THE TOWN OF HATFIELD

NATURAL HAZARD MITIGATION PLAN Update

Adopted by the Hatfield Board of Selectmen on DATE

Prepared by:
The Hatfield Natural Hazards Mitigation Planning Committee

and

The Pioneer Valley Planning Commission

This project was funded by a grant received from the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation Services (formerly the Department of Environmental Management)

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Acknowledgements

The Hatfield Board of Selectmen extends special thanks to the Hatfield Natural Hazards Mitigation Planning Committee as follows:

Marlene Michonski, Town Administrator
Robert Flaherty, Fire Chief
Mike Dekoschak, Police Chief
Phil Genovese, Director-Department of Public Works
Garret Barry, Highway Lead - Department of Public Works
Eric Meals, Sewer Superintendent - Department of Public Works
Elizabeth Kugler, Board of Health
Robert Osley, Board of Health and Historical Society

The Hatfield Board of Selectmen offers thanks to the Massachusetts Emergency Management Agency (MEMA) for developing the Massachusetts Integrated State Hazards Mitigation and Climate Adaptation Plan (https://www.mass.gov/service-details/massachusetts-integrated-state-hazard-mitigation-and-climate-adaptation-plan) which served as a model for this plan. In addition, special thanks are extended to the staff of the Pioneer Valley Planning Commission for professional services, process facilitation and preparation of this document.

The Pioneer Valley Planning Commission

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1 –PLANNING PROCESS

Introduction

The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards such as flooding, storms, high winds, hurricanes, wildfires, earthquakes, etc. Mitigation efforts undertaken by communities will help to minimize damages to buildings and infrastructure, such as water supplies, sewers, and utility transmission lines, as well as natural, cultural and historic resources.

Planning efforts, like the one undertaken by the Town of Hatfield and the Pioneer Valley Planning Commission, make mitigation a proactive process. Pre-disaster planning emphasizes actions that can be taken before a natural disaster occurs. Future property damage and loss of life can be reduced or prevented by a mitigation program that addresses the unique geography, demography, economy, and land use of a community within the context of each of the specific potential natural hazards that may threaten a community.

Preparing a Local Natural Hazards Mitigation Plan before a disaster occurs can save the community money and facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the Plan. FEMA requires that a community adopt a pre-disaster mitigation plan as a condition for mitigation funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Pre-Disaster Mitigation Program are programs with this requirement.

The 2021 Hatfield Hazard Mitigation Plan (HMP) is an update and improvement to the previous plan adopted in 2016. The team updated the plan to reflect changes in development, mitigation priorities, and recent hazards in the town. A primary difference between the 2016 and 2021 plans is that this HMP includes a new focus on climate adaptation. The integrated nature of this plan provides the opportunity to identify climate change impacts, describe the effect climate change is anticipated to have on natural hazards, and prepare an integrated strategy to understand and mitigate risks. In addition to integrating climate change, the structure of the plan was further revised and reorganized based on the integrated nature of the plan and to align with the recently published 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan.

Hazard Mitigation Planning Committee

In 2021, the Town of Hatfield completed an update of their 2016 Hazard Mitigation Plan, in collaboration with the Pioneer Valley Planning Commission. All portions of the plan were reviewed and updated as necessary. Planning for hazard mitigation in Hatfield was undertaken by the Hatfield Local Emergency Planning Committee, which includes the following members:

Marlene Michonski, Town Administrator
Robert Flaherty, Fire Chief
Mike Dekoschak, Police Chief
Phil Genovese, Director-Department of Public Works
Eric Meals, Sewer Superintendent, Department of Public Works
Garrett Barry, Highway Lead, Department of Public Works
Elizabeth Kugler, Board of Health
Robert Osley, Board of Health and Hatfield Historical Society

While not all members were able to attend every meeting, the Town Administrator and Fire Chief kept all members informed of work in between meetings.

The Hazard Mitigation planning process for the Town included the following tasks:

- Reviewing and incorporating existing plans and other information.
- Identifying the natural hazards that may impact the community.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure at the highest risk for being damaged by the identified natural hazards, particularly flooding.
- Identifying and assessing the policies, programs, and regulations the community is currently implementing to protect against future disaster damages.
- Identifying deficiencies in the current strategies and establishing goals for updating, revising or adopting new strategies.
- Adopting and implementing the final Hazard Mitigation Plan.

The key product of this process was the development of an updated Action Plan with a Prioritized Implementation Schedule.

Hazard Mitigation Committee Meetings

The local Hazard Mitigation committee met six times to review, revise and finalize a draft updated plan prepared by the PVPC staff. Because PVPC has facilitated development of thirty-seven local Hazard Mitigation plans in the region, the staff are familiar with sources of natural hazard mitigation data as well as knowledgeable about mitigation planning and the natural hazard vulnerabilities and capabilities in the region. The committee reviewed and commented upon the whole plan, chapter by chapter, at meetings facilitated by PVPC staff. This committee work was supplemented by individual research, reading and review by committee members in time outside of meetings as well as by some additional municipal staff time (not serving on the committee) who performed additional research, data collection and analysis.

Meetings of the Hazard Mitigation Planning Committee were held on the dates listed below. Due to the Covid-19 pandemic, the first two meetings took place virtually using a Zoom platform. The remaining five meetings were held in person at the Hatfield Emergency Management Building. Agendas with copies of the sign in sheets for each meeting are included in Appendix B. After review by MEMA, the Hazard Mitigation Committee met to review and incorporate MEMA feedback.

- May 14, 2021
- May 25, 2021
- June 3, 2021
- June 8, 2021
- June 15, 2021 (Public Hearing at the Select Board Meeting)
- July 14, 2021
-

While not all members of the Hazard Mitigation Committee were able to attend each meeting, all members collaborated on the plan and were updated on progress by fellow Committee members after meetings occurred as necessary.

Public Meetings with the Board of Selectmen

On DATE 2020 the Hatfield Board of Selectmen committed to work with PVPC and MEMA to update the Town's Hazard Mitigation plan.

Following review by MEMA and conditional approval by FEMA, the Board of Selectmen voted to adopt this plan update on DATE 2022.

Participation by Stakeholders

A variety of stakeholders were provided with an opportunity to be involved in the development of the Hatfield Hazard Mitigation Plan. The different categories of stakeholders that were involved, and the engagement activities that occurred, are described below.

Local and Regional agencies involved in hazard mitigation activities and surrounding community engagement and input

The Pioneer Valley Planning Commission is a regional planning agency for 43 towns and cities in Massachusetts' Hampden and Hampshire Counties. PVPC regularly engages with the Town of Hatfield as part of its regional planning efforts, which include the following:

- Developing the Pioneer Valley Regional Land Use Plan, Valley Vision 2, which advocates for sustainable land use throughout the region and consideration for the impact of flooding and other natural hazards on development.

- Developing the Pioneer Valley Climate Action and Clean Energy Plan, which assesses the impact that climate change will have on the region and recommends strategies for mitigation that can be implemented by local municipalities and businesses.
- Collaborating with state agencies, such as the Department of Conservation and Recreation, to maintain inventories of critical infrastructure throughout the region.

All of these PVPC initiatives considered the impact of natural hazards on the region and strategies for reducing their impact to people and property through hazard mitigation activities. The facilitation of the Hatfield Hazard Mitigation Plan by PVPC ensured that the information from these plans and collaborations was incorporated into the Hazard Mitigation Planning process.

In addition, the Pioneer Valley Planning Commission is actively involved in the Western Region Homeland Security Advisory Council (WRHSAC). WHRSAC, which includes representatives from Western Massachusetts municipalities, Fire Departments, Public Works Departments, Police Departments, area hospitals and regional transit from throughout the four counties of western Massachusetts, is responsible for allocating emergency preparedness funding from the US Department of Homeland Security. The representatives of these disciplines who serve on the WRHSAC are charged with sharing the information discussed at meetings with their colleagues at their regular meetings.

PVPC staff attend all WRHSAC meetings and all WRHSAC members were made aware of the fact that Hatfield was updating their Hazard Mitigation plan. Meetings of WRHSAC regularly involve discussion about how to improve emergency preparedness in western Massachusetts, and hazard mitigation activities are included in this discussion. For the development of this Hazard Mitigation Plan, PVPC staff verbally informed WRHSAC members that they were working on the Hatfield plan as the Council's Planning sub-committee was deliberating about how to disseminate information about their work to sub-regions of the Pioneer Valley.

In addition, PVPC staff regularly present to their Executive Committee and Commission (representatives from the 43 cities and towns that comprise the Pioneer Valley), when new projects are launched and when funding opportunities are available. As result, all the communities in the region were informed of Hatfield's hazard mitigation plan development process and encouraged to comment.

PVPC staff included a summary article on the status of Hazard Mitigation planning in the region in the quarterly Regional Reporter that is mailed to area Chambers of Commerce, all member municipalities, area colleges and universities and other key stakeholders in the region. In this way, businesses, educational institutions and other key stakeholders were educated about and informed of Hatfield's hazard mitigation planning work.

Hatfield is active in the Hampshire County regional emergency planning committee (REPC) and informed members of their work on this Hazard Mitigation plan.

Participation by the Public, Businesses, and Neighboring Communities

Two public planning sessions were held as part of the development of the Hatfield plan – on Tuesday, June 15, 2021 and Tuesday, November 2, 2021 at 6 p.m. The first meeting occurred after four meetings of the local Hazard Mitigation planning committee, and the final public input meeting occurred after the Hazard Mitigation Committee had provided input on hazards and mitigation strategies relevant to the

community and had prepared a proposed final draft updated plan. Notice of both public meetings were posted at Hatfield Town Hall in compliance with the Commonwealth of Massachusetts' open meeting law, and the meeting was also advertised on the Town website and Facebook page. Public meeting agendas and notices can be found in Appendix A. Both public meetings were held in person as well as remotely through GoToMeeting.

On June 10, 2021 the Pioneer Valley Planning Commission sent a press release to area media outlets to inform the public a public meeting would be held on June 15, 2021 in order to inform all stakeholders about the hazard mitigation planning process and to solicit stakeholder input into the plan. The event was to take place as part of a regularly scheduled Select Board meeting. All residents, businesses, and other concerned parties of Hatfield and adjacent communities were encouraged to provide input on the plan by attending the meeting or by contacting PVPC or the Town of Hatfield by phone or email. The press release and article published in MassLive are included in Appendix A.

On DATE 2021 the Pioneer Valley Planning Commission sent a press release to area media outlets to inform the public that that a draft of the Hatfield Hazard Mitigation Plan had been placed on PVPC's website. The release also indicated that hard copies were available at PVPC's offices and at Hatfield Town Hall, and that all residents, businesses and other concerned parties of Hatfield and adjacent communities were encouraged to comment on the plan by e-mailing or calling staff contacts at PVPC or the Town of Hatfield.

Citizens, municipal officials and others from neighboring municipalities were encouraged to comment on Hatfield's plan by e-mailing or calling staff contacts at PVPC or the Town of Hatfield. The Pioneer Valley Planning Commission's regional scope ensured that residents and government officials throughout the Pioneer Valley saw the press release and request for comments. Surrounding communities were informed of Hatfield's hazard mitigation planning process and had the opportunity to comment on the draft plan. INSERT COMMENTS.

Copies of media releases and the presentation from the first public meeting are in the Appendix. For the second meeting staff prepared copies of the plan as handouts with highlighted excerpts and the mitigation strategy charts.

Agencies that have the authority to regulate development

Hatfield is a small community with limited professional staff. The entities that have the authority to regulate development include the Select Board, the Planning Board, the Conservation Commission, the Board of Health and the Department of Public Works. The Select Board and the Planning Board were apprised of this hazard mitigation planning work by the Town Administrator who served on the committee and who staffs the Select Board. The Board of Health and Department of Public Works were represented by Committee members connected with those entities. The Local Emergency Planning Committee (LEPC) Chair, who served as Hazard Mitigation Planning Committee Chair, Fire Chief Robert Flaherty, assured inclusion of all those entities in the plan development process and that their input was integrated into the plan.

In addition, the Pioneer Valley Planning Commission, as a regional planning authority, works with all agencies that regulate development in Hatfield, including state agencies such as Department of Conservation and Recreation and MassDOT. This regular involvement ensured that during the development of the Hatfield Hazard Mitigation Plan, the operational policies and any mitigation

strategies or identified hazards from these entities were incorporated into the Hazard Mitigation Plan. All the agencies that regulate development in Hatfield are committed to integrating the natural hazard mitigation knowledge and strategies gleaned from this planning process into their work to steward development in Hatfield.

Local Mitigation Capabilities

The Hatfield Hazard Mitigation Committee used the FEMA Capability Assessment worksheet 4.1 (from the 2013 Local Mitigation Planning Handbook) to comprehensively assess existing mitigation capabilities in the community. The completed worksheet is included in this plan's Appendix and details on existing mitigation capabilities and strategies are described in Chapter 5. Hatfield is well organized and has considerable local capability to mitigate the effects of natural hazards on the community. The community has a number of plans in place that organize data and information for the community and identify recommended actions to facilitate sustainable growth and development. The Fire Department has an ISO rating of 6/6X and the Bond rating for the Town is A+.

2 – LOCAL PROFILE[1]

Community Setting

The Town of Hatfield is an historic agricultural river town on the west bank of the Connecticut River. Large land grants were made to Governor Bradstreet and Major General Dennison in 1659, and the town's early colonial settlement in 1660 was compatible with Indian life. The Nonatucks reserved their right to erect wigwams on the common, plant, hunt and fish. In 1662, Thomas Meekins operated a grist mill on the Mill River and in 1669 he added a sawmill. This single area in the town remained an industrial locus for over 200 years.

The first linseed oil mill was patented and established in 1737, and cider mills were opened. Residents raised sheep and cattle and the town was described as a "prosperous town on a strong agricultural base." Hatfield became one of the primary suppliers of beef and of soldiers to the Continental Army. In 1776, 127 men of a population of 582 were serving in the army. In 1786 the town was the site of a 50-community meeting of the rebels involved in Shay's rebellion, who were angered by the hardships and foreclosures brought on by a cash-poor economy. When they weren't fighting or rebelling, residents of Hatfield grew corn and made brooms, which became a major industry in the town. Irish, German and French-Canadian immigrants, drawn to work in building the railroads in the state, finished the track and set up as farmers in Hatfield, as did later arrivals from Poland, Austria and Czechoslovakia. These newcomers created the largest immigrant population in the county at 39.6%. The farmers raised wheat and by 1905 were the leading tobacco and onion producers in the state. There are still over 120 tobacco barns in Hatfield.

Benefactors in the town shared their prosperity with their neighbors. Sophia Smith, an heiress to one of the largest fortunes in Hatfield, used her money to create Smith College, while Caleb Cooley Dickinson founded Dickinson Hospital in Hatfield.

Main Street in Hatfield retains a remarkable historic character, with a dense concentration of well-preserved 18th and 19th century family homes.

[1] This information was taken from the Department of Housing and Community Development's narrative profile of Hatfield and the Massachusetts Historical Commission Reconnaissance Survey Town Report for Hatfield, available at https://www.sec.state.ma.us/mhc/mhcpdf/townreports/CT-Valley/htf.pdf.

Development

According to the 2005 MacConnell Land use data, the total land area of Hatfield is approximately 10,771 acres with roughly 15 percent of those acres as developed land. The remaining land is classified as undeveloped with forest as the largest category (39% of all town land) with 4,189 acres. Cropland is the second largest category of undeveloped land with 2,793 (25% of all town land) acres compared to Water and Wetlands, which represent individually, the third and fourth largest amount of undeveloped land in the town with 540 and 390 acres, respectively. Because the Connecticut River is such a prominent feature in town, it should be noted that Hatfield's maximum elevation (MassGIS) is 840 feet.

Significant commercial and industrial development occurred in Hatfield at the southernmost portion of West Street (at the border with Northampton) in the last decade, but there has not been much additional development in that area in the last five years. A project to extend the Town sewer line on West Street is currently being completed, and will allow the building of a mixed-use development that will include a 150,000 square foot industrial building as well as 30-46 condominium units. Other development in the last five years has included the Five Colleges Library Annex at 202 Plain Road, as well as scattered single-family homes. These new developments are located in areas with other development and are not anticipated by the local Hazard Mitigation committee to change the community's vulnerability.

Zoning

In addition to other factors, zoning and other land use regulations constitute Hatfield's "blueprint" for its future. Land use patterns over time will continue to look more and more like the town's zoning map until the town is finally "built out"—that is, there is no more developable land left. Therefore, in looking forward over time, it is critical that the town focus not on the current use and physical build-out today, but on the potential future uses and build-out that are allowed under the town's zoning map and zoning bylaws. Zoning is the primary land use tool that the town may use to manage development and direct growth to suitable and desired areas, while also protecting critical resources, and ensuring that development is in keeping with the town's character.

The Hatfield Zoning Bylaw establishes ten zoning districts (seven base zones and three overlay districts):

- Rural Residential District
- Outlying Residential District
- Town Center District
- Town Center Business District
- Business District
- Industrial District
- Agricultural District
- Floodplain Overlay District
- Water Supply Protection Overlay District
- Riverfront Overlay District

Although appropriate zoning is all relevant to protecting the health and safety of the Town residents, three of Hatfield's districts are specifically relevant to natural hazard mitigation. These are outlined here:

- Floodplain - The floodplain overlay applies to those areas within the boundary of the one-hundred-year flood that are considered hazardous according to FEMA. It limits some uses for preventing potential flood damage.
- Water Supply Protection District – The purpose of this overlay district is to protect and preserve Hatfield's groundwater resources from potentially damaging pollution, or environmental degradation, by regulating certain uses within the district. The regulations state specific prohibited and restricted uses, regulates drainage, details site plan requirements and special permit procedures.
- Riverfront Overlay District – The purpose of this overlay district is to protect the sensitive natural resources and rural character of the lands adjacent to the Connecticut River in Hatfield, promote the preservation of agricultural lands along the Connecticut River, and preserve the natural flood control and flood storage characteristics of the floodplain areas in the Riverfront Overlay District.

The Zoning Bylaw also establishes a Site Plan/Special Permit Approval procedure for specific uses and structures within Russell. This review allows the Special Permit Granting Authority the ability to review development to ensure that the basic safety and welfare of the people of Russell are protected, and includes several specific evaluation criteria that are relevant to natural hazards.

Infrastructure

Hatfield's geography has been a major factor in the development of its infrastructure. The broad, alluvial plains of the Connecticut River attracted farms, and settlement patterns grew around the fertile soils. The town is easily accessed by Interstate 91, and it serves as a major conduit for goods and people and has two exits within Hatfield's borders. This has spurred industrial and commercial growth in the past, whereas recent growth is modest residential growth. The town has water and sewer utilities, and the boundaries and capacities of these services are shaping and directing growth.

Roads and Highways

The major artery running through town is Interstate 91, which connects Hatfield with Northampton and Springfield to the south and with towns to the north including Greenfield, Northfield and finally communities in Vermont such as Brattleboro. Hatfield residents can travel both north and south via Route 5 & 10. Because of the river, there is not an east-to-west route available within Hatfield, but residents can travel to Route 9 to access Hadley, Amherst and points east as well as points west.

Rail

The Amtrak train was re-routed in 2014 to run from Springfield through Northampton north to Brattleboro VT, passing through Hatfield twice per day. There is not a stop in Hatfield and the passenger

train route has not had an impact on the Town, although the Hazard Mitigation Committee determined that there was also an increase in the number of cargo trains. Pan Am Railways operates the freight line that runs north-south through Hatfield which serves a handful of commercial and industrial operations in the town.

Public Transportation

The Franklin Regional Transit Authority (FRTA) provides limited bus service along routes 5/10 four times a day. This service is designed to serve employees of C&S Wholesale grocers. The town is not a member of the Pioneer Valley Transit Authority (PVTA).

Public Drinking Water Supply

The Town of Hatfield has a water distribution system with about 37 miles of water mains ranging from 2" to 16" in diameter. Town water sources include two wells, West Hatfield and the Omasta Well, and the Hatfield Reservoir located in West Hatfield. The Town of Hatfield has a reservoir located partially within the western portion of Hatfield, and this source is a major water supply for Hatfield residents. There are two Town wells (Pantry Road and West Street) and some residents have private wells.

Sewer Service

Approximately one-half of Hatfield is tied into the town's sewer system. Sanitary sewer service is provided to homes and businesses only on Elm Street, Main Street, North Street, Colonial Acres, Chestnut Street, Nolan Circle, School Street, and portions of Prospect Street, Bridge Street, King Street, Plantation Road, Elm Court, Old Farms Road, Raymond Avenue, Dwight Street, Church Street, North Hatfield Road and the southernmost portion of West Street.

Schools

Hatfield has one elementary school, Hatfield Elementary, and a High School, Smith Academy.

Natural Resources

People who live in Hatfield talk about the community's "rural character." This term encompasses agricultural lands, natural resources, open space and recreational properties and historic buildings. One cannot underestimate the strong role Hatfield's farming heritage plays in the town's rural character and sense of place. According to *National Geographic*, Hatfield has the seventh best agricultural land in the world. The community strongly identifies with its agricultural heritage.

The second and third components involved in preserving Hatfield's rural character are natural resources and open space. Adopting zoning regulations to further safeguard floodplains, rivers, wetlands, watersheds and wildlife habitats will not only sustain Hatfield's ecological richness but will also reduce the long-term risks associated with flooding and damage to the town's water supply.

Forested areas are greatest in the section of town west of Interstate 91, with high elevations reaching into the Horse and Chestnut Mountains and along the rocky ledges of The Rocks. In this densely

wooded terrain, outcroppings of bedrock alternate with pockets of wetlands, most of which flow into Running Gutter Brook, the primary stream draining Hatfield's western hills. East of the Interstate are the fertile Connecticut Valley lowlands, where the terrain has very little slope and the town is only 110 feet above sea level.

Water Resources

Hatfield's public water supply comes from three sources: the town reservoir (capacity of 500,000 gallons per day); the West Hatfield Well (capacity of 350,000 gallons per day); and the Omasta Well (capacity of 150,000 gallons per day). Water supplies are drawn primarily from the reservoir as the per gallon cost to operate the wells is higher than that of the reservoir, even taking into consideration the treatment requirements for the town's surface water supply.

Rivers and Streams

Hatfield is a town whose land is heavily influenced by watercourses. There are approximately 35 miles of stream and river channel within the town boundaries. About 7.5 miles of the Connecticut River forms the eastern and part of the southern boundaries. The two primary streams in Hatfield and their tributaries form most of the remainder of Hatfield's stream channels. Three major watersheds drain the town's 10,771 acres. Running Gutter Brook in West Hatfield drains one of the town's major watersheds. The Hatfield Reservoir is within this watershed region. Two other minor watersheds in West Hatfield drain into Hatfield. In one of these watersheds is Mountain Street Reservoir, a 25-acre water body providing drinking water for Northampton, only about one-third of which is actually in Hatfield.

The second major watershed drains through the Mill River, a primary tributary of the Connecticut River with its headwaters in the Town of Conway. This mature river is joined by flow from Running Gutter Brook. The dam at Prospect Street, the site of former industry, causes the water course to run deep upstream of the dam with wide meanders and broad marshes which are important wildlife habitats.

The third major watershed is within the north-east corner of Hatfield. The remnant of an old Connecticut River meander remains in this portion of Hatfield and receives the drainage from this watershed before eventually draining to the Connecticut River. This area was originally an oxbow lake which, over the years, has aged due to sedimentation and eutrophication, and the oxbow is now a series of ponds and marshes. It remains a significant wildlife habitat and storage area for the Connecticut River when it floods.

Wetlands

Combined, there are more than 3,000 acres of wetland, floodplain and open water (most of which is the Connecticut River) in Hatfield, which accounts for about 30% of the town's total area. These wetlands include the open water of streams and ponds, shrub swamps, forested swamps, wet meadows, bogs, marshes, and land within the flood water elevation of the 100-year storm, not all of which is currently considered true vegetated wetland under the Massachusetts Wetlands Protection Act, Chapter 131, Section 40 of the General Laws of the Commonwealth.

Most of the wetlands are in the eastern and northern sections of Hatfield in areas that border the Connecticut River, the Mill River, and the old oxbow meander in the northeast section of Hatfield. The wetlands in West Hatfield are primarily narrow wetlands bordering Running Gutter Brook and its tributaries. However, several small, isolated wetlands exist in this area as well which also help to provide important wetland wildlife habitat.

The limits of the 100-year storm flood zone are primarily located within the eastern and northern portions of Hatfield along the Connecticut River and Mill River, and coincident with the majority of Hatfield's wetlands. However, some of the 100-year flood zone exists along Running Gutter Brook in West Hatfield. Under current law, development is sharply curtailed within both the 100-year storm flood elevation and wetlands that have been defined under the Wetlands Protection Act. Therefore, with diligent application of the applicable Federal and State laws, these areas represent open space buffers to development.

Beaver Dams

Beaver dams occur in a few areas of the Town and can cause localized flooding a couple times during the year, particularly on Depot Street and School Street. These flooding events are not considered a significant hazard. The Commonwealth of Massachusetts requires a special permit for individuals to trap beavers. Affected individuals must contact the Board of Health and Conservation Commission for advice and permission to alleviate any beaver problems.

The Great Pond

A Connecticut River oxbow, the Great Pond is the largest natural freshwater body in town. It has approximately 200 acres of open water, wooded swamp and marshes, all of which serve as rare species habitat and refuge for migrating waterfowl.

Aquifers

The Town's groundwater supply is feed by the three watersheds listed above. The town relies on the two wells located over Hatfield's aquifer in emergency and periods of peak demand, such as the warmest months of summer.

Floodways

Water levels in Hatfield's rivers, streams, and wetlands rise and fall seasonally and during high rainfall events. High water levels are typical in spring, due to snowmelt and ground thaw. This is the period when flood hazards are normally expected. Low water levels occur in summer due to high evaporation and plant uptake (transpiration). At any time, heavy rainfall may create conditions that raise water levels in rivers and streams above bank full stage, which then overflow adjacent lands.

