for mitigation activities through increased training and professional development opportunities that are tailored to specific hazard issues in Adams.
- Formally designate a local Floodplain Administrator and support their training and certification as a Certified Floodplain Manager (CFM®).
- Build and maintain in-house GIS capabilities to support hazard mitigation and other community planning/project initiatives. This includes maintaining GIS hardware, software licenses, and data for the Town Planner in routine coordination with BRPC.
- Develop system/process for maintaining hazard impact/loss data.

Financial Capabilities

- Develop and integrate hazard mitigation/resilience criteria into the annual Town Budget and Capital Improvement Plan (CIP) process.

- Prioritize and dedicate resources for pursuing recurring grant funding opportunities to mitigate hazards (FEMA, MVP, CDBG, etc.).
- Explore adoption of MA Community Preservation Act (CPA).
- Seek partnerships for local and regional risk reduction projects, especially with North Adams on flood hazard mitigation efforts.

Education and Outreach Capabilities

- Partner with local non-profits and school systems to conduct outreach campaigns related to hazard mitigation.
- Identify ways of working/connecting with underserved members of the community to ensure their needs are heard and addressed and to promote increased awareness of hazard risks and mitigation activities.
- Develop better methods of communication with residents through a community newsletter or other medium of mass communication that will keep the community aware of key events in town, as well as provide more opportunities to increase risk awareness and outreach on disaster preparedness and mitigation activities.
- Explore more emergency warning systems/services such as the Wireless Emergency Alert (WEA) system, and more actively promote these systems to residents to improve outreach during hazard events.

Possible New Actions Related to NFIP Participation and Compliance

- Promote the availability of flood insurance to all property owners and renters, especially those in areas of high to moderate flood risk.
- Use FEMA Elevation Certificates for all floodplain development.
- Evaluate permit application forms to determine possible modifications focused on flood hazard prevention. Develop a checklist for review of building/development plans and for inspection of development in floodplains.
- Restrict certain uses or types of floodplain development (e.g., use of fill, storage of hazardous materials, critical facilities, etc.).
- Develop a Post-Disaster Substantial Damage Plan.
- Review the State's *Local Floodplain Action Guide* (forthcoming in 2024) for possible zoning or administrative improvements.

Chapter 6. Mitigation Strategy

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. As described in Chapter 3 (Planning Process), the HMPC worked in a consistent, coordinated manner to identify and prioritize the goals and mitigation actions for this Plan.

Mitigation Goals

C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))

***GOALS** are broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.*

Mitigation goals represent broad statements that are achieved through the implementation of more specific mitigation actions. These actions include both hazard mitigation policies (such as land use regulations) and hazard mitigation projects (such as structure or infrastructure projects). To develop goals for this Town of Adams, MA Hazard Mitigation Plan Update the HMPC reviewed the Adams Multi-Hazard Mitigation Plan 2019 goal statements, the Municipal Vulnerability Preparedness (MVP) plan goal statements, and the goals of the State's Hazard Mitigation and Climate Adaptation Plan (SHMCAP).

The HMPC developed the goal statements in the figure below to represent their vision and priorities for the Town of Adams in terms of hazard mitigation. All the hazards identified in this plan, while not named specifically in the goals, are implied and many are named specifically in the mitigation actions. When achieved by way of implementing the mitigation actions identified in this plan, the Town will mitigate risk posed by all identified hazards.

Save Lives and Property

- Reduce risk to people and property from natural hazards and climate change.

Infrastructure

- Mitigate risk to critical facilities and infrastructure from natural hazards and climate change.

Capacity

- Expand the Town's capacity to mitigate risk by adopting a culture of hazard mitigation through regulations, planning, and regional collaboration.

Natural Resources

- Implement actions that minimize risk from climate change and natural hazards to preserve or restore the functions of natural systems.

Education

- Educate all stakeholders about the value of hazard mitigation and how to implement it in their work, businesses, and homes.

Figure 17. Goal Statements.

E2-b. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement §201.6(d)(3))

The Adams Multi-Hazard Mitigation Plan 2019 included 33 mitigation actions. For the purposes of this plan, all the actions were reviewed for their status and relevance. The following table shows the previous plan's 33 actions and the status of each. In addition to their status, if an action was moved forward to this plan the final column indicates the title of the new action.

Table 62. Status of 2019 Hazard Mitigation Plan Actions.

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
1	Address damaging flooding of properties, roads and road crossings along Southwick Brook	Completed + To Be Continued	Replacement of Davis St culvert with new box culvert was completed in early spring 2022. Southwick bank reinforced using shockcrete. July 2023 storms have worsened condition of the bank in some area and likely needs additional reinforcement, grant funds should be pursued.	YES - updated/revised description provided at right, if applicable	Address flooding damaging properties roads and road crossings along Southwick Brook.
2	Identify and address Jordan St. drainage system	Partially Completed / In Progress	Town has received FEMA grant for culvert replacement July 2023 storms worsened condition of damaged culvert and caused localized flooding in the proximity of the culvert. Emergency Action taken with MEMA approval in September 2023 to remove concrete slabs from Jordan street channel and mitigate potential flooding hazards.	YES - updated/revised description provided at right, if applicable	Identify and address Jordan St. drainage system problems.
3	Address known flooding due to undersized storm	Completed	Town received MVP Funds to address issue, work was completed in the spring of 2021.	NO - explanation provided at left	

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
	drain system in Grant St. neighborhood				
4	Address known problem culverts, particularly in areas prone to flooding	Completed + To Be Continued	Town has continued to prioritize and address problem areas. Power Street culvert is known to be failing and road is in danger of collapse, Town will address in October 2023 with Town Funding.	YES - updated/revised description provided at right, if applicable	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
5	Evaluate small stormwater conveyances	Partially Completed / In Progress	Town completed preliminary design on Pecks Brook Reid field and Power Street stormwater conveyances.	YES - updated/revised description provided at right, if applicable	Evaluate small stormwater conveyances.
6	Create a stormwater bylaw	Delayed	Draft Bylaw complete anticipate adoption in Spring 2024 at Town Meeting.	YES - updated/revised description provided at right, if applicable	Create a Stormwater Bylaw.
7	Improve condition of Fisk Street Dam and mitigate infrastructure risks in Fisk Brook	Partially Completed / In Progress	The Town slip lined the culvert, Fisk street dam is a known significant hazard. Town Staff have met with the office of dam safety to discuss dam ownership and potential avenues for removal. The Town applied for a grant in the summer of 2023 to fund a study for dam removal but is unlikely to receive funding.	YES - updated/revised description provided at right, if applicable	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
			The project has become more expensive and complicated than initially expected.		
8	Establish regular maintenance schedule for the entire stormwater system	Partially Completed / In Progress	DPW conducts regular maintenance but is unable to accomplish everything. Town has completed a VMP that requires approval from MDAR. Town exploring use of fund to remove vegetation as a substitution for town staff.	YES - updated/revised description provided at right, if applicable	Establish a regular maintenance schedule for the entire stormwater system.
9	Work with the Commonwealth and the ACOE to reform the permitting and process requirements of maintaining the flood chutes	Partially Completed / In Progress	Town continues to work with the Commonwealth and the ACOE on requirements to maintain flood chutes.	YES - updated/revised description provided at right, if applicable	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.
10	Map and monitor all small stormwater conveyances, especially in known problem	Partially Completed / In Progress	CDD needs to continue this work that was started under MVP	YES - updated/revised description provided at right, if applicable	Map and monitor all small stormwater conveyances, especially in known problem areas.
11	Conduct regular maintenance on the flood chutes	Completed + To Be Continued	DPW conducts regular maintenance but is unable to accomplish everything. Town has	YES - updated/revised description provided at right, if applicable	Work with the Commonwealth and the Army Corps of Engineers

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
			completed a VMP that requires approval from MDAR. Town exploring use of fund to remove vegetation as a substitution for town staff.		to reform the permitting process requirements of maintaining the flood chutes.
12	Conduct hydrology study of Southwick Brook	Completed	Stabilization work was done on the banks of the brook. The channel was cleared and reshaped. The channel suffered some damage in the rain storms of July 2023, and the town will continue to monitor its condition.	YES - updated/revised description provided at right, if applicable	Monitor Integrity of Southwick Brook.
13	Alleviate flood concerns around the Pump Station in the Zylonite Station Road area.	Delayed	Asset Management Plan may begin in 2024 it is not deemed necessary to include in this plan update.	NO - explanation provided at left	
14	Improve the drainage on Burlingame Hill Road	Delayed	Project was not able to be completed and is not deemed necessary to include in this plan update.	NO - explanation provided at left	
15	Determine solution to river wall erosion on South Willow St.	Partially Completed / In Progress	Some survey work was done but the project was much more complicated than the Town anticipated.	NO - explanation provided at left	

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
16	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew	Delayed	This action was delayed due to resource availability.	YES - updated/revised description provided at right, if applicable	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.
17	Conduct a study and implement findings for the drainage area around West Kittler Avenue	Completed	Area with frequent ponding on W kittler was solved by installing additional drainage work completed October 2023.	NO - explanation provided at left	
18	Conduct a study and implement findings for the drainage area around Grant Street.	Completed	Same as for the West Kittler Area	NO - explanation provided at left	
19	Identify historic structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.	Partially Completed / In Progress	CDD needs to continue this work that was started under MVP	YES - updated/revised description provided at right, if applicable	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.
20	Work with the state and other responsible land owners to clear	Completed	Work was completed prior to the 2019 Hazard Mitigation Plan	NO - explanation provided at left	

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
	land of debris from the Dec. 2008 Ice Storm				
21	Alleviate the risk of landslides around East Street and Walling Road.	Partially Completed / In Progress	Some work was done to address the issue of the landslides, but, more work is required to mitigate the issue, the Town will continue to monitor the situation.	YES - updated/revised description provided at right, if applicable	Alleviate the risk of landslides around East Street and Walling Road.
22	Investigate protections against inappropriate development on steep slopes.	Delayed	This action is not considered a priority for this plan now.	NO - explanation provided at left	
23	Retaining walls on East Hoosac and Richmond Lane	Partially Completed / In Progress	Town exploring avenues for funding and continuing to evaluate issue with engineering firms.	YES - updated/revised description provided at right, if applicable	Repair the retaining walls on East Hoosac and Richmond Lane.
24	Assess condition of main water line and the Quality Street Bridge	Partially Completed / In Progress	DOT funding replacement of Quality St bridge work will not be completed until 2025.	YES - updated/revised description provided at right, if applicable	Assess condition of main water lines and the Quality Street Bridge.
25	Water conservation outreach	Partially Completed / In Progress	Ongoing process of the Water Department.	NO - explanation provided at left	
26	Remove Bassett Brook Reservoir	Delayed	Water/Fire District Project	YES - updated/revised description provided at right, if applicable	Assess condition of main water lines and the Quality Street Bridge.

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
27	Improve/update water delivery infrastructure	Completed + To Be Continued	This is an ongoing activity and not necessary to move forward.	NO - explanation provided at left	
28	Implement water metering and usage monitoring	Completed	Adams Fire District: Town upgraded all of its properties with new meters.	NO - explanation provided at left	
29	Expand emergency notification system to include cell phones and emails; investigate siren system	Partially Completed / In Progress	Red Alert and Reverse 911 are now in place in Adams, Town will continue to expand its emergency systems.	YES - updated/revised description provided at right, if applicable	Expand emergency notification system to include cell phones and email; investigate siren system.
30	Pursue grants for Adams Memorial School and pursue funding through Town capital budget	Partially Completed / In Progress	Town used CDBG funding for HVAC systems completed in 2020. Engineering design of restroom facilities at EM school needed to allow for transfer of COA to facility. Will also enhance use as shelter location	YES - updated/revised description provided at right, if applicable	Develop local shelter plan for Adams Memorial School and backup shelters.
31	Develop local shelter plan for Adams Memorial School and backup shelters	Partially Completed / In Progress	The Memorial School facility has been improved and the structure and supplies needed for a shelter are in place, but a shelter plan for the building has not been developed.	YES - updated/revised description provided at right, if applicable	Develop local shelter plan for Adams Memorial School and backup shelters.

Action #	Action Description	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
32	Designate more cooling/warming centers	Completed + To Be Continued	The Town has designated several new locations with HVAC/Heating capability that can be used as heating/warming centers.	YES - updated/revised description provided at right, if applicable	Designate more Cooling/Warming Centers.
33	Continue participation in regional Emergency Planning organizations	Completed	The Town continues and will continue to be part of regional organizations.	NO - explanation provided at left	

The Adams, Massachusetts Community Resilience Building Workshop, June 2018 (referred to as the MVP plan) plan includes 16 recommendations to improve resilience. The MVP is part of a Massachusetts state-wide initiative through the Executive Office of Energy and Environmental Affairs (EEA) to provide support to cities and towns to plan for resiliency and implement climate change adaptation actions. The recommendations identified in Adams's MVP were reviewed and considered when developing mitigation actions for this plan update. Below is the list of MVP Recommendations with notes regarding their status and relevance in the Hazard Mitigation Plan. Some of the notes include the name of the department that reported the comments.

Table 63. Status comments on MVP recommendations.

Top Recommendations to Improve Resilience (Organized by Category)	Notes / Comments
Infrastructure	
Conduct assessments of existing culverts for upgrading needs & size requirements & new regulations.	The Town DPW continues to conduct assessments of existing culverts.
Assess water flow and runoff in East Hoosac/Jordan and Lime Street areas.	Assessment efforts are continuing.
Study and prioritize culverts.	The Town has completed a portion of the culvert study, but not comprehensively.
Assessments of existing culverts for upgrading needs, size requirements, and new regulations.	Adams DPW regularly maintains and assesses the capacity and upgrade potential of culverts in Town.
Study condition of private flood chutes to determine town's ability to maintain and repair.	The Town has worked and will continue to work with private property owners to gain easement/access rights to maintain or remove hazardous infrastructure present on or near private property.
Study and identify problem areas with undersized pipes.	Town DPW and Community Development continue to identify problem areas and pipes in need of replacement or upgrade.
Evaluate retaining walls on lower East Hoosac.	The Town is exploring avenues for funding and continuing to evaluate issue with engineering firms.
Utility/Water Infrastructure	The Town has evaluated the retaining walls on East Hoosac and is hoping to repair them during the next hazard mitigation planning cycle.
Study and identify problem areas along aging water and sewer lines. Better communication with water district. Study combining of town and water district.	Town still needs to improve communication with the water district.

Top Recommendations to Improve Resilience (Organized by Category)	Notes / Comments
Assess vulnerable gas lines near bridges and other problem areas and prioritize projects.	DPW continues to assess problem areas.
Assess water main pipes at Quality Street Bridge crossing.	Town is assessing the bridge area. The Quality Street bridge will be replaced by Mass DOT in the near future.
Emergency Preparedness	
Designate more cooling, warming, and emergency overnight sheltering locations.	The Town has designated several other facilities for warming/cooling.
Pursue grants to upgrade Memorial School and prioritize this as designated shelter.	The facility has been upgraded and supplies are present for a shelter, but a plan has not been developed.
Well pumps that supply water for town do not have backup generators. Prioritize applying to grants or funding generators.	Town is hoping to acquire new backup generators during the next Hazard Mitigation planning cycle.
Update evacuation and sheltering plans; need more integration into town. Designated shelter site (Memorial School) does not have a generator for backup power.	A plan for the Memorial School Shelter has yet to be developed.
Emergency Response	
Expand public emergency notification system, and process for communicating with public. Investigate a siren system.	Several new emergency alert systems have been adopted by the Town; the Town will continue to expand those systems.
Find ways to attract more first responders to the town of Adams.	Minimal progress has been made; this is an issue throughout the region.

Comprehensive Range of Mitigation Actions

C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))

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

Identifying a range of mitigation actions was a process that included identifying and analyzing problem statements developed in Chapter 4 (Risk Assessment) for each hazard profiled. The HMPC considered 5 key assets when defining problem statements for the Town of Adams. These are:

1. People (including underserved communities and socially vulnerable populations)
2. Structures (including facilities, lifelines, and critical infrastructure)
3. Systems (including networks and capabilities)
4. Natural, historic, and cultural resources
5. Activities that have value to the community

In addition to problem statements, Chapter 4 (Risk Assessment) considered Changes in Population Patterns and Changes in Land Use and Development for each hazard profiled.

Chapter 5 (Capability Assessment) included potential actions in each of FEMA's mitigation action categories (plans and regulations, structure and infrastructure, natural resources protection, and education and awareness).

The HMPC considered the problem statements, changes in population and land use, Capability Assessment recommendations and the status of previously identified mitigation actions and MVP recommendations to develop a list of mitigation actions for this plan update. The HMPC sought to solve problems identified with the mitigation actions.

This process is illustrated in the figure below. The first column Hazards, indicates the natural hazards considered in the plan in the order of High, Medium, or Low Risk, as reviewed in the Risk Assessment (Chapter 4). The second column, Problems to Assets, indicates that the hazards caused problems in the categories of people, structures, systems, natural, historic, and cultural resources, and activities that have value to the community. The third column, Mitigation Actions, shows the four categories of mitigation action.

Figure 18. Process of Identifying a Range of Mitigation Actions.

In addition to this quantitative approach to identifying mitigation actions, the HMPC took a qualitative approach through the public outreach and engagement process to identify mitigation actions. Mitigation actions supporting underserved communities and environmental justice communities were specifically considered by the HMPC. They also focused on actions to the built environment both buildings and infrastructure as well as future development or redevelopment. The resulting list of mitigation actions includes at a minimum one action for hazard identified. In several instances multiple actions address an identified hazard and problem. For instance, flooding is addressed through multiple actions. The HMPC and the public considered four mitigation action categories defined in Figure 19 below when considering solutions to identified problems.

Local Plans and Regulations

- Government authorities, policies, or codes that shape how land and buildings are developed and maintained.

Structure and Infrastructure

- Projects modifying existing infrastructure to remove it from a hazard area, or building new structures in ways that reduce the impacts of hazards.

Natural Systems Protection

- Actions that reduce damage and losses, and that preserve or restore the functions of natural systems.

Education and Awareness Programs

- Sustained programs to teach the public and decision makers about hazard risks and community mitigation programs.

Figure 19. Four Types of Mitigation Actions.

Examples of actions in each of the above categories are shown in the table below.

Table 64. Examples of Mitigation Actions.

Mitigation Action Category	Examples of Mitigation Actions
Local Plans and Regulations	• Comprehensive plans • Land use ordinances • Subdivision regulations • Development review • Building codes and enforcement • NFIP Community Rating System • Capital improvement programs • Open space preservation • Stormwater management regulations and master plans
Structure and Infrastructure Projects	• Acquisitions and elevations of structures in flood-prone areas • Utility undergrounding

Mitigation Action Category	Examples of Mitigation Actions
	• Structural retrofits • Floodwalls and retaining walls • Detention and retention structures • Culverts
Natural Systems Protection	• Sediment and erosion control • Stream corridor restoration • Forest management • Conservation easements • Wetland restoration and preservation
Education and Awareness Programs	• Radio or television spots • Websites with maps and information • Real estate disclosure • Presentations to school groups or neighborhood organizations • Mailings to residents in hazard-prone areas

Potential mitigation actions for each identified hazard and problem identified in the Risk Assessment are shown Table 65 below. Hazards are listed in order of risk. Some of these mitigation actions are included in the Action Plan; some were not included because of cost-benefit-analysis outcomes or inconsistency with Town priorities. The Town considered the following list of hazards from the previous mitigation plan too general to keep in this plan:

- Improve/update water delivery infrastructure
- Continue participation in regional Emergency Planning organizations
- Water conservation outreach

Table 65. Possible Mitigation Actions.

Hazard	**Possible Mitigation Actions**
Flooding from Precipitation and Dam Overtopping	• Assess condition of main water lines and the Quality Street Bridge. • Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
Severe Winter Storms	• Develop a Debris Management Plan and designate a location for debris processing following a disaster.

Hazard	Possible Mitigation Actions
	• Develop local shelter plan for Adams Memorial School and backup shelters.
Average and Extreme Temperatures	• Develop and adopt a Climate Adaptation Plan. • Designate more Cooling/Warming Centers.
Hurricanes and Tropical Storms	• Create a Stormwater Bylaw.
Invasive Species	• Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams. • Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.
Other Severe Weather	• Monitor Integrity of Southwick Brook.
Droughts	• Develop and adopt a Climate Adaptation Plan.
Landslides	• Alleviate the risk of landslides around East Street and Walling Road. • Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.
Tornadoes	• Expand emergency notification system to include cell phones and email; investigate siren system.
Wildfires/Brushfires	• Develop a Vegetation Management Plan.
Earthquakes	• Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning. • Develop a Debris Management Plan and designate a location for debris processing following a disaster.

Mitigation Action Plan

C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))

The HMPC then had the job to create a cost-effective mitigation action plan that included projects to address the identified hazards, areas of risk and vulnerable assets. An online Mitigation Action Tracker was developed for the Town to track the implementation of each mitigation action. The Mitigation Action Tracker was an online spreadsheet with separate cells showing each action's essential details. These column labels (essential details) listed below are included to facilitate the Town's ability to sort through the actions as well as to apply for grant funding.

Table 66. Essential Details for Mitigation Actions.

Essential Details	Detail Description
Action Title	Typically, a short description of the mitigation action.
Action Description	A detailed description of the action that includes the purpose or what natural hazard or problem may be mitigated by implementing the mitigation action.
Action Lead	A position in Town government responsible for implementing the action.
Supporting Organizations	A possible list of supporting partners, these may be Town departments, regional organizations, state agencies or adjacent communities.
Potential Funding Source(s)	A list of possible grant sources or the location in the Town's budget for the funding necessary to implement the mitigation action.
Implementation Schedule	A timeline within 5 years (the life of the plan) that the Town hopes to implement the action.
Estimated Cost	An estimated cost designated as high, medium, or low. The Town considered these cost "buckets" because it is impossible to identify an exact cost for each mitigation action.
Hazard(s) Addressed	All the natural hazards that the action may mitigate are listed.

The priority order was chosen based on weighing costs versus benefits. It was imperative for the Town to determine if the costs associated with an action were reasonable compared to the corresponding benefits. To do this, the HMPC developed a prioritization table that included seven categories of criteria; these are detailed in the able below. Each category was assigned points with priority criteria given the highest points. The most points an action could earn was 22. Actions that scored 21 points or higher were ranked as High priority. Actions that scored between 16-20 points were considered Medium, and actions that scored under 15 points were considered low priority.

Table 67. Priority Ranking System.

	Criteria Category	Description	Detailed Ranking and Associated Points
1	Hazards Addressed	What level of hazards does the measure provide protection against?	High (Flooding from Precipitation and Dam Overtopping, Severe Winter Storms, Average and Extreme Temperatures) = 3 Medium (Hurricanes/Tropical Storms, Invasive Species, Other Severe Weather, Droughts, Landslides, Tornadoes, Wildfires & Brushfires) = 2 Low (Earthquakes) = 1
2	Approximate Cost	How much will the measure cost to implement?	Low (Under $10k) = 3 Medium ($10k - $100k) = 2 High over $100k) = 1
3	Implementation Timeline	How long will it take to implement the action?	1-2 Years = 3 3-4 Years = 2 5 or more Years = 1
4	Equity Focus	Does the measure provide support to Environmental Justice (EJ) and other Vulnerable Populations?	Direct Support = 3 Indirect Support = 2 No Support = 0
5	Protection of Lives	How effective is the measure in protecting lives and mitigating injuries resulting from the targeted hazard(s)?	Major Support = 3 Moderate Support = 2 Minor Support = 1 None = 0
6	Protection of Critical Facilities or Infrastructure	Does the measure provide protection of critical facilities and infrastructure?	Yes = 3 No = 0

	Criteria Category	Description	Detailed Ranking and Associated Points
7	Natural Resource Protection	Does the measure provide protection of natural resources?	Yes = 2 No = 0
8	Alignment with Objectives	Does the measure align with the HMP objectives?	Yes =2 No =0

All the actions are listed in Table 68 in order of priority with the action's essential details.

Additional tables are included in Appendix B. The breakdown of priority ranking points for each action is included in Appendix B. Readers of this plan must understand that the mitigation action list is aspirational, it does not mean that the HMPC is confident that all actions may be implemented in the span of five years.

Table 68. Adams Hazard Mitigation Actions.

