

The Town of South Hadley, Massachusetts Hazard Mitigation Plan Update 2024



2024 Hazard Mitigation Plan Update

Prepared by:

South Hadley Hazard Mitigation Planning Committee, with assistance from Pioneer Valley Planning Commission (PVPC)



The Pioneer Valley Planning Commission
60 Congress Street First Floor
Springfield MA 01104
(413) 781-6045
www.pvpc.org

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Acknowledgements

South Hadley Hazard Mitigation Committee

Sharon Hart, Emergency Management Director
Lisa Wong, Town Administrator
Anne Capra, Director, Planning and Conservation
Robert Authier, Fire Chief, District 1
Todd Calkins, Fire Chief, District 2
Jeff Cyr, Superintendent, Water District 1
Timothy Cauley, Superintendent, Water District 2
Jennifer Gunderson, Police Chief
Mark McLaughlin, Superintendent, South Hadley Public Schools
Sean Fitzgerald, General Manager, South Hadley Electric Light Department
John Broderick, Highway Superintendent
Rebekah Cornell, Conservation Administrator

Pioneer Valley Planning Commission

Mimi Kaplan, Senior Environmental Planner
Derek Strahan, Senior Land Use Planner
Jake Dolinger, GIS Specialist

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CHAPTER 1 - PLANNING PROCESS

Introduction

The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) define natural 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, and similar occurrences. Mitigation efforts undertaken by communities help minimize damages to public buildings and infrastructure, such as water supplies, sewers and utility transmission lines, as well as private property and natural, cultural and historic resources.

Hazard mitigation planning, including this effort by the Town of South Hadley and the Pioneer Valley Planning Commission, is 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 adequately 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, and updating every five years, a local natural hazards mitigation plan before a disaster happens can save the community money and will 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 Hazard Mitigation Plan as a condition for mitigation funding. The Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the BRIC Program are FEMA funding opportunities with this requirement.

Hazard Mitigation Plan Workgroup

In 2024, the Town of South Hadley completed an update of their 2016 Local Natural Hazards Mitigation Plan, in collaboration with the Pioneer Valley Planning Commission. All portions of the plan were reviewed and updated as necessary. The list of planning area profile reflects changes in development to infrastructure as well as buildings, the risk assessment reflects a more current list of hazards, the critical facility list has been updated to reflect a current list of facilities and the mitigation action list was updated based on need and mitigation action implementation over the last five years. All aspects of this plan were reviewed and updated to reflect development in the town. Planning for hazard mitigation in South Hadley involved a Hazard Mitigation Committee comprised of representatives from the Town of South Hadley, both fire and water districts and the School Department.

- Sharon Hart, Emergency Management Director
- Lisa Wong, Town Administrator
- Anne Capra, Director, Planning and Conservation
- Robert Authier, Fire Chief, District 1
- Todd Calkins, Fire Chief, District 2

- Jeff Cyr, Superintendent, Water District 1
- Timothy Cauley, Superintendent, Water District 2
- Jennifer Gunderson, Police Chief
- Mark McLaughlin, Superintendent, South Hadley Public Schools
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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 2024 Hazard Mitigation Plan Update.

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

The planning process began with a kickoff meeting May 2, 2023 with the South Hadley Hazard Mitigation Plan (HMP) Update Committee and Mimi Kaplan, a senior planner with Pioneer Valley Planning Commission (PVPC). PVPC was retained by the Town to assist them with the planning process. Four additional committee meetings were held, as well as two public meetings. Details about the committee meetings and the public meetings are provided below.

Committee Meetings

Meetings of the Hazard Mitigation Planning Committee, all of which took place at the South Hadley Public Library, were held on the dates listed below. Sign-in sheets for each meeting are included in Appendix B. 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.

May 2, 2023

The Hazard Mitigation Committee reviewed a PowerPoint presentation that provided an overview of the planning process, discussed the list of hazards to consider and revised the hazard index ratings based on previous occurrence, impacts and probability of future events. There was considerable discussion of the impact of climate change on many of the hazards, which is resulting in both increasing frequency and magnitude of these hazards. The Committee began updating the critical facility list from the 2016 plan, to be completed at the following meeting. They also reviewed and approved the mitigation goal statement.

August 14, 2023

During this meeting, the Hazard Mitigation Committee finished updating the list of critical facilities and began updating the information about previous occurrences of all hazards in the Town. The committee discussed possible dates and locations for the first public meeting, as well as outreach strategies to Environmental Justice communities.

September 13, 2023

The Hazard Mitigation Committee finished updating the information about previous occurrences for all hazards at this meeting. They also began the mitigation capabilities assessment and reviewed the hazard mitigation and critical facilities map.

October 17, 2023

The Hazard Mitigation Committee completed the mitigation capabilities assessment. They then chose a date for the first public meeting, came up with an agenda for the meeting and made a plan for public outreach.

February 29, 2024

The Hazard Mitigation Committee reviewed the progress on previous mitigation actions and identified new mitigation actions. They also identified a timeline, responsible parties, estimated cost, and possible funding sources for each mitigation action.

Participation by Stakeholders

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

Local and Regional Agencies

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

- Developing Our Next Future: An Action Plan for Building A Smart, Sustainable and Resilient Pioneer Valley. “Our Next Future” was created to chart a course for a more vibrant, competitive, sustainable and equitable region. This is a regional plan, designed to achieve success through promoting collaboration of communities on a regional basis.
- 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.

- Collaborating with the Town of South Hadley on climate change mitigation, adaptation, and resilience measures through the Green Communities program and the Municipal Vulnerability Preparedness program.

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 South Hadley Hazard Mitigation Plan Update by PVPC ensured that the information from these plans was incorporated into the Hazard Mitigation Planning process.

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 South Hadley's 2024 Hazard Mitigation Plan Update process and encouraged to comment.

Participation by the Public and Neighboring Communities

Two public meetings were held as part of the mitigation planning process – on December 14, 2023 and _____. Public meeting outreach materials and notices can be found in the Appendix. Both meetings occurred after the Hazard Mitigation Committee had provided input on hazards impacting the Town and progress on previous mitigation strategies. A flyer and press release were developed prior to each meeting. Notice of both public meetings was posted in the Town Hall in compliance with the Commonwealth of Massachusetts' open meeting law.

The press release was sent to the following media outlets, WWLP, Hampshire Gazette, Channel 15, and the Town Reminder. The flyer was posted on the Town website, the Town Facebook page, at the Public Library, the Senior Center and in the Senior Center newsletter, and the Town Hall. It was also sent to all relevant boards and committees. An email was sent to the EMDs of all adjacent communities to invite them to attend the public meeting and participate in the South Hadley mitigation planning process. Emails with the flyer were also sent to the facilities director at Mt. Holyoke College, the Loomis Village Retirement Community, the Village Commons (mixed business and residential community), South Hadley Housing Authority, and Neighbors Helping Neighbors Food Pantry.

December 14, 2023 Public Meeting

Eleven people attended the first public meeting, held at the South Hadley Public Library on December 14, 2023. Four members of the Hazard Mitigation Committee were in attendance as well as six members of the public, and the Director of Facilities for Mt. Holyoke College, who had been invited to attend. Ms. Kaplan delivered a PowerPoint presentation that included an overview of natural hazards and climate change impacts and hazard mitigation planning, as well as a summary of the plan update. This was followed by a discussion period, in which there were a number of questions and comments from attendees.

December 4, 2024 Public Meeting -Add details after meeting

Neighboring Communities

Emails were sent to all neighboring communities before the public meetings, inviting them to attend and to provide input on the plan. The press releases also encouraged citizens and municipal officials from nearby communities to comment on South Hadley's plan by e-mailing or calling staff contacts at PVPC or the Town. The Pioneer Valley Planning Commission's regional scope ensured that residents and government officials throughout the Pioneer Valley saw the press releases and request for comments. No comments were received by any of South Hadley's neighboring communities.

Representatives of businesses, academia, and other private organizations

The South Hadley Public Schools were represented in the HMP planning process by the involvement of the Superintendent in the HMP working group. While he was not able to attend all of the meetings, he received all of the emails and was kept informed of the discussions and updates. The Director of Facilities for Mount Holyoke College, located in South Hadley, was invited to the public meetings and attended the first meeting.

Representatives of nonprofit organizations

Representatives of the South Hadley Housing Authority and Neighbors Helping Neighbors, a local food pantry, were invited to attend the public meetings and to provide comments on the draft plan. Representatives from Loomis Village, a non-profit retirement community in South Hadley that provides both independent and assisted living for seniors, were also invited to attend the public meetings and to review the draft plan. While not

Agencies that have the authority to regulate development:

The South Hadley Planning Board is the primary Town board responsible for regulating development in South Hadley. Other Town commissions, boards, and committees that have the authority to regulate development include the Zoning Board of Appeals, the Select Board, the Conservation Commission, and the Building Inspector. The participation of the Town Administrator and the Director of Planning and Conservation on the HMP Committee ensured feedback to the Select Board and to the Planning and Zoning Boards.

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:

- **South Hadley Comprehensive Emergency Management Plan** (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to identify those infrastructure components in Town that have been identified as crucial to the function of the Town; also, this resource was used to identify vulnerable populations as well as potential emergency shortcomings.
- **South Hadley Open Space and Recreation Plan (OSRP, 2019 Update)** - This Plan was used to identify the natural context within which 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.