Floodways include the watercourses (rivers and streams) and adjacent relatively low-lying areas subject to periodic flooding (the 100-year flood zone and 500-year flood zone). These adjoining lands are flood

hazard zones and they vary in their predicted flood frequency. The 100-year flood zone has a one in 100 statistical probability (or one percent chance) of being flooded in a single year or is predicted to be flooded one year out of a 100-year period; while the 500-year flood zone is based on a 500-year period. Hatfield's gently sloping terrain, especially in the eastern section of town, permits the formation of broad floodplains.

The National Flood Insurance Program has produced maps that identify floodways across America. The following areas have been designated as floodways in Hatfield:

- Running Gutter—From Rocks Road down to the Mill River;
- The Mill River from the Hatfield's northernmost town line south along Routes 5 and 10, running under the I91 Interstate, continuing down to West Hatfield Cemetery and south of Bridge Road, then east toward the center of Town, south onto a broad flood plain to the Connecticut River.
- Cow Bridge Brook from Great Pond into the Connecticut River;
- Great Pond and its tributary streams;

The Town Hall, Town Fire Station, Town Library and Town Police Station are all located within the Connecticut River's 500-year floodplain.

Flood Control Structures

The existing flood control earthen levee, Hatfield Dike, was built in 1938 along the bank of the Connecticut River. As of 2006, natural erosion of the banks of the Connecticut River had brought the river to within 15 feet of the toe of the dike. In 2011 the Town received federal hazard mitigation funds to re-surface the toe of the Hatfield Dike and maintenance is an ongoing need.

National Flood Insurance Program

The National Flood Insurance Program has produced maps that identify floodways across America, and Hatfield is a participating member of the National Flood Insurance Program. Flood Insurance Maps (FIRMs) are used for flood insurance purposes and are on file with the Hatfield Planning Board. Hatfield had the following NFIP policy and claim statistics as of 2021:

- FIRMs have been effective since May 31, 1974 with the current map in effect since April 3, 1978.
- Hatfield has 34 in-force policies in effect for a total of $7,995,000 worth of insurance.
- There have been a total of 5 NFIP losses claimed for which $25,823.41 has been paid.
- As of 2021, there have been 0 Repetitive Loss Properties in Hatfield.
- The town will maintain compliance with the NFIP throughout the next 5-year Hazard Mitigation Planning cycle by monitoring its Flood Plain Overlay District and ensuring that the district accurately reflects the 100-year flood plain and FEMA Flood Insurance Rate Map (FIRM).

The Flood Insurance Rate Maps in Hampshire County are scheduled to be updated by FEMA in the next couple of years. When these maps are updated, the Town of Hatfield will adjust its zoning to accommodate changes to the location of floodplains.

Forests

Thirty-nine percent, or 4,189 acres, of Hatfield's total area is forested land. Different forest types offer differing values to the wood products industry, for wildlife habitat, and for recreation, which is the reason for differentiating between them. There are approximately 135 species of trees and woody shrubs naturally occurring in Hatfield. Several species have an economic importance to the lumber industry and are used locally, as well as exported out of the region to other states and markets. Eastern white pine and northern red oak head the list of commercially valuable species. Pine is used widely in the construction and the paper industry. Red oak is in demand for veneer for paneling, flooring, trim detail in homes and buildings and furniture.

Because pine and oak are so valuable, they have been selected as the standard to measure a forests' potential productivity. In Hatfield 1,000 ± acres are classified as prime, while 500 ± are of state and local importance.

3 – HAZARD IDENTIFICATION & ANALYSIS

This section examines the natural hazards which are identified as likely to affect Hatfield in more detail, and includes a summary of disasters that have affected or could affect Hatfield. In order to identify natural hazards of concern for the Plan Update, the Committee and its consulting team reviewed the 2016 Hatfield Hazard Mitigation Plan, the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), available hazard mapping, and other weather-related databases. Historical research and conversations with local officials and emergency management personnel were also used to identify and profile the natural hazards which are most likely to have an impact on the Town.

The assessment conducted for the former HMP recognized the following 8 natural hazards that could potentially impact Hatfield:

- Floods
- Severe snowstorms / ice storms
- Hurricanes
- Severe thunderstorms / wind /tornadoes
- Wildfires / brushfires
- Earthquakes
- Dam failure
- Drought
- Extreme Temperatures

Natural Hazard Analysis Methodology

This chapter examines the hazards which are identified in the Massachusetts State Hazard Mitigation and Climate Adaptation Plan and by the Hatfield HMP Update Committee as likely to affect Hatfield. The analysis is organized into the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, and Vulnerability. A description of each of these analysis categories is provided below.

Vulnerability

Sectors Assessed:

A number of key sectors were evaluated as part of the risk assessment for each of the hazards profiled in the sections below. These sectors are introduced here and are included in the hazard profiles where appropriate and where sufficient data allowed.

Vulnerability Assessment Methodology

In order to determine estimated losses due to natural hazards in Hatfield, each hazard area was analyzed with results shown below. The data below was calculated using FEMA's Understanding Your Risks: Identifying Hazards and Estimating Losses, August 2001.

Total value of all structures in Hatfield (2021): $409,882,700

Median value of an owner-occupied home in Hatfield (2019): $335,000

Average household size: 2.23 persons (across roughly 1,220 households)

Human losses are not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The damage calculations are rough estimate and likely reflect worst-case scenarios. Computing more detailed damage assessment based on assessor's records is a labor-intensive task and beyond the scope of this project.

Populations

Vulnerability of populations is influenced by three factors: exposure or contact with the hazard; sensitivity or degree to which people or communities are affected by the exposure to the hazard; and capacity to adapt or the ability of communities, institutions, or people to adjust and respond to and recover from potential hazards. The major health impacts from natural hazards and climate change include:

- Heat-related illnesses and death from an increase in extreme temperatures and poor air quality (SHMCAP, 2018).
- Increases in food and waterborne illnesses and other infectious diseases from altering geographic and seasonal distributions of existing vectors and vector-borne diseases (SHMCAP, 2018).
- Injuries and accidental premature death associated with extreme weather events. Extreme weather events can result in acute health impacts, such as injuries and accidental premature death during an event (e.g., drowning during floods). In addition, health impacts can also occur during disaster preparation and post-event cleanup. Other impacts include damage to property, destruction of assets, loss of infrastructure and public services, social and economic impacts, environmental degradation, and other factors (SHMCAP, 2018).
- Exacerbation of chronic diseases (SHMCAP, 2018).
- Mental health and stress-related disorders ranging from minimal stress and distress symptoms to clinical disorders such as anxiety, depression, post-traumatic stress, and suicidality. Specific groups of people who are at higher risk for distress and other adverse mental health consequences from exposure to climate-related or weather-related disasters include children, the elderly, women (especially pregnant and post-partum women), people with preexisting mental illness, the economically disadvantaged, the homeless, and first responders. Populations living in areas most susceptible to specific climate change events are at increased risk for adverse mental health outcomes (SHMCAP, 2018).

In most natural hazard events, the vulnerability of a population is largely dependent on local preparedness and availability of human resources for social services staffing and supplies distribution. While this Hazard Mitigation Plan does not aim to recommend specific emergency preparedness and response activities, it should be noted that preparing for emergencies by training a large group of public and professional responders to ensure continuity of operations during a hazard event can be a critical tool for mitigating the overall impacts of any hazard event.

Built Environment

The built environment sector includes all buildings in Hatfield including critical facilities owned by the municipality and critical infrastructure sectors that provide or link to key lifeline services, social welfare, and economic development. Assessments were based on assessor's data of the total value of all structures in Hatfield ($409,882,700 in July 2021 according to MassGIS data), along with the median value of a home in Hatfield, which is $335,000 based on median value of owner-occupied housing units, 2015-2019 American Community Survey (ACS). According to the 2015-2019 ACS, the average household size in Hatfield is 2.23 persons, and there are approximately 1,220 households. The critical facilities assessed were derived from the critical facilities inventory as updated by the Hatfield HMP Committee. The facility types include emergency response services and non-emergency critical infrastructure including transportation facilities, water infrastructure, etc.

Natural Resources and Environment

The natural resources and environment sector includes land-based assets in the city. It also includes key habitats and natural landscapes documented in Hatfield's BioMap 2 (Conserving the Biodiversity of Massachusetts in a Changing World) and Areas of Critical Environmental Concern, as well as species identified in the State's Wildlife Action Plan as being present in Hatfield.

Economy

Economic impacts include economic loss resulting from damage to critical facilities, the built environment, municipal resources, natural resources, and other sectors. Many sectors of the economy are dependent on the integrity of natural resources. For example, if a major recreation area is damaged beyond repair by a storm, that property will no longer attract tourists and the local economy may experience a loss of revenue from tourism and recreation. Other impacts include loss of businesses that do not return after a major catastrophic event and the loss of property tax revenue that could result from a major loss of homes and/or businesses from a disaster.

Location

Location refers to the geographic areas within the planning area that are affected by the hazard. Some hazards affect the entire planning area universally, while others apply to a specific portion, such as a floodplain or area that is susceptible to wildfires. Classifications are based on the area that would potentially be affected by the hazard, on the following scale:

Table 1. Location of Occurrence, Percentage of Town Impacted by Given Natural Hazard

Land Area Affected by Occurrence	Percentage of Town Impacted
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

Extent

Extent describes the strength or magnitude of a hazard. Where appropriate, extent is described using an established scientific scale or measurement system. Other descriptions of extent include water depth, wind speed, and duration.

Previous Occurrences

Previous hazard events that have occurred are described. Depending on the nature of the hazard, events listed may have occurred on a local, state-wide, or regional level.

Probability of Future Events

The likelihood of a future event for each natural hazard was classified according to the following scale:

Table 2. Frequency of Occurrence and Annual Probability of Given Natural Hazard

Frequency of Occurrence	Probability of Future Events
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

Impact

Impact refers to the effect that a hazard may have on the people and property in the community, based on the assessment of extent described above. Impacts are classified according to the following scale:

Table 3. Extent of Impacts, Magnitude of Multiple Impacts of Given Natural Hazard	
Extent of Impacts	**Magnitude of Multiple Impacts**
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

Climate Change and Natural Hazards

With each update of the Hatfield Hazard Mitigation Plan, the planning team may widen the lens through which natural hazards are assessed with regards to climate change, or the statistically significant variation in climate data or patterns over multiple decades due to climate variability or human activity. The Northeast Climate Adaptation Science Center (NE CASC) developed downscaled climate data that was used in the development of the 2018 SHMPCAP, forming a new basis and format for the categorization of natural hazards as they relate to the primary climate change interactions discussed in this section.

The risk assessment in this 2021 Hatfield HMP Update refers to the 2018 SHMCAP analysis and incorporates climate change interactions into each hazard assessment. A categorization of traditional natural hazards, within the context of climate change, is included below to demonstrate the connections between traditional natural hazard analysis and climate change projections. This categorization also aligns with the four climate change categories included on the Commonwealth's resilient MA Climate Change Clearinghouse website (http://www.resilientma.org/). Those categories are illustrated as follows.

Changes in Precipitation: Changes in the amount, frequency, and timing of precipitation—including both rainfall and snowfall—are occurring across the globe as temperatures rise and other climate patterns shift in response.

Sea Level Rise: Climate change will drive rising sea levels, and rising seas will have wide-ranging impacts on communities, natural resources, and infrastructure along the Commonwealth's 1,519 tidal shoreline miles. While sea level rise will not directly impact Hatfield, it may have an indirect effect by driving the migration of residents of coastal communities to inland communities such as Hatfield.

Rising Temperatures: Average global temperatures have risen steadily in the last 50 years, and scientists warn that the trend will continue unless greenhouse gas emissions are significantly reduced. The 10

warmest years on record all occurred since 2005 (From most to least recent - 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2010, and 2005), according to the U.S. National Oceanographic and Atmospheric Administration (NOAA).

Extreme Weather: Climate change is expected to cause extreme weather events to increase across the globe, including here in Massachusetts. There is strong evidence that storms—from heavy downpours and blizzards to tropical cyclones and hurricanes—are becoming more intense and damaging, and can lead to devastating impacts for residents across the state.

The hazards presented in this risk assessment and the order in which they appear are based on the taxonomy shown in Table 4 below.

Table 4. Climate Change, Natural Hazards and Impacts			
Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions	Representative Climate Change Impacts
Changes in Precipitation	Flooding	Extreme Weather	Flash flooding, urban flooding, drainage system impacts (natural and human-made), lack of groundwater recharge, impacts to drinking water supply, public health impacts from mold and worsened indoor air quality, vector-borne diseases from stagnant water, episodic drought, changes in snow-rain ratios, changes in extent and duration of snow cover, degradation of stream channels and wetland
	Drought	Rising Temperatures, Extreme Weather	
	Dam Failure/ Levee Breach	Extreme Weather	
Rising Temperatures	Extreme Temperatures	N/A	Shifting in seasons (longer summer, early spring, including earlier timing of spring peak flow), increase in length of growing season, increase of invasive species, ecosystem stress, energy brownouts from higher energy demands, more intense heat waves, public health impacts from high heat exposure and poor outdoor air quality, drying of streams and wetlands, eutrophication of lakes and ponds
	Wildfire/ Brushfire	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
Extreme Weather	Hurricane/ Tropical Storm	Rising Temperatures, Changes in Precipitation	Increase in frequency and intensity of extreme weather events, resulting in greater damage to natural resources, property, and infrastructure, as well as increased potential for loss of life
	Severe Winter Storm / Nor'easter		
	Severe Thunderstorm / Wind / Tornado		
Non-Climate-Influenced Hazards	Earthquake	Not Applicable	There is no established correlation between climate change and this hazard
	Pandemic	Not Applicable	There is no established correlation between climate change and this hazard

Hazard Analysis and Rating

Based on all of the above metrics, a hazard index rating was determined for each hazard determined to affect Hatfield. The hazard index ratings are based on a scale of 1 through 5 as follows:

1 – Highest risk
2 – High risk
3 – Medium risk
4 – Low risk
5 – Lowest risk

The ranking is qualitative and is based, in part, on local knowledge of past experiences with each type of hazard. The size and impacts of a natural hazard can be unpredictable. However; many of the mitigation strategies currently in place and many of those proposed for implementation can be applied to the expected natural hazards, regardless of their unpredictability.

The 2021 hazard profiles for Hatfield are based on a wide range of information and data including best available science and most current information on hazards, impacts, and vulnerability within the town. All hazard profiles were updated for the 2021 Plan Update with any new available information, and data from the 2016 HMP was retained where it was appropriate and still deemed current.

Table 5 - Hazard Identification and Analysis Worksheet for Hatfield

TYPE OF HAZARD	FREQUENCY OF OCCURRENCE	LOCATION OF OCCURRENCE	IMPACT	HAZARD RISK INDEX RATING
Flooding	Low	Medium	Limited	3 – Medium Risk
Dam Failures / Levee Breech	Very Low	Medium	Critical	3 – Medium Risk
Drought	Moderate	Large	Minor	3 – Medium Risk
Extreme Temperatures	Low	Large	Minor	5-- Lowest Risk
Wildfire/Brushfire	Moderate	Small	Minor	3 – Medium Risk
Hurricanes/Tropical Storms	Low	Large	Critical	Between 3 – Medium Risk and 4 – Low Risk
Severe Snowstorms/Ice Storms	High	Large	Limited	3 – Medium Risk
Severe Thunderstorms / Winds / Tornadoes	Severe Thunderstorms: Moderate; Winds: Moderate; Tornadoes: Low	Medium	Limited	Severe Thunderstorms: 3 – Medium Risk Winds: 3 – Medium Risk Tornadoes: 4 – Low Risk
Earthquakes	Low	Large	Critical	4 – Low Risk

Source: information adapted from Town of Holden Beach North Carolina Community-Based Hazard Mitigation Plan, July 15, 2003 and the Massachusetts Emergency Management Agency (MEMA).

Primary Climate Change Interaction: Changes in Precipitation

Flooding – Medium Risk

Hazard Description

Floods can be classified as one of two types: flash floods and general floods.

- **Flash floods** are the product of heavy, localized precipitation in a short time period over a given location. Flash flooding events typically occur within minutes or hours after a period of heavy precipitation, after a dam or levee failure, or from a sudden release of water from an ice jam. Most often, flash flooding is the result of a slow-moving thunderstorm or the heavy rains from a hurricane. In rural areas, flash flooding often occurs when small streams spill over their banks. However, in urbanized areas, flash flooding is often the result of clogged storm drains (leaves and other debris) and the higher amount of impervious surface area (roadways, parking lots, roof tops).
- **General floods** may last for several days or weeks and are caused by precipitation over a longer time period in a particular river basin. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff (e.g., the loss of wetlands and the higher amounts of impervious surface area in urban areas).

There are three major types of storms that can generate flooding in Hatfield:

- Continental storms are typically low-pressure systems that can be either slow or fast moving. These storms originate from the west and occur throughout the year.
- Coastal storms, also known as nor'easters, usually occur in late summer or early fall and originate from the south. The most severe coastal storms, hurricanes, occasionally reach Massachusetts and generate very large amounts of rainfall.
- Thunderstorms form on warm, humid summer days and cause locally significant rainfall, usually over the course of several hours. These storms can form quickly and are more difficult to predict than continental and coastal storms.

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large "sponges" to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain area is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard. In addition to damage of buildings directly in the floodplain, development can result in a loss of natural flood storage capacity and can increase the water levels in water bodies. Flood levels may then increase, causing damage to structures not normally in the flood path.

Location

The Floodplain Map for the Town of Hatfield shows the 100-year and 500-year flood zones identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water as a result of a flood that has a one percent chance of occurring in any given year. Likewise, a 500-year flood has a 0.2 percent chance of occurring in any given year. There are several floodplain areas in Hatfield that are described in detail below.

There are approximately 1228 acres of land within the FEMA mapped 100-year floodplain and 246 acres of land within the 500-year floodplain within the Town of Hatfield. The Town Hall, Town Fire Station, Town Library and Town Police Station are all located within the Connecticut River's 500 year floodplain. There are 552 tax parcels located within the FEMA 100 and 500 year flood plains that contain structures, according to MassGIS data from July 2021, and 467 tax parcels located in the floodplains that contain residential structures. The estimated number of people living in the floodplain is 1,041.

Extent

The observed average annual precipitation for Hatfield and surrounding areas in western Massachusetts is approximately 46 inches, with the majority of the rainfall occurring in the spring and summer. The annual precipitation in the Connecticut River watershed is expected to increase by 1.3 to 6.2 inches by 2050, and winter precipitation is expected to increase by up to 25% by 2050 (resilient MA, 2018).

Water levels in Hatfield's rivers, streams, and wetlands rise and fall seasonally and during high rainfall events. High water levels are typical in spring, due to snowmelt and ground thaw. This is the period when flood hazards are normally expected. Low water levels occur in summer due to high evaporation and plant uptake (transpiration). At any time, heavy rainfall may create conditions that raise water levels in rivers and streams above bank full stage, which then overflow adjacent lands.

Previous Occurrences

Flooding has occurred previously at these Hatfield locations:

Chestnut Street
The Mill River crossing on Chestnut Street was submerged in the October 2005 floods. In 2014 the area flooded again, but no one was isolated or harmed. There are no residential structures in this area, and no damage to property was reported. There has been occasional flooding in the last five years, but it has not been severe enough to close the road. The inconvenience and safety risks that would accompany losing this east-west route would place a strain on emergency service personnel if flooding were to continue for a longer duration during a more severe event.

South Street and Valley Street
The fields next to these streets experience frequent flooding in high rain events.

King Street
The problem culvert on King Street has been repaired since the 2008 plan and the repair has mitigated localized flooding.

The most severe flooding event in the recent memory of the members of the local Hazard Mitigation committee is the flood of May 1984, which happened after a period of extended rain. Schools were closed for two days and Elm Street was the only main road or thoroughfare that was not flooded. Bridge Street, Cronin Hill, Depot Road and North Main Street were all flooded at some point. There were no injuries reported.

Since the last Hatfield HMP update, the NOAA National Centers for Environmental Information has reported 12 flood and flash flood events in Hampshire County. While none affected Hatfield directly, the data does indicate the potential for both general and flash floods in Hatfield.

Location	County/Zone	St.	Date	Time	T.Z.	Type
Totals:						
GOSHEN	HAMPSHIRE CO.	MA	07/27/2015	15:40	EST-5	Flash Flood
HAYDENVILLE	HAMPSHIRE CO.	MA	09/30/2015	07:50	EST-5	Flood
BUZZARDS BAY	HAMPSHIRE CO.	MA	09/30/2015	08:15	EST-5	Flood
BAY STATE	HAMPSHIRE CO.	MA	02/25/2016	05:37	EST-5	Flood
WARE	HAMPSHIRE CO.	MA	08/13/2016	21:30	EST-5	Flood
BAY STATE	HAMPSHIRE CO.	MA	08/05/2017	14:14	EST-5	Flood
NORTHAMPTON	HAMPSHIRE CO.	MA	10/24/2017	21:14	EST-5	Flood
GRANBY	HAMPSHIRE CO.	MA	10/24/2017	23:17	EST-5	Flood
WARE	HAMPSHIRE CO.	MA	01/13/2018	10:18	EST-5	Flood
AMHERST	HAMPSHIRE CO.	MA	09/18/2018	08:01	EST-5	Flash Flood
WARE	HAMPSHIRE CO.	MA	07/06/2019	16:08	EST-5	Flood
EASTHAMPTON	HAMPSHIRE CO.	MA	07/06/2020	19:15	EST-5	Flood

NOAA National Centers for Environmental Information

The National Weather Service maintains water level gages on the Mill River and Connecticut River to monitor flooding. The NWS has various flooding classifications based on water level. These classifications and their definitions are:

Action Stage - the stage which, when reached by a rising stream, represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity. The type of action taken varies for each gauge location. Gauge data should be closely monitored by any affected people if the stage is above action stage.

Minor Flooding is defined to have minimal or no property damage, but possibly some public threat. A Flood Advisory product is issued to advise the public of flood events that are expected not to exceed the minor flood category. Examples of conditions that would be considered minor flooding include:

- water over banks and in yards
- no building flooded, but some water may be under buildings built on stilts (elevated)
- personal property in low lying areas needs to be moved or it will get wet
- water overtopping roads, but not very deep or fast flowing
- water in campgrounds or on bike paths
- inconvenience or nuisance flooding
- small part of the airstrip flooded, and aircraft can still land

- one or two homes in the lowest parts of town may be cut off or get a little water in the crawl spaces or homes themselves if they are not elevated

Moderate Flooding is defined to have some inundation of structures and roads near the stream. Some evacuations of people and/or transfer of property to higher elevations may be necessary. A Flood Warning is issued if moderate flooding is expected during the event. Examples of conditions that would be considered moderate flooding include:

- several buildings flooded with minor or moderate damage
- various types of infrastructure rendered temporarily useless (i.e. fuel tanks cannot be reached due to high water, roads flooded that have no alternates, generator station flooded)
- elders and those living in the lowest parts of the village are evacuated to higher ground
- access to the airstrip is cut off or requires a boat
- water over the road is deep enough to make driving unsafe
- gravel roads likely eroded due to current moving over them
- widespread flooding, but not deep enough to float ice chunks through town
- water deep enough to make life difficult, normal life is disrupted and some hardship is endured
- airstrip closed
- travel is most likely restricted to boats

Major Flooding is defined to have extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary. A Flood Warning is issued if major flooding is expected during the event. Examples of conditions that would be considered major flooding include:

- many buildings flooded, some with substantial damage or destruction
- infrastructure destroyed or rendered useless for an extended period of time
- multiple homes are flooded or moved off foundations
- everyone in threatened area is asked to evacuate
- National Guard units assist in evacuation efforts
- erosion problems are extreme
- the airstrip, fuel tanks, and the generator station are likely flooded
- loss of transportation access, communication, power and/or fuel spills are likely
- fuel tanks may float and spill and possibly float downstream
- ice chunks floating though town that could cause structural damage
- high damage estimates and high degree of danger to residents

Probability of Future Events

Based upon previous data, there is a “limited” chance of flash flooding or general flooding occurring in Hatfield. The area within the 100-year flood plain has a 1 percent chance of flooding in any given year. Based on previous occurrences there is an approximately 7 percent chance a year of localized, flash flooding.

Climate scientists predict that in the next few decades, climate change will increase the frequency and intensity of all storms that can cause flooding. Overall it is anticipated that the severity of flood-inducing weather events and storms will increase as a result of climate change. Research has shown that rainfall is increasingly concentrated into the most severe events (Easterling, 2017). While trends in overall

precipitation are less clear, the increase in severe rainfall events will exacerbate the risk of localized flooding. Currently, floods are the most costly natural hazard in the United States, and climate change will only increase this damage. The Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan has additional information about the impact of climate change and probability of future flooding events.

Impact

The Town of Hatfield faces a "limited" impact, with 10 percent or less of the total town area affected by possible flooding. There are approximately 1228 acres of land within the FEMA mapped 100-year floodplain and 246 acres of land within the 500-year floodplain.

According to MassGIS data from July 2021, there are 552 tax parcels located within the FEMA 100 and 500 year floodplains that contain any type of structure, and 467 tax parcels located in the floodplains that contain residential structures. However, not all of the residential structures are necessarily in the floodplain. There were 269 structures located within the Special Flood Hazard Area (SFHA) in Hatfield as of August 9, 2005, the most recent date for which this data is available and the most current records in the CIS for the Town of Hatfield.

Using the CIS data for structures located withing the SFHA and the average household size of 2.23 persons, the estimated number of people living in the FEMA floodplains using the 2005 data is 600. To approximate the potential impact to property and people that could be affected by this hazard, the Town's median home value of $335,000 (from 2014-2019 American Community Survey data) is used. An estimated 20 percent of damage would occur to each structure in the 100-year flood plain, resulting in a total estimated damage of $18,023,000 with 600 people affected. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Vulnerable Populations

The most vulnerable populations exposed to the flood hazard include people with low socioeconomic status, people over the age of 65, young children, people with medical needs, and those with low English language fluency. Populations that live or work in proximity to facilities that use or store toxic substances are at greater risk of exposure to these substances during a flood event.