1	**Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning.**	
High	**Action Description**	The Town should develop a COOP plan to map out the chain of command during a disaster scenario or EOC activation in the event that individuals are unable to attend.
	Lead Position	Town Planner
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director
	Cost	Low
	Potential Funding Sources	MEMA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards
	Implementation Schedule	2024-2025

2	**Develop annexes (Debris, Shelter etc.) for the Community Emergency Response Plan.**	
High	**Action Description**	Specific annexes to the CEMP will allow for better response and recovery from disasters.
	Lead Position	Town Planner
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director

	Cost	Low
	Potential Funding Sources	MEMA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards
	Implementation Schedule	2024-2025

3	**Investigate the possibility of utilizing MEMA's Wireless Emergency Alert (WEA) system in the event of a severe emergency.**	
High	**Action Description**	The Wireless Alert System (WEA) is a tool that MEMA can use in the case of severe emergencies that pings all cell phones in a defined radius with an emergency alert. This means that even individuals who are not subscribed to the Town's existing notification systems will receive an alert. This tool could be critical in a severe disaster, and the Town should look into using it.
	Lead Position	Emergency Management Director
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director
	Cost	Low
	Potential Funding Sources	MA Executive Office of Public Safety and Security, Public Safety Answering Point and Regional Emergency Communication Center Support and Incentive Grants
	Hazards	All Hazards
	Implementation Schedule	2024-2025

4	**Review and restructure Emergency Operations Center (EOC) organization, ensure that the Adams EOC is ready for an activation.**	
High	**Action Description**	Since the last EOC activation, much of the staff in Adams that would likely fill a role an activation has changed. New staff are likely unaware of what role they would play in an EOC activation. A formal restructure and reassignment of roles would ensure that the EOC is ready and capable to activate.
	Lead Position	Emergency Management Director
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director, Community Development
	Cost	Low
	Potential Funding Sources	MEMA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards

	Implementation Schedule	2024-2025

5	**Complete an update of the Adams Comprehensive Emergency Management Plan (CEMP).**	
High	Action Description	The CEMP plan has not received an update since 2018, and desperately needs an update.
	Lead Position	Town Planner
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director
	Cost	Low
	Potential Funding Sources	MEMA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards
	Implementation Schedule	2024-2025

6	**Develop a Debris Management Plan and designate a location for debris processing following a disaster**	
High	Action Description	A Debris Management Plan should be developed to ensure debris is cleaned up and processed according to FEMA's standards. This will improve the Town's debris management during disasters and also open the Town up for FEMA reimbursement for debris cleanup.
	Lead Position	Town Planner
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director
	Cost	Low
	Potential Funding Sources	FEMA BRIC
	Hazards	Hurricanes and Tropical Storms, Other Severe Weather, Landslides, Tornadoes, Earthquakes
	Implementation Schedule	2024-2026

7	**Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.**	
High	Action Description	The Town will continue to identify areas and structures of interest that could become hazardous.
	Lead Position	Community Development Director

	Supporting Agencies	Historical Commission, Berkshire Regional Planning Commission
	Cost	Low
	Potential Funding Sources	MA Preservation Projects Fund (MPPF), Preservation Massachusetts: MA Historic Preservation Matching Grant
	Hazards	Flooding from Precipitation and Dam Overtopping, Hurricanes and Tropical Storms, Other Severe Weather, Tornadoes
	Implementation Schedule	2024-2029

8	**Monitor Integrity of Southwick Brook.**	
High	**Action Description**	Southwick Brook is currently in more or less stable condition, but the channel will need to be monitored to ensure that it remains in good condition.
	Lead Position	Department of Public Works Supervisor
	Supporting Agencies	Community Development
	Cost	Low
	Potential Funding Sources	FEMA BRIC, MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2029

9	**Repair the retaining walls on East Hoosac and Richmond Lane.**	
High	**Action Description**	The Town has conducted some engineering studies on Richmond Lane's retaining walls, and would like to conduct repairs on both locations
	Lead Position	Community Development Director
	Supporting Agencies	Department of Public Works
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2029

10	Assess condition of main water lines and the Quality Street Bridge.	
High	Action Description	The Quality Street Bridge needs to be replaced in 2024.
	Lead Position	Department of Public Works Supervisor
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	MA Department of Environmental Protection (DEP): Water Quality Monitoring Grant Program, MA Department of Transportation (MassDOT): Small Bridge Replacement Program
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Invasive Species, Other Severe Weather
	Implementation Schedule	2024-2025

11	Investigate the possibility of hosting Table-Top Exercises or Full Scale Exercises to test the Adams/Regional Responders capabilities.	
High	Action Description	Adams and its regional neighbors should test their response capabilities in Table Top Exercises (TTX) or full scale exercises.
	Lead Position	Emergency Management Director
	Supporting Agencies	Community Development
	Cost	Low
	Potential Funding Sources	MEMA Emergency Management Grant
	Hazards	All Hazards
	Implementation Schedule	2024-2025

12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.	
High	Action Description	0
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MA Division of Ecological Restoration: Culvert Replacement Municipal Assistance Program
	Hazards	Flooding from Precipitation, Severe Winter Storms, Hurricanes and Tropical Storms, Other Severe Weather, Tornadoes

	Implementation Schedule	2024-2025

13	Evaluate small stormwater conveyances.	
High	Action Description	The Department of Public Works needs to identify, map, and assess the condition of the various Stormwater and flood infrastructure.
	Lead Position	Department of Public Works Supervisor
	Supporting Agencies	Community Development
	Cost	Low
	Potential Funding Sources	MA Department of Environmental Protection: Stormwater MS4 Municipal Assistance Program
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2029

14	Create a Stormwater Bylaw.	
High	Action Description	The Community Development Department has been in the process of developing a Stormwater Bylaw for some time. It would be advantageous to complete the bylaw sooner rather than later.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development
	Cost	Low
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2025

15	Map and monitor all small stormwater conveyances, especially in known problem areas.	
High	Action Description	Department of Public Works and Community Development Department seek to properly mark up where all stormwater conveyances are in Town.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works

	Cost	Low
	Potential Funding Sources	Environmental Protection Agency: Water Infrastructure Finance and Innovation Act (WIFIA), MA Department of Environmental Protection: Stormwater MS4 Municipal Assistance Program
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2029

16	**Work with property owners to obtain easements/legal rights to access and maintain vital flood infrastructure (Jordan St./ Fisk St. Dam).**	
High	**Action Description**	The Town needs access to private property to maintain flood infrastructure.
	Lead Position	Community Development Director
	Supporting Agencies	Department of Public Works
	Cost	Low
	Potential Funding Sources	Community Development Department Budget
	Hazards	Flooding from Precipitation and Dam Overtopping, Severe Winter Storms, Hurricanes and Tropical Storms, Other Severe Weather, Tornadoes
	Implementation Schedule	2026-2028

17	**Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.**	
Medium	**Action Description**	The Community Development Department has attempted to identify the owner of the land on which the Fisk Street Dam is located on. The search has been unsuccessful. The Town will seek to identify the owner or seek to obtain the ability to mitigate the hazards posed by the dam.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant, MA Executive Office of Energy and Environmental Affairs (EEA): Dam and Seawall Repair or Removal Program Grant
	Hazards	Dam Overtopping
	Implementation Schedule	2025-2028

18	Expand emergency notification system to include cell phones and email; investigate siren system.	
Medium	Action Description	The Town currently uses Red Alert and Reverse 911 but should expand its emergency notification system.
	Lead Position	Adams Police/Fire District
	Supporting Agencies	
	Cost	Low
	Potential Funding Sources	FEMA BRIC, MEMA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards
	Implementation Schedule	2025-2027

19	Develop and adopt a Climate Adaptation Plan.	
Medium	Action Description	The Town has done many activities that fall in line with Climate Adaptation but does not have a formal plan. The Town should formalize its strategy to adapt to the changing climate.
	Lead Position	Town Planner
	Supporting Agencies	Community Development, Board of Health
	Cost	Medium
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant
	Hazards	Flooding from Precipitation, Severe Winter Storms, Average and Extreme Temperatures, Hurricanes and Tropical Storms, Invasive Species, Other Severe Weather, Droughts, Landslides, Tornadoes, Wildfires/Brushfires
	Implementation Schedule	2024-2026

20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.	
Medium	Action Description	The Town will continue to work with the Army Corps of Engineers to maintain the flood chutes in Town.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Low

	Potential Funding Sources	Army Corps of Engineers
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2029

21	**Address flooding damaging properties roads and road crossings along Southwick Brook.**	
Medium	**Action Description**	The Town seeks to identify and address multiple possible hazards that may arise from aging infrastructure in both crossings over the Southwick brook and also the flood conveyance itself.
	Lead Position	Department of Public Works Supervisor
	Supporting Agencies	Community Development
	Cost	High
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2026-2028

22	**Establish a regular maintenance schedule for the entire stormwater system.**	
Medium	**Action Description**	The Town will continue to pursue a maintenance schedule for the entire Stormwater system.
	Lead Position	Department of Public Works Supervisor
	Supporting Agencies	Community Development
	Cost	Low
	Potential Funding Sources	MA Department of Environmental Protection: Stormwater MS4 Municipal Assistance Program
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2026

23	**Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.**	
Medium	**Action Description**	The study was not performed as it was delayed, the action item will be continued to the next plan cycle.

	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2026-2027

24	Complete a Community Points of Distribution Plan (CPDP) for the Town.	
Medium	Action Description	The Town should designate a point of distribution for resources received during disasters.
	Lead Position	Town Planner
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director
	Cost	Low
	Potential Funding Sources	MEMA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards
	Implementation Schedule	2024-2025

25	Designate more Cooling/Warming Centers.	
Medium	Action Description	Adams needs to identify several possible locations for Heating and Cooling centers.
	Lead Position	Emergency Management Director
	Supporting Agencies	Adams Police Department, Adams Fire District
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MEMA Emergency Management Performance Grant (EMPG)
	Hazards	Severe Winter Storms, Extreme Temperatures
	Implementation Schedule	2025-2026

26	Implement a stormwater management program to comply with EPA's MS4 regulations.

Medium	Action Description	The Town will continue to comply with its MS4 Stormwater responsibilities and needs a plan to achieve this objective more more efficiently.
	Lead Position	Department of Public Works Supervisor
	Supporting Agencies	Community Development
	Cost	Low
	Potential Funding Sources	MA Department of Environmental Protection: Stormwater MS4 Municipal Assistance Program
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2024-2026

27	Identify and address Jordan St. drainage system problems.	
Medium	Action Description	The Town is currently working on reconstructing the Jordan St culvert via a grant with FEMA. Mitigation work to stabilize the channel was completed in the summer of 2023, making the channel much more effective. The Town also seeks easement/access rights to maintain an emergency offshoot channel of the Jordan St culvert.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	High
	Potential Funding Sources	MA Division of Ecological Restoration (DER): Culvert Replacement Municipal Assistance, MA Executive Office of Energy and Environmental Affairs: MVP Action Grant, MA Executive Office of Economic Development: Community One Stop for Growth
	Hazards	Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather
	Implementation Schedule	2025-2026

28	Develop local shelter plan for Adams Memorial School and backup shelters.	
Medium	Action Description	The Town seeks to create a shelter plan for the Memorial School, and also would like to identify backup shelters in the event that memorial school is not available.
	Lead Position	Emergency Management Director
	Supporting Agencies	Adams Police Department, Adams Fire District, Emergency Management Director
	Cost	Low

	Potential Funding Sources	FEMA BRIC, MEMA Emergency Management Performance Grant (EMPG), CDBG
	Hazards	All Hazards
	Implementation Schedule	2024-2025

29	**Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.**	
Medium	**Action Description**	This program will include information regarding heating and cooling centers. It will also include community events . This action is part of implementing not only this plan but the MVP plan and the Town's Open Space and Recreation Plan.
	Lead Position	Council on Aging Director
	Supporting Agencies	Town Planner, Adams Housing Authority, Adams-Cheshire Regional School District, Hoosac Valley Regional School District
	Cost	Low
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs: MVP Action Grant, Massachusetts Cultural Council Grants, FEMA BRIC
	Hazards	All Hazards
	Implementation Schedule	2026-2029

30	**Work with local school districts to develop and implement hazard mitigation campaigns.**	
Medium	**Action Description**	Reaching all members of the population is necessary for public safety. Not all residents are aware of Reverse 911 or know how to register for it. The Town will conduct outreach with specific efforts through the schools and to the elderly.
	Lead Position	Town Planner
	Supporting Agencies	Adams-Cheshire Regional School District, Hoosac Valley Regional School District, Council on Aging
	Cost	Low
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs: MVP Action Grant, Massachusetts Cultural Council Grants, FEMA BRIC
	Hazards	All Hazards
	Implementation Schedule	2026-2029

31	**Develop a Vegetation Management Plan.**

Low	**Action Description**	The Town needs to create a Vegetation Management Plan to safely deal with nuisance vegetation that could have the potential to cause wildfires.
	Lead Position	Town Planner
	Supporting Agencies	Community Development, Fire District, Conservation Commission, Board of Health, Department of Public Works
	Cost	Low
	Potential Funding Sources	MA Bureau of Forest Control and Forestry: Community Forest Stewardship Implementation Grant
	Hazards	Wildfires/Brushfires
	Implementation Schedule	2024-2025

32	**Repair the Pecks Brook Retaining Walls.**	
Low	**Action Description**	The Pecks Brook retaining walls need to be repaired in order to mitigate flood hazards from the Fisk Brook.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	High
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs (EEA): MVP Action Grant
	Hazards	Flood from Precipitation and Dam Overtopping
	Implementation Schedule	2025-2026

33	**Repair the retaining walls on East Hoosac and Richmond Lane.**	
Low	**Action Description**	The retaining walls on East Hoosac Street in Richmond Lane are in need of repair and pose a flood risk to the surrounding neighborhoods. The Town has begun the process of analyzing how repairs to the Richmond Lane retaining walls could be done.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MA Executive Office of Energy and Environmental Affairs: MVP Action Grant
	Hazards	Flood from Precipitation and Dam Overtopping

	Implementation Schedule	2025-2028

34	**Remove Bassett Brook Reservoir.**	
Low	**Action Description**	Removal of Bassett Brook Reservoir mitigates the risk of flooding.
	Lead Position	Water Department Superintendent
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MA Executive Office of Energy and Environmental Affairs: MVP Action Grant, MA Executive Office of Energy and Environmental Affairs (EEA): Dam and Seawall Repair or Removal Program Grant
	Hazards	Flood from Precipitation and Dam Overtopping
	Implementation Schedule	2025-2028

35	**Further public education on the Town website for natural hazard mitigation and preparedness.**	
Low	**Action Description**	The Town's website and social media presence are excellent tools for communication with residents and within Town departments.
	Lead Position	Town Planner
	Supporting Agencies	Council on Aging, Emergency Management Director
	Cost	Low
	Potential Funding Sources	Emergency Management Department Budget, MA EMPG Grant, FEMA BRIC
	Hazards	All Hazards
	Implementation Schedule	2024-2029

36	**Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams.**	
Low	**Action Description**	Emerald Ash Borer has damaged or killed many trees in Adams.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Low

	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs: MVP Action Grant, MA Division of Fisheries and Wildlife: MassWildlife Habitat Management Grant Program
	Hazards	Invasive Species, Wildfire and Brushfire
	Implementation Schedule	2025-2028

37	**Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.**	
Low	**Action Description**	Invasive species are problematic throughout the Town and have been verified in Greylock Glen, Ragged Mountain, and along the train tracks.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Low
	Potential Funding Sources	MA Executive Office of Energy and Environmental Affairs: MVP Action Grant, MA Division of Fisheries and Wildlife: MassWildlife Habitat Management Grant Program
	Hazards	Invasive Species, Wildfire and Brushfire
	Implementation Schedule	2025-2028

38	**Alleviate the risk of landslides around East Street and Walling Road.**	
Low	**Action Description**	Though landslides are not a persistent issue, the Town should conduct a study to investigate possible actions that could be taken to mitigate the risk of landslides in the East Street/Walling Road area.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MA Executive Office of Energy and Environmental Affairs: MVP Action Grant
	Hazards	Landslides
	Implementation Schedule	2025-2028

39	**Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.**

Low	**Action Description**	The Community Resilience Building Summary Report for Adams implies that landslides have been a potential challenge at the Specialty Minerals sites in the northern part of the Town.
	Lead Position	Community Development Director
	Supporting Agencies	Community Development, Department of Public Works
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, MA Executive Office of Energy and Environmental Affairs: MVP Action Grant
	Hazards	Landslides
	Implementation Schedule	2025-2028

40	**Develop policies/plans to improve the Town's Cybersecurity posture so emergency response is not impacted.**	
Low	**Action Description**	Cybersecurity is a hazard that has already caused issues for the Town. The Town's servers were hacked in 2019 causing the loss of many important files and documents. The Town is the steward of much private and sensitive information, and should ensure that it is able to capably protect that information.
	Lead Position	Town Planner
	Supporting Agencies	$0
	Cost	Low
	Potential Funding Sources	MA Office of Municipal and School Technology: Municipal Cybersecurity Awareness Grant Program
	Hazards	All Hazards
	Implementation Schedule	2024-2026

Table 69 shows the mitigation actions that specifically target vulnerable populations and Table 70 shows the mitigation actions that specifically target buildings and infrastructure. Each table lists the actions in order of priority.

Table 69. Actions that Target Vulnerable Populations.

Action #	Action Title
25	Designate more Cooling/Warming Centers.
28	Develop local shelter plan for Adams Memorial School and backup shelters.

Action #	Action Title
29	Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.
30	Work with local school districts to develop and implement hazard mitigation campaigns.

Table 70. Actions that Target Buildings and Infrastructure.

Action #	Action Title
7	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.
10	Assess condition of main water lines and the Quality Street Bridge.
12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
13	Evaluate small stormwater conveyances.
15	Map and monitor all small stormwater conveyances, especially in known problem areas.
17	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.
20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.
21	Address flooding damaging properties roads and road crossings along Southwick Brook.
22	Establish a regular maintenance schedule for the entire stormwater system.
23	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.
26	Implement a stormwater management program to comply with EPA's MS4 regulations.
27	Identify and address Jordan St. drainage system problems.
33	Repair the retaining walls on East Hoosac and Richmond Lane.

Possible Funding Sources

All the mitigation actions included in this plan have identified one or more potential funding sources. The HMWG focused on projects eligible for MVP Grant funding and FEMA BRIC funding. Below is a list of some of the federal and state funding mechanisms that may assist in implementing mitigation actions.

Federal Emergency Management Agency (FEMA) Mitigation Grants

The Federal Emergency Management Agency (FEMA) makes grant funding available for a range of mitigation activities via several Hazard Mitigation Assistance (HMA) programs. These grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. They are not intended to fund repair, replacement, or deferred maintenance activities but are rather designed to assist in developing long-term, cost-effective improvements that will reduce risk to natural hazards.

- **Building Resilient Infrastructure and Communities (BRIC)**
  BRIC is a new FEMA hazard mitigation program designed to replace the agency's former HMA

Pre-Disaster Mitigation (PDM) grant program, aiming to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. It is a result of recent amendments made to Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) by Section 1234 of the Disaster Recovery Reform Act of 2018 (DRRA). BRIC will support states, local communities, tribes, and territories as they undertake hazard mitigation projects reducing the risks they face from natural hazards. The BRIC program's guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

- **Hazard Mitigation Grant Program (HMGP)**
  The HMGP is authorized under Section 404 of the Stafford Act. The HMGP provides grants to states, tribes, and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. A key purpose of the HMGP is to ensure that any opportunities to take critical mitigation measures to protect life and property from future disasters are not lost during the recovery and reconstruction process following a disaster. HMGP is typically available only in the months after a federal disaster declaration, as funding amounts are determined based on a percentage of the funds spent on FEMA's Public and Individual Assistance programs.

- **Flood Mitigation Assistance (FMA) Program**
  The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. FEMA provides FMA funds to assist states and communities with implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities. One limitation of the FMA program is that it is generally used to provide mitigation for structures that are insured or located in Special Flood Hazard Areas (SFHAs) as mapped by FEMA. Federal funding for this nationally competitive grant program is generally an annual allocation (subject to Congressional appropriation) and eligibility is linked to a community's good standing in the NFIP.

Municipal Vulnerability Preparedness Action Grants[51]

The MVP Action Grant offers financial resources to municipalities seeking to advance priority climate adaptation actions to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts.

[51] State of Massachusetts. *MVP Action Grant.* https://www.mass.gov/service-details/mvp-action-grant.

Responses to the RFR may be submitted by municipalities who have received designation from the Executive Office of Energy and Environmental Affairs (EEA) as a Climate Change Municipal Vulnerability Preparedness (MVP) Community, or "MVP Community." All projects are required to provide monthly updates, project deliverables, a final project report, and a brief project summary communicating lessons learned. The municipality is also required to match 25% of total project cost using cash or in-kind contributions. All proposals must include the following:

- Completed application template
- Project budget and deliverables
- MVP yearly progress report describing any relevant work toward advancing community priorities since earning MVP designation
- Statement of match
- Letters of support from landowner (if applicable), partners, and the public

Project types include:

- ***Detailed Vulnerability and Risk Assessment*** – In-depth vulnerability or risk assessment of a particular sector, location, or other aspect of the municipality.
- ***Public Education and Communication*** – Projects that increase public understanding of climate change impacts within and beyond the community and foster effective partnerships to develop support.
- ***Local Bylaws, Ordinances, Plans, and other Management Measures*** – Projects to develop, amend, and implement local ordinances, bylaws, standards, plans, and other management measures to reduce risk and damages from extreme weather, heat, flooding, and other climate change impacts.
- ***Redesigns and Retrofits*** – Engineering and construction projects to redesign, plan, or retrofit vulnerable community facilities and infrastructure (e.g., wastewater treatment plants, culverts, and critical municipal roadways/evacuation routes) to function over the life of the infrastructure given projected climate change impacts.
- ***Energy Resilience Strategies*** — Projects that incorporate clean energy generation, such as micro grids, and that are paired with resilience enabling technology to maintain electrical and/or heating and cooling services at critical facilities.
- ***Chemical Safety and Climate Vulnerabilities*** — Projects that seek to engage the business and manufacturing community through assistance or training on identifying vulnerabilities to chemical releases due to severe weather events, reducing use of toxic or hazardous chemicals, outreach to improve operations and maintenance procedures to prevent chemical releases and

accidents, outreach to improve emergency and contingency planning, and/or identifying existing contaminated sites that pose chemical dispersion risks during flood events.

- ***Nature-Based Storm-Damage Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques*** – Projects that utilize natural resources and pervious surfaces to manage coastal and inland flooding, erosion, and other storm damage, such as stormwater wetlands and bio-retention systems, and other Smart Growth and Low Impact Development techniques.

- ***Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality*** – Projects that utilize natural resources, vegetation, and increasing pervious surface to reduce ambient temperatures, provide shade, increase evapotranspiration, improve local air quality, and otherwise provide cooling services within the municipality.

- ***Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts*** – Nature-based projects that address other impacts of climate change such as extreme weather, damaging wind and power outages, and increased incidence of pests and vector-borne illnesses and other public health issues.

- ***Acquisition of Land to Achieve a Resiliency Objective*** — Land purchases are eligible for grant funding if the parcel has been identified through a climate vulnerability assessment as an appropriate location for a specific eligible adaptation activity to occur, such as accommodating an infrastructure or facility redesign or retrofit project, providing natural flood storage to reduce downstream flooding, or removal of pavement and planting of trees to reduce flooding and heat island effects.

- ***Ecological Restoration and Habitat Management to Increase Resiliency*** — Projects that repair or improve natural systems for community and ecosystem adaptation, such as right-sizing culverts, dam removal, restoration of coastal wetlands, etc.

- ***Subsidized Low Income Housing Resilience Strategies*** — Investments in resiliency measures for affordable housing to protect vulnerable populations that may not have the resources to recover from an extreme climate event.

- ***Mosquito Control Districts*** — Projects to reduce the risk to public health from mosquito-borne illness and to increase mosquito surveillance and control capacity by incentivizing municipalities not in an organized mosquito control project or district to form a new mosquito control district or join an existing mosquito control district. Also funding for municipalities currently in a mosquito control district for new or proactive mosquito control measures.

Chapter 7. Plan Implementation and Maintenance

The Town's Planner is the primary point of contact for the Hazard Mitigation Plan's implementation and maintenance. The Hazard Mitigation Planning Committee (HMPC) will implement the mitigation strategy and specific mitigation actions outlined in this plan, and update and maintain the plan according to the guidelines below. The HMPC includes key stakeholders in the Town, who will use the plan's goals, as well as continued analysis of hazard risks and capabilities, to weigh the available resources against the costs and benefits for each mitigation action. The Town understands the value of this plan and its positive mitigation impact and intends to continue updating this plan and implementing its strategies.