- **South Hadley Municipal Vulnerability Preparedness Summary of Findings – Community Resilience Building Workshop (2019)** – The MVP planning process and report was used to identify climate resilience and natural hazard mitigation vulnerabilities and strategies.
- **South Hadley Master Plan (2020)** – The Master Plan identified goals and action items to increase resilience to climate change impacts and natural hazards that were incorporated into the HMP.
- **South Hadley Zoning Ordinance and Subdivision Regulations** –Zoning Bylaws and Subdivision Regulations were used to identify those actions that the town is already taking to reduce the potential impacts of a natural hazard (i.e. floodplain regulations).
- **Massachusetts’ State Hazard Mitigation Plan (2018 and 2023 plans)** - The state plan was used to ensure consistency with state identification of mitigation strategies, critical infrastructure, natural hazards, and impacts of climate change.
- **FEMA Flood Insurance Study for Hampshire County (1979)** - This report was released in 1979 as the most updated Flood Insurance Study (FIS) for Hampshire County. The FIS revises and updates information on the existence and severity of flood hazards for Hampshire County, including for South Hadley, however this report is quite outdated as the last update was 1979. The FIS and accompanying Flood Insurance Rate Maps (FIRMs) include data on flooding sources, FEMA flood zone designations, base flood elevations, and discharge rates of flooding sources. This data was reviewed and incorporated into the plan update process by informing the risk assessment for flooding.

Elements of the previous HMP were also incorporated into other Town plans and documents. It informed the Comprehensive Emergency Management Plan, the Municipal Vulnerability Preparedness planning process and Summary of Findings, and some sections of the Zoning Ordinance. It also informed the development of the Master Plan Update in 2020, and the OSRP update with utilization of information on flood hazards, erosion and sedimentation, among other data.

Plan Adoption

In 2023, the Select Board agreed to begin the process of updating the Town’s 2016 Hazard Mitigation Plan. Once the plan was provisionally approved by FEMA, the Select Board held a public hearing on the plan and adopted it on ____.

CHAPTER 2 – LOCAL PROFILE

Community Setting

The town of South Hadley is a richly diverse community that includes a varied range of housing, farms, light industry, and a nationally renowned college. South Hadley is located in Hampshire County, just north of Chicopee, south of Hadley, east of Holyoke, and directly west of Granby. Situated along the east bank of the Connecticut River in proximity to the Holyoke Dam and along the southern ridge of the Mount Holyoke Range, the Town enjoys a bounty of natural resources. The town consists of moderate slopes with elevations ranging from 250 feet above sea level to over 1000 feet in the northern portion of town in the largely undeveloped and natural Mount Holyoke Range. According to the 1999 MacConnell Land Use Data, the total land area of South Hadley is approximately 11,816 acres with roughly 26 percent of those acres as developed land. The remaining land is classified as undeveloped. Forest lands represent the largest portion of the undeveloped land, 5,688 acres, that accounts for nearly half of all land in South Hadley. Cropland is the second largest category of undeveloped land with 888 acres compared to pastureland, which represents the third greatest amount of undeveloped land in the town with 310 acres.

The Town's proximity to the major cities of Springfield, Holyoke and Chicopee, as well as the regional transportation network, has contributed to its growth and vitality. Historically, the Town has had two dominant centers – the area around Mount Holyoke College that includes the Village Commons, and the South Hadley Falls neighborhood. The Village Commons is a popular commercial district near Mount Holyoke College while South Hadley Falls is situated at the southwestern portion of the Town adjacent to the Connecticut River/Holyoke Dam, is a major center of employment, and has the densest residential development in Town. There is also a concentrated area of commercial development around the intersection of Route 116 and Route 33, including the Woodlawn Plaza on Newton Street and the Big Y Center on Willimansett Street.

Demographics

The town's population in 2020 was 18,150, an increase of 3.6% over the 2010 population of 17,514. The population density is 1,025 people per square mile. As of 2020, approximately 73.8% of housing units are owner-occupied, and the average household size is 2.56 individuals.

The racial composition of the town is 82.9% White, 5.2% Asian, 2.6% Black, and 3.0% of other races. A total of 6.3% of the population identified as being of two or more races, and 7.2% of the population identified as Hispanic or Latino of any race.

The largest segment of the population in 2020 was the 35-64 age category (35.1% of the population), as shown in Figure 1 below. The second-largest age category was aged 20-34 (22.2%), followed closely by 0-19 (21.4%) and 65+ (21.1%). The median age of South Hadley residents in 2020 was 40.7 years, which is slightly higher than the countywide (38.3 years) and statewide (39.9 years) medians. Older adults are more vulnerable to health impacts from natural hazards and climate change impacts, especially extreme heat and cold. Older adults living alone and living in poverty are most vulnerable. As of the 2020 U.S. Census, 31.7% of South Hadley residents over 65 live alone, which is higher than the countywide (28.6%) and statewide (27.4%) averages. In

addition, 4,081 adults 65 and over lived under the poverty line, according to the 2022 ACS 5-year estimates. This population is most at risk during extreme high temperatures, when they may not have cooling in their home or may not use it due to the cost.

According to the U.S. Census Bureau’s 2022 American Community Survey (ACS) 5-year estimates, the median household income in South Hadley is \$92,740. As of 2022, approximately 8.2% of residents live below the poverty level as of 2022.

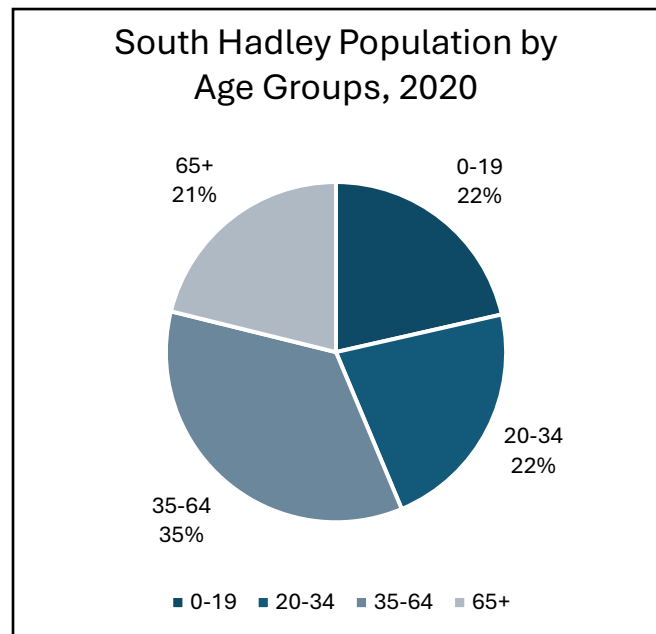
As of the 2020 Census, several portions of South Hadley are considered to be environmental justice communities. The state’s Office of Environmental Justice & Equity defines an environmental justice group as a neighborhood where one or more of the following are true:

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

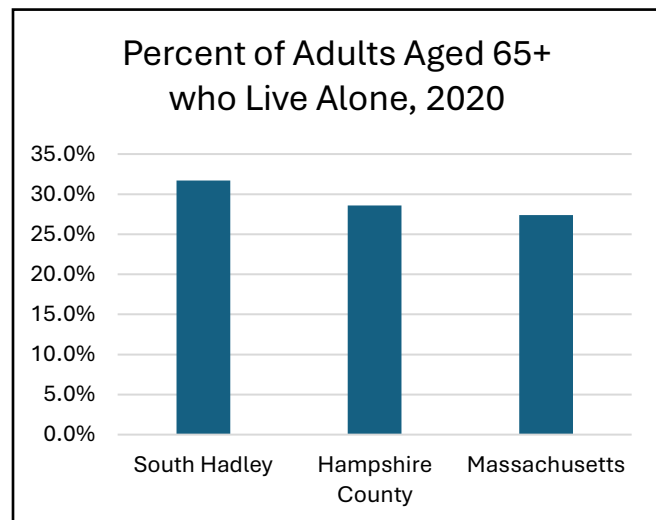
Based on these criteria, 2 of the 12 census block groups in South Hadley are environmental justice communities. Block Group 2 of Tract 8211.01 is an environmental justice community based on median

household income, which was \$54,870 as of the 2020 ACS 5-year estimates. This block groups is located in the southwestern corner of the town, in the area east of Route 116, south of Route 202, and west of Hillside Avenue, Michael Drive, and Memorial Drive. Block Group 1 of Tract 8212 meets the criteria based on minority population, which was 46.6% minority as of 2020, including 24.3% Asian. This block group covers the campus of Mount Holyoke College, and most of the population appears to consist of college students.

Figure 1: South Hadley Population by Age Groups



Source: U.S. Census Bureau



Source: U.S. Census Bureau

Infrastructure

Historically, the working landscapes of South Hadley have shaped the physical, economic, and cultural character of the community. The old mill buildings, forests and remaining farms continue to contribute to the economic and environmental well-being of the town.

Roads and Highways

South Hadley is connected to surrounding communities via four main arteries, Route 33, Route 47, Route 116 and Route 202. Route 116 runs north-to-south through South Hadley from Holyoke to Granby and Amherst. Route 202 runs southwest-to-northwest through town from Holyoke to Granby and adjacent communities. Both Routes 116 and 202 rely on bridge crossings into Holyoke for external links to surrounding communities with 116 relying on the County Bridge and 202 relying on the Muller Bridge. Secondary, but major, routes branch off of Route 116 to provide linkages to the north and south. Route 47 branches off of Route 116 in the center of town and travels north, over the Mount Holyoke Range, to Hadley (leading to Route 9 and connections to Northampton). Route 33 branches off of Route 116 at the intersection of Route 116 and Lyman street and travels south to Chicopee (and leads to the Mass Pike – Interstate 90).

Public Transportation

The Pioneer Valley Transit Authority operates four routes in South Hadley, although only Red 29 offers bus access from the north to the south end of the Town along route 116. Routes 38 and 39E only run from Mt. Holyoke north, and Route X90 offers limited service within South Hadley, between South Hadley Falls and Holyoke.

The Tiger Trolley route previously provided extensive local service within the town but this route has been eliminated. South Hadley Falls residents can use the X90 bus or the R29 bus for connections to the Holyoke transportation center, and there is also R29 service along Route 116.