Advance weather forecasting, blockades, and emergency alerts and warnings help to minimize the total number of injuries and casualties that typically result from riverine flooding. However, even a relatively low-level flood can be hazardous and can result in direct mortality to individuals interacting with the flood zone. For example, while 6 inches of moving water can cause adults to fall, 1 foot to 2 feet of water can sweep cars away. Downed powerlines, sharp objects in the water, or fast-moving debris that may be moving in or near the water all present an immediate danger to individuals in the flood zone. Floodwater can also carry a wide range of infectious organisms from raw sewage and/or chemicals and hazardous materials swept away from containment areas.

Built Environment and Economy
Flooding can cause direct damage to critical facilities and result in roadblocks and inaccessible streets that impact the ability of public safety and emergency vehicles to respond to calls for service. Buildings, infrastructure, and other elements of the built environment are vulnerable to inland flooding. Buildings within the floodplain are highly vulnerable to inland flooding and are likely to become increasingly vulnerable as riverine flooding increases due to climate change (resilient MA, 2018).

At a neighborhood to regional scale, highly developed areas and areas with high impervious surface coverage may be most vulnerable to flooding. Even moderate development that results in as little as 3 percent impervious cover can lead to flashier flows and river degradation, including channel deepening, widening, and instability (SHMCAP, 2018). Additionally, changes in precipitation will threaten key infrastructure assets with flood and water damage. Climate change has the potential to impact public and private services and business operations.

Natural Resources
Flooding is a natural environmental phenomenon. However, severe flood events can also result in substantial damage to the environment and natural resources, particularly in areas where human development has interfered with natural flood-related processes. As described earlier in this section, severe weather events are expected to become more frequent as a result of climate change; therefore, flooding that exceeds the adaptive capacity of natural systems and the built environment may occur more often.

One common environmental effect of flooding is riverbank and soil erosion. Riverbank erosion occurs when high, fast water flows scour the edges of the river, transporting sediment downstream and reshaping the ecosystem. This process can clog riverbeds and streams, disrupting the water supply to downstream habitats.

Based on the above analysis, Hatfield faces a hazard index rating of “3 - medium risk” of a 100-year base flood and annual flooding due to the community’s topography and waterways. Hatfield faces a low risk of localized flooding in locations outside of FEMA’s Flood Insurance Rate Maps for the town.

Dam Failure / Levee Breech

Hazard Description

Dams and levees and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control. However, 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 or levee fails, the potential energy of the stored water behind the dam is released rapidly. Most dam and failures occur when floodwaters above overtop and erode the material components of the dam. Often dam and levee breaches lead to catastrophic consequences as the water rushes in a torrent downstream flooding an area engineers refer to 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.

Many dams in Massachusetts were built during the 19th Century without the benefit of modern engineering design and construction oversight. Dams of this age can fail because of structural problems due to age and/or lack of proper maintenance, as well as from structural damage caused by an earthquake or flooding.

The Massachusetts Department of Conservation and Recreation Office of Dam Safety is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). To be regulated, these dams are in excess of 6 feet in height (regardless of storage capacity) and have more than 15-acre feet of storage capacity (regardless of height). Dam safety regulations enacted in 2005 transferred significant responsibilities for dams from the State of Massachusetts to dam owners, including the responsibility to conduct dam inspections.

Dams in Massachusetts are assessed according to their risk to life and property. The state has three hazard classifications for dams:

- *High Hazard*: Dams located where failure or improper operation is likely to cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- *Significant Hazard*: Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- *Low Hazard*: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

The inspection schedule for dams is as follows:

- Low Hazard dams – 10 years
- Significant Hazard dams – 5 years
- High Hazard dams – 2 years

The time intervals represent the maximum time between inspections. More frequent inspections may be performed at the discretion of the state. Dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) are excluded from the provisions of the state

regulations provided that all FERC- approved periodic inspection reports are provided to the DCR. All other dams are subject to the regulations unless exempted in writing by DCR.

Location

Hatfield has two dams located within its boundaries on the Mill River and Running Gutter River, which are legacies of Hatfield's industrial heritage. The D.F. Riley Grist Mill Dam on the Mill River near Prospect Ct is privately owned, old and unmaintained, and is rated a "Significant Hazard" by the Massachusetts Office of Dam Safety.

Ryan Reservoir and Mountain Street Reservoir dams lie outside of Hatfield's town lines, but are located uphill in watersheds that flow through Hatfield, posing a risk to Hatfield's infrastructure in the event of a dam failure. Route 5 & 10, the town's primary commercial corridor and primary connection to communities north and south, would be impacted in the event of a dam failure upstream.

Dams in or affecting Hatfield	
Dam	**Hazard Level**
Running Gutter Reservoir Dam – Reservoir Road, Hatfield	Unknown
Riley Grist Mill Dam – Prospect Court, Hatfield	Significant
Ryan Reservoir Dam (West Whately)	High Hazard
Mountain Street Reservoir Dam (Williamsburg)	High Hazard

Extent

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 released. This can lead to catastrophic consequences as the water ultimately rushes in a torrent downstream flooding an area engineers refer to 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.

Previous Occurrences

To date, there have been no dam failures in Hatfield.

Probability of Future Events

As the dams in Hatfield and those affecting Hatfield age, and if maintenance is deferred, the likelihood of a dam failure will increase. However, currently the frequency of dam failures is "very low" with a less than 1 percent chance of a dam failing in any given year.

As described in the Massachusetts Hazard Mitigation Plan, dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is

conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams are already seeing increases in stream flows from earlier releases from dams. Dams are constructed with safety features known as "spillways." Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as "design failures," result in increased discharges downstream and increased flooding potential. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

Impact

The town faces a limited impact from failure of dams or levees with a high hazard level, with 5 percent of Hatfield affected.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $409,882,700 is used, along with all inhabitants of homes. An estimated 100 percent of damage would occur to 5 percent of structures, resulting in a total of $20,494,135 worth of damage and 136 people affected. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on this analysis, Hatfield faces a hazard index rating of "3 -medium risk" from dam failure or levee breech.

In 2013 the Town met with representatives from Northampton and Whately to update joint plans for a potential dam breech of either the Ryan or Mountain Street reservoir dams, and they have approved updated plans developed since that time. The Town has also met with a regional group to update plans for potential failure of the Harriman Dam on the Deerfield River in Whitingham, Vermont, which would affect many Towns downstream in Franklin and Hampshire County, including Hatfield.

Population
The most vulnerable populations exposed to the Dam Failure / Levee Breach hazard include people in frontline communities, those with low socioeconomic status, over the age of 65, young children, people with medical needs, and those with low English language fluency. Populations that live or work in proximity to facilities that use or store toxic substances within the affected area of a dam failure or levee breach are at greater risk of exposure to these substances. Populations identified by the 2010 Census as minority, low income, and English isolated that are living in an area protected by a levee are particularly vulnerable.

Advance weather forecasting, blockades, and emergency alerts and warnings help to minimize the total number of injuries and casualties that typically result from dam failure or levee breach. While dam failure can lead to flash flood conditions that are harder to mitigate with early warning messages, even a relatively low-level flood can be hazardous and can result in direct mortality to individuals interacting

with the flood zone. See the Vulnerability discussion under the Flood profile above for additional information.

Built Environment and Economy
Flooding from dam failure or levee breach can cause direct damage to critical facilities and result in roadblocks and inaccessible streets that impact the ability of public safety and emergency vehicles to respond to calls for service.

In the event of a dam failure at either the West Whately Reservoir or Mountain Street Reservoirs, many businesses downstream along Route 5 and 10 would potentially be impacted, as well as the major north-south corridors of both Route 5&10 and Interstate 91, just east and at a lower elevation. An event of this magnitude would also have tax implications that could strain Town finances for years afterward.

Natural Resources
Dam failures and levee breaches result in severe and flash flood conditions leading to substantial damage to the environment and natural resources, particularly in areas where human development has interfered with natural flood-related processes. The Francis P. Ryan Reservoir Dam and the adjacent West Whately Reservoir Dam are rated in "Fair" condition according the Office of Dam Safety (ODS) regulations. Improvements to the spillways and embankments are required to address current deficiencies and to provide sufficient capacity to pass the one half the Probable Maximum Flood (1/2 PMF) without overtopping the dams.

Drought

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of the direct impacts of drought. Of course, these impacts can have far-reaching effects throughout the region and even the country.

Location

Because of this hazard's regional nature, a drought would impact the entire town, meaning the location of occurrence is "large" with over 50 percent of the town affected. How a drought is experienced can depend on geographic factors such as land use change, the existence of dams, and water supply withdrawals or diversions. For example, impervious surfaces associated with development can exacerbate the effects of drought due to decreased groundwater recharge.

Extent

The severity of a drought would determine the scale of the event and would vary among town residents depending on whether the residents' water supply is derived from a private well or the public water system. Massachusetts' wells are permitted according to their ability to meet demand for 180 days at maximum capacity with no recharge; if these conditions extended beyond the thresholds that determine supply capacity the damage from a drought could be widespread due to depleted groundwater supplies.

The U.S. Drought Monitor also records information on historical drought occurrence. Unfortunately, data could only be found at the state level. The U.S. Drought Monitor categorizes drought on a D0-D4 scale as shown below.

U.S. Drought Monitor		
Classification	**Category**	**Description**
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Source: US Drought Monitor, http://droughtmonitor.unl.edu/classify.htm

When evaluating drought risk utilizing the Palmer Drought Severity Index, Massachusetts is historically in the lowest percentile for severity and risk of drought. Even so, there have been several years of drought-like conditions in Western Massachusetts: 1940-1952, 1980-1983, 1995-2001, 2010, 2016 and 2020. Furthermore, global warming and climate change will have an effect on drought risk in the region, if they are not already doing so. With the projected temperature increases, some scientists think that the global hydrological cycle will also intensify. This would increase the severity and duration of droughts that could impact Hatfield.

The extent of a severe drought in Hatfield would be minor, with very few injuries, if any, only minor property damage and minimal disruption on quality of life, and a temporary shutdown of facilities or limits placed on water usage.

Secondary Hazards

Another hazard 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. As a result, a drought may increase the probability of a wildfire occurring. Additional information is provided on the wildfire hazard later in this section.

Previous Occurrences

Although Massachusetts is a relatively water-rich state, it has experienced several major statewide droughts. In Massachusetts, six major droughts have occurred statewide since 1930, the most severe in 1960 and the most recent in 2020. [2] Although it was shorted in duration, the severity of the 2016 drought state-wide was equivalent to that of the historic drought of the 1960s. In many of these droughts, water-supply systems were found to be inadequate. Water was piped in to urban areas, and water-supply systems were modified to permit withdrawals at lower water levels. The following table indicates previous occurrences of drought since 2000, based on the US Drought Monitor. Note, the table below only reports on the highest recorded drought level for each year:

Annual Drought Classification Status in Massachusetts	
Year	**Maximum Severity**
2000	No drought
2001	D2 conditions in 21% of state
2002	D2 conditions in 99% of state
2003	No drought
2004	D0 conditions in 44% of state
2005	D1 conditions in 7% of state
2006	D0 conditions in 98% of state
2007	D1 conditions in 71% of state
2008	D0 conditions in 57% of state

[2] US Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., US Geological Survey.

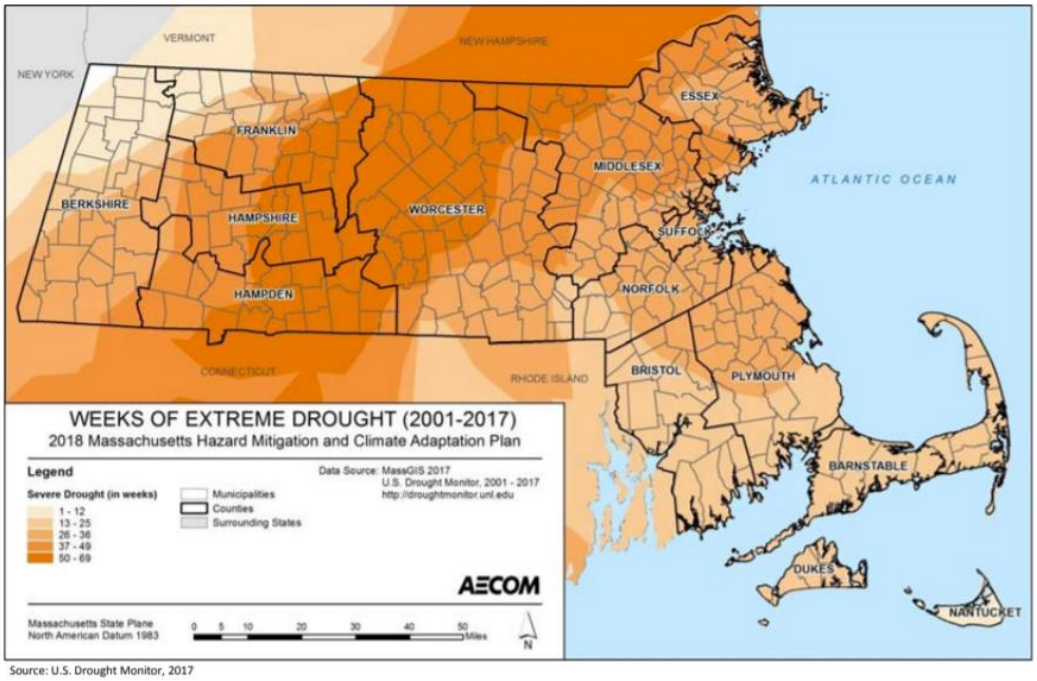
Annual Drought Classification Status in Massachusetts	
2009	D0 conditions in 44% of state
2010	D1 conditions in 27% of state
2011	D0 conditions in 0.01% of state
2012	D2 conditions in 51% of state
2013	D1 conditions in 60%, D0 in 99.9% of state
2014	D1 conditions in 26%, D0 in 99.99% of state
2015	D1 conditions in 72%, D0 in 100 % of state
2016	D3 conditions in 52%, D2 in 90%, D1 in 98%, D0 in 100% of state
2017	D3 conditions in 9%, D2 in 69%, D1 in 98%, D0 in 99% of state
2018	D1 conditions in 36%, D0 in 85% of state
2019	D0 in 85% of state
2020	D3 conditions in 37%, D2 in 83%, D1 in 96%, D0 in 100% of state

Source: US Drought Monitor

Hatfield had limited experience with severe drought conditions in the past, although that is changing as drought conditions related to climate change become more frequent. According to the Massachusetts SHMCAP, between 2001 and 2017 the Town experienced up to 69 weeks of Severe Drought and 14 weeks of Extreme Drought, almost as many weeks as any other municipality in the State as classified by the U.S. Drought Monitor.

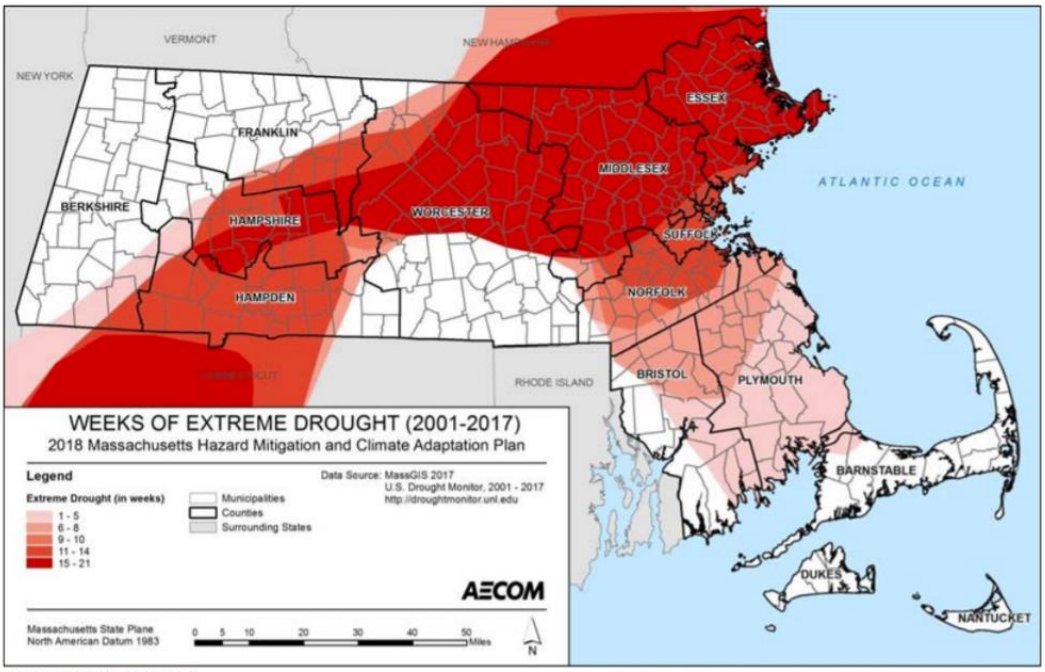
The drought conditions in 2020 were the most severe the Town has experienced to date. Voluntary water bans have been put in place for the past three years, and in 2020 the water ban began at the end of April, much earlier than normal, and lasted until September. Some private wells in Town had low levels during this time and came close to running dry.

Figure 3.3 Weeks of Severe Drought in Massachusetts (2001-2017)



Source: U.S. Drought Monitor, 2017

Figure 3.4 Weeks of Extreme Drought in Massachusetts (2001-2017)



Source: U.S. Drought Monitor, 2017

Probability of Future Events

The frequency and intensity of droughts are projected to increase during summer and fall as higher temperatures lead to greater evaporation and earlier winter and spring snowmelt, and precipitation patterns become more variable and extreme. Also due to climate change, the proportion of precipitation falling as rain instead of snow in our region and the length of time snowpack remains are both expected to decrease. This reduces the period during which snow melt can recharge groundwater supplies, bolster streamflow, and provide water for the growing period.

The Massachusetts Drought Management Plan (DMP) assesses drought conditions in six regions—Western, Connecticut River Valley, Central, Northeast, Southeast, and Cape and Islands. A regional approach allows customization of drought actions and conservation measures to address particular situations in each region. Figures 3.3 and 3.4 show the extent of severe and extreme drought across Massachusetts from the years 2001- 2017. The central and eastern parts of Hatfield experienced 50-69 weeks of severe drought during this period (the western part experienced 37-49), and all of Hatfield experienced 11-14 weeks of extreme drought.

Due to the water richness of western Massachusetts, Hatfield is unlikely to be adversely affected by anything other than a major, extended drought. While such a drought would require water saving measures to be implemented, there would be no foreseeable damage to structures or loss of life resulting from the hazard.

Average temperatures in the Pioneer Valley have been increasing over time in the Pioneer Valley due to climate change, and this trend is likely to continue in the future. Higher temperatures due to climate change will likely have an effect on future drought risk in Hatfield. A slight decrease in summer

precipitation will also support more frequent droughts, especially short-term (1 to 3 months). Droughts are likely to increase in their frequency in the Northeast to the level of once per year.

Impact

The impact of droughts as categorized by the U.S. Drought Monitor include:

- Slowing or loss of crops and pastures
- Water shortages or restrictions
- Minor to significant damage to crops, pastures;
- Low water levels in streams, reservoirs, or wells

While agriculture is a significant economic activity in Hatfield, most farms are located close to the Connecticut River and are able to access the river water for irrigation. This access to irrigation prevents damage to crops and mitigates the impact of droughts to farms. Water restrictions on the public drinking water supply have a relatively minor impact on residents, however low water levels in some private wells can potentially impact a small number of residents.

The impact of drought in Hatfield would be "minor," with minimal damages to people or property likely to occur.

Vulnerability

Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, it appears that western Massachusetts may be more vulnerable than eastern Massachusetts to severe drought conditions. However, many factors, such as water supply sources, population, economic factors (i.e., agriculture-based economy), and infrastructure, may affect the severity and length of a drought event. Based on the above assessment, Hatfield faces a hazard index rating of "3 - medium risk" from drought.

Populations

The entire population of Hatfield would be vulnerable to the impacts of a drought. Residents with a private water supply such as a well, homeless residents, and populations with respiratory health conditions are most vulnerable.

Built Environment

Some infrastructure may not be built to operate in drought conditions. Intake pipes may be too high above drought water levels, and wells may be too shallow. Private suppliers or residents with private systems may need to drill deeper wells or find alternative supplies for emergency back-up during severe droughts.

Natural Resources

Prolonged droughts can have severe impacts on groundwater and surface water-dependent ecosystems and natural resources, as most organisms require water throughout their life cycle.

Economy

Economic impacts of drought can be significant in the agriculture, recreation, forestry, and energy sectors. A prolonged drought may lead to reduced production capability or temporary closure. Most farms in Hatfield can use water from the Connecticut River for irrigation and thus would not be significantly affected by a severe drought, however it would add additional labor and cost to the farming operations. Impacts on the individual level include the need to buy water from an alternative source during a drought emergency. Crop failure can also increase food prices, straining a portion of the economy.

Primary Climate Change Interaction: Rising Temperatures

Extreme Temperatures

According to the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, there is no universal definition for extreme temperatures as the term is relative to local weather conditions. Extreme temperatures can generally be defined as those that are far outside the normal ranges. The average annual baseline temperature in Massachusetts from 1971-2000 was 47.6°F, however due to climate change this average temperature is increasing.

The average highs and lows of the hottest and coolest months in the nearby town of Amherst, the closest site for which data was available, are provided in the table below.

Monthly Temperature Normals – Amherst MA		
	July (Hottest Month)	**January (Coldest Month)**
Average High (°F)	82.2	33.1
Average Low (°F)	59.2	23.1

Source: NOAA NWS, 2020. Monthly Climate Normals (1981 – 2010) Amherst, MA

The highest temperature recorded at the Amherst station for the period from 1893 to present was 104°F on July 4, 1911, and the highest temperature recorded in western MA was 107°F at the Chester station on August 2, 1975. [3]

Projected temperature extremes will shift with climate change, according to research conducted by the Massachusetts Executive office for Energy and Environmental Affairs and the University of Massachusetts, Amherst. By 2050, summer maximum temperatures (including the presumed hottest month of July) are expected to reach as high as 87.7°F in the Connecticut River Basin, a significant increase from the 1971-2000 baseline of 80.2°F (resilientma.org).

Extreme cold events are when temperatures drop well below normal in an area. Generally, extreme cold temperatures are characterized by the ambient air temperature dropping to or below 0 degrees Fahrenheit (ºF) (National Weather Service [NWS] 2015). When winter temperatures drop significantly below normal, staying warm and safe can become a challenge. Extremely cold temperatures may accompany or follow a winter storm, which may also cause power failures and icy roads. Many homes will be too cold, either due to a power failure or because the heating system is not adequate for the weather. Extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening.

Extreme heat is defined by the Center for Disease Control (CDC) as temperatures which hover 10 degrees or more above the average high temperature for a region and that last for several weeks (CDC 2016). Heat waves cause more fatalities in the U.S. than the total of all other meteorological events

[3] https://w2.weather.gov/climate/xmacis.php?wfo=box; https://www.ncdc.noaa.gov/extremes/scec/records

combined. Since 1979, more than 9,000 Americans have died from heat-related ailments (EPA, 2016). In Massachusetts, a heat wave is defined as 3 or more days of temperatures of 90°F or above and is often accompanied by high humidity. The designation implies an extended period of unusually high atmosphere-related heat stress, which forces affected populations to make temporary modifications in lifestyle to avoid adverse health consequences (MA HMCAP, 2018).

Location

The National Oceanic and Atmospheric Administration (NOAA) established three climate divisions in Massachusetts: Western, Central, and Coastal, as shown in the figure below. Average annual temperatures vary slightly over the divisions, with annual average temperatures of around 46°F in the Western division (area 1), 49°F in the Central division (area 2) and 50°F in the Coastal division (area 3). Hatfield is in the western portion of the Central division.

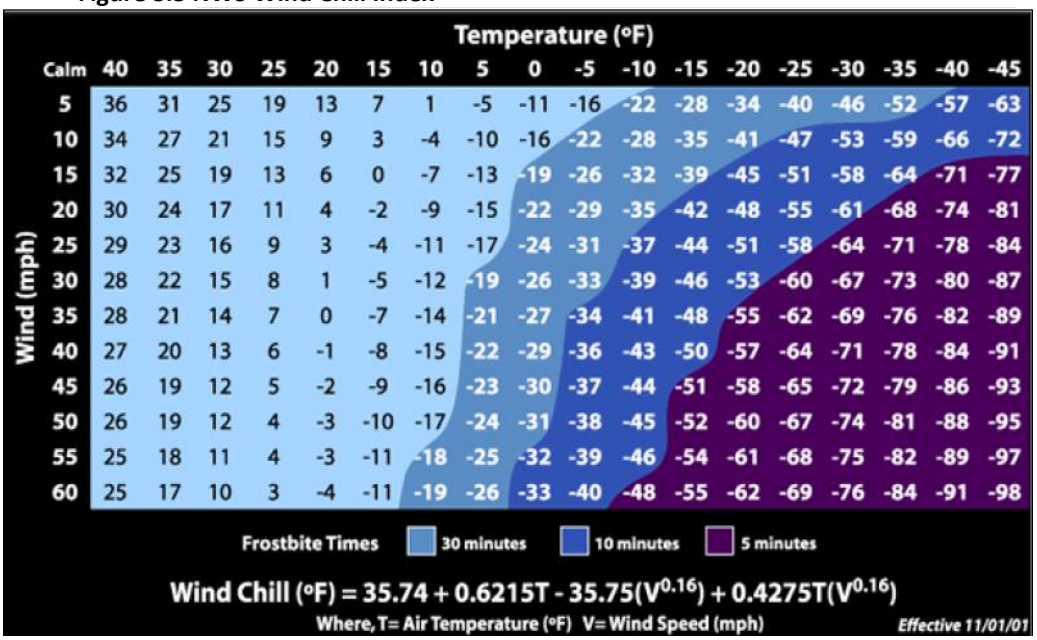
Figure 3.4 Massachusetts Climate Divisions

Extreme temperatures would affect the whole community in Hatfield, resulting in a “large” location of occurrence, or more than 50 percent of total land area affected.