Continued Public Participation

D1. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))

Public participation is an integral component of the mitigation planning process and will continue to be essential as this plan is implemented and updated over time. Based on the high level of interest in the mitigation planning process and in the Municipal Vulnerability Preparedness project, Town residents and stakeholders are interested in hazard mitigation and climate adaptation. The HMPC included a couple of education and outreach mitigation actions designed to engage the public. The Town intends to involve the public throughout the five-year implementation of this plan, as well as in the reviewing and updating processes. The Town Planner will take the lead in soliciting participation from the public with support from other Town departments and the Council on Aging. This participation will take multiple forms, including all of those outlined in the Chapter 3 (Planning Process) of this plan. Efforts to involve the public include:

- Advertising on the Town's website and through standard meeting laws.
- Posting news and announcements on the social media pages managed by Town departments, boards, and committees and Town Entities such as the Fire District.
- Conducting outreach to local community organizations and businesses.
- Hosting public presentations and meetings throughout the plan's five-year term to acquire feedback and input from stakeholders.
- Record all meetings and add links of the recordings on the Town's website.
- Post copies of the plan on the Town's website and keep a hard copy at the Visitor Center and the Town Hall for public review.
- Continue to work with vulnerable populations, local organizations, private industry, regional agencies, and adjacent communities as this plan is implemented.

Method and Schedule for Keeping the Plan Current

D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))

The HMPC and the Town of Adams recognize the importance of keeping the mitigation plan up to date. The HMPC will meet twice a year for the purposes of implementing and maintaining the Hazard Mitigation Plan. This work includes monitoring, evaluating, and updating the plan over a five-year period. Overall, the responsibility for monitoring the Plan rests with the Town Planner.

Process to Track Actions

***MONITORING** means tracking the implementation of the plan over time.*

The Town Planner and the HMPC will maintain the Mitigation Action Tracker (a tool to record the status of each mitigation action). They will send a reminder email with a link to the web-based Mitigation Action Tracker on a semi-annual basis (January and July) to all Department Heads responsible for a mitigation action and to relevant Town committees. They may also distribute the Mitigation Action Progress Worksheet (shown in Appendix C) for Department Heads who prefer a form over a digital spreadsheet.

If the Town experiences a large-scale disaster, the Town Planner will assemble an HMPC meeting to update the list of mitigation actions and review their order based on current priorities.

Process to Evaluate Effectiveness of the Plan

***EVALUATING** means assessing the effectiveness of the plan at achieving its stated purpose and goals.*

The HMPC has agreed to meet on a bi-annual basis to review the implementation of the mitigation plan. The first meeting will take place in July; the second, in January.

At the first meeting (July 2024), the HMPC will review the effectiveness of the planning process, public and stakeholder engagement, risk analysis, and the mitigation strategy, including its implementation. It is recommended that the HMPC use the worksheet provided in Appendix C. Beyond considering the planning process, the HMPC will seek to answer the following questions to determine if the plan is effective at mitigating risk to Town residents, the built environment, and the natural environment.

- Can the HMPC identify success stories of losses avoided because of hazard mitigation measures implemented? Can the HMPC identify political, social, and economic successes?
- Have the mitigation actions implemented achieved benefits beyond the cost of mitigation?

- Have the implemented mitigation actions saved lives or protected property?
- Does the list of mitigation actions coincide with the Town's priorities? Do additional actions need to be added?

Process to Update the Plan

> ***UPDATING** means reviewing and revising the plan at least once every five years.*

At each semi-annual meeting, the HMPC will review the plan's goal statements and mitigation action status. If necessary, the goal statements and mitigation actions may be revised to reflect current Town priorities. In addition, the HMPC will discuss methods for continuing to integrate the mitigation plan with other plans, processes, and projects in the Town.

They will brief the Selectboard as requested and post any significant updates to the Plan to the Town's website. The HMPC recognizes the value in keeping the public and key stakeholders informed about the implementation and status of the mitigation plan.

HMPC members will continue to participate in regional and state-based meetings to stay current with best risk-mitigation practices. Such meetings may include the Massachusetts Emergency Management Agency (MEMA), Berkshire Regional Planning Commission (BRPC), and Massachusetts Department of Conservation and Recreation (DCR). The HMPC will also participate in land use planning and mitigation planning meetings with their neighbors, North Adams, Cheshire, Savoy, Florida, Williamstown, and New Ashford.

The Town of Adams agrees to update and adopt this mitigation plan on a five-year basis. The update will include a comprehensive review and planning process like the one used to develop this mitigation plan update. It will update the mitigation action list, current land use practices, collect and review best available data, review the capability assessment, and engage the public and stakeholders. This process will occur according to FEMA guidelines. The HMPC will seek funding for the development of the plan update **two years** before the plan expires. The plan update process gives the Town the chance to add and/or re-prioritize mitigation actions based on current risk, capabilities, and public/stakeholder suggestions. The Town Planner will serve as the Project Manager for the update process. The figure below illustrates the update timeline.

Year 1	Year 2	Year 3	Year 4	Year 5
• Seek grant funding for mitigation actions • Gather the HMPC in January and July	• Seek grant funding for mitigation actions • Gather the HMPC in January and July	• Seek FEMA BRIC funding for plan update • Seek grant funding for mitigation actions • Gather the HMPC in January and July	• Begin the plan update process • Seek grant funding for mitigation actions • Gather the HMPC in January and July	• Complete the plan update process - adopt the new plan • Seek grant funding for mitigation actions • Gather the HMPC in January and July

Figure 20. Plan Update and Implementation Schedule.

The National Dam Safety Program Act has authorized FEMA to provide High Hazard Potential Dams (HHPD) Rehabilitation Grant Program assistance for the rehabilitation of dams that do not meet minimum safety standards and pose substantial risk to life and property.[52] Towns interested in accessing the HHPD grant must have an approved local hazard mitigation plan and meet criteria outlined in Element G: High Hazard Potential Dams. Element G is optional for local governments. While this Plan update did not address Element G requirements, the Town of Adams will consider adding Element G during the next Plan update. Meeting the requirements of Element G include answering the following questions:

- Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?
- Did the plan address HHPDs in the risk assessment?
- Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?
- Did the plan include actions that address HHPDs, and prioritize mitigation actions to reduce vulnerabilities from HHPDs?

[52] Local Mitigation Planning Policy Guide, FEMA, Effective April 19, 2023, p.32.

Responsible Parties for Plan Implementation and Maintenance

Adams, MA

Kevin Rayner, Town Planner

Town of Adams

8 Park Street, Adams, MA 01220

Phone: 413-743-8300 ext. 132

Email: krayner@town.adams.ma.us

For State resources:

Massachusetts Emergency Management Agency:

Address: 400 Worcester Road, Framingham, MA 01702-5399

Phone: 508-820-2000 (MEMA Headquarters and Communications Center)

or 978-328-1500 (MEMA Region 1 Office)

Website: https://www.mass.gov/orgs/massachusetts-emergency-management-agency

For Federal resources:

Federal Emergency Management Agency:

Address: 220 Binney Street, Cambridge, MA 02142

Phone: 877-336-2734

Email: fema-r1-info@fema.dhs.gov

Website: https://www.fema.gov/region-i-ct-me-ma-nh-ri-vt

System to Integrate this Plan with Existing Planning Mechanisms

D3. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))

Plan Integration

For the Town of Adams to succeed in reducing hazard risks over the long term, the information, ideas, conclusions, and strategic recommendations of this hazard mitigation plan should be integrated throughout government operations. Effective integration means to include mitigation principles,

***INTEGRATE** means to include hazard mitigation principles, vulnerability information and mitigation actions into other existing community planning to leverage activities that have co-benefits, reduce risk and increase resilience.*

vulnerability information, and mitigation actions into other existing community planning mechanisms to leverage activities that have co-benefits, reduce risk, and increase resilience. Many other local plans and processes will present opportunities to address hazard mitigation in a way that can support multiple community objectives, so an important part of maintaining and implementing this hazard mitigation plan will be to identify and capitalize on these opportunities to leverage activities that have co-benefits (including but not limited to risk reduction). The Town's integration of hazard mitigation and climate adaptation content into its 2017 Strategic Plan demonstrates this type of integration by stressing the importance of community sustainability and climate resilience strategies across various elements of this separate planning document.

The HMPC will remain tasked with helping to ensure that all new or updated local plan documents are informed by and consistent with the goals and actions of this hazard mitigation plan and will not contribute to increased hazard vulnerability in Adams. Specifically, this includes but is not limited to the implementation or future updates to the following local plans as identified and further described in Chapter 5 (Capability Assessment):

- Municipal Vulnerability Preparedness (MVP) / Community Resilience Building (CRB) Summary of Findings Report (2018)
- Open Space and Recreation Plan (2019)
- Strategic Plan (2017)
- Community Development Strategy (2018)

> ***PLANNING MECHANISMS*** *refers to the governance structures used to manage local land use development and community decision-making, such as budgets, comprehensive plans, capital improvement plans, economic development strategies, climate action plans or other long-range plans.*

Additional opportunities to integrate the requirements of this plan into other local planning mechanisms shall continue to be identified through future meetings of the HMPC and through the five-year review process described in this chapter. Other planning mechanisms include local regulations and existing code enforcement procedures (i.e., zoning bylaws, site plan review, etc.), internal municipal policies, special projects or initiatives, and other routine government or community decision-making activities such as capital improvement planning and the Town's annual budget process. Emphasis for identifying these integration opportunities will be placed on those governance structures used to manage local land use and community development in both the pre-disaster and post-disaster environment. Also, as it relates to implementing specific mitigation actions identified in this plan, it will be the responsibility of each assigned lead department to determine additional measures that can support action completion or enhancement. This includes integrating mitigation actions from this plan into other local planning documents, processes, or mechanisms as deemed appropriate and most effective.

While it is recognized that there are many possible benefits to integrating components of this plan into other local planning mechanisms, the routine maintenance of this stand-alone plan is considered by the Town to be the most effective and appropriate method to identify, prioritize, and implement local hazard mitigation actions. In moving forward, however, the Town will consider the incorporation of some other plan documents into the hazard mitigation plan, such as any future iterations of the Town's MVP Plan or related climate adaptation planning efforts.

Acronyms

AAL	Average Annual Loss
APA	American Planning Association
APHIS	Animal and Plant Health Inspection Service
ASCE	American Society of Civil Engineers
BBRS	Board of Building Regulations and Standards
BCEGS	Building Code Effectiveness Grading Schedule
BRIC	Building Resilient Infrastructure and Communities
BRPC	Berkshire Regional Planning Commission
BRTA	Berkshire Regional Transit Authority
BTU	British Thermal Unit
BVW	Bordering Vegetated Wetlands
C2ES	Center for Climate and Energy Solutions
CAV	Community Assistance Visit
CAC	Community Assistance Contact
CDBG	Community Development Block Grant
CDC	Centers for Disease Control and Prevention
CDD	Consecutive Dry Days
CEMP	Comprehensive Emergency Management Plan
CFR	Code of Federal Regulations
CFS	Cubic Feet Per Second
CFM	Certified Floodplain Manager
CIP	Capital Improvement Program
CIS	Community Information System
CMR	Code of Massachusetts Regulations
COA	Council on Aging
COOP	Continuity of Operations Plan
CPA	Community Preservation Act
CRB	Community Resilience Building
CRS	Community Rating System
DAR	Department of Agricultural Resources
DCR	Department of Conservation and Recreation
DEP	Department of Environmental Protection
DMA	Disaster Mitigation Act
DMP	Drought Management Plan
DMTF	Drought Management Task Force
DOT	Department of Transportation
DRRA	Disaster Recovery Reform Act
DWR	Days Without Rain
EF	Enhanced Fujita

EJ	Environmental Justice
EMPG	Emergency Management Performance Grant
EOC	Emergency Operations Center
EOEEA	Executive Office of Energy and Environmental Affairs
EPA	Environmental Protection Agency
ERG	Eastern Research Group, Inc.
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flooding Insurance Study
FMA	Flooding Mitigation Assistance
FPA	Floodplain Administrator
FSim	Forest Service Fire Simulation System
FY	Fiscal Year
GHG	Greenhouse Gas
GIS	Geographic Information Systems
HHPD	High Hazard Potential Dam
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
HooRWA	Hoosic River Watershed Association
HVAC	Heating, Ventilation, and Air Conditioning
IBC	International Building Code
IBHS	Insurance Institute for Business and Home Safety
ICC	International Code Council
IEBC	International Existing Building Code
IECC	International Energy Conservation Code
IFC	International Fire Code
IMC	International Mechanical Code
IRC	International Residential Code
ISO	International Organization for Standardization
ISPSC	International Swimming Pool and Spa Code
LRRP	Local Rapid Recovery Plan
MCDA	Multi-Criteria Decision Analysis
MEMA	Massachusetts Emergency Management Agency
MGL	Massachusetts General Law
MGD	Million Gallons Per Day
MIPAG	Massachusetts Invasive Plant Advisory Group
MPH	Miles Per Hour
MPPF	Massachusetts Preservation Projects Fund
MSBC	Massachusetts State Building Code
MVP	Municipal Vulnerability Preparedness

NBCC	Northern Berkshire Community Coalition
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NE CASC	Northeast Climate Adaptation Science Center
NESIS	Northeast Snowfall Impact Scale
NFIP	National Flooding Insurance Program
NFIRA	National Flood Insurance Reform Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NWS	National Weather Service
OSRP	Open Space and Recreation Plan
PA	Public Assistance
PDM	Pre-Disaster Mitigation
PPC	Public Protection Classification
PPQ	Plant Protection and Quarantine
PSA	Public Service Announcement
PWS	Public Water Systems
RMAT	ResilientMass Action Team
RRP	Rapid Recovery Plan
RSI	Regional Snowfall Index
SFHA	Special Flood Hazard Areas
SHMCAP	State Hazard Mitigation and Adaptation Plan
SI/SD	Substantial Improvement/Substantial Damage
SPGA	Special Permit Granting Authority
SWMP	Stormwater Management Plan
TRI	Toxic Release Inventory
TS	Tropical Strom
US	United States
USC	U.S. Code
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USGCRP	U.S. Global Change Research Program
WEA	Wireless Emergency Alert
WPA	Wetlands Protection Act

Appendix A. Planning Process Supporting Materials

Hazard Mitigation Planning Committee Meetings

HMPC Meeting Participants

First Name	Last Name	Title	Affiliation	Phone	Email	HMPC #1 10/26/2023	HMPC #2 11/30/2023	HMPC #3 1/25/2023	HMPC #4 3/6/2024
John	Barrett	Water Department Superintendent	Adams Fire District	(413) 743-0978 ext.13	johnbarrett@adamsfiredistrict.com	☐	☐	☐	☑
Tim	Cota	Department of Public Works Supervisor	Town of Adams	(413) 743-8300 Ext. 172	tcota@town.adams.ma.us	☐	☐	☑	☐
Eammon	Coughlin	Community Development Director	Town of Adams	(413) 743-8300 Ext. 130	ecoughlin@town.adams.ma.us	☑	☐	☐	☐
Sarah	Fontaine	Council on Aging Director	Town of Adams	(413) 743-8333 Opt. 4	sfontraine@town.adams.ma.us	☑	☐	☑	☑
Gerald	Garner	Building Commissioner	Town of Adams	(413) 743-8300 Ext. 105	ggarner@town.adams.ma.us	☑	☑	☐	☑
Jay	Green	Town Administrator	Town of Adams	413-743-8300 Ext. 102	jgreen@town.adams.ma.us	☐	☐	☐	☐
Stephanie	Melito	Admin. Assistant for Department of Public Works	Town of Adams	(413) 743-8300 Ext. 122	smelito@town.adams.ma.us	☑	☑	☑	☐
John	Pansecchi	Fire Chief	Adams Fire District	(413) 743-0179 Ext. 16	jpansecchi@town.adams.ma.us	☑	☐	☑	☑
Kevin	Rayner	Town Planner	Town of Adams	(413) 743-8300 Ext. 132	krayner@town.adams.ma.us	☑	☑	☑	☑
Dave	Rhoads	Chair, Board of Health	Town of Adams	(413) 743-8300 Ext. 106	drhoads@town.adams.ma.us	☐	☐	☐	☐
William	Schrade	Executive Director, Adams Housing Authority	Town of Adams	(413) 652-1617	bills@ahauthority.com	☑	☐	☐	☐
Coby	Tarjick	Community Development Program Manager	Town of Adams	(413) 743-8300 Ext. 127	jtarjick@town.adams.ma.us	☐	☐	☐	☑

HMPC Meeting Agendas

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

KICK-OFF MEETING

TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE

DATE: 9/18/2023
TIME: 2:00-3:00PM
ZOOM: https://us02web.zoom.us/j/82446689561?pwd=dFNvdzVSS0ZoTFN4ZDJQTWI5NE94dz09
Meeting ID: 824 4668 9561
Passcode: 519125

AGENDA ITEMS

I. Project Introduction
II. Timeline and Tasks
III. Developing a Hazard Mitigation Planning Committee (HMPC)
IV. Sharing GIS Data
V. Updating Mitigation Actions
VI. Scheduling a HMPC Meeting for October

ACTION ITEMS

I. Develop the HMPC
II. Share GIS Data & Relevant Resources
III. Update Mitigation Action Tracker with Action Status
IV. Schedule a HMPC Meeting for October

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

HMPC MEETING #1

TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE

DATE: 10/26/2023

TIME: 12:30-2:00PM

ZOOM: https://us02web.zoom.us/j/86298898290?pwd=emc0YnpqZW9DRGZLR3hhL0Z3UHNUUT09
Meeting ID: 862 9889 8290
Passcode: 012969

AGENDA ITEMS

- **I.** Introductions
  - i. HMPC Members and Consulting Team
- **II.** Introduction to Hazard Mitigation Planning
  - i. What's in a Hazard Mitigation Plan?
  - ii. Planning Timeline
  - iii. HMPC Responsibilities
- **III.** Plan Development
  - i. Plans and Policies
  - ii. Public and Stakeholder Engagement
  - iii. Hazard Identification
  - iv. Critical Facilities
  - v. Capability Assessment
  - vi. Mitigation Strategy

ACTION ITEMS

- **I.** HMPC Meeting #2 Week of November 27th
- **II.** Capability Assessment Surveys
- **III.** Mitigation Action Tracker
- **IV.** Stakeholder Engagement
- **V.** GIS and Critical Facilities

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

HMPC MEETING #2

TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE

DATE: 11/30/2023

TIME: 12:00-1:30PM

ZOOM: https://us02web.zoom.us/j/89106324313?pwd=NFhCaHFIUWYzSnZNb21KNnVTck1Jdz09
Meeting ID: 891 0632 4313
Passcode: 445592

AGENDA ITEMS

I. Project Update and Loose Ends

II. Public Meeting Outreach
- i. Outreach Efforts
- ii. Website and Social Media

III. Capability Assessment Update
- i. Key Plans Reviewed
- ii. Survey Status
- iii. Where are Strengths and Challenges Discussion

IV. Risk Assessment
- i. Hazards and Critical Facilities Identified
- ii. Hazus Impacts
- iii. Problems Identified Including High Hazard Areas
- iv. Mitigation Actions Discussion

V. Mitigation Strategy
- i. Goal Statements
- ii. Developing New Mitigation Actions

VI. Town Priorities and Changes in Development

ACTION ITEMS

I. HMPC Meeting #3

II. Tie Up Loose Ends

III. Pictures

IV. Outreach for Public Meeting

V. New Mitigation Actions

HMPC MEETING #3 AGENDA

TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE

DATE:	1/25/2024
TIME:	11:30-1:00PM
ZOOM:	https://us02web.zoom.us/j/87650739078?pwd=UjJ0aFJiaEFIWEVoTUp1Z2RkZ3dlQT09 Meeting ID: 876 5073 9078 Passcode: 208925

AGENDA ITEMS

I. **Project Update and Loose Ends**
II. **Risk Assessment**
   i. Risk Ranking
   ii. Problem Statements
III. **Capability Assessment Update**
   i. Opportunities Identified
IV. **Public Meeting**
   i. Date and Outreach Efforts
V. **Mitigation Strategy**
   i. Essential Details for New Actions
   ii. Action Prioritization
VI. **Plan Implementation**

ACTION ITEMS

I. Public Meeting Date and Outreach
II. HMPC #4 Date
III. Pictures
IV. New Mitigation Actions

HMPC MEETING #4 AGENDA

TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE

DATE: WEDNESDAY, 03/06/2024

TIME: 11:30-1:00PM

ZOOM: https://us02web.zoom.us/j/89477295223?pwd=bDBvZWc3VXJ4cDhXVWxwOEZlMktDdz09
MEETING ID: 894 7729 5223
PASSCODE: 783405

AGENDA ITEMS

I. **Project Update and Loose Ends**
II. **Public Engagement**
   i. Outreach for Public Meeting and Plan Review
III. **Final Hazard List Ranking**
IV. **Mitigation Actions**
   i. List Review Including Prioritization
V. **Plan Review**
   i. Essential Details for New Actions
   ii. Action Prioritization
VI. **Timeline for Completion**

ACTION ITEMS

I. Public Meeting Outreach
II. Plan Review

Public Outreach and Engagement

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

PUBLIC MEETING

TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE

DATE: 12/14/2023

TIME: 12:30-1:30PM

ZOOM: https://us02web.zoom.us/j/89877967081?pwd=ODFRam5jRXQvcTJLUE5YeWpwS0hwZz09

Meeting ID: 898 7796 7081

Passcode: 284079

AGENDA ITEMS

I. Introductions

II. What is Hazard Mitigation? What is a Hazard Mitigation Plan?

III. Identify Natural Hazards

IV. Identify Critical Facilities

V. Brainstorm Possible Mitigation Actions

VI. Next Steps

TOWN OF ADAMS, MA

PUBLIC MEETING

SHARE YOUR IDEAS FOR REDUCING RISK TO NATURAL HAZARDS AND CLIMATE CHANGE

Do you wonder if Adams can flood, experience a tornado, or have an earthquake? What can prevent those natural hazards and climate change from wreaking havoc in our community?

Join the meeting to learn about this important project and to share your ideas for making Adams more resilient to natural hazards and climate change.

Adams has formed a Hazard Mitigation Planning Committee to identify risks and projects to mitigate those risks. The Town is working with a consultant hired by the Massachusetts Emergency Management Agency to develop a Hazard Mitigation Plan that will be approved by the Federal Emergency Management Agency and adopted by the Town. This plan allows Adams to apply for pre- and post-disaster mitigation funds.

12/14/2023

12:30 pm – 1:30 pm

Following Council on Aging Holiday Lunch at the Adams Visitor Center in-person or Join on Zoom

HTTPS://WWW.TOWN.ADAMS.MA.US FOR MEETING DETAILS OR CONTACT KEVIN RAYNER, TOWN PLANNER 413-743-8300 X132 OR KRAYNER@ADAMS.MA.US

PUBLIC MEETING #2 AGENDA

TOWN OF ADAMS, MA HAZARD MITIGATION PLAN UPDATE

DATE: **TUESDAY, MARCH 26, 2024**

TIME: **6:00-7:00PM**

IN-PERSON: **VISITOR CENTER, 3 HOOSAC STREET, ADAMS, MA (COUNCIL ON AGING)**

ZOOM: https://us02web.zoom.us/j/87413214034?pwd=RDJOQks4NXVHMEQwbVk1UGRFeDA5QT09

Meeting ID: 874 1321 4034

Passcode: 175401

AGENDA ITEMS

I. **Project Introduction**
II. **What is Hazard Mitigation?**
   i. Benefits of Hazard Mitigation
   ii. How the Plan was Developed
III. **Risk Assessment Process**
   i. Critical Facility Identification
   ii. Hazard Identification
   iii. Where are the hazards experienced?
   iv. What are your biggest concerns?
IV. **Hazard Mitigation Strategy**
   i. Types of Mitigation Actions
   ii. What are your recommendations for hazard mitigation?
   iii. Review of actions
V. **Plan Review**
   i. What to expect and how to review
VI. **Timeline for Completion**

TOWN OF ADAMS, MA

PUBLIC MEETING

SHARE YOUR IDEAS FOR REDUCING RISK TO NATURAL HAZARDS AND CLIMATE CHANGE

Do you wonder if Adams can flood, experience a tornado, or have an earthquake? What can prevent those natural hazards and climate change from wreaking havoc in our community?