The PVRTA Red 29 route provides access from Mount Holyoke College to Holyoke and Springfield. Service is provided 7 times each weekday generally between 7:00 a.m. and 10:00 p.m., with more limited service is provided on weekends. The only stop in South Hadley for this route is Mount Holyoke College. A bus shelter at Mount Holyoke College is also a stopping point for several other bus routes serving Amherst, Northampton and the five Colleges.

PVRTA Route 38 runs from and connects Mount Holyoke College to UMass (as well as Amherst College and Hampshire College) in Amherst. Service is provided approximately every 30 minutes from 7:00 a.m. until almost midnight on weekdays. However, service varies for particular days, weekends, and during winter. This service also offers the opportunity to connect to Smith College, Atkins Farm, and the Notch Visitor Center as well as other locations in the communities of Amherst, Hadley, and Northampton.

PVRTA Route 39E offers a loop service connecting Mount Holyoke College to Hampshire College and Smith College. Similar to Route 38 in its purpose and function, this route service is provided approximately every 30 minutes from 7:00 a.m. until almost midnight on weekdays. However, service varies for weekends and during winter. This service also offers the opportunity to connect to UMass in Amherst via a connection to Route 38.

The Council on Aging provides support for van service in and around town for people with disabilities and senior citizens for a nominal fee. The van was donated to the Town by Friends of South Hadley Elderly, Inc.

Public Drinking Water Supply

Fire protection and municipal water service is provided throughout South Hadley by the two independent Fire Districts and their water departments. The inhabitants of the Town of South Hadley derive their potable water supply from both surface and ground water sources, administered by two separate political bodies, Fire Districts #1 and #2. District #1 serves approximately 70% of the Town's population, as well as sections of both Granby and Ludlow under a contract to purchase water from the Quabbin Reservoir. Within this district, two water sources, Leaping Well and Buttery Brook Reservoirs, were abandoned in 1950 due to poor water quality in favor of the currently operated hookup to Quabbin via the Chicopee Valley Aqueduct system which went on line in 1952.

The northern half of the Town lies in Fire District #2 and receives its drinking water from the District's wells located off Sullivan Lane on Dry Brook Hill. The water supplied from District #2 is pumped from the 108-foot-deep Dry Brook Well, which is comprised of saturated sand and gravel deposits sandwiched between the approximately 80 feet of confining clay layer above and impervious bedrock below. A Water Supply Protection District (§ 255-35 of the South Hadley Zoning By-Law) was established in 1992 to protect and preserve the quality and quantity of surface and ground water in this area of Town. The District prohibits certain uses that would be detrimental to the groundwater supply. The two independent districts have seven interconnections which allow them to feed each other during an emergency.

Almost all of South Hadley residents are on the municipal water supply. According to the water departments, less than 60 households in the Town have private wells.

South Hadley does not have any non-community water systems or non-transient non-community (NTNC), but has one transient non-community water systems (TNC) – Skinner State Park.

Sewer Service

South Hadley currently operates a wastewater treatment plant that serves approximately 6,700 households, including an estimated 289 in Chicopee and 285 in Granby. Additionally, over 200 commercial and industrial customers in South Hadley and several in Granby are served by the plant. An average of 2.3 million gallons of raw sewage is treated daily. Although most of the Town is serviced by the public sewer system, nearly all of the area north of Bachelor Brook is handled by private septic systems. This is largely due to the prohibitive cost of installing sewer infrastructure along the changing topography in the northern areas at the foot of the Mt. Holyoke Range. The installation of a 30-inch sewer trunk line along the Connecticut River in 1976 resulted in the expanded residential development of the Alvord Street corridor in an area of prime farmland.

Schools

South Hadley has a number of both public and private educational institutions at all levels. These South Hadley Public Schools include South Hadley High School, Michael E. Smith Middle School, Mosier School and Plains School. The Pioneer Valley Performing Arts Charter Public School is

located in South Hadley but draws students from around the region. The Berkshire Hills Music Academy is a school for adults with intellectual disabilities. Mount Holyoke is a renowned women's college that houses a population of more than 2,000 students that come from across the country and the world.

Natural Resources

The following information in the Natural Resources section was excerpted from the South Hadley Master Plan (2020) or from the South Hadley Open Space and Recreation Plan (2019).

South Hadley's landscape varies from the steep, forested mountainsides of the Mount Holyoke Range to the broad, flat alluvial floodplains of the Connecticut River. These two resources have shaped the growth of South Hadley from its founding in 1753 to the present day. In the earliest years of settlement, farming and forestry provided residents with income and nourishment. As time wore on and the industrial revolution flourished, the town embraced many new technologies that capitalized on the Connecticut River's vast reserves of unused potential and kinetic energy. Construction of the South Hadley Canal facilitated development of an industrial sector in the South Hadley Falls neighborhood. Industry has since retreated from its peak, but the roads and neighborhoods that grew and developed as the town shifted, expanded and changed still guide residential and commercial growth and development in town.

Water Resources

South Hadley's water resources include rivers, brooks and streams, extensive wetlands, and several ponds. The abundance of water resources is also reflected in the reliable availability of groundwater for municipal water supplies.

Lakes and Ponds

There are seven lakes and ponds in South Hadley. At the base of the Mount Holyoke Range lies the Lithia Springs Reservoir (formerly a source of drinking water for Fire District #2) which is now part of the Mount Holyoke Range State Park. Within the Mount Holyoke College campus are the Upper and Lower Lakes, parts of the Stony Brook watershed. Leaping Well Reservoir, formerly a source of drinking water for Fire District #1, is along the south side of Granby Road in the southern portion of the community. Smaller ponds include Black Stevens Pond, Titus Pond, Hillcrest Pond, and a few unnamed ponds in the Bynan Conservation Area, which in recent years have only seasonally held water. All of these smaller ponds are experiencing significant eutrophication and sediment accumulation.

Many other smaller bodies of water are scattered across the landscape of South Hadley primarily located along streams and in wooded areas. Most of the 452 acres of open water in South Hadley are comprised of these small ponds and lakes. These water bodies offer valuable wildlife habitat, unique natural environments, and provide benefits to South Hadley's human inhabitants in the form of prime recreational opportunities and water supply.

Rivers and Streams

South Hadley lies entirely within the Connecticut River Watershed. Most of the Town's drainage stays within Town boundaries before emptying into the Connecticut River. South Hadley has six major streams. Several streams flow generally east to west through South Hadley to the Connecticut River. Bachelor Brook and Stony Brook are two major waterways which flow westward from neighboring Granby to the Connecticut River. Elmer and Dry Brooks run south and westward from the slopes of the Mount Holyoke Range to the River. The Town is also home to Leaping Well Brook, Newton Smith Brook and Judd Brook although these streams and their contributing watersheds are not especially well-documented. Finally, White and Buttery Brooks feed into the Connecticut River from wetlands in the south section of Town.

There are 1,973 acres of land within Office of Geographic Information (MassGIS) riparian corridors in South Hadley. There are 1,571.4 acres of land in town within the 200-foot Rivers Protection Buffer Area and 828.5 acres of land in the 100-foot river buffer. The Rivers Protection Act protects the significant rivers and streams in South Hadley. The Rivers Protection Act offers additional protection of lands in the area within 200-feet of the mean high water mark of a perennial stream or river. Development within this 200-foot riverfront area requires proof that there is "no practicable or substantially equivalent economic alternative" with less adverse impacts. South Hadley currently does not have a local rivers protection bylaw. Riparian areas are those vegetated lands adjacent to streams and rivers. This juncture of land and water attracts a range of species and tends to mark a transition zone between habitats. As such, these corridors link one habitat to another.

The value in maintaining vegetative cover and uninterrupted riparian corridors goes beyond wildlife preservation. These corridors and wetlands provide many other significant public health benefits for the entire community. These benefits include:

- Flood mitigation for agricultural crops and structures by storing and slowing runoff;
- Water supply protection, through filtration of pollutants. (Studies by the Environmental Protection Agency show that over 75% of phosphorus and nitrogen can be filtered in riparian areas adjacent to farmland)
- Erosion control by absorbing and slowing down storm runoff, these storage areas reduce erosion that results from fast flowing water;
- Groundwater replenishment;
- Stormwater management and regulation of water levels in watersheds;
- Open space corridors and recreational opportunities, such as fishing, boating, and hunting.

Wetlands

There are approximately 97.2 acres of wetlands in South Hadley. Wetland habitats in town occur primarily along the streams and rivers as well as in lands adjacent to the major ponds. If open waters are included in this accounting, the total acreage of wetlands in South Hadley rises to 549.1 acres. Development of wetland areas in South Hadley is limited by the Massachusetts Wetlands Protection Act.

The Commonwealth of Massachusetts regulates activities in and within 100-feet of wetlands in South Hadley through the Wetlands Protection Act, a state law enforced by the local Conservation Commission. In 2005, South Hadley Town Meeting adopted a local Wetlands Bylaw which provides

more significant protection for wetlands and wetland buffer zones than afforded by the Massachusetts Wetlands Protection Act. The local bylaw provides additional protection for vernal pools, intermittent streams, and the buffer zone. It includes a 50 Foot conservation (or non-disturbance) zone. The bylaw allows for some exemptions including for public safety, handicapped accessibility, and community enhancement. The Attorney General Office subsequently approved the Bylaw and in 2011, the Conservation Commission enacted Rules & Regulations providing for administrative procedures for its implementation and administration.

Wetlands are areas that contain surface water or have high ground water for all or some part of the growing season. In Massachusetts, inland wetland resource areas include rivers and streams, lakes and ponds, swamps, wet meadows, bogs, beaver ponds, vernal pools, and land within the FEMA-defined 100-year flood area. Massachusetts also protects Riverfront Area, defined as the area extending out 200-feet horizontally from the banks of perennial streams and rivers. Wetlands, including water bodies, are home to amphibians, fish, mollusks, reptiles such as turtles, mammals such as beaver, muskrats, and moose, and birds such as ducks, geese, herons and bitterns. Many other animals and insects do not live in wetlands but are dependent upon them for food, such as the bald eagle.