Extent

As per the Massachusetts Hazard Mitigation Plan, extreme cold is a dangerous situation that can result in health emergencies for susceptible people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without heat. The extent (severity or magnitude) of extreme cold temperatures are generally measured through the Wind Chill Temperature Index. Wind Chill Temperature is the temperature that people and animals feel when outside and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. The chart shows three shaded areas of frostbite danger. Each shaded area shows how long a person can be exposed before frostbite develops. In Massachusetts, a wind chill warning is issued by the NWS Taunton Forecast Office when the Wind Chill Temperature Index, based on sustained wind, is –15ºF or lower for at least three hours.

Figure 3.5 NWS Wind Chill Index



Wind (mph) \ Temperature (°F)	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

Source: NWS 2018

For extremely hot temperatures, the heat index scale is used, which combines relative humidity with actual air temperature to determine the risk to humans. The NWS issues a Heat Advisory when the Heat Index is forecast to reach 100-104 degrees F for 2 or more hours. The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach 105+ degrees F for 2 or more hours. The following chart indicates the relationship between heat index and relative humidity:

Figure 3.6 NWS Heat Index Chart

Relative Humidity (%) \ Temperature (°F)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	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										

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

Source: NWS 2018

According to recent downscaled climate projections for Massachusetts, high, low, and average temperatures in Hampshire County are likely to increase significantly over the next century as a result of climate change (Resilient MA, 2019). This gradual change will put long-term stress on a variety of social and natural systems and will exacerbate the influence of discrete events. In the event of an extreme cold or heat event, multiple injuries and health impacts would be possible. Therefore, the extent of this hazard is critical.

Previous Occurrences

The following are the lowest temperatures recorded at National Climate Data Center weather stations in Massachusetts for the period from 1895 to present, according to NOAA's State Climate Extremes Committee (SCEC):

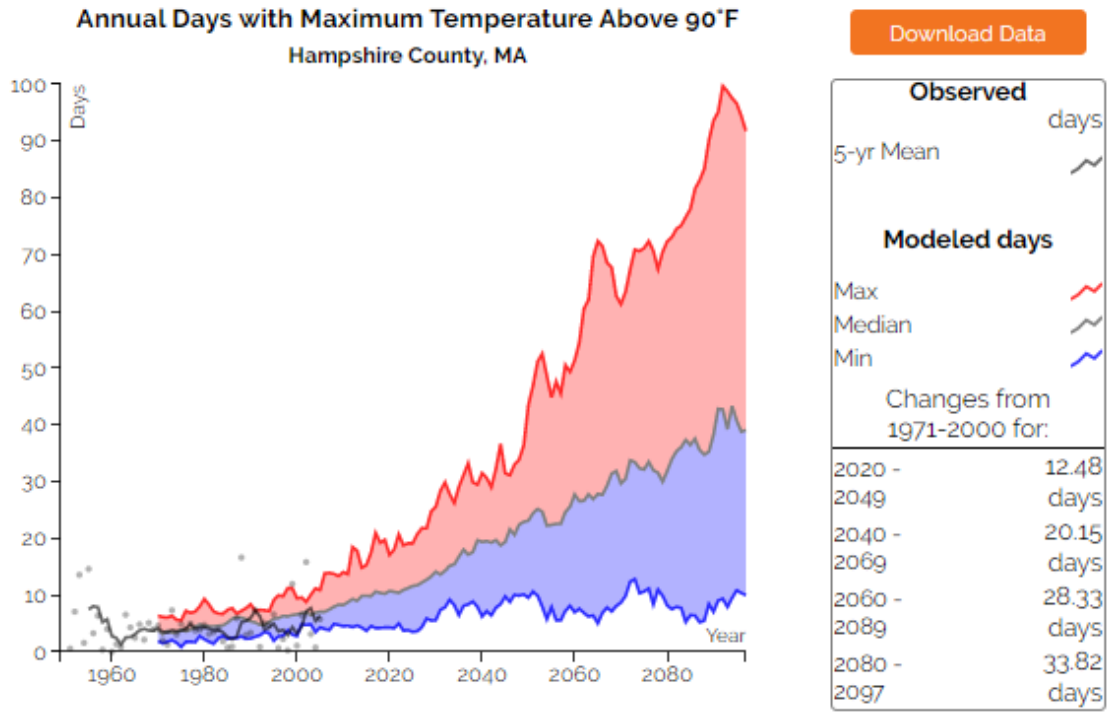
- Taunton: -35°F, January 5, 1904
- Coldbrook: -35°F, February 15, 1943
- Chester: -35°F, January 12, 1981

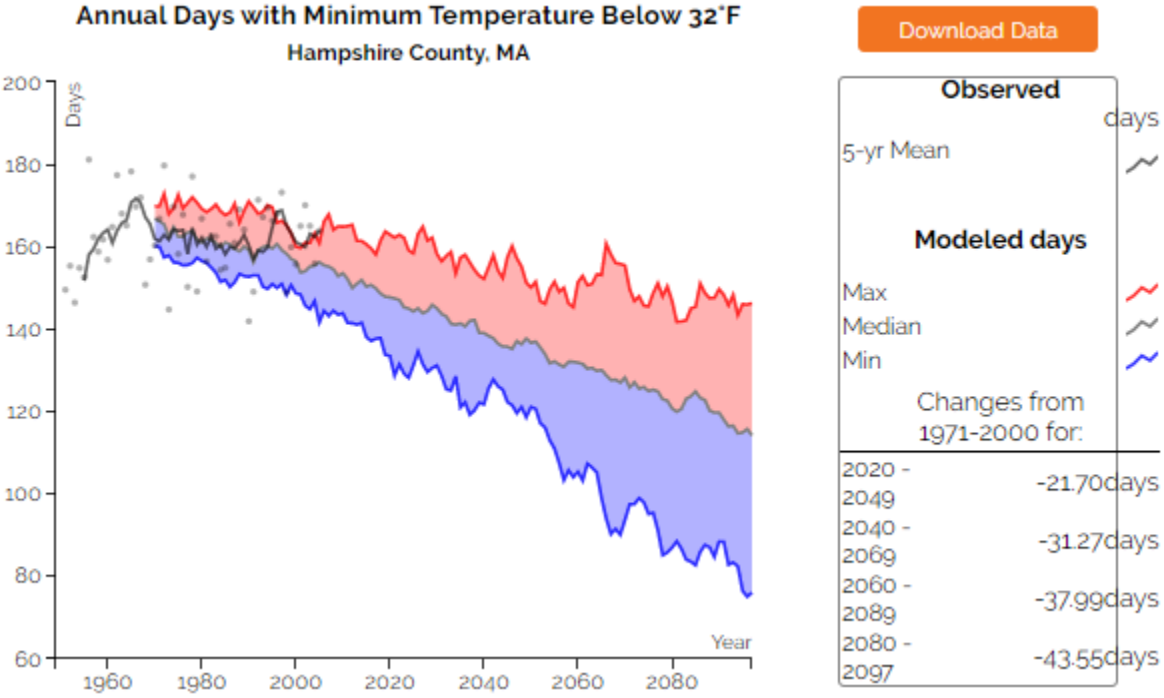
The hottest temperature recorded at National Climate Data Center weather stations was 107°F in both Chester and New Bedford on August 2, 1975. According to the NOAA's Storm Events Database, there were 43 heat events (ranging from Record Warmth/Heat to Excessive Heat events) in Massachusetts between 1995 and 2018, the most recent of which occurred in July 2013. 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 (MASHMCAP, 2018). None of these events was known to impact individuals in Hatfield. Between 1954 and 2019, Hampshire County was not included in any FEMA declared extreme temperature-related disasters (DR) or emergencies (EM).

The Town of Hatfield has an emergency center located at Hatfield Elementary School that was used as a cooling center during heat waves in the summers of 2018 and 2019. According to the Hazard Mitigation Committee, only one resident utilized the cooling center during these times.

Probability of Future Events

The Northeast Climate Adaptation Science Center (NECASC) data support the trends of an increased frequency of extreme hot weather events and a decreased frequency of extreme cold weather events. **Error! Reference source not found.** and**Error! Reference source not found.** show the projected changes in these variables between 2020 and the end of this century.


Annual Days with Maximum Temperature Above 90˚F
Hampshire County, MA
Days
Year
Download Data
Observed
days
5-yr Mean
Modeled days
Max
Median
Min
Changes from 1971-2000 for:
2020 - 2049 12.48 days
2040 - 2069 20.15 days
2060 - 2089 28.33 days
2080 - 2097 33.82 days


Annual Days with Minimum Temperature Below 32˚F
Hampshire County, MA
Days
Year
Download Data
Observed
days
5-yr Mean
Modeled days
Max
Median
Min
Changes from 1971-2000 for:
2020 - 2049 -21.70 days
2040 - 2069 -31.27 days
2060 - 2089 -37.99 days
2080 - 2097 -43.55 days

The probability of future extreme heat and extreme cold is considered to be "low," or between 1 and 10 percent in any given year.

Secondary Hazard

According to the 2018 SHMCAMP, the most significant secondary hazard associated with extreme temperatures is a severe weather event. Severe heat events are often associated with drought, as evaporation increases with temperature, and with wildfire, as high temperatures can cause vegetation to dry out and become more flammable. Warmer weather will also have an impact on invasive species (see Invasive Species section below for additional detail). More commonly, heat events contribute to poor air quality that can exacerbate asthma and result in an increase in emergency department visits. Conversely, extreme cold events are primarily associated with severe winter storms. The combination of cold weather with severe winter storm events is especially dangerous because winter weather can knock out heat and power, increasing exposure to extreme cold temperatures. Loss of heat and power may also lead to carbon monoxide poisoning from inappropriate use of combustion-powered generators, heaters, and cooking appliances, and heavy snowfall may block vents for gas dryers and heaters. Similarly, prolonged exposure to extreme heat can compromise power infrastructure, leaving customers without power or the ability to operate air conditioning. Power failure leads to increased use of diesel generators for power and more wood stoves are used in extreme cold; both situations lead to increasing air pollution and health impacts.

Impact

The impact of extreme heat or cold in Hatfield is considered to be "minor," with no property damage and very limited affect on humans. However, In the event of an extreme cold or heat event, health impacts would be possible for a small segment of the population. Figure 3.6, the NWS Heat Index chart, shown above lists the health hazards associated with high temperatures and humidity. Heat indexes above 105° present dangerous and extremely dangerous health hazards such as heat stroke, sun stroke and heat exhaustion. Heat indexes this high have been rare in Hatfield, however they are likely to become more frequent with climate change, as two heat waves with temperatures above 90°F in June 2021 have demonstrated. Heat indexes of 90 - 105°F are occurring more frequently and can result in heat exhaustion, heat stroke and muscle cramps

According to recent downscaled climate projections for Massachusetts, high, low, and average temperatures in Hampshire County are likely to increase significantly over the next century as a result of climate change (resilient MA, 2019), as are the occurrences of days over 90°F, 95°F, and 100°F. This pattern change will put long-term stress on a variety of social and natural systems, and will exacerbate the influence of discrete events.

Vulnerability

Hatfield's vulnerability from extreme heat and cold is considered to be "5 - Lowest Risk."

Populations

Extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening. Extreme cold and extreme heat are dangerous situations that can result in health emergencies for individuals without shelter or some other way to stay warm or cool, or who live in homes

without adequate heat, air conditioning or insulation. Power outages may also result in inappropriate use of combustion heaters and other appliances that can cause risks of carbon monoxide poisoning and other health impacts.

Extreme heat events can also contribute to a worsening of air quality, as high temperatures increase the production of ozone from aerosols such as volatile organic compounds. Weather patterns that bring high temperatures can also transport air pollutants from other areas of the continent. Additionally, atmospheric inversions and low wind speeds associated with heat waves allow polluted air to remain in one location for a prolonged period of time (UCI, 2017).

As mentioned earlier, the Town has an emergency center located at Hatfield Elementary School that has been used during summer heat waves since 2018, however it has very limited use. The Town should also consider how to disseminate messages to vulnerable populations, particularly the elderly, renters and lower-income residents who are less likely to have air conditioning, and keep in mind that this might require active outreach or checking on vulnerable residents during or leading up to extreme temperature events.

Built Environment

With the exception of power infrastructure, most structures and infrastructure within the Town are not at risk for damage due to extreme temperatures. In some instances, extreme cold temperature events can damage buildings through freezing or bursting pipes and freeze and thaw cycles. Extreme temperature fluctuations can also have serious implications for transportation infrastructure life-span and maintenance needs.

Natural Resources

Individual extreme temperature events usually have a limited long-term impact on natural systems, although unusual frost events occurring after plants begin to bloom in the spring can cause significant damage. However, changing average temperatures and the changing frequency of extreme climate events will likely have a major impact on natural resources throughout the Commonwealth and worldwide (2018 SHMCAP).

Changing temperatures will impact the natural environment in many ways. Because the species that exist in a given area have adapted to survive within a specific temperature range, extreme temperature events can place significant stress both on individual species and the ecosystems in which they function.

Massachusetts ecosystems that are expected to be particularly vulnerable to warming temperatures include:

- Coldwater streams and fisheries
- Vernal pools
- Spruce-fir forests
- Northern hardwood (Maple-Beech-Birch) forests, which are economically important due to their role in sugar production
- Hemlock forests, particularly those with the hemlock woolly adelgid

- Urban forests, which will experience extra impacts due to the urban heat island effect (2018 SHMCAP)

Additional impacts of warming temperatures include the increased survival and grazing damage of white-tailed deer, increased invasion rates of invasive plants, and increased survival and productivity of insect pests, which cause damage to forests.

Economy

Extreme temperatures could impact the economy in Hatfield in a number of ways, such as possible building repairs (e.g. for burst pipes), higher than normal utility bills, or business interruptions due to power failure (i.e., loss of electricity and telecommunications). Employers with outdoor workers (such as agricultural and construction companies) may have to reduce employees' exposure to the elements by reducing or shifting their hours to cooler or warmer periods of the day, and these shifts can impact the earnings of both the company and the individual employee.

The agricultural industry is most directly at risk in terms of economic impact and damage due to extreme temperature and drought events. Extreme heat can result in drought and dry conditions, which directly impact livestock and crop production, and can have an economic impact even if farms have access to irrigation due to increased costs (2018 SHMCAP). Extreme heat can also have adverse impacts on outdoor entertainment and dining, a part of the economy that has gained importance in all communities since the COVID-19 Pandemic began in 2020.

Wildfire / Brushfire

Hazard Description

Wildland fires are typically larger fires, involving full-sized trees as well as meadows and scrublands. Brushfires are uncontrolled fires that occur in meadows and scrublands, but do not involve full-sized trees. Both wildland fires and brushfires can consume homes, other buildings and/or agricultural resources. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson.

FEMA has classifications for 3 different classes of wildland fires:

- Surface fires – the most common type of wildland fire, surface fires burn slowly along the floor of a forest, killing or damaging trees.
- Ground fires burn on or below the forest floor and are usually started by lightening
- Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

Location

The forest resources and woodlands in Hatfield lie primarily west of the I-91 corridor. Extensive range of forestland encompasses approximately 4,800 acres, which consists of 45 percent of the total land area in the Town. A large wildfire could damage much of the town's forested areas in a short period of time. However, Massachusetts receives more than 40 inches of rain per year and much of the landscape is fragmented, and together these two traits make wildfires uncommon in Massachusetts. Nevertheless, in drought conditions, a brushfire or wildfire would be a matter of concern. The total amount of the Town that could be affected by wildfire is categorized as "small" at less than 10% of the total area.

Extent

Wildfires can cause widespread damage to the areas that they affect. They can spread very rapidly, depending on local wind speeds and be very difficult to get under control. Fires can last for several hours up to several days.

In Hatfield, approximately 45% of the land is forested, and is therefore at risk of fire. A large wildfire could damage almost all of the town's land mass in a short period of time. Certain forested areas of Hatfield are remote and difficult for emergency crews to access. In drought conditions, a brushfire or wildfire would be a matter of concern as a large fire could inflict widespread damage to the land mass, including vital watershed lands, in a short period of time.

As described in the next section, there have not been any major wildfires recorded in Hatfield since 2001. However, based on other major wildfires that have occurred in western Massachusetts, it is estimated that such a fire would likely destroy around 50 to 500 acres of forested land if unrestrained.

One of the major risks is fires set intentionally to burn brush or for recreation that could burn out of control. The Fire Department requires burn permits as a mitigation measure. Open burning season in January 15 through May 1, and residents must request a burn permit online or over the phone. All

burning sites are inspected by the Fire Department prior to burning, and residents have to make a request any day of the season that they want to burn. According to the Fire Chief, this process has been effective in preventing open burns from occurring when conditions are favorable for wildfires, such as when there are drought and windy conditions, and also from preventing open burns in locations that are favorable for fires spreading out of control.

Previous Occurrences

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. Drought, snowpack level, and local weather conditions can impact the length of the fire season.

Few wildfires have been recorded in the past 100 years in the Pioneer Valley, and none has ever resulted in a FEMA disaster declaration. During the past 100 years, there have not been many wildfires occurring in the Pioneer Valley. However, several have occurred during the past 20 years, as shown in the list below:

- 1995 – Russell, 500 acres burned on Mt. Tekoa
- 2000 – South Hadley, 310 acres burned over 14 days in the Litihia Springs Watershed
- 2001 – Hatfield, 40 acres burned
- 2010 – Russell, 320 acres burned on Mt. Tekoa
- 2012 – Eastern Hampden County, dry conditions and wind gusts created a brush fire in Brimfield, and burned 50 acres
- 2016 - Montgomery, 60 acres burned on Mt. Tekoa (MA HMP, 2013)

As a point of reference, the total number of any type of fire incidence in Hatfield for the years 2013-2019 is provided below. These can include structural and vehicle fires as well as brush fires. The Hatfield Fire Department responds to house fires and the few "wildfires" that occur. There are no other records, authenticated or anecdotal, of wildfires in Hatfield.

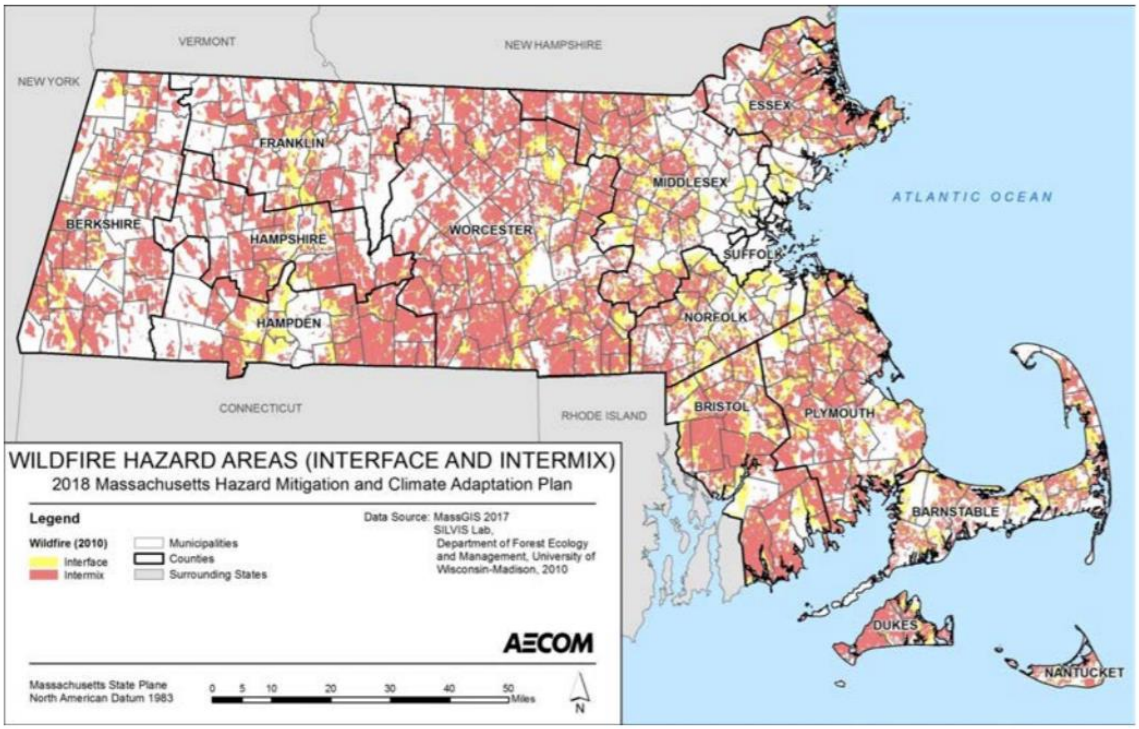
Total Fire Incidents in Hatfield	
2013	5
2014	9
2015	11
2016	13
2017	9
2018	13
2019	12

Source: Massachusetts Fire Incidence Reporting System, 2018 Annual Report plus 2019 Fire Data Analysis County Reporting System-most recent data available

Unfragmented and heavily forested areas are vulnerable to wildfires, particularly during droughts, and forested and agricultural areas with high fuel content have more potential to burn. In addition, it is

often very difficult to access some of these locations to extinguish brush fires. However, the greatest potential for significant damage to life and property from fire exists in areas designated as wildland-urban interface areas. The wildland-urban interface area defines the conditions where highly flammable vegetation is adjacent to developed areas. Figure 3.7 below shows the wildland-urban interface areas in Massachusetts that are most at risk for wildfires.

Figure 3.7 Wildland-Urban Interface and Hazard Areas in Massachusetts



Source: Massachusetts Hazard Mitigation Plan

Probability of Future Events

The Town Hazard Mitigation Committee found it is difficult to predict the likelihood of wildfires in a probabilistic manner because the number of variables involved. However, given the proximity and frequency of previous wildfires as well as the impact of climate change, the Committee determined the probability of future wildfires to be “moderate”.

Climate scenarios project an estimated increase in average temperatures in Hampshire County of 7.5°F by the end of the century, as well as decreases in precipitation in summer and fall by up to 15 percent Research has also found that the frequency of lightning strikes – an occasional cause of wildfire – could increase by approximately 12 percent for every degree Celsius of warming (2018 SHMCAP).

Impact

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $409,882,700 and the average household size of 2.23 people are used.

An estimated 100 percent of damage would occur to 1 percent of structures, resulting in a total $4,098,827 worth of damage and 105 people affected. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Hatfield faces a hazard index rating of "3 - medium risk" from wildfires.

Population
Human health and the lives of residents and responders are at risk from wildfire. The most vulnerable populations include emergency responders and those within a short distance of the interface between the built environment and the wildland environment.

Built Environment
For the purposes of this planning effort, all elements of the built environment located in the wildland interface and intermix areas are considered exposed to the wildfire hazard.

Critical facilities are particularly important for routine town operation and emergency response in case of a sever wildfire. Energy distribution lines are subject to wildfire risk because most poles are made of wood and susceptible to burning. Transmission lines are also at risk to faulting during wildfires, which can result in a broad area outage.

Natural Resources
Fire can serve important ecological purposes as a natural part of many ecosystems. Functions include facilitating the nutrient cycling from dead and decaying matter, removing diseased plants and pests, and regenerating seeds or stimulating germination of certain plants. Conversely, wildfires can also have significant negative impacts on the environment. Specifically, the ash they generate can distort the flow of nutrients through an ecosystem, reducing the biodiversity that can be supported.

Economy
The initial loss of structures and the subsequent loss of revenue from destroyed businesses from a wildfire can have major economic impacts on a community. Individuals and families will face economic challenges if their home is impacted by wildfire. The exposure of homes to this hazard is widespread.

Primary Climate Change Interaction: Extreme Weather

Hurricanes/Tropical Storms

Hazard Description

Hurricanes are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. The primary damaging forces associated with these storms are high-level sustained winds and heavy precipitation. Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour and which generate large amounts of precipitation. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities.

Location

Because of the hazard's regional nature, all of Hatfield is at risk from hurricanes. Ridgetops are more susceptible to wind damage.

Extent

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Hurricane Wind Scale, which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense.

Saffir-Simpson Scale	
Category	**Maximum Sustained Wind Speed (MPH)**
1	74–95
2	96–110
3	111–129
4	130–156
5	157 +

Source: National Hurricane Center, 2012

Impact

A description of the damages that could occur due to a hurricane is described by the Saffir-Simpson scale, as shown below.

Hurricane Damage Classifications			
Storm Category	**Damage Level**	**Description of Damages**	**Wind Speed (MPH)**
1	MINIMAL Very dangerous winds will produce some damage	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage. An example of a Category 1 hurricane is Hurricane Dolly (2008).	74-95
2	MODERATE Extremely dangerous winds will cause extensive damage	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings. An example of a Category 2 hurricane is Hurricane Francis in 2004.	96-110
3	EXTENSIVE Devastating damage will occur	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland. An example of a Category 3 hurricane is Hurricane Ivan (2004).	111-129
4	EXTREME Catastrophic damage will occur	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland. An example of a Category 4 hurricane is Hurricane Charley (2004).	130-156
5	CATASTROPHIC Catastrophic damage will occur	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required. An example of a Category 5 hurricane is Hurricane Andrew (1992).	157+

Previous Occurrences

Hurricanes and tropical storms that have affected the Pioneer Valley are shown in the following table.

Major Hurricanes in the Pioneer Valley		
Hurricane/Storm Name	**Year**	**Saffir/Simpson Category (when reached MA)**
Great Hurricane of 1938	1938	3
Great Atlantic Hurricane	1944	1
Carol	1954	3
Edna	1954	1
Diane	1955	Tropical Storm
Donna	1960	Unclear, 1 or 2
Groundhog Day Gale	1976	Not Applicable
Gloria	1985	1
Bob	1991	2
Floyd	1999	Tropical Storm
Irene	2011	Tropical Storm
Sandy	2012	Super Storm

Source: NOAA National Hurricane Center, 2019

Probability of Future Events

Hatfield's location in Western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes, although it can experience some high wind events. During tropical storms or severe wind events, the Town has experienced downed trees on structures and parked vehicles. Wires have come down and the community has suffered power outages lasting up to 36 hours, but generally not more than 8 hours. This can be a problem for some people who rely on oxygen and need power for their pumps. Based upon past occurrences, it is reasonable to say that there is a "low" probability of hurricanes in Hatfield in any given year, between 1 percent and 10 percent. The local Hazard Mitigation committee reports that no hurricanes have tracked directly through Hatfield.
and

Vulnerability

Based on the above analysis, Hatfield faces a hazard index rating between "3 – medium" and "4 - high risk" from hurricanes.