Join our <u>**second public meeting**</u> to learn about this important project and to **share your ideas** for making Adams **more resilient** to natural hazards and climate change.

Adams has formed a Hazard Mitigation Planning Committee to identify projects to mitigate the risks caused by natural hazards and climate change.

The Town is working with a consultant hired by the Massachusetts Emergency Management Agency to develop a Hazard Mitigation Plan that will be approved by the Federal Emergency Management Agency and adopted by the Town. This plan allows Adams to apply for pre- and post-disaster mitigation funds.

03/26/2024

6:00 pm – 7:00 pm

Join In-Person at the Visitor Center (COA) or via Zoom!

HTTPS://WWW.TOWN.ADAMS.MA.US FOR MEETING DETAILS OR CONTACT KEVIN RAYNER, TOWN PLANNER 413-743-8300 X132 OR KRAYNER@TOWN.ADAMS.MA.US

FOR IMMEDIATE RELEASE

The Town of Adams Welcomes Community Input on Hazard Mitigation Plan

Adams, Massachusetts – March 5, 2024

Do you wonder if Adams can flood, experience a tornado, or have an earthquake? What is the worst that can happen in Adams? What can prevent those natural hazards and others from wreaking havoc?

The Town is extending an invitation to the community to participate in a public meeting as it develops their Hazard Mitigation Plan. This plan details all the natural hazard risks that may impact the Town and includes potential actions to mitigate those risks.

Meeting Information:

- Tuesday, March 26, 2024
- 6:00 pm – 7:00 pm
- In-Person: Visitor Center, 3 Hoosac Street, Adams, MA (Council On Aging)
- https://us02web.zoom.us/j/87413214034?pwd=RDJOQks4NXVHMEQwbVk1UGRFeDA5QT09
- Meeting ID: 874 1321 4034
- Passcode: 175401

The Town encourages all residents and business owners to attend this public meeting to share ideas and offer feedback on which hazards present the greatest risks, which areas of Town are most susceptible to damage, and what you would like to see done to mitigate these risks.

The Hazard Mitigation Planning Committee, in partnership with Jamie Caplan Consulting LLC, a Northampton, MA-based firm, is developing the plan with a grant from the Massachusetts Emergency Management Agency (MEMA). FEMA approval, coupled with Town adoption, will enable Adams to access pre- and post-disaster hazard mitigation grant funds.

For Further Inquiries:

- *Kevin Rayner, Town Planner*
- *Phone: 413-743-8300 x132*
- *Email: krayner@town.adams.ma.us*

Public participation is essential to a Hazard Mitigation Plan. This Plan needs to represent the interests of all community members while working to mitigate risk to natural hazards and the impacts of climate change.

The Town looks forward to a collaborative effort in building a resilient and secure future!

Town of Adams Hazard Mitigation Survey

The Town of Adams is developing an update to its Hazard Mitigation Plan. The purpose of the plan is identify and assess the Town's Hazard Mitigation risks (such as flooding, winter storms and wildfires) and determine how to best minimize those risks. This survey is an opportunity for our planning committee to gain insight on the public's perspective on hazardous infrastructure, events or threats, so that the Hazard Mitigation Plan can better capture the hazard profile of the town and mitigate key hazards effectively.

1. **Circle the hazards that you think pose the largest threat to Adams:**

   Flooding   Landslides   Winter Storms   Wildfire   Tropical Storms   High Wind Events

   Extreme Temperatures   Drought   Invasive Species   Earthquakes   Other

2. **On a scale of 1-5 how much does flooding affect you?**

   1   2   3   4   5

3. **Please list any infrastructure you think presents a hazard or needs to be addressed:**

____
____
____
____
____
____

4. **Please list any comments or questions you have about the Hazard Mitigation Plan or hazards you may wish to have addressed by the plan:**

____
____
____
____
____
____

THE TOWN OF ADAMS WELCOMES COMMUNITY INPUT ON HAZARD MITIGATION PLAN UPDATE

Join Us in Building a Resilient Future for Adams, MA!

WHAT?

Review and provide feedback on the Hazard Mitigation Plan Update drafted by Adams' Hazard Mitigation Planning Committee.

HOW?

- For Online Access: https://www.town.adams.ma.us/ to read the draft plan.
- In-Person Viewing: Hard copies available at the Visitor Center, Town Hall, & Library.
- Complete the Google Form on the Town's website or at designated locations to provide feedback.

WHEN?

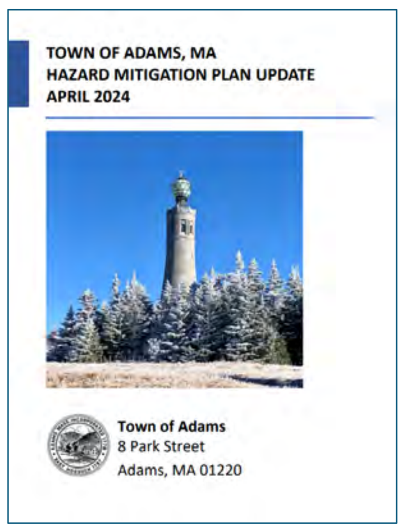
- Commentary Period: **April 16, 2024 – April 30, 2024**

WHY?

- Strengthen our community's resilience to natural hazards and climate change impacts, such as flooding, snowstorms, high winds, and extreme temperatures.

CONTACT FOR INQUIRIES

- Kevin Rayner, Town Planner
- Phone: 413-743-8300 x132
- Email: krayner@adams.ma.us


TOWN OF ADAMS, MA
HAZARD MITIGATION PLAN UPDATE
APRIL 2024

Town of Adams
8 Park Street
Adams, MA 01220

FOR IMMEDIATE RELEASE

The Town of Adams Invites Community Input on Hazard Mitigation Plan Update

Adams, Massachusetts – April 16, 2024

The Hazard Mitigation Planning Committee of Adams has developed a comprehensive Hazard Mitigation Plan that identifies and prioritizes strategies to mitigate the impacts of natural hazards and climate change on our community.

Engage with the Draft Plan:

- Online Access: Visit the Town's website at https://www.town.adams.ma.us/ to review the draft plan.
- In-Person Review: Hard copies are available for review at the Visitor Center located at 3 Hoosac Street, Adams, MA 01220, the Town Hall, and the library.

Commentary Period: April 16, 2024 – April 30, 2024

How to Provide Feedback:

- Complete the Google Form provided on the Town's website and available in hard copy at the designated viewing locations.

Adams' Hazard Mitigation Planning Committee has developed this plan as a strategy for our Town against existing and future natural hazard threats and the evolving challenges posed by climate change. Implementation of this plan will significantly enhance our resilience to hazards such as flooding, snowstorms, high winds, and extreme temperatures.

Town officials and local stakeholders developed this plan with funding support from the Massachusetts Emergency Management Agency. Federal Emergency Management Agency (FEMA) approval, and Town adoption, of the Hazard Mitigation Plan Update allows the Town to pursue pre- and post-disaster hazard mitigation grant opportunities.

For Further Inquiries:

- **Kevin Rayner, Town Planner**
- **Phone:** 413-743-8300 x132
- **Email:** krayner@adams.ma.us

Public engagement lies at the core of our Hazard Mitigation Plan. It is imperative that this plan reflects the diverse perspectives and priorities of our community members as we move to mitigate risks posed by natural hazards and climate change.

The Town looks forward to a collaborative effort in building a resilient and secure future!

Appendix B. Mitigation Actions.

Priority Ranking Points

Table 71. Priority Ranking Points for each action.

Action #	Action Title	Hazards Addressed	Approximate Cost	Internal Capacity	Implementation Timeline	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
1	Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning.	3	3	2	3	2	3	3	2	2	23
2	Develop annexes (Debris, Shelter etc.) for the Community Emergency Response Plan.	3	3	2	3	2	3	3	2	2	23
3	Investigate the possibility of utilizing MEMA's Wireless Emergency Alert (WEA) system in the event of a severe emergency.	3	3	2	3	2	3	3	2	2	23
4	Review and restructure Emergency Operations Center (EOC) organization, ensure that the Adams EOC is ready for an activation.	3	3	2	3	2	3	3	2	2	23
5	Complete an update of the Adams Comprehensive Emergency Management Plan (CEMP).	3	3	1	3	2	3	3	2	2	22

Action #	Action Title	Hazards Addressed	Approximate Cost	Internal Capacity	Implementation Timeline	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
6	Develop a Debris Management Plan and designate a location for debris processing following a disaster	3	3	2	2	2	3	3	2	2	22
7	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.	3	3	2	3	2	2	3	2	2	22
8	Monitor Integrity of Southwick Brook.	3	3	2	1	2	3	3	2	2	21
9	Repair the retaining walls on East Hoosac and Richmond Lane.	3	2	1	3	2	3	3	2	2	21
10	Assess condition of main water lines and the Quality Street Bridge.	3	2	1	3	2	3	3	2	2	21
11	Investigate the possibility of hosting Table-Top Exercises or Full Scale Exercises to test the Adams/Regional Responders capabilities.	3	3	1	2	2	3	3	2	2	21
12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.	3	2	1	3	2	3	3	2	2	21

Action #	Action Title	Hazards Addressed	Approximate Cost	Internal Capacity	Implementation Timeline	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
13	Evaluate small stormwater conveyances.	3	3	1	3	2	2	3	2	2	21
14	Create a Stormwater Bylaw.	3	3	1	3	2	2	3	2	2	21
15	Map and monitor all small stormwater conveyances, especially in known problem areas.	3	3	1	3	2	2	3	2	2	21
16	Work with property owners to obtain easements/legal rights to access and maintain vital flood infrastructure (Jordan St./ Fisk St. Dam).	3	3	1	3	2	2	3	2	2	21
17	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.	3	2	1	2	2	3	3	2	2	20
18	Expand emergency notification system to include cell phones and email; investigate siren system.	3	3	1	3	2	3	3	0	2	20

Action #	Action Title	Hazards Addressed	Approximate Cost	Internal Capacity	Implementation Timeline	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
19	Develop and adopt a Climate Adaptation Plan.	3	2	1	2	2	3	3	2	2	20
20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.	3	2	1	1	2	3	3	2	2	19
21	Address flooding damaging properties roads and road crossings along Southwick Brook.	3	2	1	2	2	2	3	2	2	19
22	Establish a regular maintenance schedule for the entire stormwater system.	3	2	1	2	2	2	3	2	2	19
23	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.	3	2	1	2	2	2	3	2	2	19
24	Complete a Community Points of Distribution Plan (CPDP) for the Town.	3	3	2	3	2	3	0	0	2	18
25	Designate more Cooling/Warming Centers.	3	3	1	3	3	3	0	0	2	18

Action #	Action Title	Hazards Addressed	Approximate Cost	Internal Capacity	Implementation Timeline	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
26	Implement a stormwater management program to comply with EPA's MS4 regulations.	3	3	2	2	0	1	3	2	2	18
27	Identify and address Jordan St. drainage system problems.	3	1	0	1	2	3	3	2	2	17
28	Develop local shelter plan for Adams Memorial School and backup shelters.	3	2	1	3	3	3	0	0	2	17
29	Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.	3	3	2	1	3	2	0	0	2	16
30	Work with local school districts to develop and implement hazard mitigation campaigns.	3	3	2	1	3	2	0	0	2	16
31	Develop a Vegetation Management Plan.	2	3	2	3	0	1	0	2	2	15
32	Repair the Pecks Brook Retaining Walls.	3	1	0	3	0	1	3	2	2	15
33	Repair the retaining walls on East Hoosac and Richmond Lane.	3	2	1	1	0	1	3	2	2	15
34	Remove Bassett Brook Reservoir.	3	2	1	1	0	1	3	2	2	15

Action #	Action Title	Hazards Addressed	Approximate Cost	Internal Capacity	Implementation Timeline	Equity Focus	Protection of Lives	Protection of Critical Facilities or Infrastructure	Protection of Natural Resources	Alignment with Objectives	Total
35	Further public education on the Town website for natural hazard mitigation and preparedness.	3	3	2	1	0	1	0	0	2	12
36	Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams.	2	3	2	1	0	0	0	2	2	12
37	Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.	2	3	2	1	0	0	0	2	2	12
38	Alleviate the risk of landslides around East Street and Walling Road.	2	2	1	1	0	1	0	2	2	11
39	Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.	2	2	1	1	0	1	0	2	2	11
40	Develop policies/plans to improve the Town's Cybersecurity posture so emergency response is not impacted.	1	3	2	2	0	0	0	0	2	10

Types of Mitigation Actions

Table 72. Mitigation Actions Sorted by Type.

Action #	Action Title
Local Plans and Regulations	
1	Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning.
2	Develop annexes (Debris, Shelter etc.) for the Community Emergency Response Plan.
3	Investigate the possibility of utilizing MEMA's Wireless Emergency Alert (WEA) system in the event of a severe emergency.
4	Review and restructure Emergency Operations Center (EOC) organization, ensure that the Adams EOC is ready for an activation.
5	Complete an update of the Adams Comprehensive Emergency Management Plan (CEMP).
6	Develop a Debris Management Plan and designate a location for debris processing following a disaster
11	Investigate the possibility of hosting Table-Top Exercises or Full Scale Exercises to test the Adams/Regional Responders capabilities.
14	Create a Stormwater Bylaw.
16	Work with property owners to obtain easements/legal rights to access and maintain vital flood infrastructure (Jordan St./ Fisk St. Dam).
18	Expand emergency notification system to include cell phones and email; investigate siren system.
24	Complete a Community Points of Distribution Plan (CPDP) for the Town.
25	Designate more Cooling/Warming Centers.
28	Develop local shelter plan for Adams Memorial School and backup shelters.
31	Develop a Vegetation Management Plan.
40	Develop policies/plans to improve the Town's Cybersecurity posture so emergency response is not impacted.
Structure and Infrastructure	
7	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.

Action #	Action Title
10	Assess condition of main water lines and the Quality Street Bridge.
12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
13	Evaluate small stormwater conveyances.
15	Map and monitor all small stormwater conveyances, especially in known problem areas.
17	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.
20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.
21	Address flooding damaging properties roads and road crossings along Southwick Brook.
22	Establish a regular maintenance schedule for the entire stormwater system.
23	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.
26	Implement a stormwater management program to comply with EPA's MS4 regulations.
27	Identify and address Jordan St. drainage system problems.
33	Repair the retaining walls on East Hoosac and Richmond Lane.
Natural Resources Protection	
8	Monitor Integrity of Southwick Brook.
9	Repair the retaining walls on East Hoosac and Richmond Lane.
19	Develop and adopt a Climate Adaptation Plan.
32	Repair the Pecks Brook Retaining Walls.
34	Remove Bassett Brook Reservoir.
36	Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams.
37	Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.
38	Alleviate the risk of landslides around East Street and Walling Road.

Action #	Action Title
39	Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.
Education and Awareness Programs	
29	Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.
30	Work with local school districts to develop and implement hazard mitigation campaigns.
35	Further public education on the Town website for natural hazard mitigation and preparedness.

Actions Sorted by Goal Statement

Table 73. Mitigation Actions Sorted by Goal Statement and Priority.

Action #	Action Title
Save Lives and Property	
1	Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning.
2	Develop annexes (Debris, Shelter etc.) for the Community Emergency Response Plan.
3	Investigate the possibility of utilizing MEMA's Wireless Emergency Alert (WEA) system in the event of a severe emergency.
4	Review and restructure Emergency Operations Center (EOC) organization, ensure that the Adams EOC is ready for an activation.
5	Complete an update of the Adams Comprehensive Emergency Management Plan (CEMP).
25	Designate more Cooling/Warming Centers.
28	Develop local shelter plan for Adams Memorial School and backup shelters.
Infrastructure	
7	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.
9	Repair the retaining walls on East Hoosac and Richmond Lane.
10	Assess condition of main water lines and the Quality Street Bridge.
12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
13	Evaluate small stormwater conveyances.
14	Create a Stormwater Bylaw.
15	Map and monitor all small stormwater conveyances, especially in known problem areas.
17	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.
21	Address flooding damaging properties roads and road crossings along Southwick Brook.
22	Establish a regular maintenance schedule for the entire stormwater system.
26	Implement a stormwater management program to comply with EPA's MS4 regulations.
27	Identify and address Jordan St. drainage system problems.
32	Repair the Pecks Brook Retaining Walls.
33	Repair the retaining walls on East Hoosac and Richmond Lane.
Capacity	
6	Develop a Debris Management Plan and designate a location for debris processing following a disaster
11	Investigate the possibility of hosting Table-Top Exercises or Full Scale Exercises to test the Adams/Regional Responders capabilities.
16	Work with property owners to obtain easements/legal rights to access and maintain vital flood infrastructure (Jordan St./ Fisk St. Dam).

18	Expand emergency notification system to include cell phones and email; investigate siren system.
20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.
23	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.
24	Complete a Community Points of Distribution Plan (CPDP) for the Town.
40	Develop policies/plans to improve the Town's Cybersecurity posture so emergency response is not impacted.
Natural Resources	
8	Monitor Integrity of Southwick Brook.
19	Develop and adopt a Climate Adaptation Plan.
31	Develop a Vegetation Management Plan.
34	Remove Bassett Brook Reservoir.
36	Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams.
37	Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.
38	Alleviate the risk of landslides around East Street and Walling Road.
39	Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.
Education	
29	Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.
30	Work with local school districts to develop and implement hazard mitigation campaigns.
35	Further public education on the Town website for natural hazard mitigation and preparedness.

Actions Sorted by Hazard

Table 74. Mitigation Actions Sorted by Hazard Addressed.

Action #	Action Title
All Hazards	
1	Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning.
2	Develop annexes (Debris, Shelter etc.) for the Community Emergency Response Plan.
3	Investigate the possibility of utilizing MEMA's Wireless Emergency Alert (WEA) system in the event of a severe emergency.
4	Review and restructure Emergency Operations Center (EOC) organization, ensure that the Adams EOC is ready for an activation.
5	Complete an update of the Adams Comprehensive Emergency Management Plan (CEMP).
11	Investigate the possibility of hosting Table-Top Exercises or Full Scale Exercises to test the Adams/Regional Responders capabilities.
18	Expand emergency notification system to include cell phones and email; investigate siren system.
24	Complete a Community Points of Distribution Plan (CPDP) for the Town.
28	Develop local shelter plan for Adams Memorial School and backup shelters.
29	Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.
30	Work with local school districts to develop and implement hazard mitigation campaigns.
35	Further public education on the Town website for natural hazard mitigation and preparedness.
40	Develop policies/plans to improve the Town's Cybersecurity posture so emergency response is not impacted.
Dam Overtopping	
17	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.
Flood from Precipitation and Dam Overtopping	
32	Repair the Pecks Brook Retaining Walls.
33	Repair the retaining walls on East Hoosac and Richmond Lane.
34	Remove Bassett Brook Reservoir.
Flooding from Precipitation and Dam Overtopping, Hurricanes and Tropical Storms, Other Severe Weather, Tornadoes	
7	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.
Flooding from Precipitation and Dam Overtopping, Severe Winter Storms, Hurricanes and Tropical Storms, Other Severe Weather, Tornadoes	

16	Work with property owners to obtain easements/legal rights to access and maintain vital flood infrastructure (Jordan St./ Fisk St. Dam).
Flooding from Precipitation, Hurricanes and Tropical Storms, Invasive Species, Other Severe Weather	
10	Assess condition of main water lines and the Quality Street Bridge.
Flooding from Precipitation, Hurricanes and Tropical Storms, Other Severe Weather	
8	Monitor Integrity of Southwick Brook.
9	Repair the retaining walls on East Hoosac and Richmond Lane.
13	Evaluate small stormwater conveyances.
14	Create a Stormwater Bylaw.
15	Map and monitor all small stormwater conveyances, especially in known problem areas.
20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.
21	Address flooding damaging properties roads and road crossings along Southwick Brook.
22	Establish a regular maintenance schedule for the entire stormwater system.
23	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.
26	Implement a stormwater management program to comply with EPA's MS4 regulations.
27	Identify and address Jordan St. drainage system problems.
Flooding from Precipitation, Severe Winter Storms, Average and Extreme Temperatures, Hurricanes and Tropical Storms, Invasive Species, Other Severe Weather, Droughts, Landslides, Tornadoes, Wildfires/Brushfires	
19	Develop and adopt a Climate Adaptation Plan.
Flooding from Precipitation, Severe Winter Storms, Hurricanes and Tropical Storms, Other Severe Weather, Tornadoes	
12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
Hurricanes and Tropical Storms, Other Severe Weather, Landslides, Tornadoes, Earthquakes	
6	Develop a Debris Management Plan and designate a location for debris processing following a disaster
Invasive Species, Wildfire and Brushfire	
36	Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams.
37	Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.

Landslides	
38	Alleviate the risk of landslides around East Street and Walling Road.
39	Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.
Severe Winter Storms, Extreme Temperatures	
25	Designate more Cooling/Warming Centers.
Wildfires/Brushfires	
31	Develop a Vegetation Management Plan.

Actions Sorted by Lead Position

Table 75. Mitigation Actions Sorted by Action Lead.

Action #	Action Title
Emergency Management Director	
3	Investigate the possibility of utilizing MEMA's Wireless Emergency Alert (WEA) system in the event of a severe emergency.
4	Review and restructure Emergency Operations Center (EOC) organization, ensure that the Adams EOC is ready for an activation.
11	Investigate the possibility of hosting Table-Top Exercises or Full Scale Exercises to test the Adams/Regional Responders capabilities.
25	Designate more Cooling/Warming Centers.
28	Develop local shelter plan for Adams Memorial School and backup shelters.
Town Planner	
1	Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning.
2	Develop annexes (Debris, Shelter etc.) for the Community Emergency Response Plan.
5	Complete an update of the Adams Comprehensive Emergency Management Plan (CEMP).
6	Develop a Debris Management Plan and designate a location for debris processing following a disaster
19	Develop and adopt a Climate Adaptation Plan.
24	Complete a Community Points of Distribution Plan (CPDP) for the Town.
30	Work with local school districts to develop and implement hazard mitigation campaigns.
31	Develop a Vegetation Management Plan.
35	Further public education on the Town website for natural hazard mitigation and preparedness.
40	Develop policies/plans to improve the Town's Cybersecurity posture so emergency response is not impacted.
Community Development Director	
7	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.
9	Repair the retaining walls on East Hoosac and Richmond Lane.
12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
14	Create a Stormwater Bylaw.
15	Map and monitor all small stormwater conveyances, especially in known problem areas.
16	Work with property owners to obtain easements/legal rights to access and maintain vital flood infrastructure (Jordan St./ Fisk St. Dam).
17	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.
20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.

Action #	Action Title
23	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.
27	Identify and address Jordan St. drainage system problems.
32	Repair the Pecks Brook Retaining Walls.
33	Repair the retaining walls on East Hoosac and Richmond Lane.
36	Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams.
37	Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.
38	Alleviate the risk of landslides around East Street and Walling Road.
39	Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.
Department of Public Works Supervisor	
8	Monitor Integrity of Southwick Brook.
10	Assess condition of main water lines and the Quality Street Bridge.
13	Evaluate small stormwater conveyances.
21	Address flooding damaging properties roads and road crossings along Southwick Brook.
22	Establish a regular maintenance schedule for the entire stormwater system.
26	Implement a stormwater management program to comply with EPA's MS4 regulations.
Adams Police/Fire District	
18	Expand emergency notification system to include cell phones and email; investigate siren system.
Council on Aging Director	
29	Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.
Water Department Superintendent	
34	Remove Bassett Brook Reservoir.

Actions Sorted by Implementation Schedule

Table 76. Mitigation Actions Sorted by Implementation Schedule.