Wetlands are protected for their eight functions: protection of public and private water supply, protection of ground water supply, flood control, storm damage prevention, prevention of pollution, protection of land containing shellfish, protection of fisheries, and protection of wildlife habitat. The most common wetlands protected by the Wetlands Protection Act are the vegetated wetlands that border rivers, streams, ponds and lakes. These 'bordering vegetated wetlands' provide critical wildlife habitat. They also play a critical role in maintaining water quality by serving as natural filters for nutrients, toxins, and sediment that would otherwise move directly into surface and ground waters. Wetlands also serve as temporary storage areas for flood waters, allowing the water to percolate slowly into the ground rather than run off quickly and violently into streams and developed areas.

Beaver Dams

Beaver activity has been increasing over the past decade. Several wetland areas have been flooded by beaver dam construction. As a result, their vegetation has changed from forested wetland to marshy habitat. Sometimes beaver activity is detrimental to property, causing problems for local landowners (e.g., flooding of wells, septic systems, lawns, out-buildings, and roadways). Affected individuals must contact the Board of Health and Conservation Commission for advice and permission to alleviate the beaver problem. In general, beavers have not caused significant flooding problems in Town. If necessary, beavers are trapped and moved, if moving a beaver when it isn't trapping season then an emergency permit is issued to trap the beaver.

Floodways

The 100-year floodplain is defined as an area with a 1% chance of flooding in any given year. The floodplain serves as a critical habitat for many plant and animal species and provides some of the most fertile soils in the region. Areas in the 100-year flood zone in South Hadley are primarily those lands adjacent to the Connecticut River, Bachelor Brook and Stony Brook and portions of their immediate tributaries (such as a portion of BATTERY Brook), shown in the Figure below. Not including open water areas, there are 622 acres of 100-year floodplain in Town, totaling 5.5% of the Town's

land area. 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.

Protective regulations and disincentives that limit development in the floodplain exist at several levels – private and public. For example, lending institutions require flood insurance for those structures built in the 100-year flood zone. The consumer cost of the federally supported National Flood Insurance Program (NFIP) has historically been relatively inexpensive, however with increasing flooding events due to climate change, the cost is rising and some prospective homeowners do not want to take on this additional cost. In addition, the Massachusetts Wetlands Protection Act and the South Hadley Wetlands Bylaw limit the impacts of construction and alteration activities in the floodplain through enforcement by the Conservation Commission. Moreover, South Hadley’s zoning bylaw is an additional regulatory layer that can control development in these critical areas. South Hadley’s Floodplain regulations prohibits fill and requires floor levels to be above the designated 100-year flood elevations. Finally, the State Building Code requires the elevation of structures in the floodway—the floor of the lowest habitable area in the structure must be above the base elevation for floodwaters during a 100-year storm event. The code also reinforces the overlay district regulations by prohibiting any change in the flood storage capacity of the area.

Forests

Forest cover is by far the most prominent land cover in South Hadley. South Hadley’s map of existing land use shows the extensive range of these forestlands. They encompass approximately 6,429 acres, which comprises 54% of the total land area in the Town (source: MassGIS, 2016 Land Cover/Land Use). Over 100 acres of South Hadley forestlands are protected under the Forest Legacy program. Wooded areas are habitat for bears, coyotes, deer, grouse, woodpeckers, squirrels, porcupines, and deep wood songbirds such as wood thrush, scarlet tanager, and veery. These significant forest resources provide a benefit to wildlife and residents of the community. Protecting and enhancing these resources can provide long term economic benefits as well as providing protection for the diversity of wildlife species that are fully dependent on the forestlands.

Development in South Hadley

Several factors have played, and will continue to play, an important role in the development of South Hadley. These include: the existing development pattern and availability of land for future development; the present road network; physical factors such as steep slopes, soil conditions, land set aside for conservation, the Connecticut River, its tributaries and floodplains; and the availability of utilities such as public water and sanitary sewers. These factors have an impact, both individually and cumulatively, on where and how development occurs.

Zoning and other land use regulations constitute a town’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 a significant 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.

Current Development Trends

There has been a small amount of new residential and commercial development since the last HMP. Since 2020, there has been an average of 17 building permits issued per year for new construction. This new development has not been concentrated in any particular area of the Town. However, there are significant sections of the Town that are permanently protected or regulated from development through local, state and federal environmental protection laws. This includes the southern slope of the Mount Holyoke Range, Connecticut River waterfront, a network of brooks and streams, a significant number of publicly protected open spaces.

An estimated 31% of South Hadley is estimated to be public or protected open space, much of which is open for passive recreation on established trails. Within South Hadley Falls, 46% of the area is within Biomap2 Critical Natural Landscape, Biomap2 Core Habitat, and/or an NHESP Primary Habitat for Rare Species. Open water or wetlands make up 11% of the town’s land area, and an additional 17% is within the highly regulated 200’ Riverfront Area. Overall, an estimated 58% of land is affected by these constraints. In some cases, these constraints totally prevent any new development, while in other cases it may push it to one part of a site.

The following table details all of the recent new residential construction in South Hadley, or development that is in the planning stages.

Table 1: New Residential Construction in South Hadley

Street	Project	# Units
Lyman Street (99)	The Clover – Wayfinders 40R Plan Approval	60-unit affordable housing apartment building; construction to commence 2025
Lyon Green	Mountain Brook Subdivision – Phase II	19 single-family units, detached Buildout to be complete 2024
Skinnerwoods Way	Skinnerwoods Flexible Development Special Permit	10 single-family units, detached Buildout to be complete 2025
Bardwell Street (27)	Former Gaylord Library Condominium Conversion Special Permit	5 single-family units, attached Buildout completion date TBD
Bridge Street (36)	Mixed Use - Luis Builders – Site Plan Review	5-unit multifamily & commercial storefront; construction not initiated
Hadley Street	North Pole Estates Subdivision, Phase I (preliminary plan included multiple phases totaling 59 units)	Denied, under appeal in Superior Court; 8 single-family units, detached; excavation of 497,000 cu.yds. soil in Dry Brook Aquifer Zone II
Brockway Lane (116)	Conversion of single-family to two-family Special Permit	Construction completed
Lithia Springs Road	Creation of 4 ANR lots endorsed	3 single-family homes constructed

Street	Project	# Units
Park Street (88)	Creation of 2 ANR Lots endorsed	2 single-family homes constructed
McKinley Ave	Special Permit for new 2-family	Permit denied

New commercial and industrial development remains limited and generally focused along existing arterial roadways. Some noteworthy projects, inclusive of redevelopment expansions, include the following:

Table 2: New Commercial and Industrial Development in South Hadley

Street	Project	Status
Gaylord Street (25)	EINK – Special Permit for expansion of industrial manufacturing facility	Construction delayed
Gaylord Street (27)	Fuel Services Inc – Site Plan Review for expansion of parking garage for commercial delivery fleet	Construction completed
Newton Street (501)	Rocky’s Ace Hardware – Site Plan Review for new construction commercial hardware store and garden center	Construction commenced July 2024
Newton Street (468)	People’s Bank – Site Plan Review and Special Permit for new bank	Construction completed
Granby Road (459)	Redevelopment to Delany’s Market	Construction completed
Conti Drive	New Commercial Building - Site Plan Review	Construction not initiated
Old Lyman Road	New Commercial Building – Site Plan Review	Construction completed
Willimansett Street (84)	New walk up ATM – Special Permit	Construction completed
Memorial Drive (2078)	Redevelopment commercial storefront to dental office – Special Permit	Construction completed

Within the realm of community planning, zoning and conservation, several initiatives have been completed or are underway in support of sustainable development:

- Updated to the 2016 Housing Production Plan (2022)
- Update to the 2010 Master Plan (2020)
- Adoption of an Accessory Dwelling Unit Bylaw (May 2024)
- Completion of a study of the Routes 202 and 33 corridor and initiation of re-zoning recommendations to promote mixed use development along the corridor while protecting the character of the residential neighborhoods in this part of town which were constructed in the 1950s and 60s
- Façade Improvement Grants awarded to small businesses for capital improvements in business districts

- Construction of new Dog Park, Mulligan Drive
- 210-acre Agricultural Preservation Restriction on Lauzier Farm, Alvord Street
- Acquisition of 20 acres at 315 Amherst Road for conservation
- Construction of new Senior Center at 45 Dayton Street

Impact of new development on South Hadley’s vulnerabilities to natural hazards:

According to the planning department, all new development has occurred outside of flood prone areas. The two properties with expansions on Gaylord Street do have flood zones on their properties but the expansions were outside of those areas. Both properties are part of the former Rexam Graphics manufacturing plant, and the current owners have worked steadily to remove or repurpose the former mill infrastructure and improve stormwater management on site.

The Town updated their Stormwater Management Bylaw in 2020 to address the impacts of climate change. Developers are required to use the most current precipitation and storm frequency data when sizing stormwater systems. However, very few projects trigger the 1 acre of disturbance threshold. There were approximately 4 Stormwater Management Permits issued between 2017-2024.

South Hadley Zoning Districts

South Hadley has twelve base zoning districts and five overlay districts, see the Zoning Map in the Figure below. The base districts define the allowed uses and dimensional requirements in all parts of the Town, while the overlay districts provide for additional restrictions in certain areas. These districts are described below.

Residence A-1 (Low-Density Residential)

The purpose of this district is to allow residential and compatible uses, including new development that is in character with existing predominantly single-family housing, while preserving natural open spaces for their scenic quality and for ecosystem services, protection of water resources, recreation, agriculture, and forestry. Approximately 30% of the zoned land in South Hadley is Residence A-1.