Populations
Populations unable to safely evacuate are most at risk during a Hurricane or Tropical Storm hazard. Low-income populations may lack means to evacuate. The elderly often face physical challenges or require regular medical attention. Low-English speaking populations may face challenges receiving and understanding emergency directions.

Built Environment and Economy
The entire town would be vulnerable to the impact of a hurricane. Hurricanes and tropical storms can result in power outages and road closures that impact emergency response. Heavy rains can lead to contamination of well water, septic system failure, and overburdened stormwater systems. Areas prone to flooding are particularly vulnerable. Additionally, high winds could impact the town's communication and energy infrastructure, and damage older buildings. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $409,882,700 is used.

- Estimated wind damage: 5% of the structures with 10% damage, $2,049,414;
- Estimated flood damage: 10% of the structures with 20% damage, $8,197,654;
- Vulnerability assessment for a hurricane event (both wind and flood damages): $10,247,068;
- Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included.

Wind gusts of only 40 to 50 mph can sometimes cause scattered power outages from downed trees and wires. This is especially true after periods of prolonged drought or excessive rainfall, since both are situations that can weaken the root systems and make them more susceptible to the winds' effects. Roads may become impassable due to downed trees or roadway flooding resulting from a severe wind or thunderstorm.

Natural Environment
High winds, flooding, and large quantities of debris can damage the natural environment through contamination of resources, felling of trees, scouring of riverbeds, and injury and mortality of animals.

Severe Snowstorms / Ice Storms

Hazard Description

Severe winter storms include ice storms, nor'easters, heavy snow, blowing snow, and other extreme forms of winter precipitation.

Snow is characterized as frozen precipitation in the form of six-sided ice crystal. In order for snow to occur, temperatures in the atmosphere (from ground level to cloud level) must be at or below freezing. The strongest form of a severe snow storm is a blizzard. Blizzards are characterized by frequent wind gusts above 35 miles per hour, limited to no visibility due to falling snow and extreme cold that lasts longer than three hours.

Ice storms are liquid rain that falls and freezes upon contact with cold objects. There must be an ice build-up of greater than ¼ inch for it to be considered an ice storm. When more than a ½ inch of ice build-up is forecasted a winter storm warning can be triggered.

Nor'easters are among winter's most ferocious storms. They are characterized by a large counter-clockwise wind circulation around a low-pressure center, and are known for producing heavy snow, high winds, and rain. These storms occur most often in late fall and early winter.

Severe winter storms can pose a significant risk to property and human life. The rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can cause the following hazards:

- Disrupted power and phone service
- Unsafe roadways and increased traffic accidents
- Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt
- Tree damage and fallen branches that cause utility line damage and roadway blockages
- Damage to telecommunications structures
- Reduced ability of emergency officials to respond promptly to medical emergencies or fires
- Elderly are affected by extreme weather

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. Research on climate change indicates that there is great potential for stronger, more frequent storms as the global temperature increases. Severe winter storms typically occur during January and February; however, they can occur from late September through late April.

Location

Severe winter weather occurs regionally and therefore would impact the entire town. The entire Town of Hatfield is susceptible to severe snowstorms.

Any severe winter weather incident can cause critical snow and ice hazards due to windblown snow across the roadway. This is due to open areas prone to high winds, causing driving difficulties and impairing visibility. The following areas have been identified by the Hazard Mitigation Committee as areas where snow drifts form during winter storm events:

North Hatfield Road
Depot Road--the Town did erect a snow fence on this road, but it did not mitigate the snow drifting into the road.
Upper Main Road
Elm Street
Maple Street
Bridge Street

Extent

Since 2005, the Regional Snowfall Index (RSI) has become the descriptor of choice for measuring winter events that impact the six climactic regions in the eastern two-thirds of the U.S. The RSI ranks snowstorm impacts on a scale system from 1 to 5 as depicted in the table below. The RSI is similar to the scale used to measure tornadoes (Fujita) or hurricanes (Saffir-Simpson), with the added benefit of considering population as a variable. The RSI is based on three factors: the spatial extent of the storm, the amount of snowfall, and population (NOAA, n.d.). As a regional index, the RSI incorporates region-specific parameters and thresholds for calculating a storm's category.

Regional Snowfall Index Categories, Corresponding RSI Values and Description

Category	RSI Value	Description
1	1—3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18.0+	Extreme

Source: http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

Prior to the RSI, the Northeast Snowfall Impact Scale (NESIS) was the ranking system used. It was developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10-inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts.

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

Northeast Snowfall Impact Scale Categories		
Category	**NESIS Value**	**Description**
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

Source: http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

Previous Occurrences

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. Severe winter storms typically occur during January and February; however, they can occur from late September through late April.

There is significant overlap between winter weather disasters and other types of disasters, such as flooding. Based on data available from the National Oceanic and Atmospheric Administration, there were 27 winter storms in the Northeast Urban Corridor since 2010 that have registered on the NESIS scale. Of these, approximately 14 storms resulted in snow falls of at least 10 inches in the Pioneer Valley. These storms are listed in the table below in order of their NESIS severity.

Winter Storms Producing Over 10 inches of Snow in the Pioneer Valley, 2010 -2021			
Date	NESIS Value	NASIS Category	NESIS Classification
2/23/2010	5.46	3	Major
1/29/2015	5.42	3	Major
1/9/2011	5.31	3	Major
2/11/2014	5.28	3	Major
3/12/2017	5.03	3	Major
1/31/2021	4.93	3	Major
2/7/2013	4.35	3	Major
3/5/2018	3.45	2	Significant
3/4/2013	3.05	2	Significant
1/25/2015	2.62	2	Significant
3/11/2018	3.16	2	Significant
10/29/2011	1.75	1	Notable
1/3/2018	1.65	1	Notable
2/8/2015	1.32	1	Notable

Source: http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

Between 2010 and 2019, Hampshire County was included in 3 FEMA declared severe winter storm-related disasters (DR) or emergencies (EM) classified as one or a combination of the following hazards: blizzard, severe winter storm, snowstorm, record snowfall, and snow (See Table 1). Hatfield may not have been impacted by all of these events. It should be noted that because population is used as a criteria for FEMA declarations, the storms that rank higher will be those that impact densely populated areas and regions such as Boston and other large cities and, as such, might not necessarily reflect the storms that impact lightly populated areas

The October Snow Storm in 2011, which caused major damages and disruptions across New England, also impacted Hatfield. Most residents of the town were without electricity for 2 days. While this was a severe storm paired with trees still in full foliage, most winter storms that hit Hatfield are more manageable. According to the local Hazard Mitigation committee, the most significant snowfall in the community was likely during the Blizzard of 1978 in February, when approximately two feet of snow fell. However, there have been similar snowfall events in more recent decades as well.

Probability of Future Events

Based on the NESIS scale, Hatfield's risk of a major to extreme winter storm in any given year is slightly less than 50 percent. Extreme weather events—including extreme precipitation and snowfall levels—are anticipated to occur more frequently as climate change occurs. However, as temperatures throughout the year increase, it is possible that nor'easter events may become more concentrated in the coldest winter months when atmospheric temperatures are still low enough to result in snowfall rather than rain. Therefore, this hazard has a high probability of occurrence (40-70% probability in the next year) in Hatfield.

The Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan has additional information about the impact of climate change and probability of future snowfall events.

Impact

The Town of Hatfield faces a "limited" impact, or less than 10 percent of total property damaged, from snowstorms.

The weight from multiple snowfall events can test the load ratings of building roofs and potentially cause significant damage. Multiple freeze-thaw cycles can also create large amounts of ice and make for even heavier roof loads.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $409,882,700, and the average household size, 2.23 people, is used. An estimated 20 percent of damage would occur to 10 percent of structures, resulting in a total of $8,197,654 worth of damage and 272 people affected. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Hatfield faces a hazard index rating of "3 - medium risk" from severe snow storms and ice storms.

Populations
Winter storms are considered deceptive killers because most deaths and other impacts are indirectly related to the storm. They generally bring strong winds that can create blizzard conditions with blinding wind-driven snow, drifting snow, and extreme cold temperatures with dangerous wind chill. Injuries and deaths may occur due to traffic accidents on icy roads, heart attacks while shoveling snow, or hypothermia from prolonged exposure to cold. Heavy snow can paralyze a region or town, shutting down transportation, stopping the flow of supplies, and disrupting medical and emergency services. Accumulations of snow can cause structures to collapse, and knock down trees and power lines. Rural populations especially may become isolated by downed trees, blocked roadways, and power outages. Residents may be displaced or require temporary to long-term sheltering.

Elderly populations are particularly susceptible to risks of extreme winter weather such as injury from falls, hypothermia, and overexertion. Low-income residents are also susceptible if they are not able to secure housing with adequate insulation and heating.

Built Environment and Economy
The Town of Hatfield's power and communication infrastructure are vulnerable to the impacts of a severe winter storm. This could cause residents, businesses and municipal offices to lose power and could impact the Town's ability to operate normally, impacting the Town's economy. Additionally, buildings with flat roofs are especially vulnerable to damage, especially when the snow is wet and heavy. Lastly, because parts of Hatfield are heavily forested, a severe snow or ice storm could also cause damage and power outages from downed trees.

Natural Resources
Severe winter weather is common in Massachusetts and native species and habitats are well adapted to withstand most winter weather.

Severe Thunderstorms / Wind / Tornadoes/Microburst

Hazard Description

A thunderstorm is a storm with lightning and thunder produced by a cumulonimbus cloud, usually producing gusty winds, heavy rain, and sometimes hail. Effective January 5, 2010, the NWS modified the hail size criterion to classify a thunderstorm 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).

Wind is air in motion relative to surface of the earth. For non-tropical events over land, the NWS issues a Wind Advisory (sustained winds of 31 to 39 mph for at least 1 hour or any gusts 46 to 57 mph) or a High Wind Warning (sustained winds 40+ mph or any gusts 58+ mph). For non-tropical events over water, the NWS issues a small craft advisory (sustained winds 25-33 knots), a gale warning (sustained winds 34-47 knots), a storm warning (sustained winds 48 to 63 knots), or a hurricane force wind warning (sustained winds 64+ knots). For tropical systems, the NWS issues a tropical storm warning for any areas (inland or coastal) that are expecting sustained winds from 39 to 73 mph. A hurricane warning is issued for any areas (inland or coastal) that are expecting sustained winds of 74 mph. Effects from high winds can include downed trees and/or power lines and damage to roofs, windows, etc. High winds can cause scattered power outages. High winds are also a hazard for the boating, shipping, and aviation industry sectors.

Tornadoes are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along a path that ranges from a few dozen yards to over a mile in width. The path of a tornado may be hard to predict because they can stall or change direction abruptly. Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in eastern Hampshire County. High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and other personal property (cars, etc.).

Location

As per the Massachusetts Hazard Mitigation Plan, the entire town is at risk of high winds, severe thunderstorms, and tornadoes. While an average thunderstorm is 15 miles across, the actual area affected by thunderstorms, wind, or tornadoes is "small," with less than 10 percent of the town affected.

Extent

An average thunderstorm is 15 miles across and lasts 30 minutes; severe thunderstorms can be much larger and longer. Southern New England typically experiences 10 to 15 days per year with severe thunderstorms. Thunderstorms can cause hail, wind, and flooding.

Tornadoes are measured using the enhanced F-Scale, shown with the following categories and corresponding descriptions of damage:

Enhanced Fujita Scale Levels and Descriptions of Damage			
EF-Scale Number	**Intensity Phrase**	**3-Second Gust (MPH)**	**Type of Damage Done**
EF0	Gale	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	Moderate	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Significant	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

Previous Occurrences

Because thunderstorms and wind affect the town regularly on an annual basis, there are not significant records available for these events. There have typically been 1 to 3 tornadoes somewhere in southern New England per year. Most occur in the late afternoon and evening hours, when the heating is the greatest. The most common months are June, July, and August, but the Great Barrington, MA tornado (1995) occurred in May and the Windsor Locks, CT tornado (1979) occurred in October.

Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester. In 2011, a tornado ranked F3 (Severe Damage) on the Fujita Scale of Tornado Intensity, blew through the towns of West Springfield, Westfield, Springfield, Monson, Wilbraham, Brimfield, Sturbridge, and Southbridge. The tornado and related storm killed 3 people and resulted in hundreds of injuries across the state. Nine incidents of tornado activity (F3 or less) have occurred in Hampshire County since 1954 and one known tornado has touched down in Hatfield. In 2014 trees were damaged on Linseed Road by a severe thunderstorm and in 2015 a microburst on 7/26/15 caused tree damage on King Street and Main Street. A heavy windstorm on 10/7/2020 resulted in a number of downed trees and power outages that lasted almost 48 hours in some locations of Town.

Probability of Future Events

One measure of tornado activity is the tornado index value. It is calculated based on historical tornado events data using USA.com algorithms. It is an indicator of the tornado level in a region. A higher

tornado index value means a higher chance of tornado events. Data was used for Hampshire County to determine the Tornado Index Value as shown in the table below.

Tornado Index for Hampshire County	
Hampshire County	125.73
Massachusetts	87.60
United States	136.45

Source: USA.com, http://www.usa.com/hampshire-county-ma-natural-disasters-extremes.htm

Based upon the available historical record, as well as Hatfield' location in a high-density cluster of state-wide tornado activity, it is reasonable to estimate that there is a "very low" (less than 1 percent) frequency of tornado occurrence in Hatfield in any given year.

According to the Massachusetts Hazard Mitigation Plan, there are approximately 20 to 30 days of thunderstorm activity in the state each year. Thus, there is a "moderate" probability (10 percent to 40 percent chance in any given year) of a severe thunderstorm or winds affecting the town.

Impact

Overall, Hatfield faces a "limited" impact from severe thunderstorms, winds, or tornadoes, with 10 percent or less of the Town affected.

The potential for locally catastrophic damage is a factor in any severe weather event. In Hatfield, a tornado that hit residential areas would leave much more damage than a tornado with a travel path that ran along the town's forested areas, where little settlement has occurred. Most buildings in town have not been built to Zone 1, Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, with most of the town's housing built before this date.

To approximate the potential impact to property and people that could be affected by severe weather, tornado, or wind, the total value of all property in town, $409,882,700 and the average household size, 2.23 people, are used. An estimated 20 percent of damage would occur to 10 percent of structures, resulting in a total of $8,197,654 worth of damage and 272 people affected. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Hatfield faces a hazard index rating of 3-medium risk from severe thunderstorms/microbursts and wind, and a hazard index rating of 4-low risk from tornadoes.

The potential for locally catastrophic damage is a factor in any tornado, severe thunderstorm, or wind event. In Hatfield, a tornado that hit the residential areas would leave much more damage than a tornado with a travel path through undeveloped forest land. Most buildings in the town have not been built to

Zone 1, Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, and most of the town's housing was constructed prior to this date.

Populations

Populations unable to safely evacuate are most at risk from severe thunderstorms and tornados. Low-income populations may lack means to evacuate. The elderly often face physical challenges or require regular medical attention. Limited English Proficiency (LEP) populations may face challenges receiving and understanding emergency directions.

Built Environment and Economy

The most common problem associated with severe weather is loss of utilities. Downed trees from severe storms can create serious impacts on power and aboveground communication lines. Water and sewer systems may not function if power is lost. The vulnerabilities associated with flooding could be present if substantial rain accompanies severe thunderstorms. Additionally, severe wind may damage older buildings. Many buildings throughout Hatfield are older and designed to withstand lower wind speeds, meaning they are more vulnerable to damage from high wind events, microbursts of tornadoes.

Sometimes, wind gusts of only 40 to 50 mph can cause scattered power outages from downed trees and wires. This is especially true after periods of prolonged drought or excessive rainfall, since both are situations that can weaken the root systems and make them more susceptible to the winds' effects. Roads may become impassable due to downed trees or roadway flooding resulting from a severe wind or thunderstorm.

Natural Resources

Downed trees and the transportation of small flora and fauna by high winds can cause damage to the natural environment.

Non-Climate Influenced Hazards

Earthquakes

Hazard Description

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.[4] Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.[5]

Location

Because of the regional nature of the hazard, the entire town of Hatfield is susceptible to earthquakes.

Extent

The magnitude of an earthquake is measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times.

Richter Scale Magnitudes and Effects	
Magnitude	**Effects**
< 3.5	Generally not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.
5.4 - 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 - 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

The intensity of an earthquake is measured using the Modified Mercalli Scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on

[4] Northeast States Emergency Consortium Web site: *www.nesec.org/hazards/earthquakes.cfm.*
[5] Federal Emergency Management Agency Web site: *www.fema.gov/hazards/earthquakes/quake.shtm.*

a scale of I through XII, with I denoting a weak earthquake and XII denoting a earthquake that causes almost complete destruction.

Modified Mercalli Intensity Scale for and Effects			
Scale	**Intensity**	**Description Of Effects**	**Corresponding Richter Scale Magnitude**
I	Instrumental	Detected only on seismographs.	
II	Feeble	Some people feel it.	< 4.2
III	Slight	Felt by people resting; like a truck rumbling by.	
IV	Moderate	Felt by people walking.	
V	Slightly Strong	Sleepers awake; church bells ring.	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

Source: US Federal Emergency Management Agency

Previous Occurrences

The most recent felt earthquakes to affect New England are shown in the table below. Hatfield has not been affected by any earthquakes.

Largest Earthquakes in the Region, 1924 – 2020		
Location	**Date**	**Magnitude**
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1
Bar Harbor, NH	October 3, 2006	4.2
Hollis Center, ME	October 16, 2012	4.6
New Bedford, MA	November 8, 2020	3.6

Source: Northeast States Emergency Consortium website, www.nesec.org/hazards/earthquakes.cfm

Number of Felt Earthquakes in the Northeast States		
State	**Years of Record**	**Number Of Earthquakes**
Connecticut	1668 - 2016	115
Maine	1766 - 2016	454
Massachusetts	1668 - 2016	408
New Hampshire	1638 - 2016	320
Rhode Island	1776 - 2016	34
Vermont	1843 - 2016	50
New York	1840 - 2016	551
Total Number of Earthquakes within the New England states between 1638 and 1989 is 2262.		

Source: Northeast States Emergency Consortium website, *www.nesec.org/hazards/earthquakes.cfm*

Probability of Future Events

One measure of earthquake activity is the Earthquake Index Value. It is calculated based on historical earthquake events data using USA.com algorithms. It is an indicator of the earthquake activity level in a region. A higher earthquake index value means a higher chance of earthquake events. Data was used for Hampshire County to determine the Earthquake Index Value as shown in the table below.

Earthquake Index for Hampshire County	
Hampshire County	0.17
Massachusetts	0.70
United States	1.81

Source: USA.com

Based upon existing records, there is a “very low” frequency of earthquakes in Hatfield with less than a 1 percent probability of an earthquake occurring in any given year.

Impact

Massachusetts introduced earthquake design requirements into their building code in 1975 and improved building codes for seismic reasons in the 1980s. However, these specifications apply only to new buildings or to extensively-modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before the 1980s may not have been designed to withstand the forces of an earthquake. This is also true for a large number of buildings in Hatfield, many of which were built before 1975 and would probably be destroyed by an earthquake. The seismic standards have also been upgraded with the 1997 revision of the State Building Code.

It is important to note that soft soils, such as filled land and river sediments, tend to amplify some aspects of earthquake ground shaking compared to nearby sites that have bedrock or ledge at the surface. The thickness of the soft soils helps control which aspects of the ground shaking that is amplified. For example, soft soil that is 30 feet thick might amplify the aspect of the ground shaking that is most damaging to 1-2 story buildings. On the other hand, soft soil that is 200 feet to 300 feet thick might amplify the aspect of the ground shaking that is most damaging to buildings that are 5-20 stories high. For this reason, the amount of damage due to earthquake shaking in a city can vary significantly from block to block and from building to building.

While a significant earthquake, estimated to be approximately of magnitude 6.1 or higher, would cause a “critical” impact, with more than 25 percent of Hatfield affected, a smaller earthquake that is more likely to occur in Hatfield would have "minor" impact, with limited damage to property. As shown in the table of the Richter Scale above, an earthquake of 6.0 or lower would result in at most slight damage to well-designed buildings. Earthquakes between 3.5 and 5.4 would be felt but rarely cause damage, and earthquakes smaller than 3.5 would not be noticed. Therefore, the overall impact rating for earthquake in Hatfield is “Limited.”

Vulnerability

Based on the above analysis, Hatfield faces a hazard index rating of “4-low risk” from earthquakes.

To approximate the potential impact to property and people that could be affected by an earthquake, the total value of all property in town, $409,882,700 and the average household size, 2.23 people, are used. An estimated 10 percent of damage would occur to 25 percent of structures, resulting in a total of

$10,247,068 worth of damage and 680 people affected. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Populations
Socially vulnerable populations are at the highest risk from earthquakes. These populations may lack the means physically or financially to respond to an earthquake. They may not be able to prepare and live self-sufficiently in the aftermath of an earthquake. Low-income populations are more likely to live in structurally compromised buildings.

Built Environment and Economy
Older buildings are particularly vulnerable to earthquakes because their construction pre-dates building codes that included strong seismic consideration. The Town has a number of historical buildings that could be damaged or destroyed if a large enough earthquake were to happen. Losing these historic buildings would be a loss of Hatfield's history and culture. There have been no studies done to determine how Hatfield's critical infrastructure would fare in an earthquake. Any recently constructed buildings would likely withstand an earthquake with little or no damage. Following a severe earthquake, damage to roadways, bridges or underpasses that serve as evacuation routes would limit access to emergency services and hospitals.

A catastrophic earthquake in Hatfield would impact all structures, commercial and residential alike. FEMA research has shown that nearly 1 in 4, or 25%, of businesses do not return after a major catastrophic event. The loss of 25% of businesses would have a major impact on City tax income and operating budget. A significant loss of homes due to the same earthquake could also have major tax implications that could strain City cash flow for years after the event.

Natural Resources
A strong earthquake can cause trees to fall and cliffs or rock outcroppings to collapse. Such environmental damage can impact the balance within a habitat or ecosystem, leading to increased vulnerability to invasive species.

Other Hazards

In addition to the hazards identified above, the Hazard Mitigation Committee reviewed the full list of hazards listed in the Massachusetts Hazard Mitigation and Climate Adaptation Plan. Due to the location and context of the Town of Hatfield, coastal erosion, landslides, and tsunamis, were determined to not be a threat. The Committee also determined that invasive species, while problematic, are not a severe enough risk to be included in the list of hazards for Hatfield.

4 – CRITICAL FACILITIES

Section 201.6 44CFR states that a Local Hazard Mitigation Plan risk assessment shall provide a description of the jurisdiction's vulnerability to the identified hazards of concern, and this vulnerability should be described in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

The law does not specify or define the term "Critical Facility," but instead allows each unique planning effort to identify and define those facilities and infrastructure that are critical to providing emergency services to the planning area. These definitions can and should be unique to the defined planning area. FEMA defines critical facilities as facilities/infrastructure that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals. For the purposes of the Hatfield Hazard Mitigation Plan Update, a Critical Facility is defined as a building, structure, or location which:

- Is vital to the hazard response effort.
- Maintains an existing level of protection from hazards for the community.
- Would create a secondary disaster if a hazard were to impact it.

Critical Facilities within Hazard Areas

Hazards identified in this plan are regional risks and, as such, all critical facilities fall into the hazard area. The exception to this is flooding. There are several critical facilities that fall within the 100-year floodplain as shown in the table at the end of this section.

Hatfield's Hazard Mitigation Committee reviewed the Critical Facilities list from the 2016 Plan, and made updates based on local knowledge and updated MassGIS data to create the following list. The Hazard Mitigation Committee has broken up this list of facilities into three categories:

- Facilities needed for Emergency Response in the event of a disaster, referred to as Emergency Response Facilities and Services.
- Non-Emergency Response Facilities that have been identified by the Committee as non-essential. These are not required in an emergency response event, but are considered essential for the everyday operation of Northampton.
- Facilities/Populations that the Committee wishes to protect in the event of a disaster.

The Critical Facilities Map at the end of this Plan identifies these facilities.

Category 1 – Emergency Response Services

The Town has identified the Emergency Response Facilities and Services as the highest priority in regard to protection from natural and man-made hazards.

1. **Emergency Operations Center**
   Public Safety Building at Hatfield Fire Station- 3 School Street (renovated in 2014)

2. **Fire Station**
   Hatfield Fire Station- 3 School Street

3. **Police Station**
   Hatfield Police Department – 3 School Street

4. **Highway Garage**
   Located at Hatfield Transfer Station – Straits Road

5. **Water Department**
   Hatfield Water Treatment Plant – Reservoir Road

6. **Emergency Fuel Stations – Straits Rd**
   2,000 gallons of unleaded at the DPW

7. **Emergency Electrical Power Facility**
   EOC Public Safety Building, 3 School Street
   Hatfield Water Treatment Plant – Reservoir Road
   Hatfield Waste Water Treatment Plant – Main Street
   Hatfield Elementary School – Main Street
   Town Hall – 59 Main Street

8. **Emergency Centers (not Red Cross Approved)**

Town is participating in sub-regional shelter planning and for extended sheltering would direct residents to Shelter at Smith Vocational School in Northampton.