Action #	Action Title
2024-2025	
1	Develop a Continuity of Operations Plan for use during emergencies and for pre-disaster planning.
2	Develop annexes (Debris, Shelter etc.) for the Community Emergency Response Plan.
3	Investigate the possibility of utilizing MEMA's Wireless Emergency Alert (WEA) system in the event of a severe emergency.
4	Review and restructure Emergency Operations Center (EOC) organization, ensure that the Adams EOC is ready for an activation.
5	Complete an update of the Adams Comprehensive Emergency Management Plan (CEMP).
10	Assess condition of main water lines and the Quality Street Bridge.
11	Investigate the possibility of hosting Table-Top Exercises or Full Scale Exercises to test the Adams/Regional Responders capabilities.
12	Complete the restoration of the Jordan Street Culvert using FEMA grant funding.
14	Create a Stormwater Bylaw.
24	Complete a Community Points of Distribution Plan (CPDP) for the Town.
28	Develop local shelter plan for Adams Memorial School and backup shelters.
31	Develop a Vegetation Management Plan.
2024-2026	
6	Develop a Debris Management Plan and designate a location for debris processing following a disaster
19	Develop and adopt a Climate Adaptation Plan.
22	Establish a regular maintenance schedule for the entire stormwater system.
26	Implement a stormwater management program to comply with EPA's MS4 regulations.
40	Develop policies/plans to improve the Town's Cybersecurity posture so emergency response is not impacted.
2024-2029	
7	Identify Historic Structures, businesses and critical facilities located in hazard-prone areas, including floodplains and dam failure inundation areas.
8	Monitor Integrity of Southwick Brook.
9	Repair the retaining walls on East Hoosac and Richmond Lane.
13	Evaluate small stormwater conveyances.
15	Map and monitor all small stormwater conveyances, especially in known problem areas.
20	Work with the Commonwealth and the Army Corps of Engineers to reform the permitting process requirements of maintaining the flood chutes.
35	Further public education on the Town website for natural hazard mitigation and preparedness.

Action #	Action Title
2025-2026	
25	Designate more Cooling/Warming Centers.
27	Identify and address Jordan St. drainage system problems.
32	Repair the Pecks Brook Retaining Walls.
	2025-2027
18	Expand emergency notification system to include cell phones and email; investigate siren system.
2025-2028	
17	Improve condition of the Fisk Street Dam and mitigate infrastructure risks in Fisk Brook.
33	Repair the retaining walls on East Hoosac and Richmond Lane.
34	Remove Bassett Brook Reservoir.
36	Conduct a study to analyze the past and potential future damage caused by Emerald Ash Borer in Adams.
37	Conduct a study to identify invasive species in the Greylock Glen and assess their potential risk to forest cover in Adams.
38	Alleviate the risk of landslides around East Street and Walling Road.
39	Conduct a study of Landslides in the area around Specialty Minerals to determine if there is a significant risk of landslides.
2026-2027	
23	Conduct a study and implement findings for the drainage problems around Burt Street and Renfrew Park.
2026-2028	
16	Work with property owners to obtain easements/legal rights to access and maintain vital flood infrastructure (Jordan St./ Fisk St. Dam).
21	Address flooding damaging properties roads and road crossings along Southwick Brook.
2026-2029	
29	Educate vulnerable and environmental justice populations about disaster mitigation and preparedness.
30	Work with local school districts to develop and implement hazard mitigation campaigns.

Appendix C. Plan Implementation and Review Supporting Materials.

Plan Update Evaluation Worksheet

Table 77. Plan Update Evaluation Worksheet.

Plan Section	Considerations	Explanation
Planning Process	Should the town invite any additional stakeholders to participate in the planning process? What public outreach activities have occurred? How can public involvement be improved?	
Risk Assessment	What disasters has the town, or the region experienced? Should the list of hazards be modified? Are new data sources, maps or studies available? If so, what have they revealed, and should the information be incorporated into the plan update? Has development in the region occurred and could it create or reduce risk?	
Capability Assessment	Has the town adopted new policies, plans, regulations, or reports that could be incorporated into this plan? Are there different or additional administrative, human, technical, and financial resources available for mitigation planning? Are there different or new education and outreach programs and resources available for mitigation activities?	
Mitigation Strategy	Is the mitigation strategy being implemented as anticipated? Were the cost and timeline estimate accurate? Should new mitigation actions be added to the Action Plan? Should existing mitigation actions be revised or removed from the plan? Are there new obstacles that were not anticipated in the plan that will need to be considered in the next plan update? Are there new funding sources to consider? Have elements of the plan been incorporated into other planning mechanisms?	
Implementation Plan	Was the plan monitored and evaluated as anticipated? What are needed improvements to the plan implementation procedures?	

Mitigation Action Progress Worksheet

Table 78. Mitigation Action Progress Worksheet.

Mitigation Action Progress Worksheet				
Progress Report Period	From Date		To Date	
Action/Project Title				
Responsible Department				
Contact Name				
Contact Phone/Email				
Project Description				
Project Goal				
Project Objective				
Project Cost				
Project Status				
Date of Project Approval	Date of Project Start	Anticipated Date of Completion	Project Canceled	Project Delayed
Explanation of Delay or Cost Overruns				
Project Report Summary				
What was accomplished for this project during this reporting period?				
What obstacles, problems, or delays did the project encounter?				
Plans for next reporting period.				

Appendix D. Hazus Reports

Hazus: Flood Global Risk Report

Region Name: Adams_Flood

Flood Scenario: 100year

Print Date: Tuesday, November 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

HAZUS

EARTHQUAKE • WIND • FLOOD • TSUNAMI

Table of Contents

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Massachusetts

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 2 square miles and contains 178 census blocks. The region contains over 4 thousand households and has a total population of 8,166 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 3,014 buildings in the region with a total building replacement value (excluding contents) of 1,293 million dollars. Approximately 88.42% of the buildings (and 61.24% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 3,014 buildings in the region which have an aggregate total replacement value of 1,293 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	791,522	61.2%
Commercial	255,618	19.8%
Industrial	136,211	10.5%
Agricultural	3,026	0.2%
Religion	11,519	0.9%
Government	54,985	4.3%
Education	39,694	3.1%
Total	**1,292,575**	**100%**

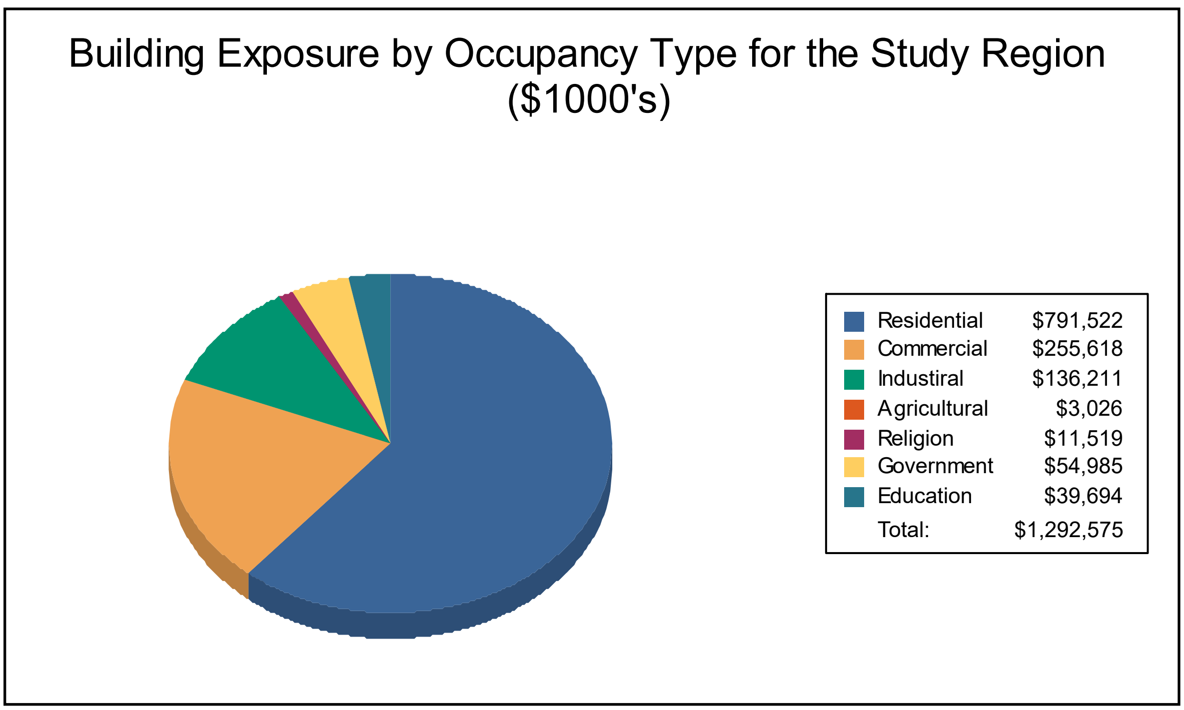
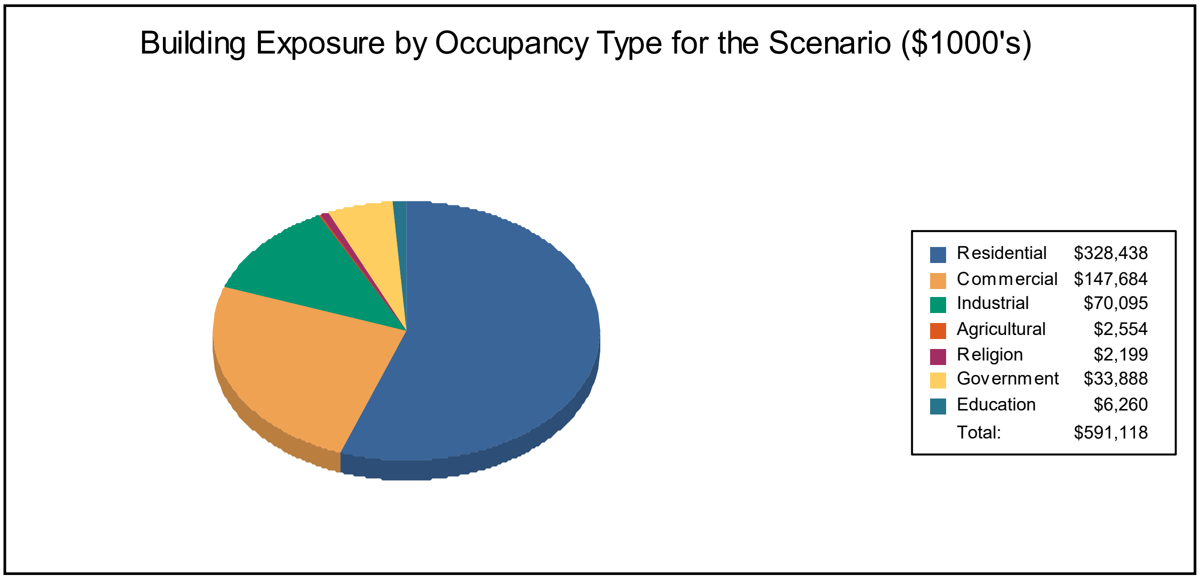


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	328,438	55.6%
Commercial	147,684	25.0%
Industrial	70,095	11.9%
Agricultural	2,554	0.4%
Religion	2,199	0.4%
Government	33,888	5.7%
Education	6,260	1.1%
Total	**591,118**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 3 schools, 2 fire stations, 1 police station and 1 emergency operation center.

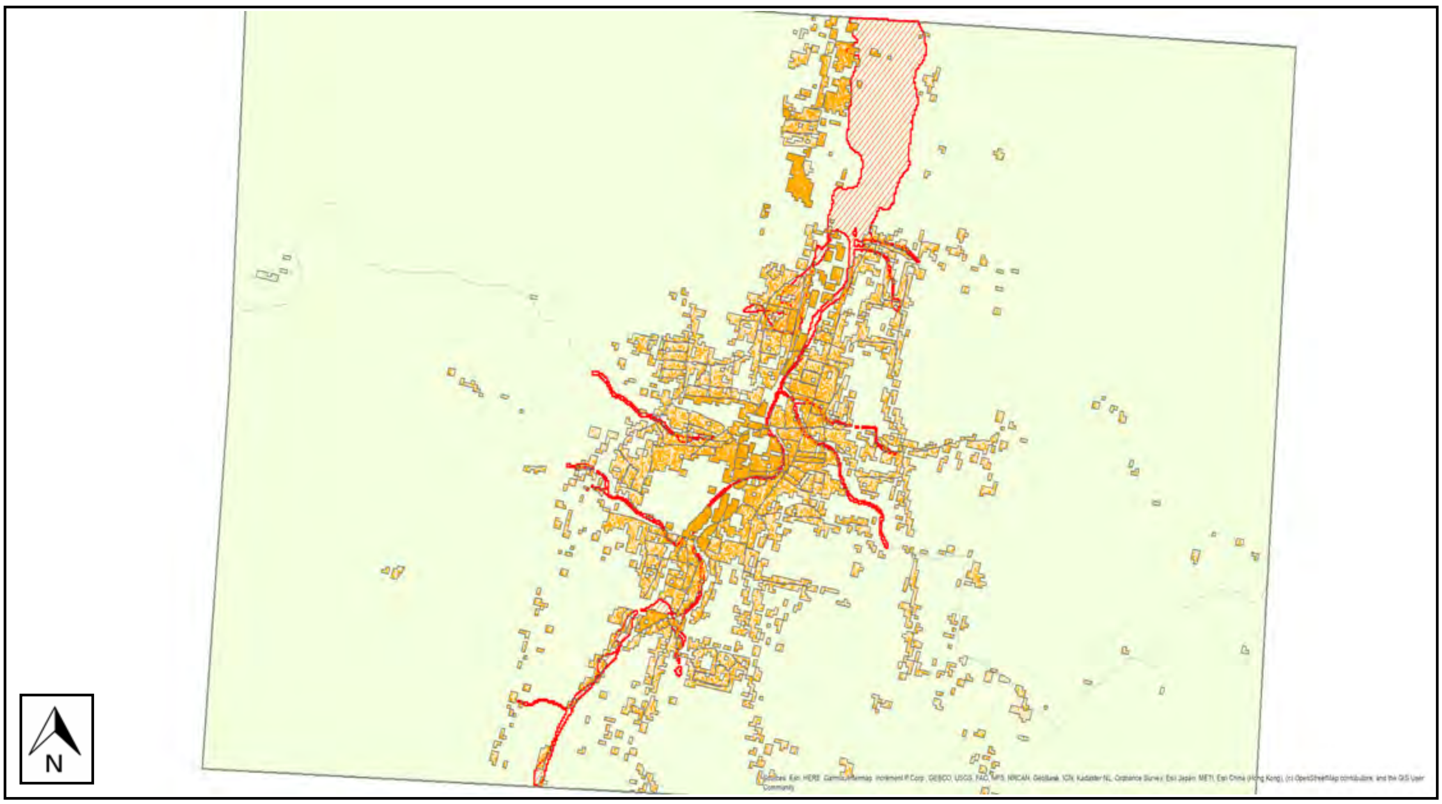
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Adams_Flood
Scenario Name:	100year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 1 building will be at least moderately damaged. This is over 60% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

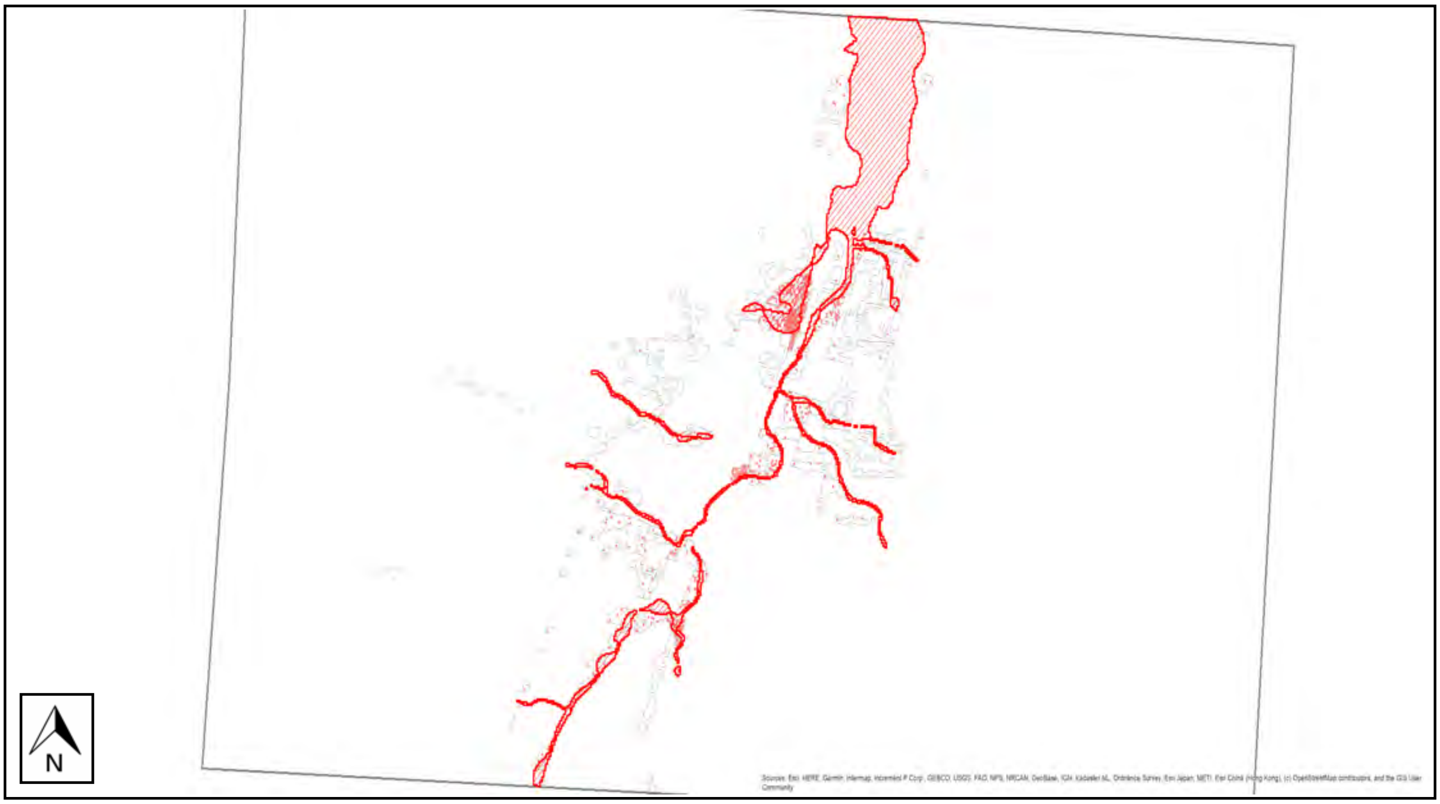


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	2	100	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	34	97	1	3	0	0	0	0	0	0	0	0
Total	**36**		**1**		**0**		**0**		**0**		**0**	

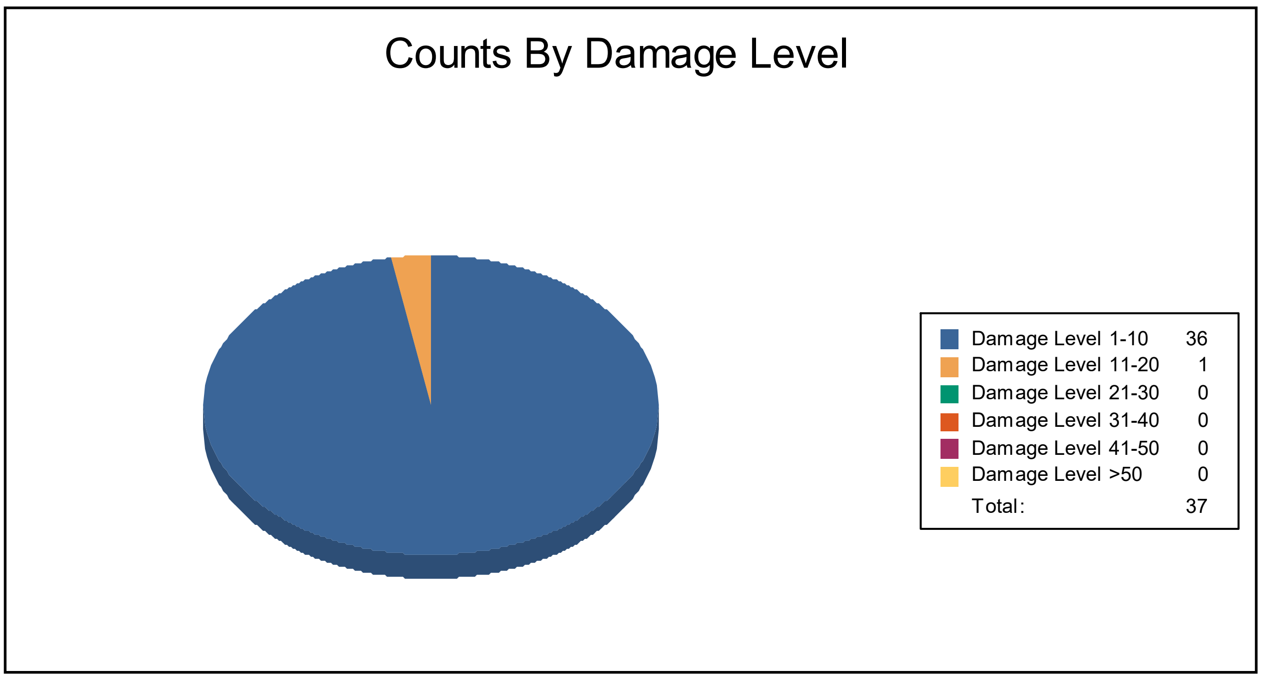


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	2	100	0	0	0	0	0	0	0	0	0	0
Steel	1	100	0	0	0	0	0	0	0	0	0	0
Wood	33	97	1	3	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	2	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	3	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

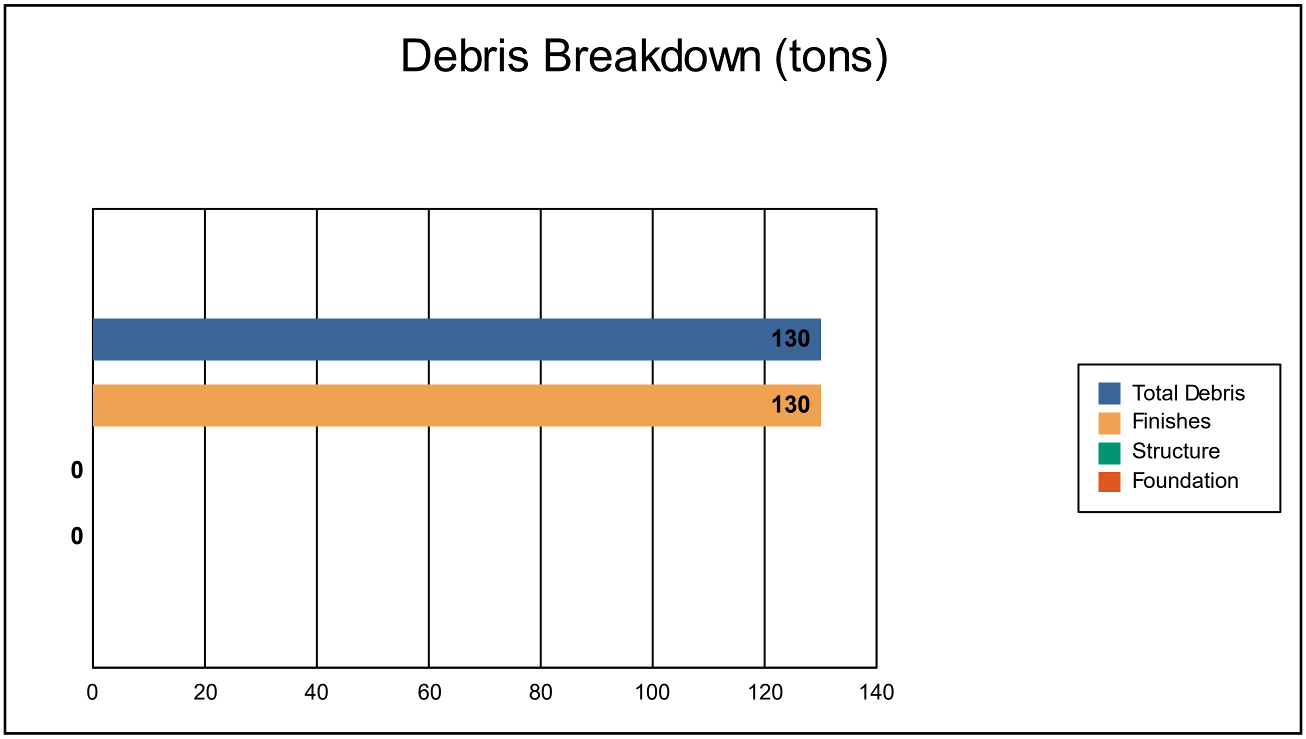
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

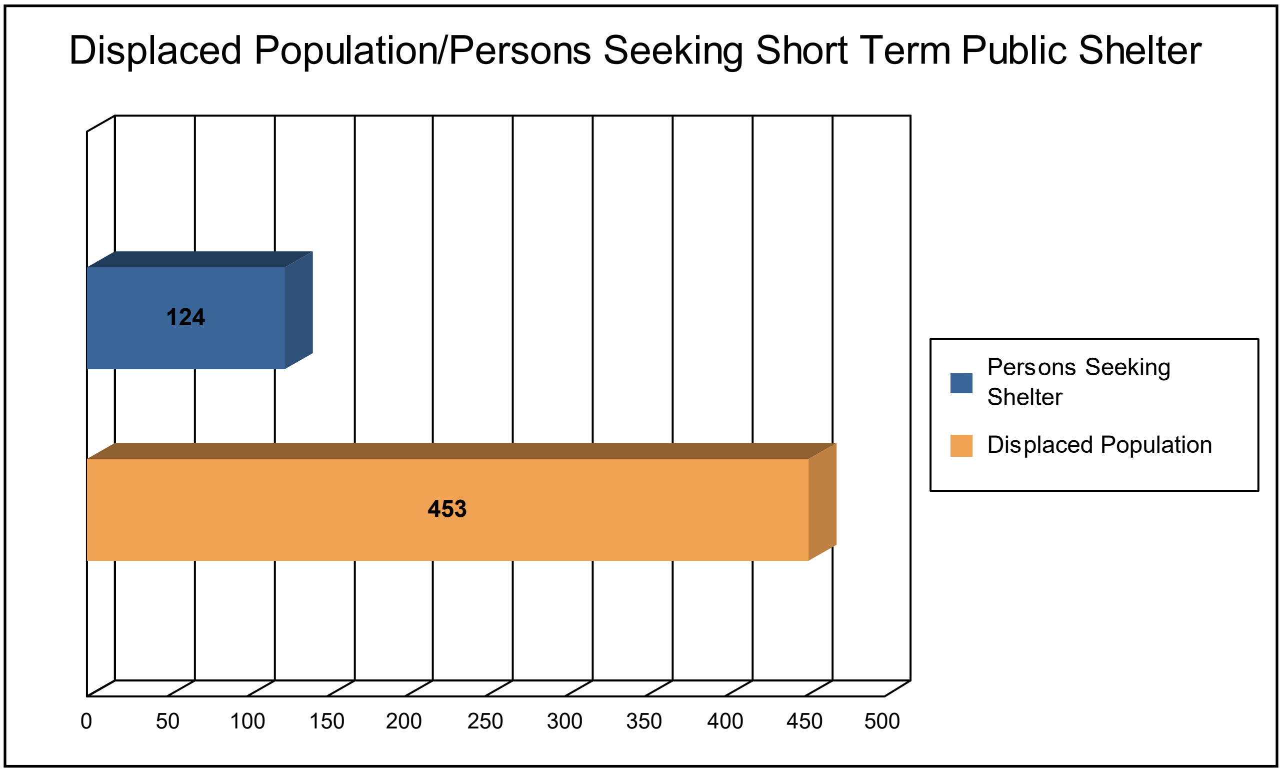


The model estimates that a total of 130 tons of debris will be generated. Of the total amount, Finishes comprises 100% of the total, Structure comprises 0% of the total, and Foundation comprises 0%. If the debris tonnage is converted into an estimated number of truckloads, it will require 6 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 151 households (or 453 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 124 people (out of a total population of 8,166) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 17.44 million dollars, which represents 2.95 % of the total replacement value of the scenario buildings.