Residence A-2 (Medium-Density Residential)

The purpose of this district is to allow medium-density residential and compatible uses within developed areas of the town and to provide for new development within proximity of these developed areas that is in character with existing housing, which is predominantly single-family in nature. Approximately 10% of the zoned land in South Hadley is Residence A-2.

Residence B (Village Residential)

The purpose of this district is to maintain the traditional character, scale, density, design, and mix of housing types that characterize the residential portions of South Hadley’s historic villages. Approximately 1.5% of the zoned land in South Hadley is Residence B.

Residence C (High Density Residential)

The purpose of this district is to accommodate relatively dense residential development, especially multi-family development in a limited number of locations. Approximately 0.5% of the zoned land in South Hadley is Residence C.

Agricultural

The purpose of this district is to promote agriculture, forestry, recreation, and land conservation, as well as compatible open space and rural uses, by siting development in a manner that preserves large contiguous tracts of open space and agricultural land. The preservation of scenic vistas of open land, forestland, the Mount Holyoke Range, the Mount Tom Range, and the Connecticut River in this district is a key aspect of maintaining South Hadley's desired scenic and rural identity. Approximately 51% of the zoned land in South Hadley is Agricultural.

Business A-1 (General Business)

The purpose of this district is to create vibrant commercial areas while minimizing impacts on roads and residential districts. Approximately 1% of the zoned land in South Hadley is Business A-1.

Business A (Neighborhood Business)

The purpose of this district is to allow a mix of business and residential uses along major corridors where the surrounding context is predominantly residential. Approximately 0.2% of the zoned land in South Hadley is Business A.

Business B (Village Center Mixed Use)

The purpose of this district is to maintain the traditional scale, density, design, and mix of uses that characterize South Hadley's historic village centers and in other areas intended to develop with a similar village character, including a wide range of business uses, low-impact manufacturing, and residential use. Approximately 0.3% of the zoned land in South Hadley is Business B.

Business C (Planned Business)

This purpose of this district is to provide development methods that accommodate large scale businesses, while mitigating impacts on pedestrians and traffic. Approximately 0.7% of the zoned land in South Hadley is Business C.

Industrial A

The purpose of this district is to allow low-impact industrial and business uses. Approximately 2% of the zoned land in South Hadley is Industrial A.

Industrial B

The purpose of this district is to allow industrial and business uses with a greater impact than those permitted in Industrial A. Approximately 0.5% of the zoned land in South Hadley is Industrial B.

Industrial Garden

The purpose of this district is to allow low-impact industrial uses, as well as compatible business uses and public-private recreation in a setting with high quality design that preserves natural scenic beauty. Approximately 2.5% of the zoned land in South Hadley is Industrial Garden.

Overlay Districts

South Hadley's Overlay Districts further regulate land use within the community. These include:

Water Supply Overlay District

The purpose of this overlay district is to promote the health, safety and welfare of the community by protecting and preserving the surface and groundwater resources of the Town and the region from any use of land or buildings which may reduce the quality and quantity of its water resources.

Adult Entertainment Use Overlay District

The purpose of this overlay district is to prevent the deleterious effects that Adult Entertainment uses have on the community and adjacent areas; to prevent the secondary effects associated with such uses; to protect the health, safety, and general welfare of the present and future inhabitants of the Town; and to provide for regulation of such uses without suppressing any speech or expression activities protected by the First Amendment.

South Hadley Falls Overlay District

The purpose of this overlay district is to encourage redevelopment of South Hadley Falls in a manner consistent with its historic urban pattern.

South Hadley Falls Smart Growth District

Similar in purpose to the South Hadley Falls Overlay District, this Smart Growth District was enacted under the provisions of Chapter 40R of MGL and is limited to a more defined portion of the Falls area. It also provides for higher density residential and mixed-use development by right subject to a Plan Review including Design Review.

Newton Street Smart Growth District

Like South Hadley Falls Smart Growth District, this district provides for residential development and encourages mixed-use development, promotes development that is pedestrian friendly and provides for diversified housing stock, including affordable housing, and encourages preservation and rehabilitation of historic structures.

National Flood Insurance Program (NFIP)

The town of South Hadley participates in the National Flood Insurance Program. According to FEMA, as of June 13, 2023, there were 47 policies in effect in South Hadley for a total of \$24,489 in premium and policy fees, and a total net payment of \$124,607.43. There were four repetitive loss properties. These structures were all single-family homes that were initially lost in 1984 and then lost again in 1987. There are no recent instances of repetitive loss properties. South Hadley entered the NFIP in 1974, and their current NFIP map is dated August 15, 1979¹. New flood maps for the Town are currently in development and are due to be released in late 2024. This information is also provided in Table below, along with additional information about South Hadley's participation in the NFIP.

The town is not a member of the Community Rating System (CRS), which entitles policyholders to a discount on flood insurance premiums. The CRS reduces flood insurance premiums to reflect what

¹ <http://www.fema.gov/cis/MA.html>

a community does above and beyond the National Flood Insurance Program’s (NFIP) minimum standards for floodplain regulation. The objective of the CRS is to reward communities for flood mitigation efforts, as well as to provide an incentive for new flood protection activities.

While the town sees the value in participating in the CRS program, the requirements of the CRS are too burdensome for the town to pursue currently. Limited staff time and funding makes pursuing the CRS challenging, and given the relatively low number of recurring loss properties in the Town, singular participation in the program would not likely be cost-effective. The Town does, however, sees potential benefit in a regional effort. A regional effort would require partnering with other communities and the Pioneer Valley Planning Commission to pool resources in order to fulfill the CRS requirements. For example, a region-wide public information campaign could be created and used by multiple communities, as opposed to each community creating their own to fulfill the community outreach component of the CRS. If a regional CRS program could be created, South Hadley would consider participating.

The NFIP has produced maps that identify floodways across America. According to the NFIP maps South Hadley does not have any V-Zone properties and they have sixteen A-Zone properties. The following areas have been designated as floodways in South Hadley:

- Bachelor Brook—Pearl Street south along Route 47, Moody Corner to the Connecticut River, Pearl Street to the South Hadley Town Line;
- Stoney Brook—Town Line to Granby Road continuing on to the Mount Holyoke Campus Ponds continuing on to Route 116 and draining into the Connecticut River between Ferry and Alvord Streets;
- Connecticut River—Smith’s Ferry area, the majority of the Town’s western boundary, most especially within the White Brook Area;
- South Hadley’s Town Center is located within the Connecticut River’s 100 year flood plain, which places the Town Police Station and the Town Hall in a flood-prone area.

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 floodplain and FEMA Flood Insurance Rate Map.

The following table summarizes South Hadley’s participation in and compliance with the NFIP, including NFIP policy and claim statistics as of 2023.

Table 3: Town Participation in and Compliance with the NFIP

NFIP Topic	Sources of Information	Comments
Number of NFIP policies in the community and total coverage.	FEMA NFIP Services	As of March 2023, a total of 47 NFIP policies with a total premium amount of \$24,489.00.
History of claims and insurance payments.	FEMA NFIP Services	There have been a total of 24 NFIP claims for which \$124,607.43 has been paid.

NFIP Topic	Sources of Information	Comments
Repetitive Loss Properties	FEMA NFIP Services	There are four repetitive loss properties with a total of eight losses. These structures were all single-family homes that were initially impacted in 1984 and then again in 1987. There are no recent instances of repetitive loss properties. Total building payments for RL properties are \$51,345.85 and total content payments of \$18,378.25
Format and location of FIRMS	Community	Hard copies of the FIRM are on file with the Town Clerk, Planning Board and Building Commissioner.
Date the community entered the NFIP and date of most recent FIRMS	FEMA NFIP Services	South Hadley entered the NFIP in 1974. FIRMS have been effective since 1979 with the current map in effect since August 15, 1979. New flood maps for the Town are currently in development and expected to be completed by December 2024.
Number of structures exposed to flood risk within the community	GIS Analysis	There are an estimated 525 structures within the SFHA and thus exposed to flood risk. Some of these may be garages, barns or other outbuildings.
Areas of flood risk with limited NFIP policy coverage	GIS Analysis, FPA	There is not address-specific data available from FEMA, but it is likely that property owners in the SFHA are underinsured, based on the number of properties in flood zones and the fact that there are only 47 current NFIP policies.
NFIP Administration in the community	Community	The Town complies with the NFIP by enforcing floodplain regulations, maintaining current floodplain maps, and providing information to property owners and developers about floodplain regulations and building requirements. Floodplain regulations are administered through the enforcement of the Town's zoning bylaws, by the Planning Board, the Conservation Commission, and the Building Inspector.
NFIP compliance	Community, FEMA NFIP program	The Town is in good standing with the NFIP, and there are no outstanding compliance issues. The Town will maintain compliance with the NFIP throughout the next 5-year hazard mitigation planning cycle by monitoring its Floodplain Zone and ensuring that this zoning district accurately reflects the 100-year floodplain and FEMA Flood Insurance Rate Map.

NFIP Topic	Sources of Information	Comments
Adoption of NFIP minimum floodplain management criteria via local regulation.	Community	Zoning Bylaw, Section 8, Floodplain District
Adoption of the latest effective Flood Insurance Rate Map (FIRM), if applicable	Community	Zoning Bylaw, Section 8. The Floodplain District is established as an overlay district. The Flood Plain District includes all special flood hazard areas designated as Zone A, A1-30 on the South Hadley Flood Insurance Rate Maps (FIRM), and all areas within the limits of the 100 year flood boundary indicated on the Flood Boundary and Floodway map, said maps dated August 15, 1979 and having been placed on file with the Town Clerk, Planning Board and Building Commissioner.
Appointment of a designee or agency to implement the addressed commitments and requirements of the NFIP	Community	There is currently not a designated Floodplain Administrator in South Hadley. The Building Inspector and Planning Department work together to implement the NFIP requirements.
Implementation and enforcement of local floodplain management regulations to regulate and permit development in SFHAs.	Community	Floodplain regulations are administered through the enforcement of the Town's zoning bylaws, by the Planning Board, the Conservation Commission, and the Building Inspector.
Description of how participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event.	Community	The Town implements the SI/SD provisions of its floodplain management regulations as required per the NFIP (CFR Title 44, Parts 59 - 65) and Massachusetts State Building Code (780 CMR). The Town will also coordinate with State Flood Hazard Management Program staff to assure that proper practices are followed and that a post-disaster plan will be in place to implement all SI/SD provisions.