Center Name & Address	Capacity @ 40 sq. ft. / person	Restrictions (if applicable)
Hatfield Elementary School 33 Main Street	1119	None

9. **Hydrants - Fire Ponds - Water Sources**
   Numerous locations in Hatfield

10. **Transfer Station**
    Hatfield Transfer Station – Straits Road

11. **Utilities**
    Hatfield Sewer Department serves approximately half of the Town

12. **Helicopter Landing Sites**
    Rear section of 33 Main Street – behind Elementary School
    Smith Academy – Athletic Field
    Brockway Smith Company – Chestnut Street

General area of 129 West Street

13. Communications

Cell Towers – One Located at Brockway Smith
Emergency Services Building, 3 School Street
Telephone Crossboxes:
Central Switching Office – Verizon Building Located on Chestnut Street

14. Primary Evacuation Routes

Elm Street/Maple Street
Chestnut Street – would be closed in the event of flooding from the Mill River
North Hatfield Road
Depot Road
N Main Street to River Rd – all of Main Street would be closed in the event of flooding from the Connecticut River

15. Bridges Located on Evacuation Routes

Maple Street Bridge
Chestnut Street Bridge — subject to seasonal flooding.

Category 2 – Non Emergency Response Facilities

The town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Hatfield.

1. Water Supply

Running Gutter Brook Reservoir – Horse Mountain
West Hatfield Well, back up
Omasta Well, back up

2. Sewer Infrastructure (Pump Stations)

Hatfield Wastewater Treatment Plant – Main Street
Nine pumping stations:
Depot Road
Ferry Road
King Street
Bridge Street
Gore Ave.
Dwight Street
Bridge/Dwight Street
Elm Court
Maple Street (largest station with emergency generator)
Additional pump station currently being built on West Street

3. Problem Culverts

Depot Road, #73
North Hatfield Road, #115
Main Street, #435

King Street, #19
North Street, #21
Pantry Road, #155
Old Stage Road (Dirt section) #53
Plain Road (Dirt section)- No houses
Plain Road, #54
Prospect Street, #131
School Street, #12-#27

Category 3 – Facilities/Populations to Protect

The third category contains people and facilities that need to be protected in event of a disaster.

1. Special Needs Population

74 North Hatfield Road – DMR home

2. Elderly Housing/Disabled

Capawonk Housing Authority – 2 School Street
139-143 West Street
Hatfield Village 115 Elm Street
58 Main Street (currently being renovated)

3. Recreation Areas

Hatfield Reservoir and Watershed – Horse Mountain
Chestnut Mountain Hiking Trails
State Boat Ramp – Kellogg Hill Road
Hatfield Elementary School Grounds – Main Street
Smith Academy Fields – School Street
Town Park – School / Main Street
Center School Playing Fields
Bashin Rd -DCR property on Connecticut River
Main Street Dike (dog walking area)

4. Schools

Hatfield Elementary School – Main Street
Smith Academy – School Street

5. Churches

1st Congregational Church – Main Street
Our Lady of Grace - School Street

6. Historic Buildings/Sites

Town Hall -- Main Street
Hatfield Public Library – Main Street
Mary Lou and Robert J. Cutter Hatfield Farm Museum – Main Street

7. Apartment Complexes

Kenwood – West Street
171 West Street, 177 West Street, 151 West Street
8 King Street
115 Elm Street, Hatfield Village
Hatfield Meadows – 31-33 Elm Street
Capawonk Housing Authority
58 Main Street

8. Employment Centers

C&S Wholesale Grocers – Elm Street

9. Mobile Home Parks

139-143 West Street – 40-plus units

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas

Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Flooding (100-year Flood)	Farm fields in East Hatfield, Mill River below dam, Main Street Historical District	Schools, Sewage Pump Station, Hatfield Dikes Along the Connecticut River affected by erosion	N. Hatfield Rd., Chestnut Street, Depot Road, Main St.
Dam Failure/Levee Breach	Varies depending on structure	Site Specific	Site Specific
Drought	Entire Town	Minor impact on all services	None
Extreme Temperatures	Entire Town	None	None
Wildfires/Brushfires	West Hatfield – 3,800 acres	Town Public Water Supply	Old Stage Road, Linseed Road, Rocks Rd., Mountain Rd., Reservoir Rd.
Hurricane/Tropical Storm	Variable, Town-wide	Localized damage, depending on extent of storm, possibly water and sewer	Location would determine impact
Severe Thunderstorms/ Wind/Tornadoes	Variable, Town wide	Localized damage, depending on extent of storm, possibly water and sewer	Location would determine impact
Severe Winter Storm/Nor'easter	Entire Town	Possible power outages at elderly/disabled housing	All Secondary routes. Primary routes cleared quickly. (Elm, Chestnut, and Depot, and N. Hatfield and Main Street are primary routes)
Earthquake	Entire Town	Emergency operations; water and sewer	Location would determine impact

(Critical Facilities Map Located at Back of Plan)

5 – MITIGATION CAPABILITIES/STRATEGIES

One of the steps of this Hazard Mitigation Plan is to evaluate all of the town's existing policies and practices related to natural hazards and identify potential gaps in protection. After reviewing these policies and the hazard identification and assessment, the Hazard Mitigation Committee developed a set of hazard mitigation strategies it would like to have implemented moving forward. As noted previously, the Town used the FEMA Capability Assessment Worksheet 4.1 from the March 2013 Local Mitigation Planning Handbook to assess existing capabilities, completed form is included in Appendix.

The Town of Hatfield has developed the following goal to serve as a framework for mitigation of the hazards identified in this plan.

Goal Statement

To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to the following hazards: flooding, severe snowstorms/ice storms, severe thunderstorms, hurricanes, tornadoes, wildfires/brushfires, earthquakes, dam failures, and drought.

For the extent of this analysis, the Committee reviewed the following Town documents:

- Subdivision Rules and Regulations
- Hatfield Comprehensive Emergency Management Plan
- Hatfield Open Space and Recreation Plan 2014
- Hatfield Zoning Bylaws
- Other relevant By-Laws as identified (Stormwater management, Fire Department Burn Permit Procedures, Building Code, etc.)

This section of the plan serves to identify current mitigation strategies and recommend future mitigation strategies. This is done both generally, and by hazard type.

Existing Mitigation Capabilities/Strategies

The Town of Hatfield had many mitigation capabilities/strategies in place prior to the update of this Hazard Mitigation Plan in 2021. These capabilities/strategies are included on the following pages and have been evaluated in the "Effectiveness" column.

Flooding

The key factors in flooding are the water capacity of water bodies and waterways, the regulation of waterways by flood control structures, and the preservation of flood storage areas and wetlands. As more land is developed, more flood storage is demanded of the town's water bodies and waterways. The town currently addresses this problem with a variety of mitigation tools and strategies. Flood-related regulations and strategies are included in the town's zoning ordinance, and subdivision regulations. Infrastructure like dams and culverts are in place to manage the flow of water.

Management Plans

The Comprehensive Emergency Management (CEM) Plan for Hatfield lists the following measures for flood planning:

- Identify areas in the community that are flood prone and define methods to minimize the risk. Review National Flood Insurance Maps.
- Disseminate emergency public information and instructions concerning flood preparedness and safety.
- Community leaders should ensure that Hatfield continues to be enrolled in the National Flood Insurance Program.
- Strict adherence should be paid to land use and building codes, (e.g. Wetlands Protection Act), and new construction should not be built in flood-prone areas.
- Ensure that flood control works are in good operating condition at all times.
- Natural water storage areas should be preserved.
- Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.

Subdivision Rules and Regulations

Hatfield's most recent draft of its Subdivision Rules and Regulations (January 21, 2009) which govern the subdivision of land were adopted for the purpose of "protecting the safety, convenience, and welfare of the inhabitants of the inhabitants of [Hatfield]…by regulating the laying out and construction of ways in subdivision providing access to the several lots therein, but which have not become public ways, and ensuring sanitary conditions in subdivision and in proper cases, parks and open areas. The powers of a planning board and of a board of appeal under the subdivision control law shall be exercised with due regard for the provision of adequate access to all of the lots in a subdivision by ways that will be safe and convenient for travel; for lessening congestion in such ways and in the adjacent public ways; for reducing the danger to life and limb in the operation of motor vehicles; for securing safety in case of a

fire, flood, panic, and other emergencies; for insuring compliance with the applicable zoning ordinances or by-laws; for securing adequate provision for water, sewerage, drainage, and other requirements where necessary in a subdivision; and for co-coordinating the ways in a subdivision with each other and with the public ways in the city or town in which it is located and with the ways in neighboring subdivisions." The Subdivision Rules and Regulations, found in Appendix F, contain several provisions that mitigate the potential for, and impact of, flooding, including:

- A required preliminary plan that depicts a drainage plan, adjacent natural waterways, existing drainage and utility lines, and the topography of the surrounding area
- Regulated grading of no less than .5% and no more than 6% (for tertiary roads) or 10% (for local roads)
- Required preservation of all existing natural and cultural features, including landscape elements which act as natural flood infrastructure
- A storm water run-off plan that includes the installation of catch-basins every 300' that can sustain a 50-year storm
- Streets shall be designed to use Low Impact Development (LID) drainage systems to closely mimic natural systems that allow for percolation, groundwater recharge and stormwater quality, and reduce runoff.
- Drainage systems, including swales, detention, retention, and infiltration, must be designed to prevent any increase in peak flows for the one, two, ten, and one-hundred year NRCS design storms.
- Stormwater should be directed to enter an artificial wetland or stormwater treatment facility before entering an open stream channel, and all open stream channels shall be maintained expect for short sections that need to be placed in a culvert to allow stream crossings.
- No open water body or pond or wet or swampy area shall be filled in unless it can be shown that provisions have been made in the lower drainage system to account for the removal of the storage area.

Hatfield Zoning By-Laws

The Town of Hatfield has established a set of bylaws designed "to promote and regulate the use of land, buildings and structures to the full extent of the independent constitutional powers of cities and towns and to protect the health, safety and general welfare of Hatfield's present and future inhabitants (Hatfield Zoning Bylaws, Amended 2013)." The Zoning By-Laws include several provisions that mitigate the potential for flooding, as illustrated below.

- The Site Plan Review process requires the submission of an erosion control plan that details practices aimed at minimizing adverse impacts on sedimentation and vegetation to preserve natural hydrology
- The Floodplain Overlay District encompasses flood zones A and A1-30, imposing wetland restrictions and permitting only low-impact uses by-right, such as agriculture and conservation in order to protect the natural floodplain and reduce future losses
- The Riverfront Overlay District preserves the natural floodplains in Hatfield by permitting only low-impact uses by-right

- The Water Supply Protection District preserves Hatfield's natural hydrology by ensuring it is not impinged upon by development that could be detrimental to the environment and place structures within floodways
- Stormwater Management Performance Standards and Bylaw seek to reduce the volume of run-off by limiting modifications to the environment and requiring development to include effective infrastructure that can sustain during a 50-year storm.

- An Open Space Development By-Right Bylaw encourages the physical clustering of residential structures, subsequently preserving open space, in order to maintain pervious surfaces and natural flood infrastructure
- Transfer of Development Rights encourages developers to build in areas which are not increasingly environmentally sensitive and prone to flooding.

Wetlands Protection

The Town of Hatfield follows the standards established by the Wetlands Protection Act, which protects water bodies and wetlands through the town Conservation Commission. The Town also has instituted its Stream and Lake Protection District, an overlay district that provides restrictions on the location of septic tanks and leach fields, as well as on the impacting of the flood storage capacity of the land.

Hatfield Open Space and Recreation Plan

Recent efforts by the Town of Hatfield Conservation Commission and others have resulted in the creation of municipal plans that are useful for flood hazard mitigation purposes. Hatfield updated the Town's Open Space and Recreation Plan in 2014 and it expires in 2021. The intent of the document is not to address hazard mitigation or flood control in a direct or comprehensive way; however, it inventories the natural features and environments in the town, many of which, such as wetlands, aquifer recharge areas, farms, rivers, streams, and brooks, contain floodplain, dam failure inundation or localized flooding areas.

The plan highlights the importance of balancing future development with the preservation of the community's natural and scenic resources. The preservation of open space and farmland provides flood storage capacity, which reduces the amount of impervious surfaces as well as other benefits not directly related to natural hazard mitigation.

The following 7-year goals of the 2014 Plan that impact the Hazard Mitigation Plan are as follows:

Goal C: Protect Wetlands and Floodplain
Objectives and Action Items:

- Promote the value of wetlands and floodplains in the community
    - Reach out to owner of the Mill River dam to determine its condition and develop a consensus between Town and landowner regarding the future of the dam
- Prevent residential and non-agricultural development from occurring in the floodplains to ensure adequate flood storage capacity and prevent public hazards.
    - Identify at risk parcels along public roads and acquire the properties or development rights Open Space Committee Agricultural Advisory Com. Board of Selectmen 2014-2021 N/A Objective: Pro
- Promote land protection tools and strategies

    - Work with owners in floodplain on South St. to implement APR's on their parcels
    - Talk with landowners in impoundment area above Mill River dam about protection opportunities
    - Investigate opportunities for flood plain protection on Bashin Road
- Coordinate technical assistance to landowners to implement protection strategies

Goal D: Protect Water Supply
Objectives and Action Items:

- Promote the value of continued drinking water protection
    - Educate the public about the Towns' water supply through signage at the Terry Blunt Watershed and Conservation Area
- Prevent residential and non-agricultural development from occurring in the floodplains to ensure adequate flood storage capacity and prevent public hazards.
    - Acquire land or purchase development rights in threatened lands in watershed area
- Permanently protect open space within the primary recharge areas to the Town Wells and Running Gutter Reservoir watershed
    - Prioritize and acquire land within the Town Well's Zone II or other permanent conservation restriction.

Goal E: Protect Woodlands
Objective and Action Item:

- Support sustainable forestry practices on private & town-owned lands to ensure healthy forest ecosystems & control of invasive species, and prevent down gradient erosion and flooding
    - Annually contract with a forest management consultant for the purposes of implementing best forestry practices on town owned lands.

National Flood Insurance Program

The National Flood Insurance Program has produced maps that identify floodways across America. Hatfield is a participating member of the National Flood Insurance Program, and had the following NFIP policy and claim statistics as of 2021:

- Flood Insurance Maps (FIRMs) are used for flood insurance purposes and are on file with the Hatfield Planning Board.
- FIRMs have been effective since May 31, 1974 with the current map in effect since April 3, 1978.
- Hatfield has 34 in-force policies in effect for a total of $7,995,000 worth of insurance.
- There have been a total of 5 NFIP losses claimed for which $25,833 has been paid.
- As of 2021, there have been 0 Repetitive Loss Properties in Hatfield.
- The town will maintain compliance with the NFIP throughout the next 5-year Hazard Mitigation Planning cycle by monitoring its Flood Plain Overlay District and ensuring that the district accurately reflects the 100-year flood plain and FEMA Flood Insurance Rate Map (FIRM).

The Flood Insurance Rate Maps in Hampshire County are scheduled to be updated by FEMA in the next few years. When these maps are updated, the Town of Hatfield will adjust its zoning to accommodate changes to the location of floodplains.

Existing Flooding Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEM Plan lists the following measures for flood planning: Identify areas in the community that are flood prone, review National Flood Insurance Maps, disseminate emergency public information and instructions concerning flood preparedness and safety, adhere to land use and building codes, ensure that flood control works are in good condition, and preservation of natural and manmade levees are in good operating condition at all times.	Entire Town.	Effective.	None.
Subdivision Rules and Regulations	Requires a Preliminary and Definitive Plan for new subdivisions, including location of all wetlands, cultural properties, natural lands, and proposed storm drainage of land.	Entire town.	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure.	None. None.
Zoning Bylaws: **Erosion Control** **Site Plan Review**	 Requires that the site design, materials, and construction processes be designed to avoid erosion damage, sedimentation or uncontrolled surface water runoff and regulates slope and vegetative cover. Requires that plans show storm drainage.	 Entire town.	 Somewhat effective for controlling surface runoff and erosion problems. Somewhat effective for controlling surface runoff and erosion problems.	 None. None.

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
Floodplain Overlay District **Open Space Development Allowed by Right**	Requires that the development process minimize the impact on wetlands, floodplain lands, aquifer recharge areas and town infrastructure. Purpose includes to preserve natural flood control characteristics and flood storage capacity of the flood plain and to preserve and maintain the ground water table and water recharge areas within the flood plain. Allows development of land in a subdivision pattern, but preserves open space by requiring that 40% of the land be set aside and protected with either a Conservation Restriction or Agricultural Preservation Restriction.	Areas delineated by the Hatfield Flood Insurance Rate Map Entire Town	Somewhat effective for minimizing impacts of development on flood levels within flood plain. Effective method of preserving a portion of the Town's flood storage lands.	None. None.
Special Permits	Prior to issuing of a Special Permit, the Planning Board or Zoning Board will consider potential impacts on the natural environment and on neighborhood character and social structures.	Entire town.	Somewhat effective for ensuring that permitted projects do not increase flooding potential.	Consider adding more specific impacts to address including topographic change, removal of cover vegetation, risk of erosion or siltation and increased storm water runoff.
Town of Hatfield Open Space and Recreation Plan	Inventories natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, aquifer	Entire town.	Effective in identifying sensitive resource areas, including floodplains.	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
	recharge areas, farms and open space, rivers, streams and brooks.		Encourages forestland and farmland protection, which will help conserve the town's flood storage capacity.	
Participation in the National Flood Insurance Program	As of 2021, there were 34 policies in effect in Hatfield for a total of $7,995,000	Areas identified by the FEMA maps.	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program.	None
Beaver Management Strategy	Removing beaver dams, when necessary, can protect the property and lives of Hatfield residents. Requires obtaining permits.	Areas within the 100-Year Floodplain.	Would be effective in controlling the negative impacts of flooding caused by beaver activity.	None
Water Supply Protection District	Restrict Development in primary and secondary recharge areas of groundwater aquifers and the watershed areas of the Town (Running Gutter Brook) Reservoir and the Mountain Street Reservoir	Municipal Drinking Water Supply	Effective tool for preventing development along sensitive lands and floodplains.	None
Riverfront Overlay District	Restricts development and land use types along Hatfield's riverfront parcels; regulations same as Floodplain Overlay, but also excludes seasonal camps.	Hatfield Riverfront Overlay District – March 17, 2003	Somewhat effective for minimizing impacts of development on flood levels within flood plain.	None
Transfer of Development Rights	Allows developers to buy development credits and transfer them to areas that have been selected for their ability to handle greater levels of	Entire Town	Effective tool for preventing the loss of	None

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes
	development. This mechanism protects open space and directs development to existing centers.		critical flood storage lands.	
Subdivision Regulations – Design Standards for Roads	Standards include street grade regulations (.05 to 6 percent maximum).	Entire town.	Effective.	None.

Severe Snowstorms/Ice Storms

Winter storms can be especially challenging for emergency management personnel even though the storm has been forecast. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors National Weather Service (NWS) alerting systems when winter storms are expected.[6]

Management Plans

The CEM Plan for Hatfield lists the following generic mitigation measures for severe winter storms:

- Develop and disseminate emergency public information concerning winter storms, especially material which instructs individuals and families how to stock their homes, prepare their vehicles, and take care of themselves during a severe winter storm.

To the extent that some of the damages from a winter storm can be caused by flooding, all of the flood protection mitigation measures described in Table 4-1 can also be considered as mitigation measures for severe snowstorms/ice storms.

Restrictions on Development

There are no restrictions on development that are directly related to severe winter storms.
The Town of Hatfield Subdivision Rules and Regulations set grade limits on streets as part of its Section 4000 Required Improvements, and restrictions on utility placement (Section III. Procedure for the Submission and Approval of Plans, Sub-Section V, Design Standards), which, although not specified as weather hazard mitigation, can serve to minimize accident potential and power loss from severe winter storms:

Other Mitigation Measures

The Town is participating in sub-regional sheltering with other Hampshire County communities and is confident of sheltering capabilities in the event of extended power outages.

State Building Code

For new or recently built structures, the primary protection against snow-related damage is construction according to the State Building Code, which addresses designing buildings to withstand snow loads. The Town of Hatfield has measures in place for building inspections.

[6] Comprehensive Emergency Management Plan for the Town of Hatfield, 2001.

Existing Severe Snows and Ice Storm Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEM Plan lists the following mitigation measure for severe winter storms: Develop and disseminate emergency public information concerning winter storms, especially material which instructs individuals and families how to stock their homes, prepare their vehicles, and take care of themselves during a severe winter storm.	Entire town.	Effective.	None.
Subdivision Regulations – Utilities (electric and telephone)	The town requires all utilities for new subdivisions to be underground.	Entire town.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	None.
State Building Code	Hatfield follows the Massachusetts State Building Code.	Entire town.	Effective.	None.

Hurricanes / Severe Thunderstorms / Wind / Tornadoes

Hurricanes, severe thunderstorms, and tornadoes all generate high winds that can fell trees, down electrical wires, and generate hurtling debris. This common characteristic means that the same set of mitigation strategies applies equally to all four hazards. For example, current land development regulations, such as restrictions on the height of telecommunications towers, can help prevent wind damages from all four types of hazards. In addition to wind damage, hurricanes can generate significant flooding that damages buildings, infrastructure and threatens human lives. All of the existing mitigation measures listed in the Flooding section are also hurricane mitigation measures.

Management Plans

The Comprehensive Emergency Management (CEM) Plan for Hatfield includes the following mitigation measure for hurricanes, severe thunderstorms, wind, and tornadoes: Develop and disseminate emergency public information and instructions concerning disaster safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.

Zoning

Although the Town of Hatfield does not maintain an independent zoning ordinance that governs the design of wireless communication facilities, the facilities are overseen by the Special Permit and Site Plan review process.

- 5.4 Special Permits with Site Plan Approval
- Section 5.4.7 Site Plan Approval Decisions and Criteria
- 5.4.7.9 Electric lines, telecommunications lines and other such utilities shall be underground

Restrictions on Development

The only restrictions on development that are wind-related are the provisions in the zoning bylaw related to the burying of utilities when a special permit requires site plan review.

Mobile Homes

According to the Town of Hatfield's Zoning Bylaws, mobile homes are not allowed in Hatfield. However, a pre-existing trailer park is located in town and future planning efforts should take into consideration any potential impacts of a natural hazard on residents of this trailer park.

State Building Code

For new or recently built structures, the primary protection against wind-related damage is construction that adheres to the State Building Code, which, when followed, results in buildings that withstand high winds. The Town of Hatfield has measures in place to guarantee building inspection services are provided.

Existing Hurricane / Thunderstorm / Wind / Tornado Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEMP includes the following mitigation measure: Develop and disseminate emergency public information and instructions concerning disaster safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.	Entire town.	Effective.	None
Site Plan Review for tele-communications facilities	Special Permit and Site Plan Review process applicable to the design and construction of new wireless communication facilities	Entire town.	Somewhat Effective, no independent zoning ordinance	None

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Subdivision Regulations – Utilities (electric and telephone)	The town requires all utilities for new subdivisions to be underground.	Entire town.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	None.
Zoning Regulations regarding new mobile homes	Mobile homes are not an allowed use.	Entire town.	Does not address the potential for wind-related damage to existing mobile homes.	None.
State Building Code	The Town of Hatfield has adopted the Massachusetts State Building Code.	Entire town.	Effective.	None.
Back-up power for wastewater pumping stations	3 emergency generators to run pumping stations during power outage (One at Maple Street PS, one at WWTP, one portable)	Entire town	Somewhat effective, but requires moving the portable generator to all pumping stations	Town is applying for grant funding to purchase generators for all pumping stations

Wildfires/Brushfires

Wildfire and brushfire mitigation strategies involve educating people about how to prevent fires from starting, as well as controlling burns within the city.

Management Plans

The Hatfield Comprehensive Emergency Management Plan does not include any specific information on wildfires.

Regulatory Measures

Burn Permits: The Hatfield Fire Department issues burn permits to town residents with the following stipulations: the burn permit must be issued on the day that the burn has been scheduled, the forecast cannot call for a windy day, and a burn permit will not be issued of the season has been particularly dry.

Subdivision Review: The following measures are required in Hatfield's Land Use Regulations for the Development Impact Statement for a subdivision and/or a special permit application:

Appendix A: Development Impact Statement [The impact of the proposed subdivision is to be described according to the following criteria…]:

Section III Support Systems
f. Fire Protection – Discuss the type and capacity of fuel storage facilities, location of storage areas for hazardous substances, special requirements, and distance to fire station.
Section 5.3.5 Procedures for Review and Referral of SPA

Public Education/Outreach: The Hatfield Fire Department maintains a public outreach program that targets children and seniors with the intention of spreading information about fire safety within these two populations. Furthermore, the Town has a safety inspection program that works to ensure that fire safety standards are being met.

Restrictions on Development

There are currently no restrictions on development that are based on the need to mitigate the hazards of wildfires and brushfires.

Existing Wildfire/Brushfire Hazard Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Burn Permits	Residents are permitted to obtain burn permits over the phone or online, and they must be issued in person. State police personnel provide information on safe burn practices.	Entire town.	Effective.	None.
Subdivision Review: Fire Safety	The Fire Department is involved in the review of subdivision plans. The Town of Hatfield has extensive public water supplies and all residents are within the town's fire prevention operations. Regulations allow lower water flows above certain elevations for sprinkler systems and water storage in houses that are not connected to city water lines.	Entire town.	Effective. Would be effective in providing for an increase in fire suppression capacity. Effective.	None.
Public Education/Outreach	The Fire Department has an ongoing educational program in the schools and Senior Center	Entire town.	Effective.	None.

Earthquakes

Although there are five mapped seismological faults in Massachusetts, there is no discernible pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard for which to plan.

Most buildings and structures in the state were constructed without specific earthquake resistant design features. In addition, earthquakes precipitate several potential devastating secondary effects such as building collapse, utility pipeline rupture, water contamination, and extended power outages. Therefore, many of the mitigation efforts for other natural hazards identified in this plan may be applicable during the City's recovery from an earthquake.

Management Plans

Updates to the Hatfield Comprehensive Emergency Management Plan should include the following mitigation measures for earthquakes:

- Community leaders in cooperation with Emergency Management Personnel maintain an assessment of structures and land areas that are especially vulnerable to earthquake.
- Strict adherence should be paid to land use and earthquake resistant building codes for all new construction.
- Periodic evaluation, repair, and/or improvement should be made to older public structures.
- Emergency earthquake public information and instructions should be developed and disseminated.