Building-Related Losses

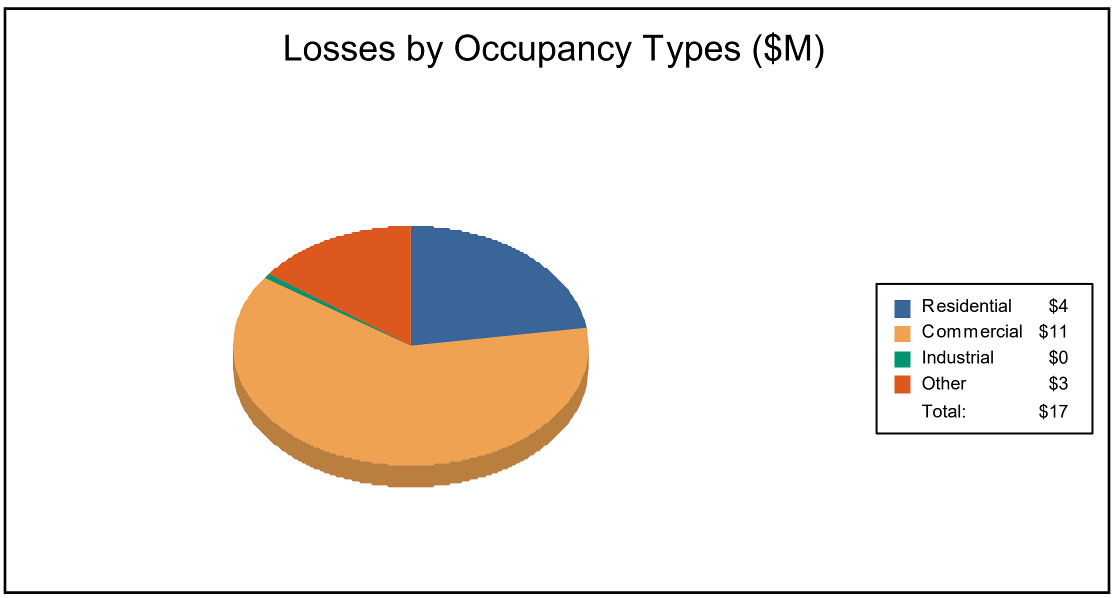
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 2.40 million dollars. 86% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 22.61% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	0.78	0.13	0.01	0.00	0.91
	Content	0.74	0.63	0.00	0.04	1.41
	Inventory	0.00	0.08	0.00	0.00	0.08
	Subtotal	**1.52**	**0.83**	**0.01**	**0.04**	**2.40**
Business Interruption						
	Income	0.00	4.22	0.02	0.37	4.61
	Relocation	1.54	1.20	0.02	0.23	2.99
	Rental Income	0.87	0.89	0.00	0.03	1.80
	Wage	0.01	3.70	0.04	1.89	5.64
	Subtotal	**2.43**	**10.01**	**0.08**	**2.51**	**15.04**
ALL	**Total**	**3.94**	**10.85**	**0.09**	**2.56**	**17.44**



Appendix A: County Listing for the Region

Massachusetts

- Berkshire

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Massachusetts				
Berkshire	8,166	791,522	501,053	1,292,575
Total	**8,166**	**791,522**	**501,053**	**1,292,575**
Total Study Region	**8,166**	**791,522**	**501,053**	**1,292,575**

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FEMA

RiskMAP
Increasing Resilience Together

Hazus: Hurricane Global Risk Report

Region Name: Adams_Wind

Hurricane Scenario: Probabilistic 500-year Return Period

Print Date: Tuesday, November 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

HAZUS EARTHQUAKE • WIND • FLOOD • TSUNAMI

FEMA

Table of Contents

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Massachusetts

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 23.01 square miles and contains 3 census tracts. There are over 3 thousand households in the region and a total population of 8,166 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 1,293 million dollars. Approximately 88% of the buildings (and 61% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 3,014 buildings in the region which have an aggregate total replacement value of Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provi distribution of the building value by State and County.

Building Exposure by Occupancy Type

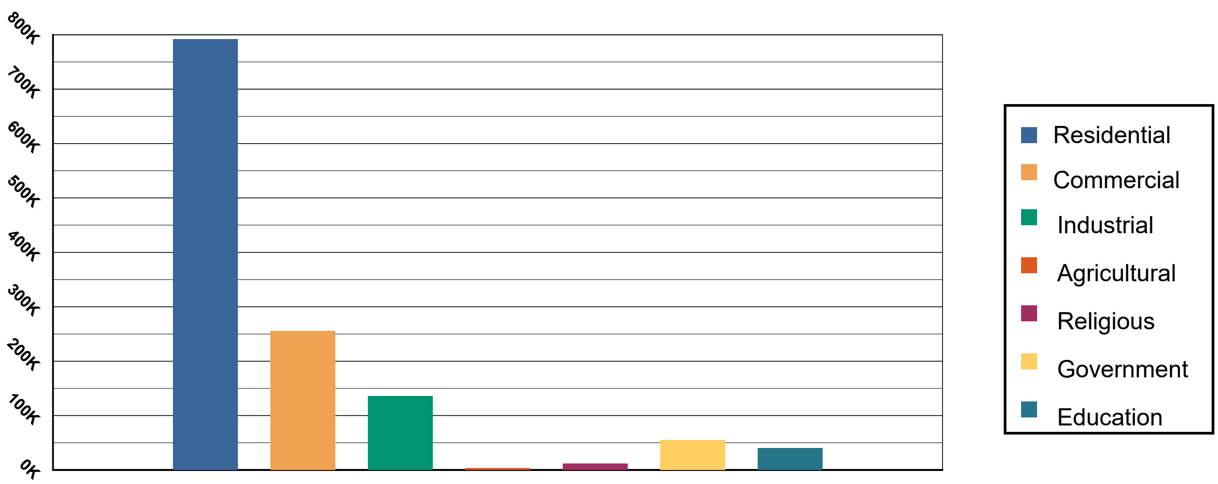

Table 1: Building Exposure by Occupancy Type

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Residential	791,522	61.24%
Commercial	255,618	19.78%
Industrial	136,211	10.54%
Agricultural	3,026	0.23%
Religious	11,519	0.89%
Government	54,985	4.25%
Education	39,694	3.07%
Total	**1,292,575**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 3 schools, 2 fire stations, 1 police stations and 1 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 16 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

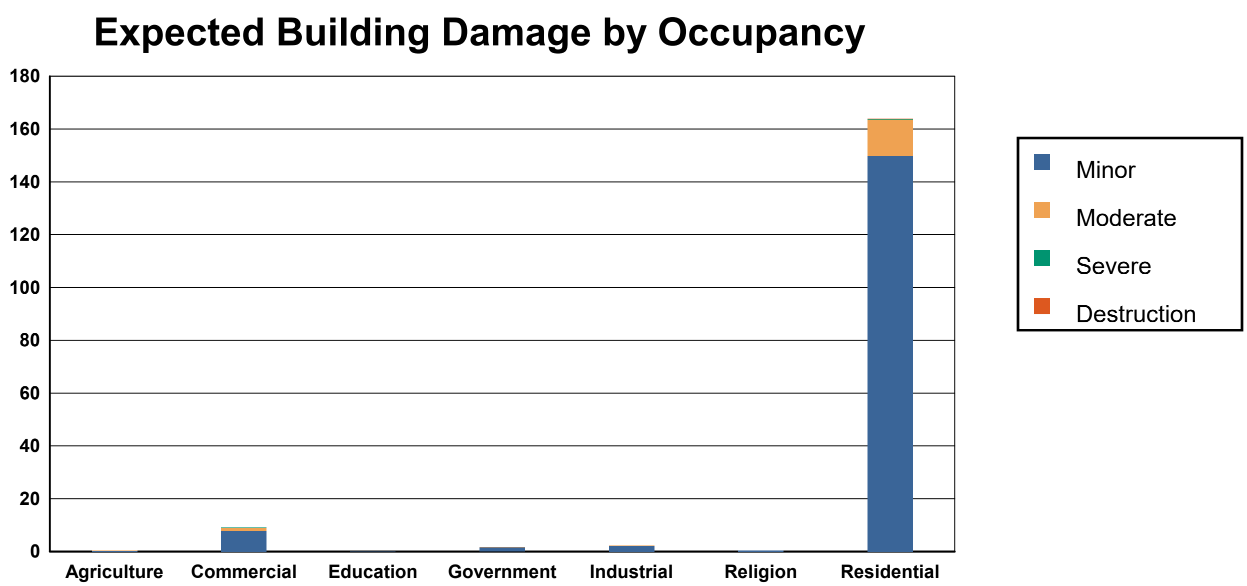


Table 2: Expected Building Damage by Occupancy : 500 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	5.70	95.03	0.25	4.13	0.04	0.60	0.01	0.24	0.00	0.01
Commercial	214.98	95.97	7.94	3.55	0.99	0.44	0.09	0.04	0.00	0.00
Education	3.86	96.51	0.13	3.35	0.01	0.14	0.00	0.00	0.00	0.00
Government	42.32	96.19	1.60	3.63	0.08	0.18	0.00	0.00	0.00	0.00
Industrial	56.69	96.09	2.14	3.62	0.15	0.26	0.02	0.03	0.00	0.00
Religion	11.57	96.44	0.41	3.45	0.01	0.12	0.00	0.00	0.00	0.00
Residential	2,501.06	93.85	149.73	5.62	13.90	0.52	0.27	0.01	0.04	0.00
Total	**2,836.19**		**162.20**		**15.18**		**0.40**		**0.04**	

Table 3: Expected Building Damage by Building Type : 500 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	30	96.11	1	3.69	0	0.20	0	0.00	0	0.00
Masonry	283	93.15	16	5.17	5	1.62	0	0.07	0	0.00
MH	8	99.30	0	0.54	0	0.12	0	0.00	0	0.04
Steel	150	96.19	5	3.36	1	0.41	0	0.04	0	0.00
Wood	2,247	94.25	132	5.52	5	0.22	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

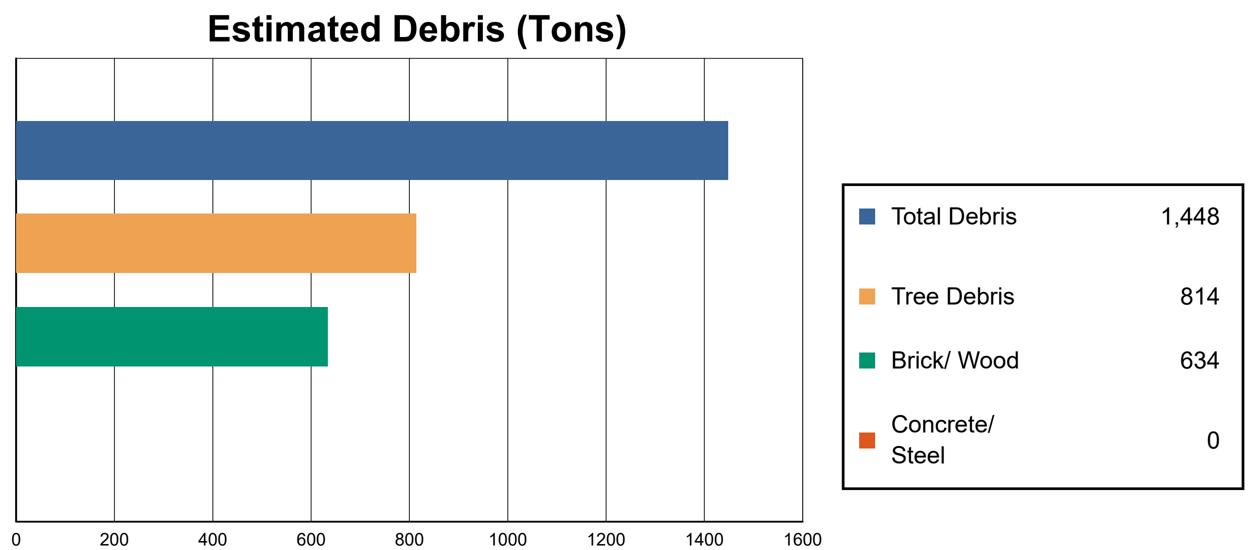
Thematic Map of Essential Facilities

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	2	0	0	2
Police Stations	1	0	0	1
Schools	3	0	0	3

Induced Hurricane Damage

Debris Generation



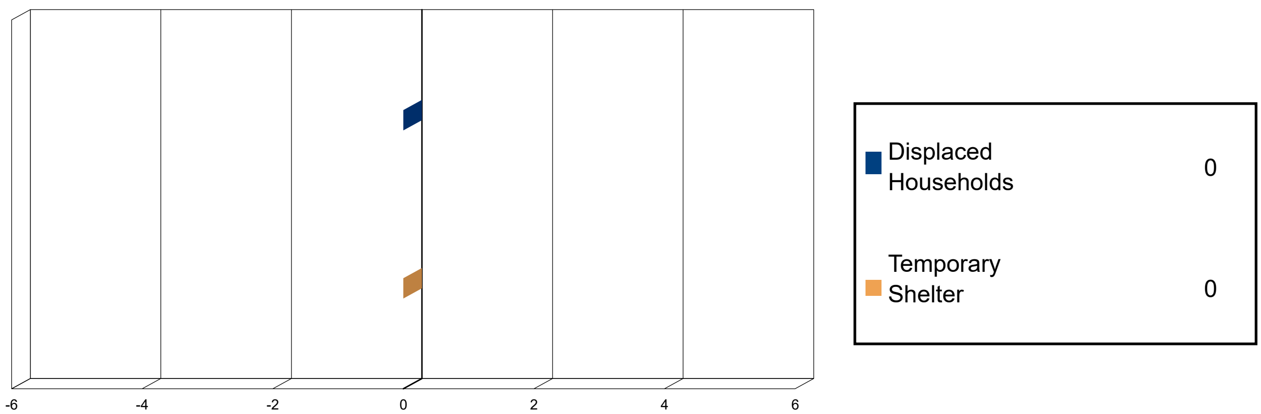
Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,448 tons of debris will be generated. Of the total amount, 557 tons (38%) is Other Tree Debris. Of the remaining 891 tons, Brick/Wood comprises 71% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 25 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 257 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement

Estimated Shelter Needs



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 8,166) will seek temporary shelter in public shelters.

Economic Loss

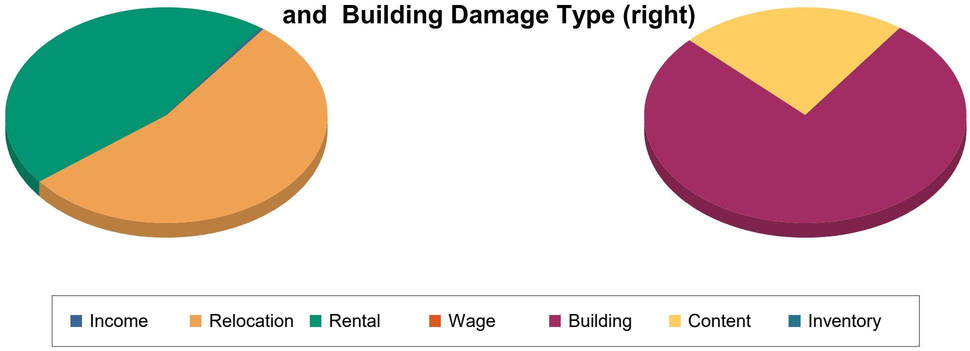
The total economic loss estimated for the hurricane is 8.2 million dollars, which represents 0.63 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 8 million dollars. 4% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 94% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

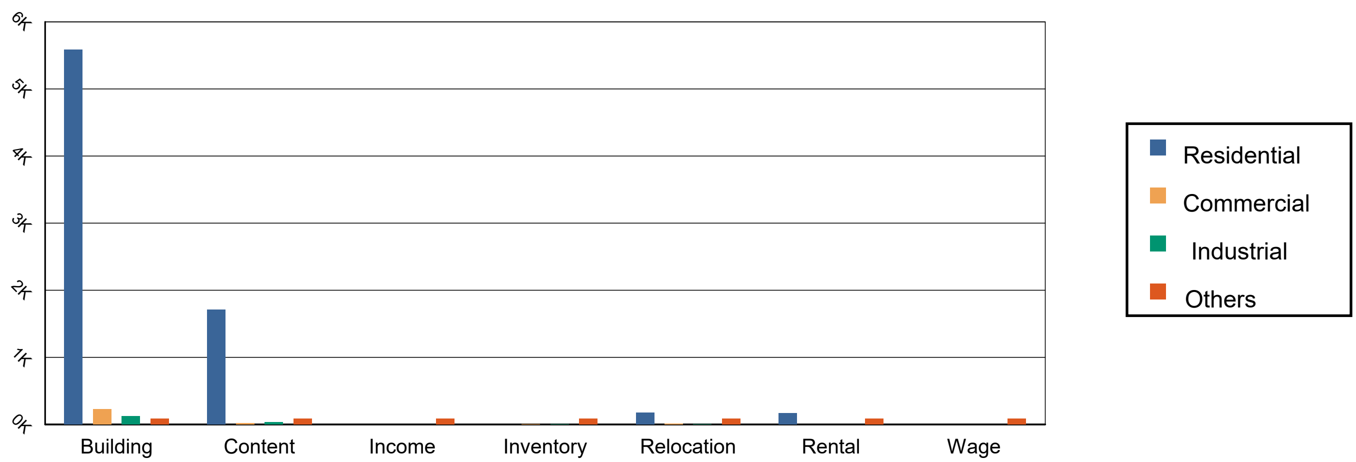


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	5,580.70	229.39	127.42	79.57	6,017.08
	Content	1,711.99	22.62	35.55	4.47	1,774.63
	Inventory	0.00	4.62	3.95	1.15	9.73
	Subtotal	**7,292.69**	**256.62**	**166.92**	**85.20**	**7,801.44**
Business Interruption Loss						
	Income	0.00	0.81	0.04	0.00	0.86
	Relocation	178.57	12.67	3.84	1.50	196.58
	Rental	164.25	0.34	0.03	0.01	164.62
	Wage	0.00	0.29	0.07	0.00	0.36
	Subtotal	**342.81**	**14.11**	**3.99**	**1.51**	**362.42**

Total

Total	**7,635.51**	**270.73**	**170.91**	**86.71**	**8,163.85**

Appendix A: County Listing for the Region

Massachusetts
- Berkshire

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
Massachusetts				
Berkshire	8,166	791,522	501,053	1,292,575
Total	**8,166**	**791,522**	**501,053**	**1,292,575**
Study Region Total	**8,166**	**791,522**	**501,053**	**1,292,575**

Hazus: Hurricane Global Risk Report

Region Name: Adams_Wind

Hurricane Scenario: Probabilistic 1000-year Return Period

Print Date: Tuesday, November 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

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The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Massachusetts

Note:
Appendix A contains a complete listing of the counties contained in the region.

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There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 1,293 million dollars. Approximately 88% of the buildings (and 61% of the building value) are associated with residential housing.