CHAPTER 3 – HAZARD IDENTIFICATION & RISK ASSESSMENT

The following section includes the identification and risk assessment of natural hazards that have affected or could affect South Hadley. In updating this section, the HMP committee considered the hazards identified in the previous plan, the 2018 and 2023 State hazard Mitigation and Adaptation Plan (SHMCAP), as well as the results of the Town’s Municipal Vulnerability Preparedness (MVP) planning efforts completed in 2020 and the Master Plan adopted in 2022. Also considered in developing this assessment was historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases. The top four natural hazards identified in the MVP planning process were flooding, ice and snow, drought and extreme precipitation, and severe storms.





The identified hazards affecting South Hadley are the following:

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

The 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) identified the natural hazards that can occur in the state along with the climate change interaction for each, and the representative climate change impacts. The one hazard without a climate change interaction is earthquakes. These are shown in Table below from the SHMCAP.

All hazards identified in the SHMCAP were considered, however, some of the hazards were not included in the plan as they do not apply to South Hadley, or the committee did not consider them to be significant risks. Given South Hadley’s inland location, coastal hazards and tsunamis would not affect the Town. The core team did not include landslides in their natural hazard inventory, as they have not previously occurred in the town. The plan also does not include invasive species as a natural hazard, although they are identified as a vulnerability. It is assumed that the entire Town of South Hadley and its critical facilities are exposed to earthquakes, high wind events, hurricanes, winter storms, snow and ice, temperature extremes, and drought, to a similar extent. Flood risk from riverine flooding is elevated in the vicinity of flood zones.

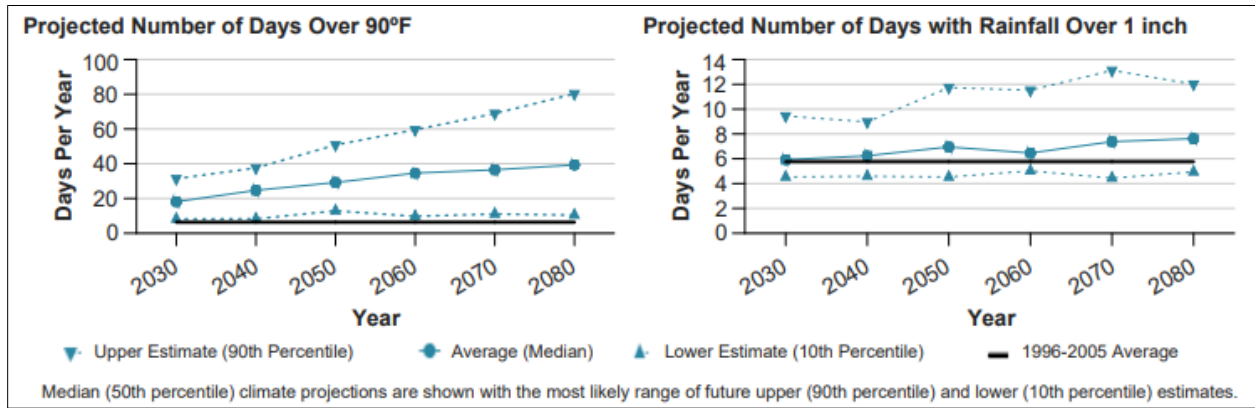
Table 4: Natural Hazards and Climate Change Interaction

Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions	Representative Climate Change Impacts
 <p>Changes in Precipitation</p>	Inland 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	
	Landslide	Rising Temperatures, Extreme Weather	
 <p>Sea Level Rise</p>	Coastal Flooding	Extreme Weather	Increase in tidal and coastal floods, storm surge, coastal erosion, marsh migration, inundation of coastal and marine ecosystems, loss and subsidence of wetlands
	Coastal Erosion	Changes in Precipitation, Extreme Precipitation	
	Tsunami	Rising Temperatures	
 <p>Rising Temperatures</p>	Average/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
	Wildfires	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
 <p>Extreme Weather</p>	Hurricanes/Tropical Storms	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	Rising Temperatures, Changes in Precipitation	
	Tornadoes	Rising Temperatures, Changes in Precipitation	
	Other Severe Weather (Including Strong Wind and Extreme Precipitation)	Rising Temperatures, Changes in Precipitation	
Non-Climate-Influenced Hazards	Earthquake	Not Applicable	There is no established correlation between climate change and this hazard

The data shown below in Figure 3 gives the projections for the annual number of days over 90°F and the number of days with rainfall over 1 inch for South Hadley. This data from Resilient.mass.gov gives projections ranging from the lowest estimates (10th percentile) to the highest estimates (90th percentile) depending on emissions scenarios, as well as the average. By 2080, South Hadley could experience up to 80 days per year above 90°F and up to 13 days per year with rainfall over 1 inch. While these changes in temperature and precipitation will directly impact flooding and extreme

temperatures (particularly high temperatures), research indicates that temperature increases will likely increase the frequency and intensity of strong storms such as hurricanes.

Figure 3: Climate Change Projections for South Hadley



Statewide and Regional Climate Change Impacts

[The Massachusetts Climate Change Assessment report](#) was issued in December 2022. This report provides region-specific data and analysis of climate change impacts for each of the seven regions of the Commonwealth. South Hadley is within the “Greater Connecticut River Valley” region. The report identifies the most urgent impacts to five sectors (Human, Infrastructure, Natural Environment, Governance, and Economy) for the Greater Connecticut River Valley Region. Figure 4 below shows the top two or three most urgent impacts per sector.

Figure 4: Most Urgent Regional Climate Change Impacts



Source: 2022 Massachusetts Climate Change Assessment

The Town of South Hadley has been subject to a number of federal disaster declarations along with all of Hampshire County. Some of these disaster declarations also correspond to emergency declarations in Massachusetts that applied to all or part of the state. Table below lists all of the Massachusetts emergency declarations since 2011 that have applied to South Hadley, along with the corresponding federal disaster declarations that applied to South Hadley.

Table 5: Massachusetts Emergency Declarations and Federal Disaster Declarations affecting South Hadley

Massachusetts Emergency	Start	Termination	Corresponding Federal Disaster Declaration	FEMA Public Assistance	Application to South Hadley
Hurricane Lee	9/15/2023	9/16/2023	NA	NA	Yes
Severe Weather and Flooding	9/12/2023	9/16/2023	NA	NA	Yes
Covid-19 Pandemic	3/13/2020	5/11/2023	DR-4496-MA	All counties	Yes
Severe Winter Storm, Snowstorm, and Flooding	2/8/2013	2/9/2013	DR-4110-MA	All counties	Yes
Severe Snow and Snowstorm	10/29/2011	10/30/2011	DR-4051-MA	Middlesex, Worcester, Hampden, Hampshire, Franklin, Berkshire	Yes
Tropical Storm Irene	8/27/2011	8/29/2011	DR-4028-MA	Barnstable, Dukes, Plymouth, Bristol, Norfolk, Hampden, Hampshire, Franklin, Berkshire	Yes

Natural Hazard Analysis Methodology

The hazard profiles were updated with information from the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP; EEA and EOPSS, 2018), the Town’s MVP community resilience building process and related report and additional research and assessment conducted by the project team. The HMP Committee provided local accounts of each hazard. The hazard 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.

Hazard Description

The hazard description describes the hazard, its characteristics, and potential impacts. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms may cause wind-related damage.

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, as shown below in Table:

Table 6: Percentage of Town Impacted by Given Natural Hazard

Location of 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

This provides information on the history of previous hazard events for the Town and region, including some description of the impacts on people and property. Generally, the plan describes hazards and events from within the past decade (roughly 2014 – 2024), except for very significant events that occurred prior to that time period.

Probability of Future Events

The likelihood of a future event for each natural hazard was classified according to scale shown below in Table:

Table 7: 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

Vulnerability Assessment

The vulnerability assessment describes the potential impacts to the community from natural hazard events, including estimated potential economic losses, impacts to populations, and impacts to the natural environment, as well as the anticipated effects of climate change.

Impact

Impact refers to the effect that a hazard may have on populations, the built environment, and the environment, based on the assessment of extent described above. Very generally, impacts are classified according to the scale shown below in Table:

Table 8: Extent of Impacts, Magnitude of Multiple Impacts of Given Natural Hazard

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.

The method used to determine estimated economic losses due to natural hazards in South Hadley is described below in the text box entitled “Vulnerability Assessment Methodology.” The data was calculated using the methodology outlined in FEMA’s mitigation planning guide, *Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)*, August 2001.

Vulnerability Assessment Methodology

In order to determine estimated losses due to natural hazards in South Hadley, the hazard area were analyzed using the data shown below. The estimated losses were calculated using the methodology outlined in FEMA’s mitigation planning guide, *Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)*, August 2001.

Total value of all structures in South Hadley (Assessor’s data, FY 2024): \$1,522,697,600

Median value of an owner-occupied home in South Hadley - American Community Survey (ACS) 2022 5-year estimates: \$311,600.

Most of these figures exclude both the land value and contents of the structure. The damage calculations are rough estimates, 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.

Overall Vulnerability (Hazard Index Rating)

Based on the above metrics, a hazard index rating was determined for each hazard. The hazard index ratings are based on a scale of 1 (highest risk) through 5 (lowest risk) 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. Table below gives the rating for the location, probability of future events, impact and overall vulnerability for each hazard determined to affect South Hadley.