State Building Code

State and local building inspectors are guided by regulations put forth in the Massachusetts State Building Code. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975 and included specific earthquake resistant design standards. These seismic requirements for new construction have been revised and updated over the years and are part of the current, 6th Edition of the Massachusetts State Building Code. Given that most structures in Massachusetts were built before 1975, of many buildings and structures do not have specific earthquake resistant design features. According to the 2000 U.S. Census, 65 percent of the housing in Hatfield was built before 1970. In addition, built areas underlain by artificial fill, sandy or clay soils are particularly vulnerable to damage during an earthquake.

Restrictions on Development

There are no seismic-related restrictions on development.

Existing Earthquake Hazard Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
State Building Code	The Town of Hatfield has adopted the 8th Edition of the State Building Code.	Entire town.	Effective for new buildings or substantial renovations only.	None

Dam Failures / Levee Breech

Dam or levee failure is a highly infrequent occurrence, but a severe incident could prove catastrophic. In addition, dam failure most often coincides with flooding, so its impacts can be multiplied, as the additional water has nowhere to flow.

Management Plans and Regulatory Measures

The Hatfield Comprehensive Emergency Management (CEM) Plan contains the following mitigation measures for dam failure:

- Maintains up-to-date plans to deal with threat and actual occurrence of dam over-spill or failure.
- Monitors community dams during a disaster
- Determine minimum notification time for downstream areas

Permits Required for New Dam Construction

Massachusetts State Law (M.G.L. Chapter 253 Section 45) regulates the construction of new dams. A permit must be obtained from the Department of Conservation and Recreation (DCR) before construction can begin. One of the permit requirements is that all local approvals or permits must be obtained. All new dams must adhere to seismic requirements set forth in the 8th Edition of the Massachusetts State Building Code.

Dam Inspections and Removal of Dams

The DCR requires that dams rated as Low Hazards are inspected every ten years and dams that are rated as Medium/Significant Hazards are inspected every five years. High Hazard dams must be inspected every two years.

Zoning

There is no mention made regarding the construction of new dams in Hatfield.

Restrictions on Development

There are no restrictions on dam locations. The DCR issues permits for new dams and does have the authority to deny a permit if it is determined that the design and/or location of the dam is not acceptable.

Existing Dam Failure Hazard Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	Maintains up-to-date plans to deal with threat and actual occurrence of dam over-spill or failure. Monitors community dams during a disaster	Entire Town	Effective	None
Permits required for new dam construction	State law requires a permit for the construction of any dam.	Entire town.	Effective. Ensures dams are adequately designed.	None.
Dam Inspections	DCR has an inspection schedule that is based on the hazard rating of the dam (low, medium, high hazard).	Entire town.	Somewhat effective. Dams located on private land must be inspected by property owner.	None.

Drought

Although Massachusetts does not face extreme droughts like many other places in the country, it is susceptible to dry spells and drought. Drought can most likely be effectively mitigated in regions like the Pioneer Valley if measures are put into place, such as ensuring that groundwater is recharged.

Management Plans

The Hatfield CEM Plan lists the following generic mitigation measures for drought the town can commit to:

- Seek to balance demand on water supply through land use, zoning and other tools.
- Encourage water conservation and water control measures to ease demand on water supply.
- Improve efficiency and capacity of the water supply system, including lead detection and repair.

The Hatfield CEM Plan lists the following generic preparedness measures for drought:

- Identify potential emergency water sources, such as a purchase from adjoining communities if available.
- Keep abreast of drought forecasts issued by the State Drought Task Force
- Encourage businesses and other bulk users to develop water conservation and shortage plans.

State Regulations

The Town of Hatfield follows the state's Water Management Act, which limits the amount of water consumption during a state-issued Water Emergency Declaration. For more information visit: www.mass.gov/eea/agencies/massdep/water/drinking/the-massachusetts-water-management-act-program.html.

Municipal Operations

Hatfield has implemented a series of policies that can lessen the town's overall demand on its water supply at both peak and normal periods of demand. Customer metering has been applied to 95 percent of the Hatfield Water Department's coverage area, which can allow residents to gauge their water usage.

Hatfield has an active Drought and Emergency Plan, which contains policies and measures for how to cope with water shortages. To prevent water shortages, the town adopted aquifer protection regulations in 1990, which will help to limit development around the town's surface water supply, the town's main source of water; and followed suit in 2002 with wellhead protection regulations for the West Hatfield Well and the Omasta Well.

Restrictions on Development

Floodplain and watershed protection overlays limit development within areas that contribute to aquifer recharge zones and surface water supplies. Furthermore, Title V regulations limit the placement of houses in lands that are unsuitable for water and septic infrastructure.

Existing Drought Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Massachusetts Water Management Act	Regulates amount of water that can be used during a Water Emergency Declaration.	Entire town.	Effective.	None.
Identification and reduction of water system leaks	The Department of Public Works routinely inspects and repairs water system leaks, and performs tanker checks annually.	Entire town.	Effective.	None.
Intermunicipal emergency water connections	The Town planned to enter into an inter-municipal water supply connection agreement with the neighboring city of Northampton in 2014 but it was not completed.	Entire town.	Effective.	The Town will complete an interconnection agreement with both Northampton and Whately
Town Bylaw - Water ban	The Town may declare a State of Water Supply Conservation if a majority of the BOS determine that a shortage of water exists and conservation measures are appropriate to ensure an adequate supply of water to all water consumers.	Entire Town	Effective	None

Extreme Temperatures

Although Massachusetts does not face extreme temperatures like many other places in the country, it is increasingly susceptible to extreme heat and cold. Extreme temperatures can be effectively managed with a combination of public information and education informing residents of techniques they can use to stay cool in the event of extreme heat and the availability of cooling/warming centers as well as public shelters in the event of power outages during extreme temperature events.

Hatfield is an active participant in the Hampshire County regional emergency planning committee (REPC) and has designated Smith Vocational High School in Northampton as a regional shelter. In the event of extreme heat, residents without air conditioning or the ability to stay cool would be able to take shelter at Smith Vocational High School. The Fire Station/Emergency Management Building has air conditioning and can be used by residents during extreme heat events to cool down for a short period of time.

Existing Extreme Temperature Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Educate residents on how to stay cool/warm, as appropriate in the event of extreme temperatures	Educational pamphlets distributed to elders as well as use of reverse 911 calling	Entire town.	Effective.	None.
Cooling Center at the Fire Station/Emergency Management Building	The building is open to residents as a cooling center during periods of high temperatures.	Entire Town	Effective	None.

Discontinued or Completed Mitigation Strategies

Several mitigation strategies listed in the 2016 Hatfield Hazard Mitigation Plan have been removed or completed in the time since this 5-year update. Deleted and completed strategies, and their status, are indicated in the table below. Mitigation strategies from the 2016 plan that were partially complete and are ongoing are presented with detailed status reports in the following section.

MITIGATION ACTION	RESPONSIBLE DEPARTMENT/BOARD	HAZARDS MITIGATED	PRIORITY	2021 STATUS
Monitor Toe of Hatfield Dike (on CT River) and be prepared to repair as necessary. The Dike is a major flood mitigation structure and requires ongoing maintenance and occasional repair. Significant repair and maintenance work was undertaken in 2011 and it is anticipated that additional major maintenance will be necessary	DPW	Flooding	High	Discontinued. Regular maintenance is performed but DPW does not anticipate a need for major repair work.
Develop a local system for monitoring the status of the Mill River. This is a new strategy for the Town to take on. There are gauges on the river, but the Town wants to establish its own system of regularly monitoring available information to assure up to date information	DPW/EMD	Flooding	Low	Completed. Town staff from DPW and EMD have put a system in place and perform regular monitoring.
Become a part of FEMA's Community Rating System--review the CRS Coordinator's Manual (2013), contact ISO/CRS Specialist and complete 'What if" table to assess community cost/benefit of participation[7]. Did not work on this and plan to research costs in 2016	Board of Selectmen/EMD	Flooding	Medium	Discontinued. This program has been discontinued.
Research means to restrict access to area in Town that flood. This is a new strategy	EMD/Fire			Completed. Rescue boat purchased in

[7] additional detail on the CRS in Appendix A

the Town is considering to mitigate the need to rescue people who go into areas that have flooded and then are unable to exit		Flooding	Low	2019 and rescue training completed. Roads that flood are closed off which restricts access.
Previous action items that were not completed or are ongoing:				
Review problem culvert list and work to upgrade high priority problem culverts. The Town made progress repairing problem culverts in the last five years, but with the increase in severe rain events, they need to be constantly upgraded, repaired, and in some places replaced. List of problem culverts on pp 73-74.	Board of Selectmen, Highway Department, DPW	Flooding	Very High	Partially completed, with more to replace/repair, see new strategy list.
Develop an action plan for toxic chemical releases along transit routes	EMD, REPC	Town Staff	High	Keep in - this is an annual need. Plume testing has been completed
Maintain tree trimming and tree maintenance and inspection system Note: existing capability and very important to continue. Ongoing activity and is the Town's chief mitigation strategy for snow and ice storms. The Town collaborates with and works closely with the Electric utility company.	DPW	Severe storms, hurricanes, tropical storms, winter storms	High	Completed. This is completed annually; It is an ongoing need
Maintain Emergency Management Planning Committee	Board of Selectmen, EMD	Town Staff/Volunteers	High	Annual need
Implement Open Space and Recreation Plan	Conservation Commission, Planning Board, Board of Selectmen, add Open Space Committee	Town Staff/Volunteers	High	Keep in as this is ongoing- progress is being made. Will need to be updated in 2022
Develop and distribute an educational pamphlet on fire safety and prevention.	Fire Department	Town Staff/Volunteers	Medium	Completed but keep in as this is an annual need

Prioritized Implementation Plan

Several of the action items previously identified in the 2007 Hazard Mitigation Plan are currently continuing, either because they require more time to secure funding or their construction process is ongoing. In addition, the Hazard Mitigation Committee identified several new strategies that are also being pursued. These new strategies are based on experience with currently implemented strategies, as well as the hazard identification and risk assessment in this plan. Overall mitigation strategy priorities have not changed since the last version of this plan, with specific mitigation strategies addressing all identified hazards through a combination of planning, public outreach, and infrastructure improvements.

Prioritization Methodology

The Hatfield Hazard Mitigation Planning Committee reviewed and prioritized a list of previously identified and new mitigation strategies using the following criteria:

Application to multiple hazards – Strategies are given a higher priority if they assist in the mitigation of several natural hazards.

Time required for completion – Projects that are faster to implement, either due to the nature of the permitting process or other regulatory procedures, or because of the time it takes to secure funding, are given higher priority.

Estimated benefit – Strategies which would provide the highest degree of reduction in loss of property and life are given a higher priority. This estimate is based on the Hazard Identification and Analysis Chapter, particularly with regard to how much of each hazard's impact would be mitigated.

Cost effectiveness – in order to maximize the effect of mitigation efforts using limited funds, priority is given to low-cost strategies. For example, regular tree maintenance is a relatively low-cost operational strategy that can significantly reduce the length of time of power outages during a winter storm. Strategies that have identified potential funding streams, such as the Hazard Mitigation Grant Program, are also given higher priority.

Eligibility Under Hazard Mitigation Grant Program – The Hazard Mitigation Grant Program (HMGP) provides grants to states 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. Funding is made available through FEMA by the Massachusetts Emergency Management Agency. Municipalities apply for grants to fund specific mitigation projects under MEMA requirements

The following categories are used to define the priority of each mitigation strategy:

Low – Strategies that would not have a significant benefit to property or people, address only one or two hazards, or would require funding and time resources that are impractical

Medium – Strategies that would have some benefit to people and property and are somewhat cost effective at reducing damage to property and people

High – Strategies that provide mitigation of several hazards and have a large benefit that warrants their cost and time to complete

Several hazard mitigation strategies identified in the previous Hazard Mitigation Plan have not yet been completed, but were changed in priority during the update of this plan by the Hazard Mitigation Committee. The Committee changed priorities by evaluating the entire list of mitigation strategies in a comprehensive manner according to the factors listed above. For strategies that have changed in priority, the previous priority is provided in parenthesis in the "Priority" column.

Cost Estimates

Each of the following implementation strategies is provided with a cost estimate. Projects that already have secured funding are noted as such. Where precise financial estimates are not currently available, categories were used with the following assigned dollar ranges:

- **Low** – cost less than $50,000
- **Medium** – cost between $50,000 – $100,000
- **High** – cost over $100,000

Cost estimates take into account the following resources:

- Town staff time for grant application and administration (at a rate of est. $35 per hour (avg of staff working on plan update))
- Consultant design and construction cost (based on estimates for projects obtained from city and general knowledge of previous work in Town)
- Town staff time for construction, maintenance, and operation activities (at a rate of est. $35 per hour (avg of staff working on plan update))

Project Timeline

Each strategy is provided with an estimated length of time it will take for implementation. Where funding has been secured for the project, a specific future date is provided for when completion will occur. However, some projects do not currently have funding and thus it is difficult to know exactly when they will be completed. For these projects, an estimate is provided for the amount of time it will take to complete the project once funding becomes available.

MITIGATION STRATEGIES TO BE IMPLEMENTED							
MITIGATION ACTION	**ACTION TYPE**	**HAZARDS MITIGATED**	**RESPONSIBLE DEPARTMENT/ BOARD**	**TIMEFRAME**	**POTENTIAL FUNDING SOURCE(S)**	**ESTIMATED COST**	**PRIORITY**
Repair/replace undersized and problem culverts	Implementation/ Maintenance	Flooding, tropical storms, hurricanes	DPW	Secure funding, complete by 2025	BRIC, MVP action grant, DER Culvert Replacement Municipal Assistance Grant Program	High	High
Study relocation of critical facilities out of floodplain	Programmatic	Flooding, tropical storms, hurricanes	Facilities Committee, PD, FD, DPW, BOS, TA	Secure funding, complete by 2024	BRIC, MVP action grant	Low	Moderate
Move/secure vital records; digitize records and move originals to WTP	Implementation/ Maintenance	Flooding, tropical storms, hurricanes	Town Clerk	Secure funding, complete by 2024	Town funds, CPA, MBLC, SHRAB[8]	Low	High
Upgrade WTP to be able to be a secondary emergency operation center	Implementation/ Maintenance	All hazards	EMD	Secure funding, complete by 2026	BRIC/HMGP	Low	Moderate
Clarify with Army Corps about check valves on Hatfield Dike re. condition and importance, responsibility for maintenance.	Programmatic	Flooding	Town Administrator, DPW	Complete by 2022	Town funds	Low	Medium
Maintain tree trimming and tree maintenance and inspection system	Implementation/ Maintenance	Winter storms, tropical storms, hurricanes	DPW	Undertaken annually	Town funds	Low	HIgh

[8] https://www.sec.state.ma.us/arc/arcaac/aacgrants.htm; https://mblc.state.ma.us/programs-and-support/lsta-grants/opportunities.php

MITIGATION STRATEGIES TO BE IMPLEMENTED							
MITIGATION ACTION	**ACTION TYPE**	**HAZARDS MITIGATED**	**RESPONSIBLE DEPARTMENT/ BOARD**	**TIMEFRAME**	**POTENTIAL FUNDING SOURCE(S)**	**ESTIMATED COST**	**PRIORITY**
Establish a back-up power system (generators) for Pumping Stations	Implementation/ Maintenance	Flooding	Sewer Department	Secure funding, complete by 2023	USDA	High	High
Implement Open Space and Recreation Plan	Programmatic	All hazards	Conservation Commission, Planning Board, Board of Selectmen, add Open Space Committee	ongoing- progress is being made. Will need to be updated in 2022	Town funds, DLTA, EEA	Low	Moderate
Maintain Emergency Management Planning Committee	Programmatic	All hazards	Board of Selectmen, EMD	Annual need	Town Funds	Low	Low
Distribute educational material on fire safety and prevention.	Implementation/ maintenance	Wildfire	Fire Department	Annual need	DFS grants	Low	Medium

6: PLAN REVIEW, EVALUATION, IMPLEMENTATION, AND ADOPTION

Plan Adoption

Upon completion of the draft Hazard Mitigation Plan, a public meeting was held on XXX Date to receive comments. The Hazard Mitigation Plan was then submitted to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency for their review. Upon receiving conditional approval of the plan by FEMA, the plan was presented to the Hatfield Select Board and adopted.

Plan Implementation

The implementation of this plan began upon its formal adoption by the Select Board and approval by MEMA and FEMA. Those Town departments and boards responsible for ensuring the development of policies, ordinance revisions, and programs as described in Sections 5 and 6 of this plan will be notified of their responsibilities immediately following approval. The Hazard Mitigation Committee will oversee the implementation of the plan.

Incorporation with Other Planning Documents

Existing plans, studies, reports and municipal documents were incorporated throughout the planning process. This included a review and incorporation of significant information from the following key documents:

- ***Hatfield Comprehensive Emergency Management Plan*** (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to identify those infrastructure components in Hatfield that have been identified as crucial to the function of the Town; also, this resource was used to identify special needs populations as well as potential emergency shortcomings.

- ***Hatfield*** **Open Space, and Recreation Plan, 2014-2021** – this Plan was used to identify the natural context within which the Hatfield mitigation planning would take place. This proved useful insofar as it identified water bodies, rivers, streams, infrastructure components (i.e. water and sewer, or the lack thereof), as well as population trends. This was incorporated to ensure that the Town's mitigation efforts would be sensitive to the surrounding environment. The plan is due to be updated in 2021/2022. During the OSRP update, the Town can use the work of the Hazard Mitigation Plan to incorporate identified hazard areas into open space and recreation planning. This could either take the form of acquiring parcels of land that are currently un-developed, but situated within an identified hazard area, as permanent open space, thereby minimizing the likelihood that critical infrastructure components will be constructed in an area prone to damage from natural hazards.

- ***Hatfield Zoning Bylaws and Subdivision Regulations*** - The Town's Zoning was used to gather identify those actions that the Town is already taking that are reducing the potential impacts of a natural hazard (i.e. floodplain regulations) to avoid duplicating existing successful efforts.

- ***Massachusetts' State Hazard Mitigation and Climate Adaptation Plan*** - This plan was used to insure that the Town's HMP was consistent with the State's Plan.

The Hazard Mitigation Plan will also be incorporated into updates of the following plans:

- Comprehensive Emergency Management Plan
- Open Space and Recreation Plan, 2022 Update

During regular update meetings for the Hazard Mitigation Plan, the Hazard Mitigation Committee will review whether any of these plans are in the process of being updated. If so, the Hazard Mitigation Committee will provide copies of the Hazard Mitigation Plan to relevant Town staff and brief them on the content of the Hazard Mitigation Plan. The Hazard Mitigation Committee will also review current Town programs and policies to ensure that they are consistent with the mitigation strategies described in this plan.

Plan Monitoring and Evaluation

The measure of success of the Hatfield Hazard Mitigation Plan Update 2021 will be the number of identified mitigation strategies implemented. In order for the Town to become more disaster resilient, there must be a coordinated effort between elected officials, appointed bodies, Town employees, regional and state agencies involved in disaster mitigation, and the general public.

The Hatfield Hazard Mitigation Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different Town departments and/or revise the goals and objectives contained in the plan. The committee will review and update the plan every year, beginning in the Spring of 2022. The meetings of the committee will be organized and facilitated by the Emergency Management Director.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Committee (Local Emergency Planning Committee-LEPC) will hold all meetings in accordance with Massachusetts open meeting laws. Hard copies of the plan will be available in Town Hall and at the Town Library. The Hazard Mitigation Committee (LEPC) will meet annually to discuss any needs and amendments. Any proposed amendments will be advertised and posted on the Town's website. Any changes will be proceeded by a public hearing and solicitation of public comments.

Insert certificate of adoption

APPENDICES

Appendix A Documentation of the Planning Process

Committee Meeting Agendas and Records of Attendance

Hatfield Hazard Mitigation Committee
Meeting #1 Agenda
Virtual Meeting over Zoom
May 14, 2021 9:30 am

1. Introductions

2. Overview of Hazard Mitigation Planning Process
    a. Background on Hazard Mitigation Planning (see HMP overview doc)
    b. Planning process and requirements
        i. Items to be reviewed/updated in current Hatfield Hazard Mitigation Plan
        ii. 3-5 committee meetings, 2 public outreach meetings
        iii. MEMA / FEMA review and conditional approval
        iv. Select Board adoption
        v. FEMA final approval
    c. Schedule for committee and public outreach meetings
3. Identify/update local hazards
4. Identify/Update Potential New Development Sites
5. Update Critical Facilities Inventory and Mapping
6. Set date for next meeting/meeting schedule

Attending:

Robert Flaherty, Fire Chief
Marlene Michonski, Town Administrator
Mike Dekoschak, Police Chief
Eric Meals, Wastewater Superintendent
Robert Osley, Board of Health
Kiz Kugler, Board of Health
Mimi Kaplan, PVPC
Catherine Ratte, PVPC

Hatfield Hazard Mitigation Committee
Meeting #2 Agenda
Virtual Meeting over Zoom
May 25, 2021 9:30 am

1. Update all recent hazard and other information needed from Town
2. Identify/Update Potential New Development Sites
3. Update facilities/populations to protect
4. Update critical facilities and evacuation routes affected by hazard areas
5. Complete 4.1 Capability Assessment Worksheet (Planning & Regulatory, Administrative & Technical, Financial, Education & Outreach)
6. Set date for next meeting and first public meeting

Attending:

Robert Flaherty, Fire Chief
Michael Dekoschak, Police Chief
Marlene Michonski, Town Administrator
Mimi Kaplan, PVPC

Hatfield Hazard Mitigation Planning Committee
Meeting #3 Agenda
June 3, 2021
10:30 am – 12 pm
Hatfield Public Safety Building

1. Review hazard mitigation capabilities
2. Review existing mitigation strategies and actions
    a. Evaluate progress in implementation (completion of mitigation actions)
    b. Describe any changes in priorities
3. Begin updated mitigation strategy and action plan:
    a. Local plans and regulations
    b. Structure and infrastructure projects
    c. Natural systems protection
    d. Education and awareness programs
4. Discuss format of public meeting and set date/time

Attending:

Robert Flaherty, Fire Chief
Marlene Michonski, Town Administrator
Eric Meals, Wastewater Superintendent
Liz Kugler, Board of Health
Mimi Kaplan, PVPC

Hatfield Hazard Mitigation Planning Committee
Meeting #4 Agenda
June 8, 2021
9:30 am – 11 am
Hatfield Public Safety Building

1. Finish reviewing and evaluating mitigation strategies
2. Review existing mitigation measures
    a. Are they still in place?
    b. Are they still effective?
    c. Potential changes
    d. Add any measures in place since last plan
3. Add new mitigation strategies (look at MVP SOF)
4. Discuss public meeting agenda and set next committee meeting date

Attending:

Robert Flaherty, Fire Chief
Marlene Michonski, Town Administrator

Mimi Kaplan, PVPC

Hatfield Hazard Mitigation Planning Committee
Meeting #5 Agenda
July 14, 2021
9:30 am – 11:30 am
Hatfield Public Safety Building

1. Review draft map
2. Address remaining questions about hazards
3. Finish reviewing existing mitigation measures
    a. Potential changes
    b. Add any measures in place since last plan
4. Finish reviewing previous mitigation strategies
5. Add new mitigation strategies
6. Set next committee meeting date

Attending:

Marlene Michonski, Town Administrator
Michael Dekoschak, Police Chief
Phil Genovese, DPW Director
Robert Flaherty, Fire Chief
Mimi Kaplan, PVPC

Hatfield Hazard Mitigation Planning Committee
Meeting #6 Agenda
August 30, 2021 9:30- 11 am
Hatfield Public Safety Building

1. Review Natural Hazard Analysis and Rating – remaining questions
2. Review Evacuation Routes for Critical Facilities
3. Review existing mitigation measures for all hazards
4. Complete proposed mitigation strategies table - timeline, cost, priority
5. Plan for public meeting #2
    a. Set date for meeting
    b. Present draft plan at PM#2
    c. Complete draft plan 3 weeks before PM #2, and post on Town Website
    d. Public outreach plan for PM #2

Attending:

Robert Flaherty, Fire Chief
Marlene Michonski, Town Admnistrator
Garrett Barry, Highway Superintendent
Mimi Kaplan, PVPC

Public Meeting Agendas, Records of Attendance, Press Releases and Presentations

Hatfield Hazard Mitigation Plan Update
Public Meeting #1
Public Hearing of the Board of Selectmen
In-person and remotely through GoToMeeting
June 15, 2021, 5:30 pm

Agenda

1. Welcome and Introductions
2. Overview of the hazard mitigation planning process
3. Hazard identification and risk assessment
    a. Types of hazards affecting Hatfield
    b. Previous occurrences, extent, location, impact, future probability, and vulnerability of each hazard.
4. Next Steps

Attendees:

Marlene Michonski, Town Administrator
Michael Dekoschak, Police Chief
Phil Genovese, DPW Director
Eric Meals, Wastewater Supertintendent
Bob Osley, Board of Health Chair
Liz Kugler, Board of Health member
Mimi Kaplan, PVPC

Media Release/Notice

Catalyst for Regional Progress
PVPC

Kimberly H. Robinson, MUP
Executive Director

MEDIA RELEASE

CONTACT: Mimi Kaplan, PVPC Senior Planner, (413) 285-1188 or mkaplan@pvpc.org

FOR IMMEDIATE RELEASE
June 10, 2021

Town of Hatfield to hold Public Engagement Event for Hazard Mitigation Plan Update

Hatfield residents, businesses, and surrounding community residents and representatives are invited to provide comments on the Town of Hatfield Hazard Mitigation Plan on Tuesday, June 15 at 6:30 pm at the Hatfield Town Hall at 59 Main Street, or via the GoToMeeting link below:

https://global.gotomeeting.com/join/267630021

By Phone: +1 (872) 240-3311

The purpose of the Hazard Mitigation Plan is to identify and assess Hatfield's natural hazard risks and determine how to best minimize and manage them. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards. All members of the public, representatives from surrounding communities and other interested parties are welcome to attend the event. Public participation and input is essential!