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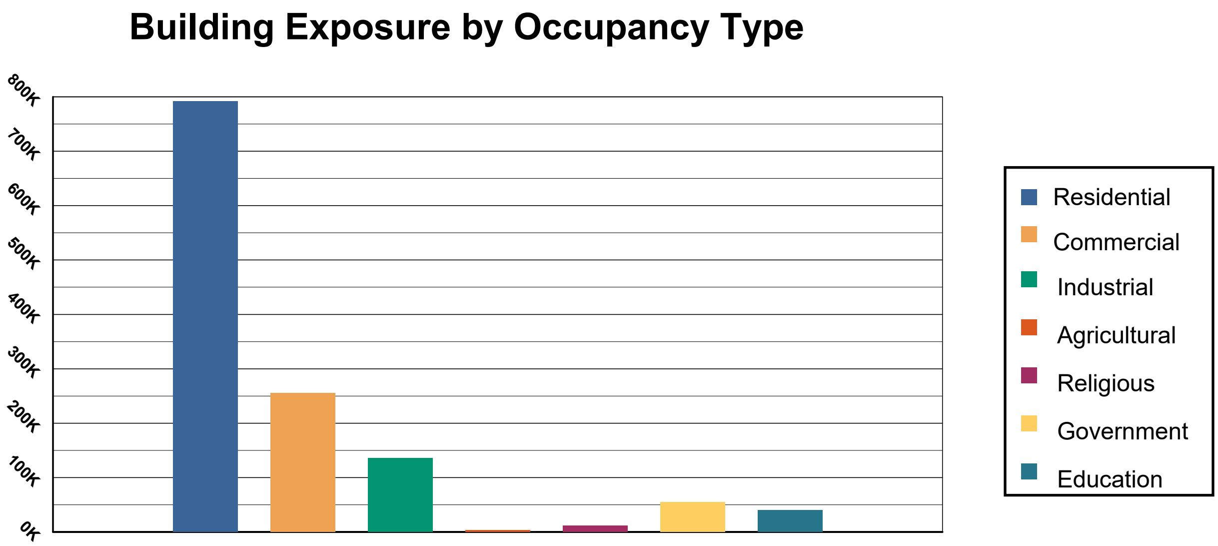

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Religious	11,519	0.89%
Government	54,985	4.25%
Education	39,694	3.07%
Total	**1,292,575**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 3 schools, 2 fire stations, 1 police stations and 1 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 37 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

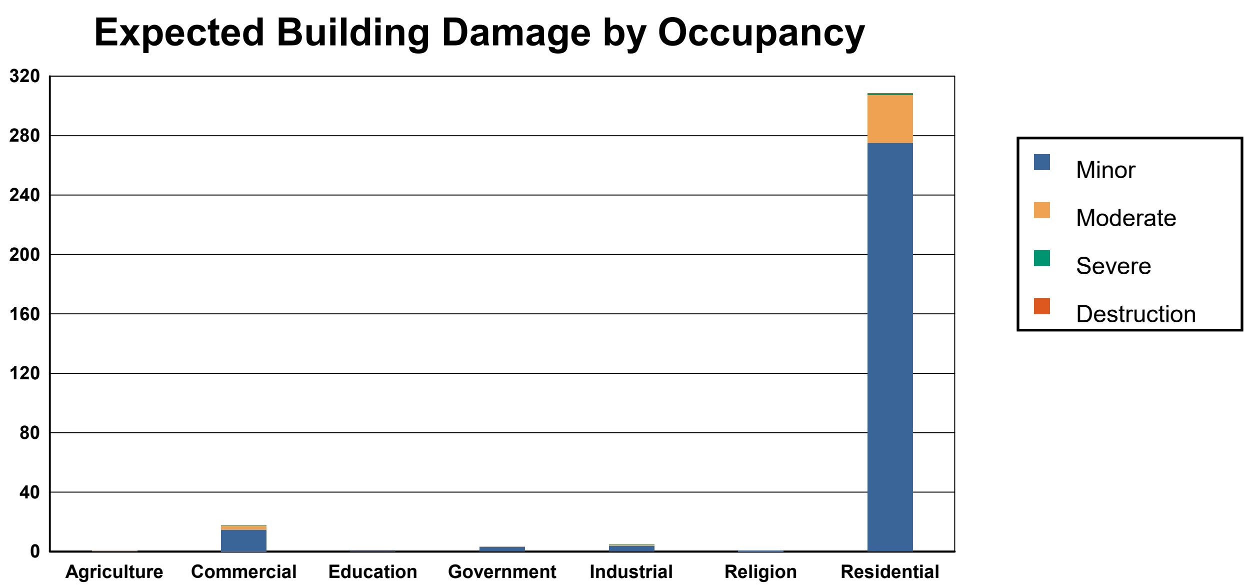


Table 2: Expected Building Damage by Occupancy : 1000 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	5.41	90.16	0.46	7.70	0.09	1.46	0.04	0.65	0.00	0.04
Commercial	206.54	92.20	14.63	6.53	2.52	1.12	0.31	0.14	0.00	0.00
Education	3.73	93.29	0.25	6.13	0.02	0.57	0.00	0.01	0.00	0.00
Government	40.70	92.49	2.95	6.71	0.34	0.78	0.01	0.02	0.00	0.00
Industrial	54.45	92.29	3.93	6.66	0.55	0.93	0.07	0.12	0.00	0.00
Religion	11.15	92.90	0.80	6.63	0.06	0.47	0.00	0.00	0.00	0.00
Residential	2,356.55	88.43	275.15	10.32	32.25	1.21	0.72	0.03	0.34	0.01
Total	**2,678.52**		**298.16**		**35.83**		**1.15**		**0.35**	

Table 3: Expected Building Damage by Building Type : 1000 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	29	92.65	2	6.54	0	0.79	0	0.01	0	0.00
Masonry	269	88.42	25	8.34	9	3.09	0	0.14	0	0.00
MH	8	97.99	0	1.41	0	0.43	0	0.01	0	0.15
Steel	145	92.68	9	6.02	2	1.13	0	0.16	0	0.00
Wood	2,117	88.81	250	10.49	16	0.68	0	0.01	0	0.01

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

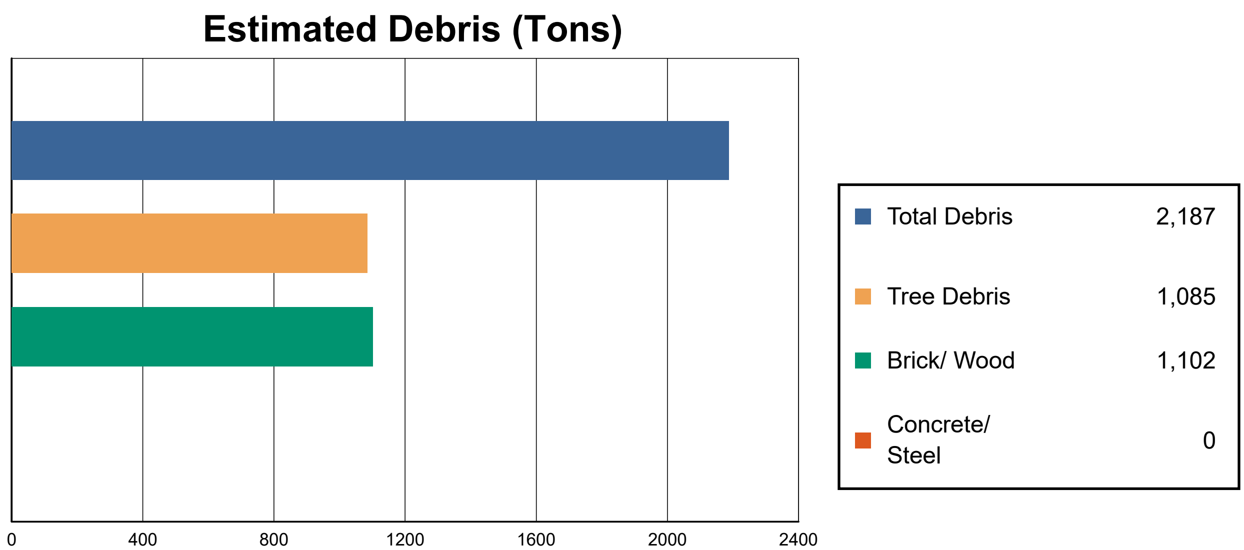
<u>Thematic Map of Essential Facilities</u>

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	2	0	0	2
Police Stations	1	0	0	1
Schools	3	0	0	3

Induced Hurricane Damage

Debris Generation

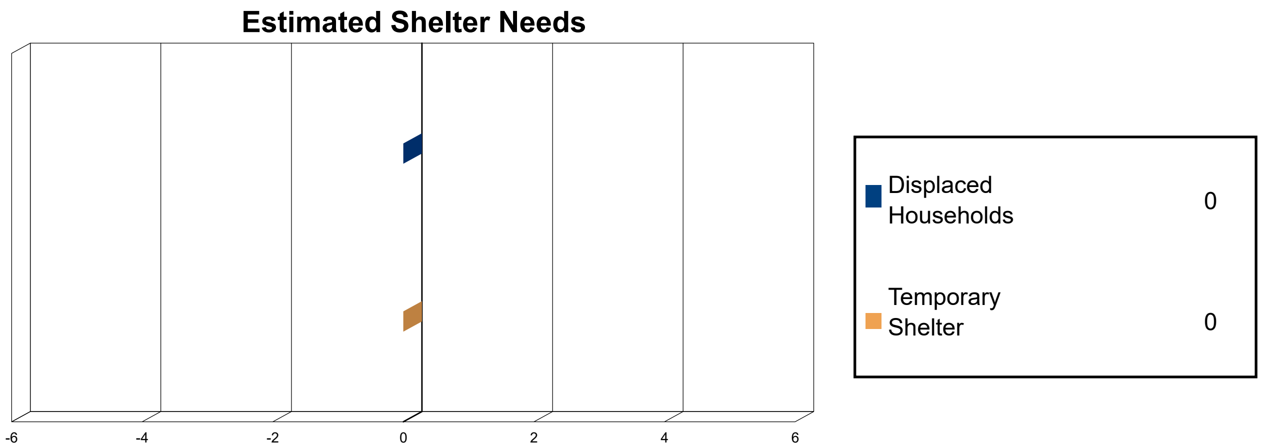


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 2,187 tons of debris will be generated. Of the total amount, 739 tons (34%) is Other Tree Debris. Of the remaining 1,448 tons, Brick/Wood comprises 76% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 44 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 346 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 8,166) will seek temporary shelter in public shelters.

Economic Loss

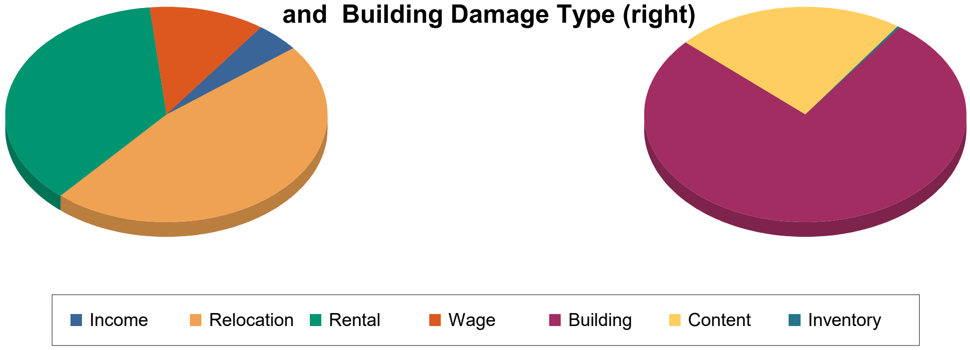
The total economic loss estimated for the hurricane is 13.6 million dollars, which represents 1.05 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 14 million dollars. 6% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 89% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

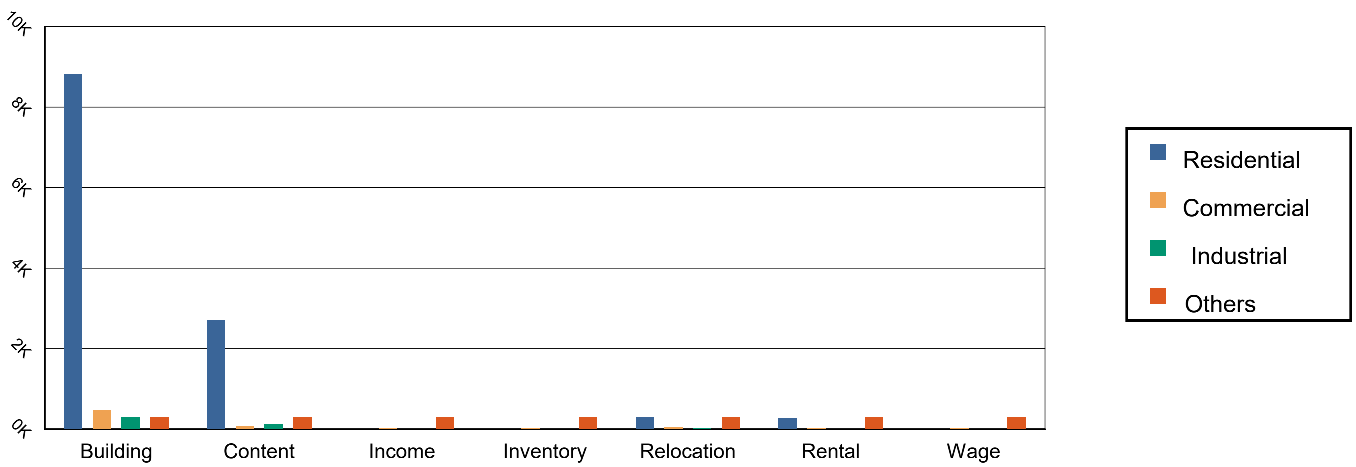


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	8,822.62	478.17	293.99	172.61	9,767.40
	Content	2,712.37	86.05	121.14	23.09	2,942.65
	Inventory	0.00	19.52	13.67	3.74	36.93
	Subtotal	**11,535.00**	**583.74**	**428.80**	**199.45**	**12,746.98**
Business Interruption Loss						
	Income	0.00	28.29	1.54	6.18	36.01
	Relocation	289.81	51.60	18.16	16.41	375.97
	Rental	274.44	17.78	1.31	3.30	296.83
	Wage	0.00	23.00	2.57	69.27	94.84
	Subtotal	**564.25**	**120.67**	**23.58**	**95.16**	**803.65**

Total

Total	**12,099.24**	**704.40**	**452.38**	**294.61**	**13,550.64**

Appendix A: County Listing for the Region

Massachusetts

- Berkshire

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Massachusetts				
Berkshire	8,166	791,522	501,053	1,292,575
Total	**8,166**	**791,522**	**501,053**	**1,292,575**
Study Region Total	**8,166**	**791,522**	**501,053**	**1,292,575**

Hazus: Earthquake Global Risk Report

Region Name: Adams_EQ

Earthquake Scenario: 1500-year

Print Date: November 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Massachusetts

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 23.00 square miles and contains 3 census tracts. There are over 3 thousand households in the region which has a total population of 8,166 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 1,292 (millions of dollars). Approximately 88.00 % of the buildings (and 61.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 910 and 292 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 3 thousand buildings in the region which have an aggregate total replacement value of 1,292 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 79% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 3 schools, 2 fire stations, 1 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 1,202.00 (millions of dollars). This inventory includes over 15.53 miles of highways, 23 bridges, 157.83 miles of pipes.

Table 1: Transportation System Lifeline Inventory

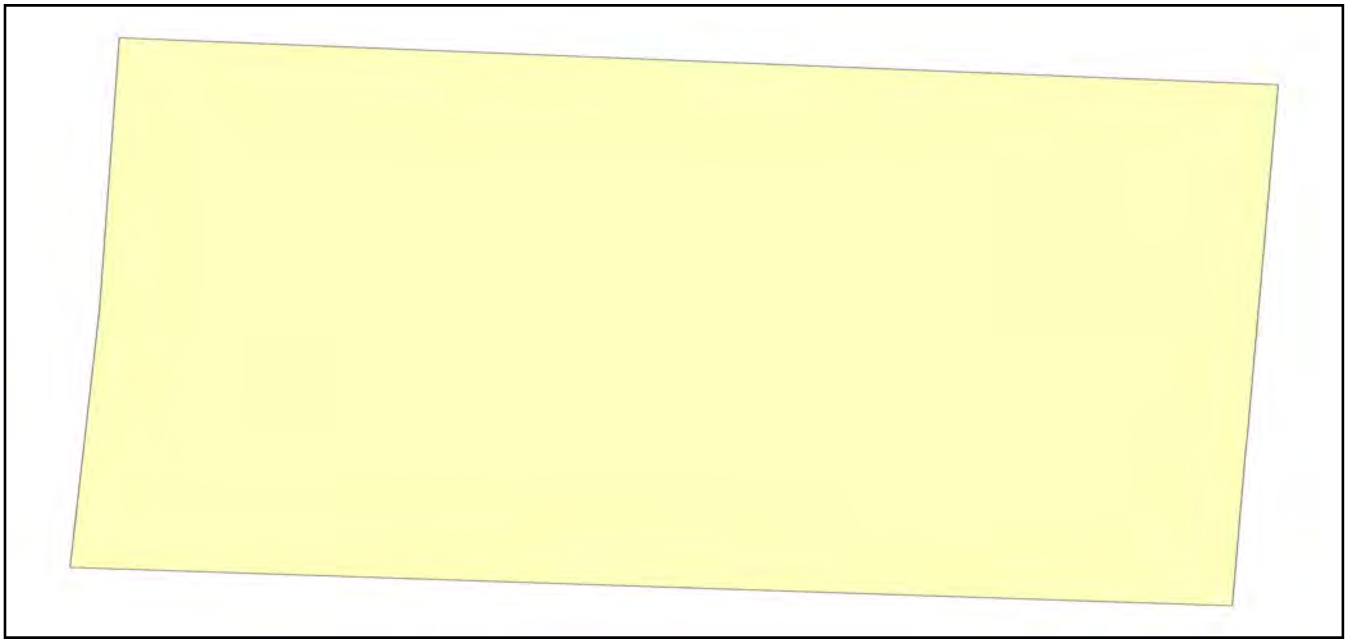
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	23	25.8520
	Segments	2	86.5787
	Tunnels	0	0.0000
		Subtotal	**112.4307**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	16	798.1346
	Tunnels	0	0.0000
		Subtotal	**798.1346**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**910.60**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	2.9258
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.9258**
Waste Water	Distribution Lines	NA	1.7555
	Facilities	1	156.8418
	Pipelines	0	0.0000
		Subtotal	**158.5973**
Natural Gas	Distribution Lines	NA	1.1703
	Facilities	0	0.0000
	Pipelines	1	129.3170
		Subtotal	**130.4873**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	2	0.2320
		Subtotal	**0.2320**
		Total	**292.20**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	1500-year
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	1,500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	6.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 16 buildings will be at least moderately damaged. This is over 1.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

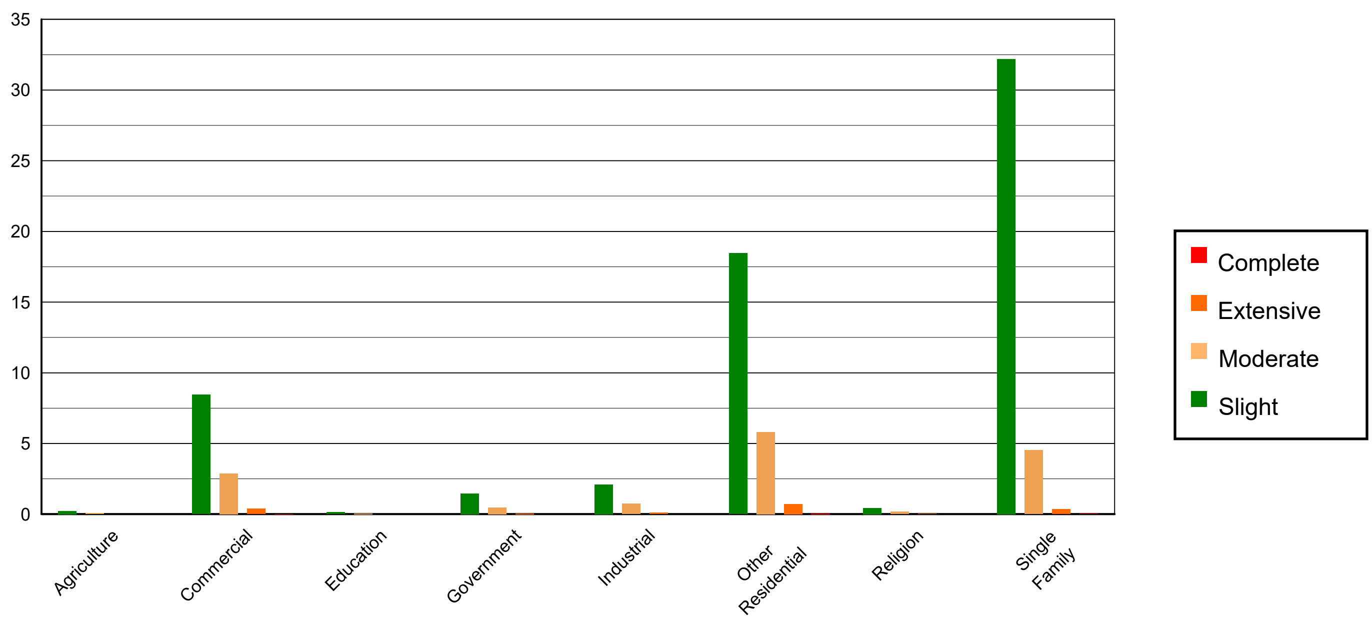


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	5.71	0.19	0.22	0.35	0.06	0.42	0.01	0.50	0.00	0.27
Commercial	212.29	7.24	8.44	13.31	2.87	19.54	0.38	23.07	0.02	17.40
Education	3.81	0.13	0.14	0.22	0.05	0.31	0.01	0.35	0.00	0.32
Government	42.01	1.43	1.46	2.30	0.47	3.23	0.05	3.30	0.00	2.04
Industrial	56.07	1.91	2.10	3.30	0.73	5.00	0.09	5.57	0.00	3.26
Other Residential	628.97	21.44	18.44	29.07	5.82	39.62	0.72	44.04	0.05	47.09
Religion	11.38	0.39	0.43	0.68	0.16	1.10	0.02	1.43	0.00	1.51
Single Family	1973.89	67.27	32.21	50.76	4.52	30.76	0.36	21.76	0.03	28.10
Total	**2,934**		**63**		**15**		**2**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Wood	2348.66	80.05	34.19	53.90	2.88	19.59	0.00	0.00	0.00	0.00
Steel	176.88	6.03	5.27	8.31	1.63	11.10	0.14	8.64	0.00	0.00
Concrete	45.34	1.55	1.51	2.38	0.43	2.89	0.02	1.05	0.00	0.00
Precast	9.73	0.33	0.50	0.78	0.31	2.12	0.05	3.35	0.00	0.00
RM	81.43	2.78	2.39	3.77	1.19	8.13	0.15	9.06	0.00	0.00
URM	258.64	8.81	18.48	29.12	7.82	53.28	1.27	77.39	0.10	100.00
MH	13.46	0.46	1.11	1.74	0.42	2.89	0.01	0.52	0.00	0.00
Total	**2,934**		**63**		**15**		**2**		**0**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	3	0	0	3
EOCs	1	0	0	1
PoliceStations	1	0	0	1
FireStations	2	0	0	2

Transportation Lifeline Damage

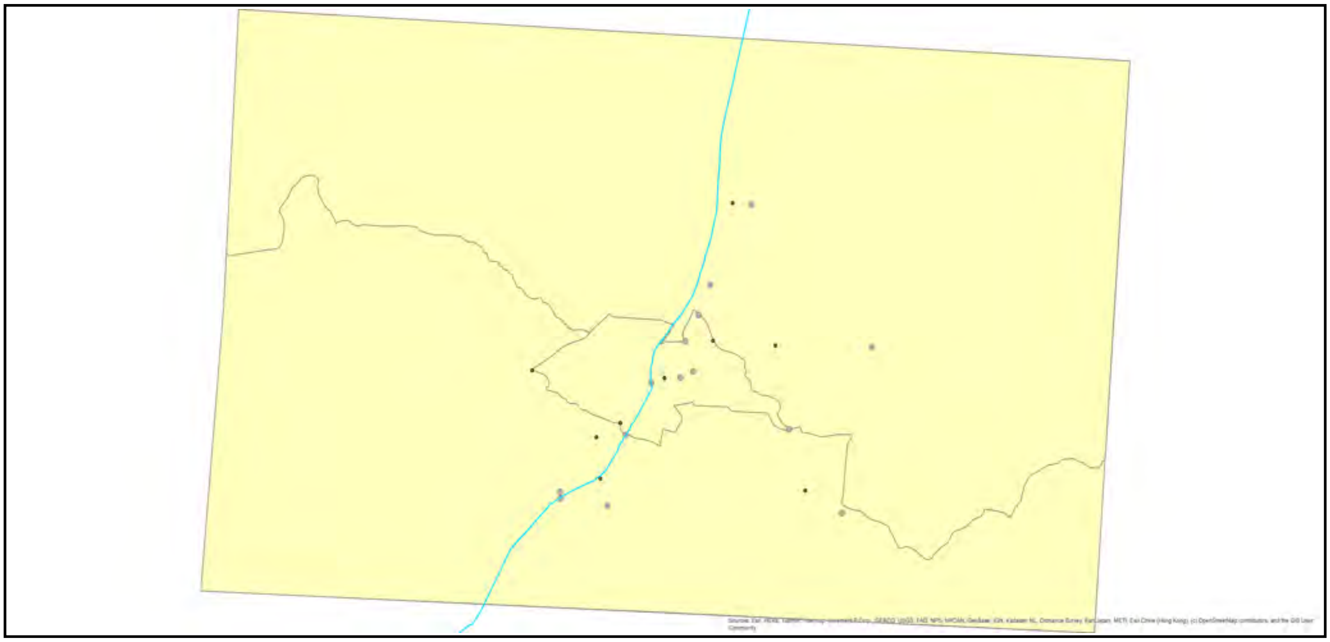


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	2	0	0	2	2
	Bridges	23	0	0	23	23
	Tunnels	0	0	0	0	0
Railways	Segments	16	0	0	15	15
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	2	0	0	2	2

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	91	0	0
Waste Water	55	0	0
Natural Gas	13	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,821	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0 tons of debris will be generated. Of the total amount, Brick/Wood comprises 73.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)