Table 9: Hazard Identification and Analysis for South Hadley

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Vulnerability
Dam Failure	Large	Very Low	Catastrophic	3
Drought*	Large	High	Minor	4
Earthquake	Large	Very Low	Catastrophic	5
Extreme Temperatures	Large	Very High	Limited	3
Flooding*	Medium	High	Minor	3
Hurricanes	Large	Low	Critical	3
Severe Snowstorm/Ice Storm*	Large	Very High	Critical	1
Severe Thunderstorm/ Wind/Tornadoes*	Medium	Very High	Catastrophic	1
Wildfire/Brushfire	Medium	Moderate	Limited	3

Source: Adapted from FEMA Local Hazard Mitigation Planning Handbook (March 2013) Worksheet 5.1; Town of Holden Beach North Carolina Community-Based Hazard Mitigation Plan, July 15, 2003 and the Massachusetts Emergency Management Agency (MEMA).

*These hazards were identified as top hazards for the Town during the MVP Community Resilience Building Workshop in 2019.

Dam Failure

Hazard Description

Dams 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 fails, the potential energy of the stored water behind the dam is released rapidly. Most dam failures occur when floodwaters above overtop and erode the material components of the dam. Often dam 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.

Location

The Massachusetts Emergency Management Agency (MEMA) identifies thirteen dams in South Hadley (shown in Table). Six of these are High Hazard Dams, one is Significant/Medium Hazard and six are Low Hazard. High hazard dams are 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 are located where failure or improper operation may cause minimal property damage. Of South Hadley’s high hazard dams, failure of the Holyoke Dam, would result in the most significant loss of life. The failure of the Holyoke Dam could result in flooding of the South Hadley Falls area, which is where the town hall and primary Emergency Operations Center are located.

Table 10: Dams in and Affecting South Hadley

Dam	Purpose	Hazard Level	Most Recent Inspection Date	Condition Rating	Most Recent EAP Date
Mt. Holyoke College Upper Pond Dam	Recreation	High	08/16/2022	Fair	11/01/2022
Mt. Holyoke College Lower Pond Dam	Recreation	High	08/16/2022	Fair	11/01/2022
Marcalus Manufacturing Company Dam	Recreation	High	09/30/2021	Fair	10/25/2018
Leaping Well Reservoir Dam	Recreation	High	07/13/2022	Satisfactory	06/01/2022
Hillside Beach Dam	Recreation	High	10/09/2020	Fair	10/20/2018
Holyoke (Hadley Falls) Dam, Holyoke	Hydroelectricity, flood protection	High			
Queensville Pond Dam	Road Support	Significant		Poor	11/30/2018
Lithia Springs Reservoir Dam	Recreation	Low			01/05/2021
Newton Smith - Lower Dam		N/A			
Sunset Beach Upper Pond Dam		N/A			
Sunset Beach Tributary Dam		N/A			
Pearl City Pond Dam		N/A			
Mt. Holyoke College Middle Pond Dam		N/A			

It is also important to consider and plan for any potential critical failure of dams upstream in Granby and Belchertown. Belchertown has one *High Hazard* dam.

Extent

Often dam breaches 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.

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.

Previous Occurrences

To date, there have been no dam failures in South Hadley.

Probability of Future Events

As South Hadley's dams age, and if maintenance is deferred, the likelihood of a dam failure will increase, but, 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 hydrograph 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.

Vulnerability Assessment

Impact to the Built Environment

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, \$1,522,697,600, is used.

The Committee estimated that dam failure could impact 50% or more of the area in South Hadley. However, not all structures would be impacted equally – structures closer to a dam in the inundation zone would likely sustain greater damage than those further away, and structures at a lower elevation would sustain greater damage than those at higher elevations. Finally, the number of structures affected would depend on which dam failed and the size of the inundation zone. In an estimation of damages based on these factors, an average of 10% damage would occur to 50% percent of structures, resulting in a total of \$76,134,880 of damages. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

The South Hadley Falls area of town could be particularly vulnerable to dam failure, as it is located within the inundation zone of the Holyoke Dam. This area of South Hadley houses a considerable population, and is the site of town resources including the library, town hall and Old Firehouse Museum.

Population Impacts

Injury or death from flooding due to a dam failure is the most significant impact that could affect South Hadley residents. Flood damage to property from a dam failure is the most likely impact, however. As with all hazards, more vulnerable residents would be most impacted by dam failure. These include seniors, small children, disabled and low-income residents. These individuals may be unable to physically or financially prepare for or respond to the hazard events and require additional assistance. The Town will need to ensure that vulnerable populations in South Hadley have information about flooding (riverine, localized, or as a result of dam failure), can adequately prepare, and can be reached after a flooding event in case an evacuation is necessary.

Changes in Land Use/Development

There has been a small amount of new residential development since the previous plan was adopted, and a very limited amount of commercial development. This development is not likely to increase the Town's vulnerability to dam failure. The Town has also made significant efforts to mitigate flooding risk, which also reduced vulnerability to flooding from dam failure. In 2022, the Town adopted a stormwater management bylaw with requirements and procedures to reduce stormwater runoff.

Hazard Risk Index Rating

Based on this analysis, South Hadley faces a medium risk from dam failure.

Drought

Hazard Description

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. The Hazard Mitigation Committee did not identify any areas of South Hadley that they felt were especially vulnerable to drought.

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.

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 in Table below.

Table 11: US Drought Monitor Classifications

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>

Previous Occurrences

South Hadley has had limited experience with severe drought conditions in the past, although this is changing as drought conditions related to climate change become more frequent.

Massachusetts has suffered significant droughts several times in the last century, with three major droughts within the last 10 years (2016-2017, 2020, and 2022). Other major droughts occurred in 1929-1932, 1939-1944, 1961-1969, and 1980-1983. While these droughts affected South Hadley as well, they were more impactful in other areas of the state and in communities with less reliable water supplies. Table indicates previous occurrences of drought since 2000, based on the US Drought Monitor:

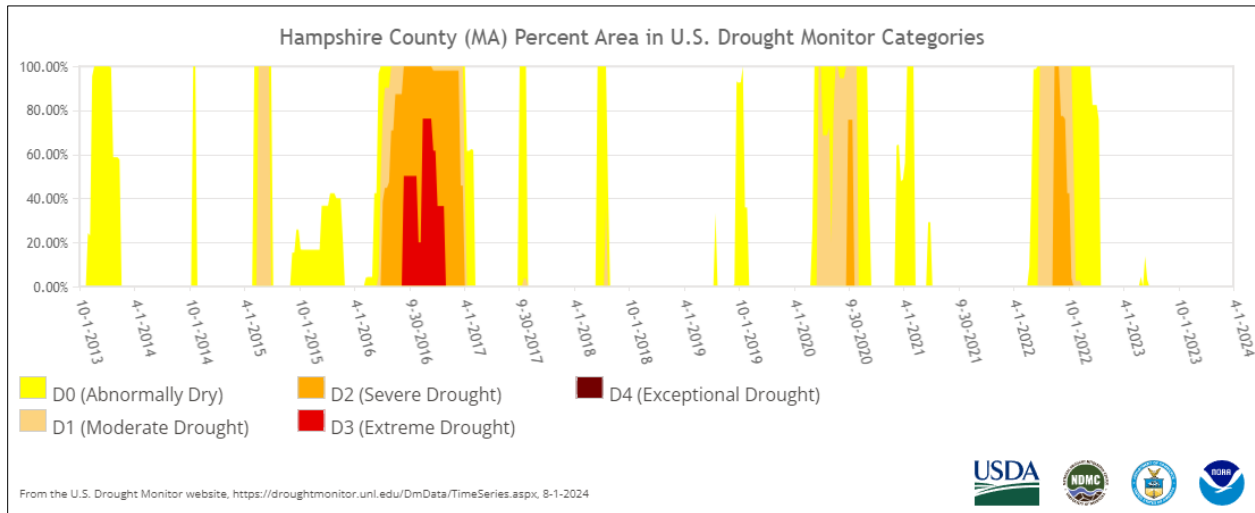
Table 12: Drought Classification Status in Massachusetts, 2000-2022

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
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
2021	D1 conditions in 2.5%, D0 in 6% of state
2022	D3 conditions in 39%, D2 in 96%, and D1 in 100% of state

Source: US Drought Monitor

Figure 5 below shows the incidences of drought specifically in Hampshire County from 2014 – 2024. As can be seen on this graph, the drought in 2016-2017 was the most extreme and significant for the county. The droughts in 2020 and 2022 were significant as well, falling into the severe category in 2022 and a short period of extreme drought in 2020.

Figure 5: Incidences of drought in Hampshire County, 2014- 2024



Probability of Future Events

Based on previous occurrences of drought, as well as the likelihood of future droughts due to changes in temperature and precipitation related to climate change, the HMP Committee suggested that the probability of drought occurring is “high,” (40-70% in a given year).

According to Resilientma.org, there could be up to 2 more consecutive dry days per year by the middle of the century in the lower Connecticut River watershed. However, many factors, such as water supply sources, population, economic factors, and infrastructure, may affect the severity and length of a drought event.

Vulnerability Assessment

Impact to the Built Environment

Due to the water richness of Western Massachusetts and the dependability of South Hadley’s water supplies, the Town 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. There could be an impact to agricultural operations in the Town, however there are a fairly small number of farms in South Hadley that could be affected. Because of these factors, the Hazard Mitigation Committee has determined the impact from this hazard to be “minor,” with minimal damage to people and property.

Population Impacts

Almost all residents in South Hadley are on Town water, either through water district #1 or #2. Only about 55 residents townwide have private wells. As mentioned above, both water districts have very

dependable water supplies, and in the case of any shortage, can rely on interconnections. Because of this, there are very minimal impacts from drought on drinking water for Town residents. Any water conservation measures that would be enacted would first impact homeowners who would need to cut back on activities such as watering lawns and washing cars. Farming operations without irrigation are especially vulnerable to droughts, and even those with irrigation may have difficulties during a severe or extended drought. However, there are a limited number of agricultural operations in South Hadley that would be affected.