The meeting will include an overview of the Municipal Vulnerability Preparedness and hazard mitigation planning process, a discussion of existing mitigation initiatives addressing natural hazards in Hatfield, and the strategies as currently proposed by the committee. Municipal officials and PVPC staff will be available to answer questions and hear input about the project. The meeting provides an opportunity for you to share your opinions and participate in the mitigation planning process.

The plan is being updated by the Town with assistance from the Pioneer Valley Planning Commission and is funded by the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA).

Upon completion, the plan will be submitted to Massachusetts Emergency Management Agency (MEMA) and Federal Emergency Management Agency (FEMA) for review and approval. A FEMA approved plan makes the community eligible for federal and state mitigation grant funding.

For more information, please contact PVPC's Mimi Kaplan at mkaplan@pvpc.org or (413) 285-1188.

https://www.wwlp.com/news/local-news/hampshire-county/hatfield-holding-public-forum-on-community-natural-hazard-plan/

Flyer for First Public Meeting Posted on Website and Social Media

Hatfield Hazard Mitigation Plan - Public Meeting

Natural hazards can have serious impacts for the residents of Hatfield.



The Hatfield Hazard Mitigation Plan is being updated to help the Town reduce its vulnerability to natural hazard events such as flooding, winter storms, strong winds, and drought. Please attend a public presentation and provide your input to the Hatfield Hazard Mitigation Plan at a public meeting of the Board of Selectmen:

- **Date: Tuesday, June 15, 2021**
- **Time: 6:30 pm**
- **Location: Hatfield Town Hall, 59 Main Street Hatfield**

Join Virtually: https://global.gotomeeting.com/join/267630021

or call (872) 240-3311, access code 267-630-021

For more information, contact Mimi Kaplan at 413-285-1188, or by email at mkaplan@pvpc.org.

Catalyst for Regional Progress
pvpc

HATFIELD

Slides from Public Outreach Presentation at Public Meeting #1 on June 15, 2021

WHAT IS HAZARD MITIGATION?

FEMA

"Any sustained action taken to reduce or eliminate long -term risk to people and property from natural hazards."

Examples:

- Limiting development in high -risk areas
- Retrofitting structures to protect them from floods, high winds, etc.
- Drainage and flood control projects in areas of localized flooding
- Fire safety education

2

EMERGENCY MANAGEMENT CYCLE

MITIGATION VS. PREPAREDNESS

Hazard Mitigation	Emergency Preparedness
Planning and zoning	Evacuation plans and emergency shelters
Open space preservation	Radio communications equipment
Education and outreach	Emergency response drills
Drainage improvements	

4

BENEFITS OF HAZARD MITIGATION

- Makes communities eligible to apply for Hazard Mitigation funds from FEMA
- Mitigation is less expensive than disaster clean up
- Having a plan provides an approach for using limited resources more effectively
- Makes communities more resilient

Weather.gov

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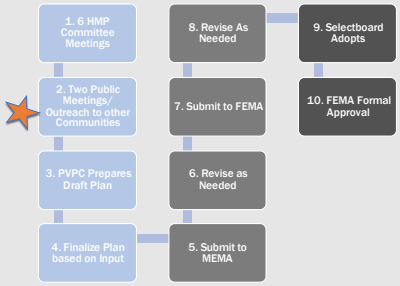
PLANNING PROCESS



6

PARTICIPANTS

Town

- Marlene Michonski , Town Administrator
- Robert Flaherty, Fire Chief
- Michael Dekoschak , Police Chief
- Elizabeth Kugler, Board of Health
- Eric Meals, Sewer Dept. Superintendent (DPW)
- Phillip Genovese, DPW Director
- Garrett Barry, Highway Lead (DPW)
- Bob Osley , Hatfield Historical Society and Board of Health

Other

- Consultant -Pioneer Valley Planning Commission
- General public via public meetings

COMPONENTS OF A HAZARD MITIGATION PLAN

- Hazard identification and assessment
- Analysis of vulnerabilities - how hazards impact buildings, property, and residents, especially vulnerable populations
- Identification of critical infrastructure
- Existing and proposed mitigation strategies
- Proposed schedule for implementation of mitigation strategies

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NATURAL HAZARD ASSESSMENT FOR HATFIELD

TYPE OF HAZARD	FREQUENCY OF OCCURRENCE	LOCATION OF OCCURRENCE	IMPACT	HAZARD RISK INDEX RATING
Flooding	Low	Medium	Limited	3 – Medium Risk
Severe Snowstorms/Ice Storms	High	Large	Limited	3 – Medium Risk
Severe Thunderstorms / Winds / Tornadoes	Severe Thunderstorms: Moderate; Winds: Moderate; Tornadoes: Low	Medium	Limited	Severe Thunderstorms: 3 – Medium Risk Winds: 3 – Medium Risk Tornadoes: 4 – Low Risk
Hurricanes/Tropical Storms	Low	Large	Critical	Between 3 – Medium Risk and 4 – Low Risk
Wildfire/Brushfire	Moderate	Small	Minor	3 – Medium Risk
Earthquakes	Low	Large	Critical	4 – Low Risk
Dam Failures / Levee Breech	Very Low	Medium	Critical	3 – Medium Risk
Drought	Moderate	Large	Minor	3 – Medium Risk
Extreme Temperatures	Low	Large	Minor	5– Lowest Risk

INVENTORY OF CRITICAL FACILITIES

- **A Critical Facility is defined as a building, structure, or location which :**
  - Is vital to the hazard response effort.
  - Maintains an existing level of protection from hazards for the community.
  - Would create a secondary disaster if a hazard were to impact it.
- **The following were identified as critical facilities and services, and populations to protect:**
  - Police, Fire
  - DPW, Water and Sewer
  - Roads, bridges/culverts
  - Access to Power
  - Communications
  - Historic Buildings and Sites
  - Vital records
  - Evacuation Routes
  - Vulnerable Populations (elderly, disabled, special needs)

EXISTING MITIGATION CAPABILITIES

- Zoning Ordinance, Bylaws, Codes
  - Floodplain and Riverfront Overlay Districts, Water Supply Protection District, Stormwater Bylaw, design standards, etc.
  - State Building code
- Existing plans: CEMP, OSRP
- NFIP enrollment (34 flood insurance policies)
- Burn Permit Requirement
- Cooling/Heating Center
- Tree Management
- Fire Safety Education
- Emergency Communication

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EXISTING AND NEW MITIGATION STRATEGIES

- Hatfield's current HMP includes a list of existing mitigation strategies, as well as strategies to be pursued in the future
- The HMP Advisory Group is currently:
  - Evaluating the effectiveness of each identified mitigation strategy
  - Assessing strategy implementation from the previous plan and integration with other municipal plans
  - Re-prioritizing the list of strategies and adding new strategies

NEXT STEPS

- Group meets in July and August, finalizes Draft Plan
- Draft Plan will be released at a public meeting in late summer/early fall
- Plan submitted to MEMA/revise as needed
- Submit to FEMA
- Select Board adopts
- Revise as needed/re -submit/FEMA approval
- Eligible to apply for funds

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Hatfield Hazard Mitigation Plan Update
Public Meeting #2
Public Hearing of the Board of Selectmen
In-person and remotely through GoToMeeting
November 2, 2021, 5:30 pm

Agenda

1. Welcome and Introductions
2. Presentation of Draft Hazard Mitigation Plan Update
3. Review of Mitigation Strategy
4. Next Steps

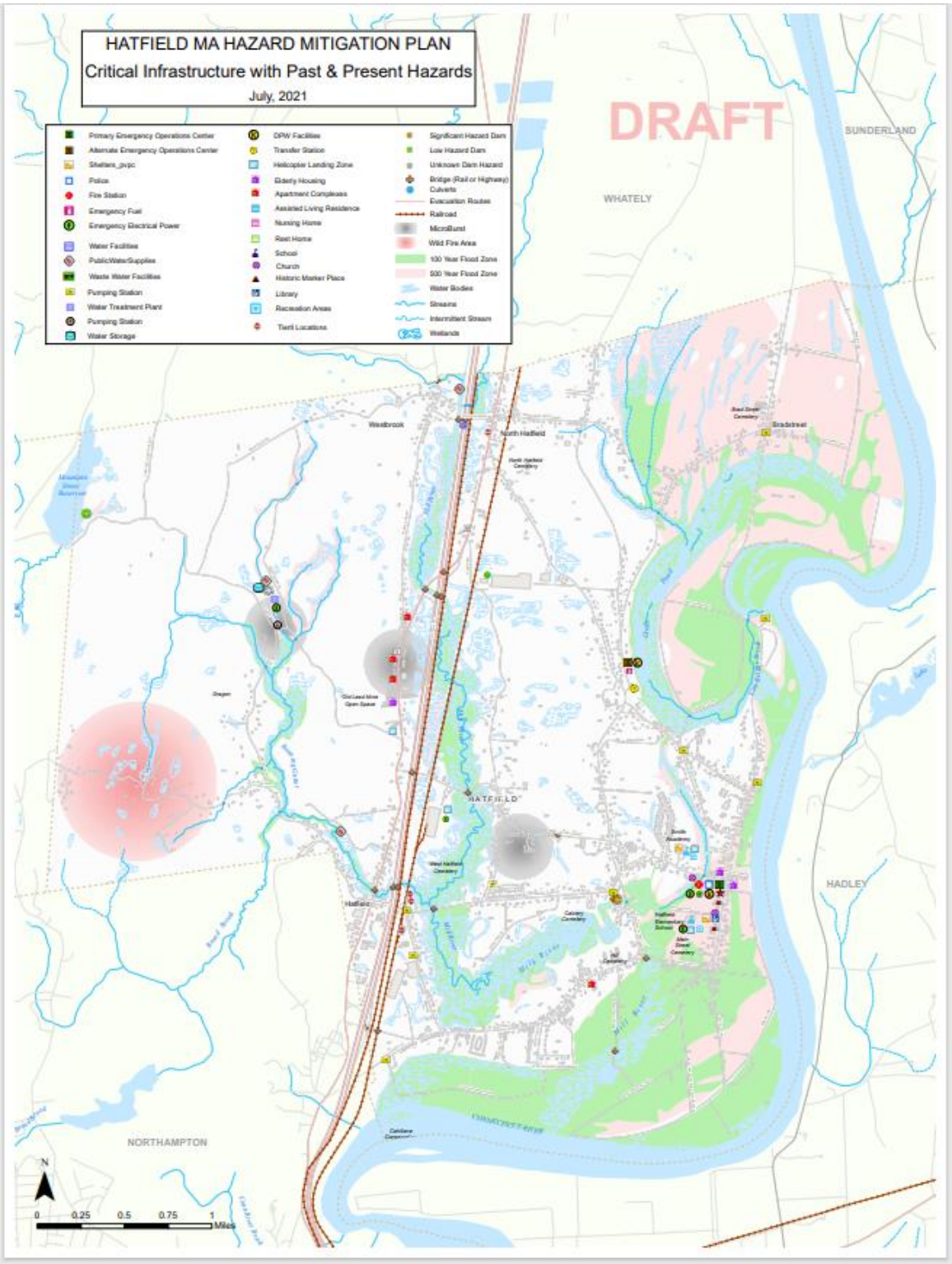
Attendees:

Appendix B – List of Acronyms

CDC	Center for Disease Control
CEM	Community Emergency Management
CEMP	Community Emergency Management Plan
CIS	FEMA Community Information System
COVID-19	Coronavirus Disease
CRB	Community Resilience Building
CRS	Community Rating System
DCR	Department of Conservation and Recreation
DER	Department of Ecological Restoration
DPW	Hatfield Department of Public Works
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FMA	Flood Mitigation Assistance Program
HMGP	Hazard Mitigation Grant Program
LEP	Limited English Proficiency
LID	Low Impact Development
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MassGIS	Massachusetts Bureau of Geographic Information
MAVEN	Massachusetts Viral Epidemiological Network
MEMA	Massachusetts Emergency Management Agency
MVP	Municipal Vulnerability Preparedness

NAACC	North Atlantic Aquatic Connectivity
NE CASC	Northeast Climate Adaptation Science Center
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
OSRD	Open Space Residential Development
PDM	Pre-Disaster Mitigation Program
PVPC	Pioneer Valley Planning Commission
PVTA	Pioneer Valley Transit Authority
RiskMAP	FEMA Risk Mapping, Assessment, and Planning
SFHA	Special Flood Hazard Area
SHMCAP	State Hazard Mitigation and Climate Adaptation Plan
SRO	Single Room Occupancy
THIRA	Threat Identification and Risk Assessment
WHO	World Health Organization
WRHSAC	Western Region Homeland Security Advisory Council

Appendix C - Map of Local Hazards and Critical Infrastructure



Worksheet 4.1
Capability Assessment Worksheet

Capability Assessment Worksheet

Jurisdiction: Hatfield, MA

Local mitigation capabilities are existing authorities, policies, programs, and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible. Complete one worksheet for each jurisdiction.

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Please indicate which of the following your jurisdiction has in place.

Plans	Yes/No Year	Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive/Master Plan	Y 2005	Need to update No, No, — Marlene will get back
Capital Improvements Plan	Y	N, N, possibly (DPW) Nothing currently funded
Economic Development Plan		N, N, when updated Econ. Redevpt. auth. Will be Updated – when?
Local Emergency Operations Plan		CEMP
Continuity of Operations Plan		Response Plans Don't address mitigation but do
Transportation Plan		address Response
Stormwater Management Plan	Y	N, N, Y Bylaw useful in identifying potential hazards
Community Wildfire Protection Plan	N	Not necessary
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Y	OSRP – A lot of action items hiking trails, renovate parks,

Wastewater mngmt plan — MVP
CPA – Funded some projects in regard to end. species
CR

A-17

Worksheet 4.1
Capability Assessment Worksheet

Building Code, Permitting, and Inspections	Yes/No	Are codes adequately enforced?
Building Code	Y	Version/Year: State Bldg code – Updated every 3 years
Building Code Effectiveness Grading Schedule (BCEGS) Score	? N/A	Score: Maybe – Marlene will check
Fire department ISO rating	Y	Rating: ~~should be in low 5s or high 4s~~ ~~5.6 or 5.7 but not accurate~~ – still 6/6x ISO needs to check. Haven't been here since 2002
Site plan review requirements	Y	Y

Land Use Planning and Ordinances	Yes/No	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning ordinance	Y	Y, Y
Subdivision ordinance	Y	Y, Y
Floodplain ordinance	Y	Y Y, Y
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Y	Y, Y
Flood insurance rate maps	Y	Y, Y
Acquisition of land for open space and public recreation uses	Y	Y, Y
Other		Water Supply prot. district Riverfront overlay district Open space devpt

How can these capabilities be expanded and improved to reduce risk?

Em Prep. Comm. has evolved to a smaller core group to work on group to take to public. More efficient, more produce. 8 or 9 voting members

A-18 Local Mitigation Planning Handbook

Worksheet 4.1
Capability Assessment Worksheet

Administrative and Technical

Identify whether your community has the following administrative and technical capabilities. These include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.

Administration	Yes/No	Describe capability Is coordination effective?
Planning ~~Commission~~ Board	Y	Y, Board functions effectively
Mitigation Planning Committee	Y	This Committee functions well
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Y	Y, DPW coordinates with Utilities and contracts out for tree trimming
Mutual aid agreements		Statewide mutual aid, police, fire, & DPW (waste water)
Staff	**Yes/No FT/PT[1]**	**Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?**
Chief Building Official Building Inspector	Y, PT	(33 hrs/wk) Y
Floodplain Administrator	N	Need to appoint
Emergency Manager	Y	Y, Y, Y
Community Planner	N	Planning Board, use services of PVPC
Civil Engineer	N	Hire engin. firms as needed
GIS Coordinator	N	Assessor contracts w/outside firms as needed
Other		Town is lacking in resources - additional staff would be helpful

1 Full-time (FT) or part-time (PT) position

Worksheet 4.1
Capability Assessment Worksheet

Technical	Yes/No	Describe capability Has capability been used to assess/mitigate risk in the past?
Warning systems/services (Reverse 911, outdoor warning signals)	Y	System works well
Hazard data and information	Y	
Grant writing	Y	Limited staff capability/time Utilize PVPC
Hazus analysis	N	
Other		
How can these capabilities be expanded and improved to reduce risk?		
Additional resources, staff		

Worksheet 4.1
Capability Assessment Worksheet

Financial

Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.

Funding Resource	Access/ Eligibility (Yes/No)	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	N, Y	Annual process Can also use free cash
Authority to levy taxes for specific purposes	N, Y	4½ Override Vote 2020 - Borrowing Water + Sewer Improv. Passed
Fees for water, sewer, gas, or electric services	Y	Water + Sewer enterprise fund
Impact fees for new development	N	Not legal in MA
Storm water utility fee	N	
Incur debt through general obligation bonds and/or special tax bonds	Y	N, Y - Used for purchasing equipment that can assist with haz. mit.
Incur debt through private activities	N	
Community Development Block Grant	Y	Under School Sold and redevel. for 55+ condos.
Other federal funding programs	Y	HMPG grant CARES Act
State funding programs	Y	MassWorks - $2 Million water + sewer PARC grant (DCS) - Renovating Park, 2018
Other MVP Planning Grant	Y	MVP planning grant
How can these capabilities be expanded and improved to reduce risk?		

Worksheet 4.1
Capability Assessment Worksheet

Education and Outreach

Identify education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

Program/Organization	Yes/No	Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	N	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Y	Fire Safety - Youth + Senior (COA)
Natural disaster or safety related school programs	Y	Fire Safety, Disaster Prep. in Schools - lock down + fire drills
StormReady certification	N	
Firewise Communities certification	N	
Public-private partnership initiatives addressing disaster-related issues	Y	Active in Regional ERC + WRHSAC - Participate in monthly meetings
Other		
How can these capabilities be expanded and improved to reduce risk?		

Appendix F - References

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Northeast States Emergency Consortium, http://nesec.org/

NPDP, 2018. National Performance of Dam Program (NPDP), Dam Incident Notification (DIN) system, http://npdp.stanford.edu/dams_database

Pioneer Valley Planning Commission's Climate Action and Clean Energy Plan, www.pvpc.org/plans/climate-action-and-clean-energy-plan

Pioneer Valley Regional Land Use Plan, www.pvpc.org/plans/valley-vision-4-land-use

resilient MA, 2018/UMass climate data https://resilientma.org/home.html

Sperry-Piltz Ice Accumulation (SPIA) Index , https://www.spia-index.com/

Summary of Findings, Town of Hatfield Community Resilience Building Workshop

USA.com, http://www.usa.com/hampshire-county-ma-natural-disasters-extremes.htm

US Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., US Geological Survey.

Appendix G – Technical Resources

1) Agencies

Massachusetts Emergency Management Agency (MEMA)	508/820-2000
Hazard Mitigation Section	617/626-1356
Federal Emergency Management Agency (FEMA)	617/223-4175
MA Board of Building Regulations & Standards (BBRS)	617/227-1754
MA Coastal Zone Management (CZM)	617/626-1200
DCR Water Supply Protection	617/626-1379
DCR Waterways	617/626-1371
DCR Office of Dam Safety	508/792-7716
DFW Riverways	617/626-1540
MA Dept. of Housing & Community Development	617/573-1100
Woods Hole Oceanographic Institute	508/457-2180
UMass-Amherst Cooperative Extension	413/545-4800
National Fire Protection Association (NFPA)	617/770-3000
New England Disaster Recovery Information X-Change (NEDRIX – an association of private companies & industries involved in disaster recovery planning)	781/485-0279
MA Board of Library Commissioners	617/725-1860
MA Highway Dept, District 2	413/582-0599
MA Division of Marine Fisheries	617/626-1520
MA Division of Capital & Asset Management (DCAM)	617/727-4050
University of Massachusetts/Amherst	413/545-0111
Natural Resources Conservation Services (NRCS)	413/253-4350
MA Historical Commission	617/727-8470
U.S. Army Corps of Engineers	978/318-8502

Northeast States Emergency Consortium, Inc. (NESEC)	781/224-9876
National Oceanic and Atmospheric Administration: National Weather Service; Tauton, MA	508/824-5116
US Department of the Interior: US Fish and Wildlife Service	413/253-8200
US Geological Survey	508/490-5000

MA Regional Planning Commissions:

Berkshire Regional Planning Commission (BRPC)	413/442-1521
Cape Cod Commission (CCC)	508/362-3828
Central Massachusetts Regional Planning Commission (CMRPC)	508/693-3453
Franklin Regional Council of Governments (FRCOG)	413/774-3167
Martha's Vineyard Commission (MVC)	508/693-3453
Merrimack Valley Planning Commission (MVPC)	978/374-0519
Metropolitan Area Planning Council (MAPC)	617/451-2770
Montachusett Regional Planning Commission (MRPC)	978/345-7376
Nantucket Planning and Economic Development Commission (NP&EDC)	508/228-7236
Northern Middlesex Council of Governments (NMCOG)	978/454-8021
Old Colony Planning Council (OCPC)	508/583-1833
Pioneer Valley Planning Commission (PVPC)	413/781-6045
Southeastern Regional Planning and Economic Development District (SRPEDD)	508/823-1803

2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP): Massachusetts Emergency Management Agency

406 Public Assistance and Hazard Mitigation: Massachusetts Emergency Management Agency

Community Development Block Grant (CDBG): DHCD, also refer to RPC

Dam Safety Program: MA Division of Conservation and Recreation

Disaster Preparedness Improvement Grant (DPIG): Massachusetts Emergency Management Agency

Emergency Generators Program by NESEC: Massachusetts Emergency Management Agency

Emergency Watershed Protection (EWP) Program: USDA, Natural Resources Conservation

Service Flood Mitigation Assistance Program (FMAP): Massachusetts Emergency Management Agency

Flood Plain Management Services (FPMS): US Army Corps of Engineers

Mitigation Assistance Planning (MAP): Massachusetts Emergency Management Agency

Mutual Aid for Public Works: Western Massachusetts Regional Homeland Security Advisory Council

Municipal Vulnerability Preparedness Program: MA Executive Office of Energy and Environmental Affairs

National Flood Insurance Program (NFIP) †: Massachusetts Emergency Management Agency

Power of Prevention Grant by NESEC‡ : Massachusetts Emergency Management Agency

Roadway Repair & Maintenance Program(s): Massachusetts Highway Department

Section 14 Emergency Stream Bank Erosion & Shoreline Protection: US Army Corps of Engineers

Section 103 Beach Erosion: US Army Corps of Engineers

Section 205 Flood Damage Reduction: US Army Corps of Engineers

Section 208 Snagging and Clearing: US Army Corps of Engineers

Shoreline Protection Program: MA Department of Conservation and Recreation

Various Forest and Lands Program(s): MA Department of Environmental Protection

Wetlands Programs: MA Department of Environmental Protection

‡NESEC – Northeast States Emergency Consortium, Inc. is a 501(c)(3), not-for-profit natural disaster, multi-hazard mitigation and emergency management organization located in Wakefield, Massachusetts. Please, contact NESEC for more information.

† Note regarding National Flood Insurance Program (NFIP) and Community Rating System (CRS): The National Flood Insurance Program has developed suggested floodplain management activities for those communities who wish to more thoroughly manage or reduce the impact of flooding in their jurisdiction. Through use of a rating system (CRS rating), a community's floodplain management efforts can be evaluated for effectiveness. The rating, which indicates an above average floodplain management effort, is then factored into the premium cost for flood insurance policies sold in the community. The higher the rating achieved in that community, the greater the reduction in flood insurance premium costs for local property owners. MEMA can provide additional information regarding participation in the NFIP-CRS Program.

3) Internet Resources

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	https://hazards.colorado.edu/resources/research-centers-data	Searchable database of references and links to many disaster-related websites.
Hurricane Tracking Data by Year	https://www.nhc.noaa.gov/data/	Hurricane track maps for each year, 1958-2021
National Emergency Management Association	https://www.nemaweb.org/	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center "Disaster Finder:	https://appliedsciences.nasa.gov/what-we-do/disasters	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	https://earthdata.nasa.gov/earth-observation-data/near-real-time/hazards-and-disasters	Searchable database of worldwide natural disasters.
National Weather Service	https://www.weather.gov/	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	https://waterdata.usgs.gov/nwis/rt	Provisional hydrological data
Dartmouth Flood Observatory	https://floodobservatory.colorado.edu/	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	https://www.fema.gov/flood-insurance/work-with-nfip/community-status-book	Searchable site for access of Community Status Books
National Lightning Safety Institute Florida State University Atlantic Hurricane Site	https://emergency.fsu.edu/resources/hazards/tropical-storms-hurricanes/tropical-storms-hurricanes-history-fsu	Information and listing of appropriate publications regarding lightning safety. Tracking and NWS warnings for Atlantic Hurricanes and other links
NASA Optical Transient Detector National Lightning Safety Institute	https://ghrc.nsstc.nasa.gov/lightning/	Space-based sensor of lightning strikes Information and listing of appropriate publications regarding lightning safety.
LLNL Geologic & Atmospheric Hazards NASA Optical Transient Detector	https://ghrc.nsstc.nasa.gov/lightning/overview_otd.html	General hazard information developed for the Dept. of Energy. Space-based sensor of lightning strikes
The Tornado Project Online LLNL Geologic & Atmospheric Hazards	http://www.tornadoproject.com/	Information on tornadoes, including details of recent impacts. General hazard information developed for the Dept. of Energy.

National Severe Storms Laboratory	https://www.nssl.noaa.gov/	Information about and tracking of severe storms. Information on tornadoes, including details of recent impacts.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map National Severe Storms Laboratory	https://www.inscenter.com/info-center/disaster-planning/risk-profile	A multi-disaster risk map. Information about and tracking of severe storms.
USDA Forest Service	https://www.fs.usda.gov/	Information on forest fires and land management.