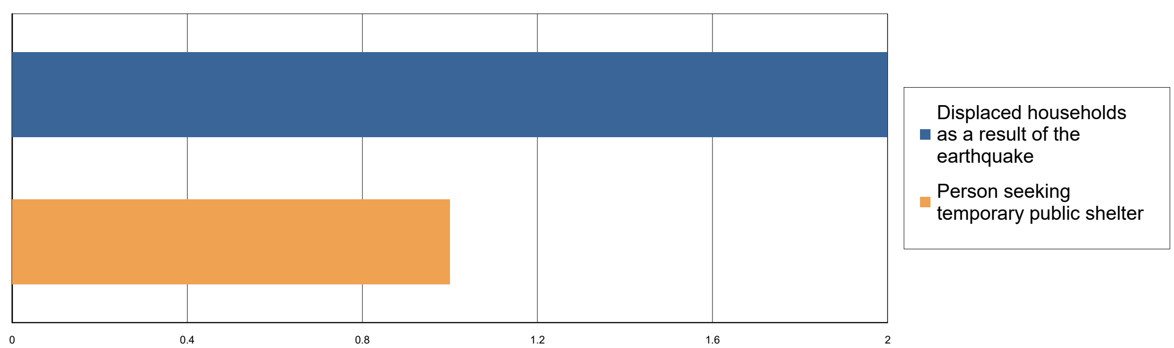
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.00	0.00	0.00	0 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 2 households to be displaced due to the earthquake. Of these, 1 people (out of a total population of 8,166) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
2	1

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.25	0.03	0.00	0.00
	Single Family	0.10	0.01	0.00	0.00
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0.25	0.03	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.06	0.01	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.03	0.00	0.00	0.00
	Other-Residential	0.08	0.01	0.00	0.00
	Single Family	0.03	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0.19	0.02	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.02	0.00	0.00	0.00
	Other-Residential	0.10	0.01	0.00	0.00
	Single Family	0.04	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**

Economic Loss

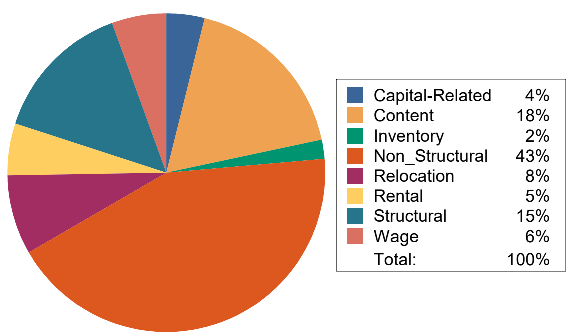
The total economic loss estimated for the earthquake is 4.00 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 3.09 (millions of dollars); 23 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 40 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

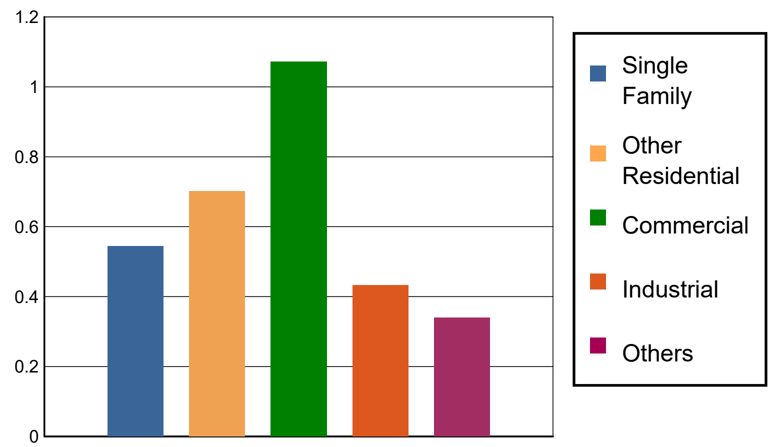


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0107	0.1289	0.0065	0.0250	0.1711
	Capital-Related	0.0000	0.0045	0.1136	0.0038	0.0023	0.1242
	Rental	0.0094	0.0687	0.0692	0.0051	0.0110	0.1634
	Relocation	0.0308	0.0517	0.0927	0.0305	0.0454	0.2511
	Subtotal	**0.0402**	**0.1356**	**0.4044**	**0.0459**	**0.0837**	**0.7098**
Capital Stock Losses							
	Structural	0.0714	0.0977	0.1569	0.0698	0.0529	0.4487
	Non_Structural	0.3226	0.3776	0.3140	0.1811	0.1334	1.3287
	Content	0.1103	0.0903	0.1610	0.1179	0.0676	0.5471
	Inventory	0.0000	0.0000	0.0364	0.0182	0.0018	0.0564
	Subtotal	**0.5043**	**0.5656**	**0.6683**	**0.3870**	**0.2557**	**2.3809**
	Total	**0.54**	**0.70**	**1.07**	**0.43**	**0.34**	**3.09**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	86.5787	0.0000	0.00
	Bridges	25.8520	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**112.4307**	**0.0000**	
Railways	Segments	798.1346	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**798.1346**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**910.57**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.9258	0.0015	0.05
	Subtotal	**2.9258**	**0.0015**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	156.8418	0.9050	0.58
	Distribution Lines	1.7555	0.0007	0.04
	Subtotal	**158.5973**	**0.9057**	
Natural Gas	Pipelines	129.3170	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	1.1703	0.0003	0.03
	Subtotal	**130.4873**	**0.0003**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.2320	0.0025	1.08
	Subtotal	**0.2320**	**0.0025**	
	Total	**292.24**	**0.91**	

Appendix A: County Listing for the Region

Berkshire,MA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Massachusetts					
	Berkshire	8,166	791	501	1,292
Total Region		**8,166**	**791**	**501**	**1,292**

Hazus: Earthquake Global Risk Report

Region Name: Adams_EQ

Earthquake Scenario: 2500-year

Print Date: November 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Massachusetts

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 23.00 square miles and contains 3 census tracts. There are over 3 thousand households in the region which has a total population of 8,166 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 1,292 (millions of dollars). Approximately 88.00 % of the buildings (and 61.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 910 and 292 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 3 thousand buildings in the region which have an aggregate total replacement value of 1,292 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 79% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 3 schools, 2 fire stations, 1 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 1,202.00 (millions of dollars). This inventory includes over 15.53 miles of highways, 23 bridges, 157.83 miles of pipes.

Table 1: Transportation System Lifeline Inventory

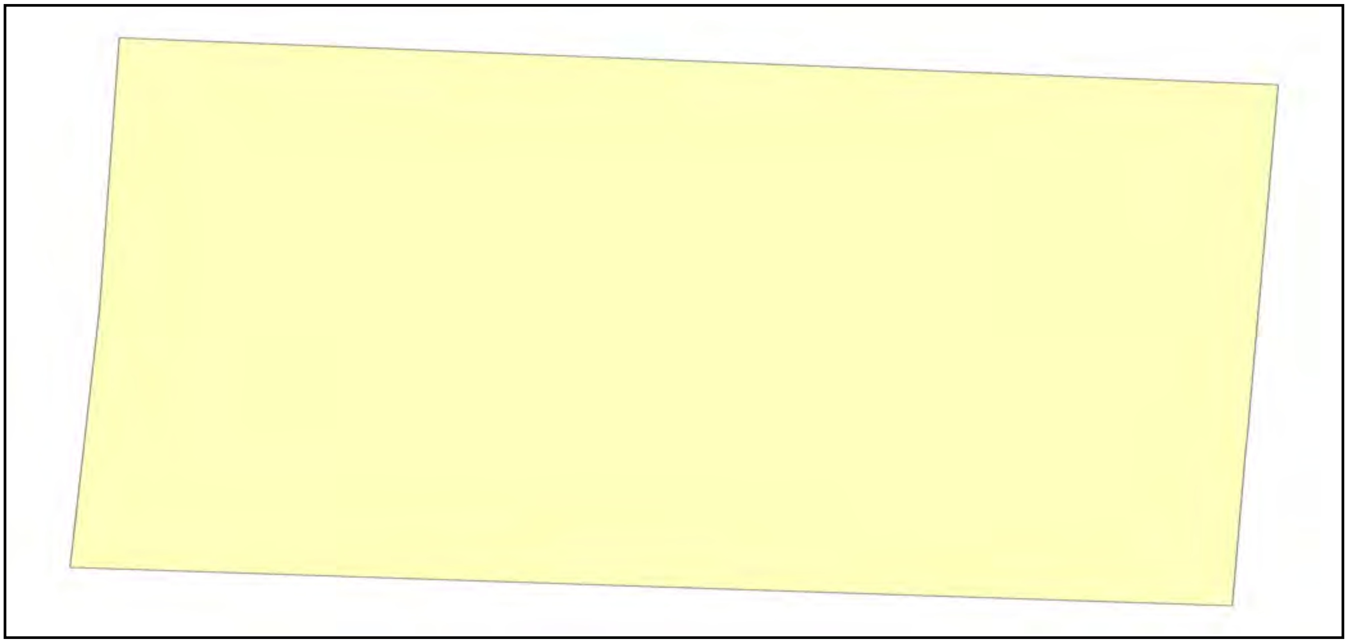
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	23	25.8520
	Segments	2	86.5787
	Tunnels	0	0.0000
		Subtotal	**112.4307**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	16	798.1346
	Tunnels	0	0.0000
		Subtotal	**798.1346**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**910.60**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	2.9258
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.9258**
Waste Water	Distribution Lines	NA	1.7555
	Facilities	1	156.8418
	Pipelines	0	0.0000
		Subtotal	**158.5973**
Natural Gas	Distribution Lines	NA	1.1703
	Facilities	0	0.0000
	Pipelines	1	129.3170
		Subtotal	**130.4873**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	2	0.2320
		Subtotal	**0.2320**
		Total	**292.20**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	2500-year
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	2,500.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	7.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 29 buildings will be at least moderately damaged. This is over 1.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

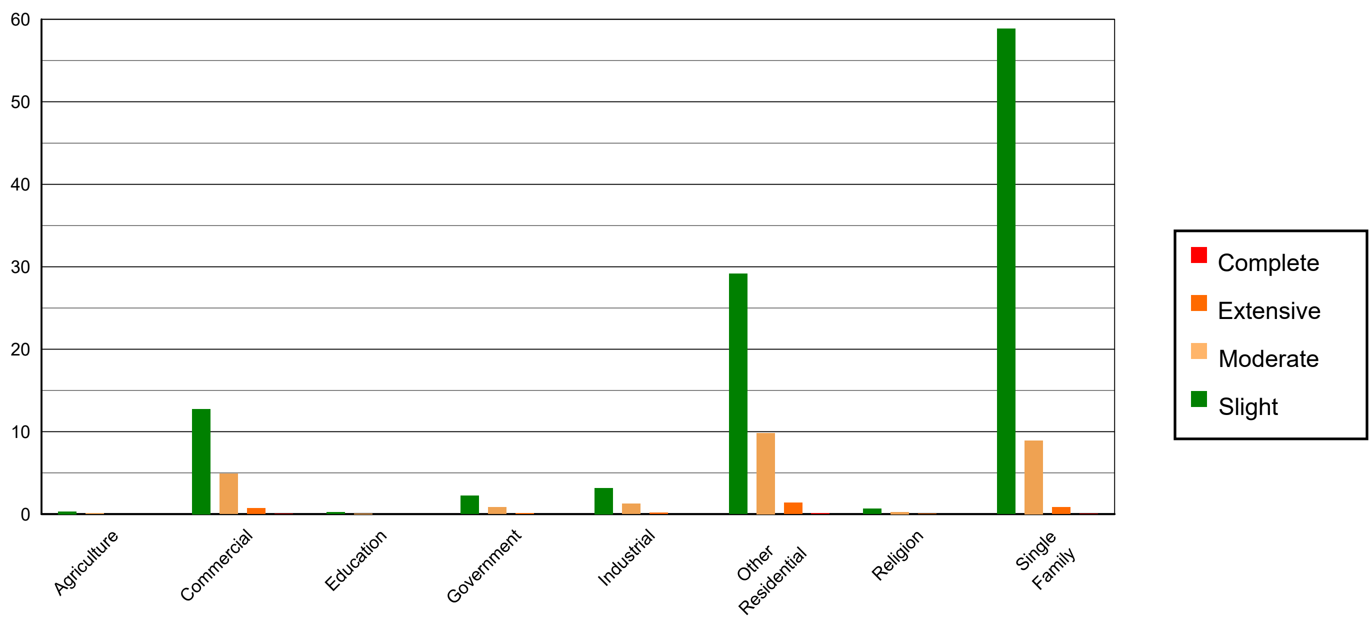


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	5.53	0.19	0.34	0.32	0.11	0.41	0.02	0.48	0.00	0.27
Commercial	205.60	7.15	12.76	11.88	4.88	18.63	0.72	21.96	0.04	17.19
Education	3.70	0.13	0.21	0.20	0.08	0.30	0.01	0.33	0.00	0.32
Government	40.81	1.42	2.24	2.09	0.84	3.19	0.11	3.24	0.01	2.10
Industrial	54.36	1.89	3.18	2.96	1.27	4.86	0.18	5.43	0.01	3.31
Other Residential	613.51	21.33	29.16	27.15	9.83	37.51	1.38	41.95	0.12	47.26
Religion	11.04	0.38	0.65	0.61	0.26	1.01	0.04	1.33	0.00	1.45
Single Family	1942.31	67.52	58.86	54.80	8.93	34.08	0.83	25.30	0.07	28.10
Total	**2,877**		**107**		**26**		**3**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	2313.75	80.43	64.93	60.45	6.83	26.04	0.23	7.08	0.00	0.00
Steel	172.20	5.99	8.33	7.75	3.08	11.76	0.31	9.38	0.00	0.00
Concrete	43.97	1.53	2.43	2.26	0.85	3.24	0.05	1.42	0.00	0.00
Precast	9.31	0.32	0.69	0.65	0.49	1.88	0.10	3.06	0.00	0.32
RM	79.30	2.76	3.54	3.29	2.02	7.71	0.30	9.25	0.00	0.00
URM	245.65	8.54	25.92	24.13	12.22	46.62	2.27	69.12	0.24	99.68
MH	12.68	0.44	1.57	1.46	0.72	2.75	0.02	0.70	0.00	0.00
Total	**2,877**		**107**		**26**		**3**		**0**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	3	0	0	3
EOCs	1	0	0	1
PoliceStations	1	0	0	1
FireStations	2	0	0	2

Transportation Lifeline Damage

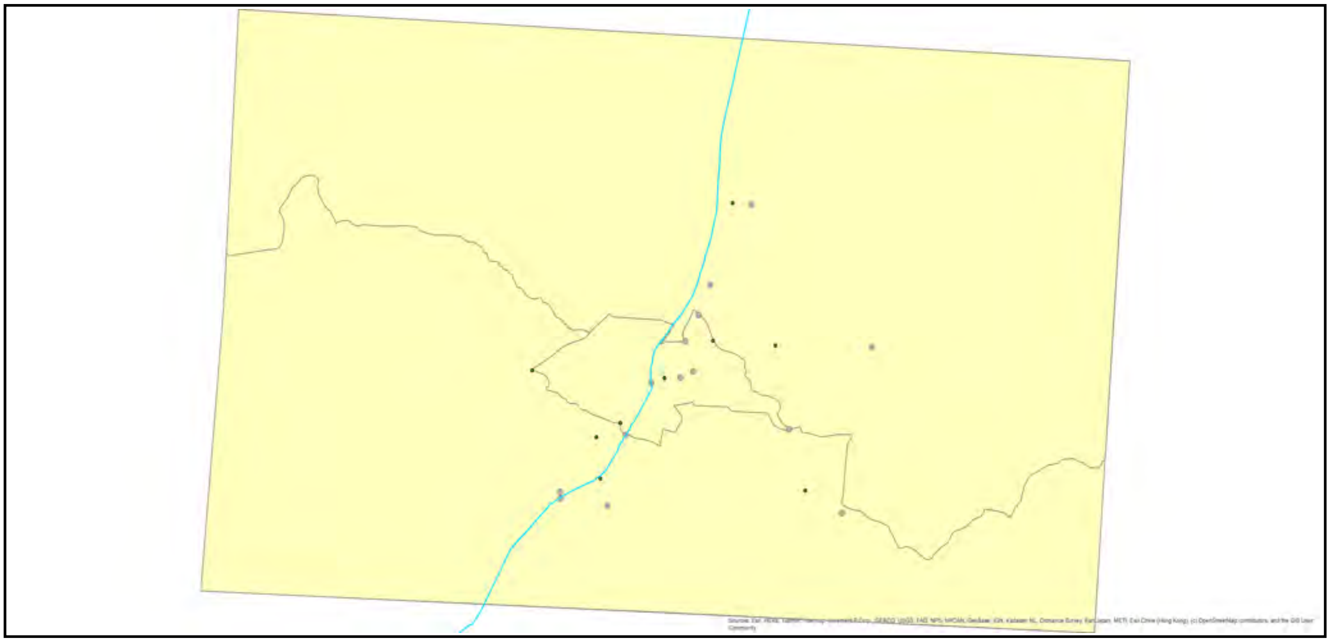


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	2	0	0	2	2
	Bridges	23	0	0	23	23
	Tunnels	0	0	0	0	0
Railways	Segments	16	0	0	15	15
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	2	0	0	2	2

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	91	1	0
Waste Water	55	0	0
Natural Gas	13	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,821	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

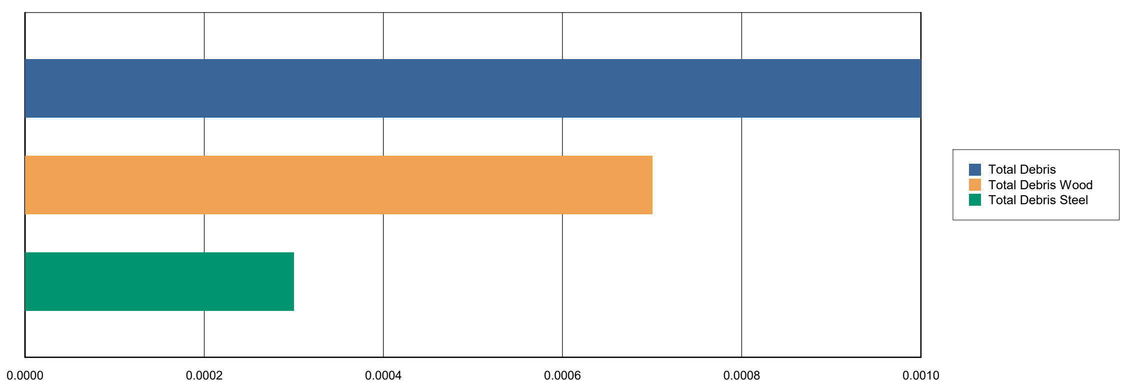
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 70.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 40 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



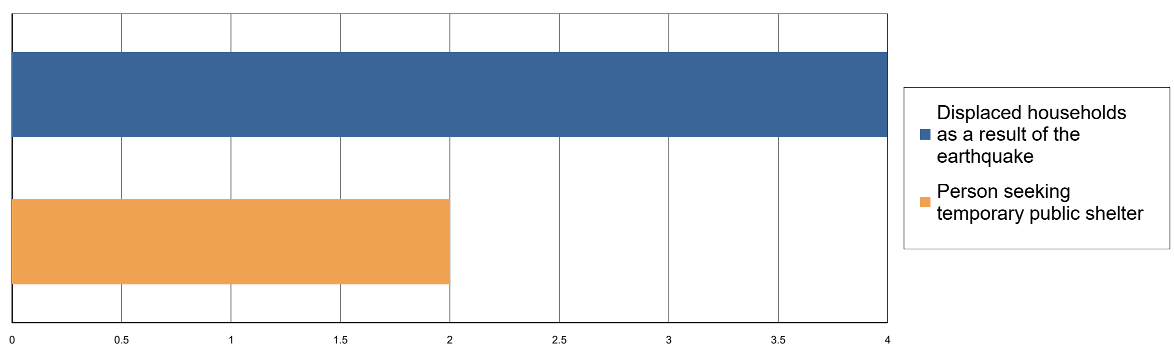
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.00	0.00	0.00	40 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 4 households to be displaced due to the earthquake. Of these, 2 people (out of a total population of 8,166) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
4	2

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.01	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.01	0.00	0.00	0.00
	Other-Residential	0.45	0.06	0.01	0.01
	Single Family	0.20	0.02	0.00	0.00
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	0.45	0.06	0.00	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.11	0.01	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.06	0.01	0.00	0.00
	Other-Residential	0.14	0.02	0.00	0.00
	Single Family	0.06	0.01	0.00	0.00
	Total	**1**	**0**	**0**	**0**
5 PM	Commercial	0.33	0.04	0.00	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.04	0.00	0.00	0.00
	Other-Residential	0.18	0.02	0.00	0.00
	Single Family	0.08	0.01	0.00	0.00
	Total	**1**	**0**	**0**	**0**

Economic Loss

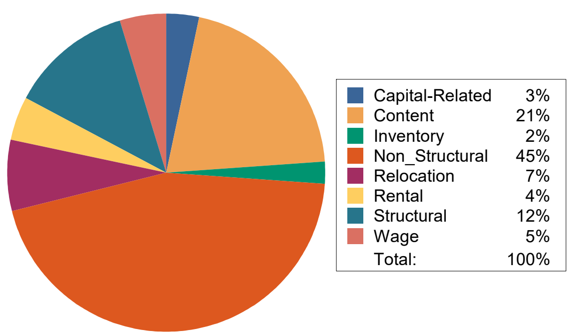
The total economic loss estimated for the earthquake is 8.51 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 6.38 (millions of dollars); 20 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 41 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

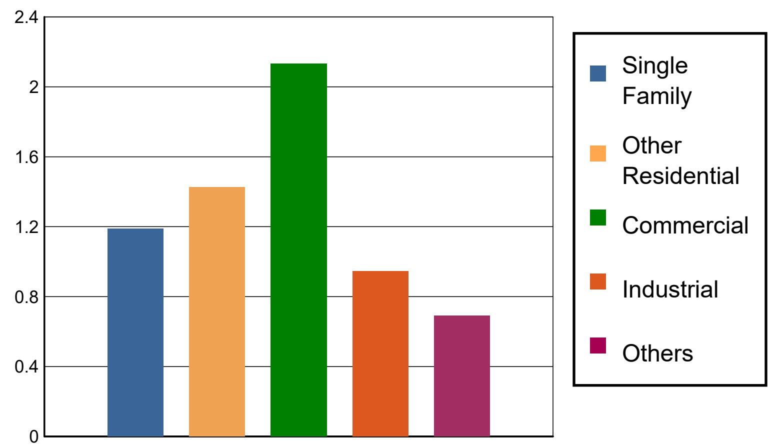


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0196	0.2267	0.0116	0.0423	0.3002
	Capital-Related	0.0000	0.0083	0.2004	0.0069	0.0040	0.2196
	Rental	0.0189	0.1213	0.1182	0.0088	0.0195	0.2867
	Relocation	0.0631	0.0912	0.1634	0.0537	0.0817	0.4531
	Subtotal	**0.0820**	**0.2404**	**0.7087**	**0.0810**	**0.1475**	**1.2596**
Capital Stock Losses							
	Structural	0.1400	0.1706	0.2733	0.1211	0.0926	0.7976
	Non_Structural	0.7052	0.8014	0.6755	0.4156	0.2836	2.8813
	Content	0.2616	0.2144	0.3876	0.2831	0.1619	1.3086
	Inventory	0.0000	0.0000	0.0875	0.0436	0.0045	0.1356
	Subtotal	**1.1068**	**1.1864**	**1.4239**	**0.8634**	**0.5426**	**5.1231**
	Total	**1.19**	**1.43**	**2.13**	**0.94**	**0.69**	**6.38**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	86.5787	0.0000	0.00
	Bridges	25.8520	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**112.4307**	**0.0000**	
Railways	Segments	798.1346	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**798.1346**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**910.57**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.9258	0.0030	0.10
	Subtotal	**2.9258**	**0.0030**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	156.8418	2.1189	1.35
	Distribution Lines	1.7555	0.0015	0.09
	Subtotal	**158.5973**	**2.1204**	
Natural Gas	Pipelines	129.3170	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	1.1703	0.0005	0.04
	Subtotal	**130.4873**	**0.0005**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.2320	0.0060	2.59
	Subtotal	**0.2320**	**0.0060**	
	Total	**292.24**	**2.13**	

Appendix A: County Listing for the Region

Berkshire,MA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Massachusetts					
	Berkshire	8,166	791	501	1,292
Total Region		**8,166**	**791**	**501**	**1,292**