Land Use/Development Impacts

The modest amount of new residential and commercial development in South Hadley will not have a significant impact on the Town's vulnerability to drought. As mentioned above, the drinking water supply in South Hadley is very dependable, and there is capacity for adding new users.

Hazard Risk Index Rating

Based on the above assessment, South Hadley faces a hazard index rating of "4- low risk" of drought.

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.² 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.³

Location

Because of the regional nature of the hazard, the entire town of South Hadley is equally susceptible to earthquakes. This makes the location of occurrence “large,” or over 50 percent of the total area.

Extent

The magnitude of an earthquake is measured using the Richter Scale (shown in Table) 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. The intensity of an earthquake is measured using the Modified Mercalli Scale (shown in Table

Table). This scale quantifies the effects of an earthquake on the Earth’s surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII denoting a earthquake that causes almost complete destruction.

Table 13: Richter Scale

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.

Source: US Federal Emergency Management Agency

² Northeast States Emergency Consortium Web site: www.nesec.org/hazards/earthquakes.cfm.

³ Federal Emergency Management Agency Web site: www.fema.gov/hazards/earthquakes/quake.shtm.

Table 14: Modified Mercalli Intensity Scale

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

Previous Occurrences

The most recent earthquakes to affect New England are shown below in Table.

Table 15: Largest Earthquakes between 1924-2024

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
Bliss Corner, MA	November 8, 2020	3.6
Tewksbury, NJ	April 5, 2024	4.8

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

The earthquake that occurred on April 5, 2024 was felt by some residents South Hadley, but no damage was reported.

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 Table below.

Table 16: Earthquake Index for Hampshire County

Earthquake Index	
Hampshire County	0.17
Massachusetts	0.70
United States	1.81

Based upon existing records, there is a very low frequency of earthquakes in South Hadley with between a 1 percent and 2 percent chance of an earthquake occurring in any given year.

Vulnerability Assessment

Impact to the Built Environment

Massachusetts introduced earthquake design requirements into their building code in 1975 and improved building code 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. The seismic standards have also been upgraded with the 1997 revision of the State Building Code.

Older buildings are particularly vulnerable to earthquakes because their construction pre-dates building codes that included seismic considerations. The hazard mitigation committee currently lacks the information necessary to consider how its critical facilities would fare in the event of an earthquake. Evacuation routes that contain bridges, most notably Route 202 and Route 116 which both have bridges spanning the Connecticut River, are also vulnerable to earthquakes. If the bridges were to fall in an earthquake, evacuation attempts could be hampered.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, \$1,522,697,600 is used.

An estimated 10 percent of damage would occur to 50 percent of structures, resulting in a total of \$76,134,880 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Population Impacts

Damage to homes and property are the primary impacts from earthquakes that could affect South Hadley residents. With a high magnitude earthquake, injuries and even death could be impacts, however, New England has not experienced such large earthquakes since they have been recorded. As with all hazards, vulnerable populations are more likely to be impacted by damages from earthquakes. These individuals may be physically or financially less able to both prepare for and respond to this hazard. Emergency Management, the Board of Health, the Council on Aging, and other Town departments should have processes in place to provide assistance to vulnerable individuals who could be in need in the event of an earthquake.

Land Use/Development Impacts

The limited amount of new residential and commercial development in South Hadley will not have a significant impact on the Town's vulnerability to earthquakes. Any new construction would adhere to the most recent State Building Code and earthquake design requirements.

Hazard Risk Index Rating

Based on this analysis, South Hadley faces a hazard index rating of "5 - lowest risk" from earthquakes.

Extreme Temperatures

Hazard Description

Massachusetts has four clearly defined seasons. Extreme temperatures are considered outliers, or temperatures that fall outside the typical range for each season. Extreme temperatures can last from an afternoon to three days or more. Day and nighttime temperature fluctuations also factor into the overall effects of temperature. For example, when the temperature does not cool off at night during an extreme heat wave, the risk of heat related illnesses is intensified.

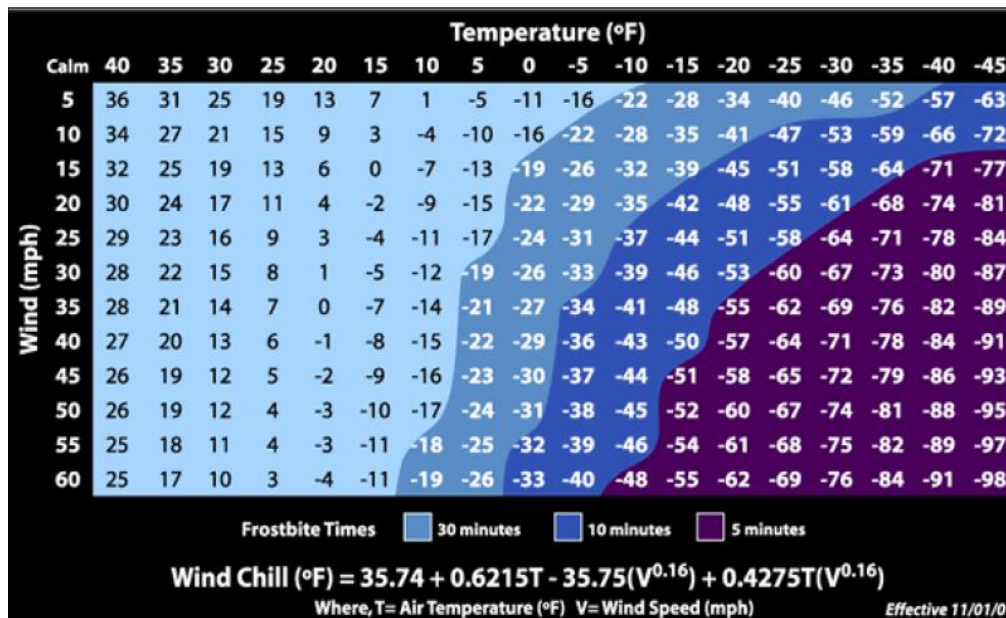
Extreme Cold

Extreme cold does not have a threshold temperature, but rather is defined as prolonged periods of excessively cold weather. This may vary by region based on average temperatures in the region. In Massachusetts, where temperatures regularly go below freezing during winter months, the community is often used to these temperatures. However, this does not lessen the risk. Extremely cold temperatures can create dangerous conditions for homeless populations, stranded travelers, and residents without sufficient insulation or heat in their homes. The homeless, the elderly, and people with disabilities are often most vulnerable. In South Hadley, 22% of the population is over 65 years old. Cold weather events can also have significant health impacts such as frostbite and hypothermia. Furthermore, power outages during cold weather may result in inappropriate use of combustion heaters, cooking appliances, and generators in poorly ventilated areas, which can lead to increased risk of carbon monoxide poisoning. During extreme cold, pipes may freeze and burst in many buildings with unreinforced masonry.

Extent

As per the Massachusetts Hazard Mitigation Plan, the extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature Index (shown below in Figure 6 **Error! Reference source not found.**). 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 below 25°F or lower for at least three hours.

Figure 6: Extreme Cold and Wind Chill Index



Source: National Weather Service

Extreme Heat

Extreme heat is considered to occur when the maximum temperature reaches above 90°F during the day. A heat wave is defined as three consecutive days with the temperature above 90°F. Projected heat days and heat waves can have an increased impact in areas with a greater amount of impervious surface, such as buildings, roads, parking lots, and driveways. These can become “heat islands” as dark asphalt and roofs store the heat from the sun. Impacts from heat stress can exacerbate pre-existing respiratory and cardiovascular conditions.

Extent

The NWS issues a Heat Advisory when the Heat Index is forecast to reach 100-104°F for two or more hours (NOAA, n.d.). The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach 105°F for two or more hours. The Heat Index Chart in Figure 7 below indicates the relationship between heat index and relative humidity.

Because most heat-related deaths occur during the summer, people should be aware of who is at greatest risk and what actions can be taken to prevent a heat-related illness or death. According to the Centers for Disease Control and Prevention, the populations most vulnerable to extreme heat impacts include the following:

- People over the age of 65
- Children under the age of five
- Individuals with pre-existing medical conditions that impair heat tolerance
- Individuals without proper cooling
- Individuals with respiratory conditions
- Individuals that overexert themselves during extreme heat events

Figure 7: Heat Index Chart

Relative Humidity (%)	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.										

Location

Occurrences of extreme temperatures are regional in nature and would affect the entire town, resulting in a “large” location of occurrence, or more than 50 percent of total land area affected.

Previous Occurrences

NOAA’s National Centers for Environmental Information Storm Events Database provides data on excessive heat. Between 2000 and 2023, Massachusetts experienced 16 heat or excessive heat days, which did not result in any injury or property damage. None of these events were reported for Hampshire County. During this same time period, Massachusetts experienced 60 extreme cold/wind chill events; however, again none of these events were reported for Hampshire County. Extreme temperatures are classified as medium frequency events. As defined by the 2013 State Hazard Mitigation and Climate Adaptation Plan, these events occur from once in 5 years to once in 50 years or have a chance of occurrence of 2% to 20% per year. According to the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan, between four and five heat waves (3 or more consecutive days of 90°F temperatures) occur annually in Massachusetts.

July is generally the hottest month in South Hadley, with an average daytime high temperature of approximately 85°F (NEIC, 2021). While there may not have been a great need for air conditioning in the past, as the occurrence of high heat days over 90° increases, the need for cooling centers for residents without air conditioning will increase, or for whom running air conditioners is cost prohibitive. This will particularly be an issue for vulnerable populations such as seniors, low-income residents, and renters.

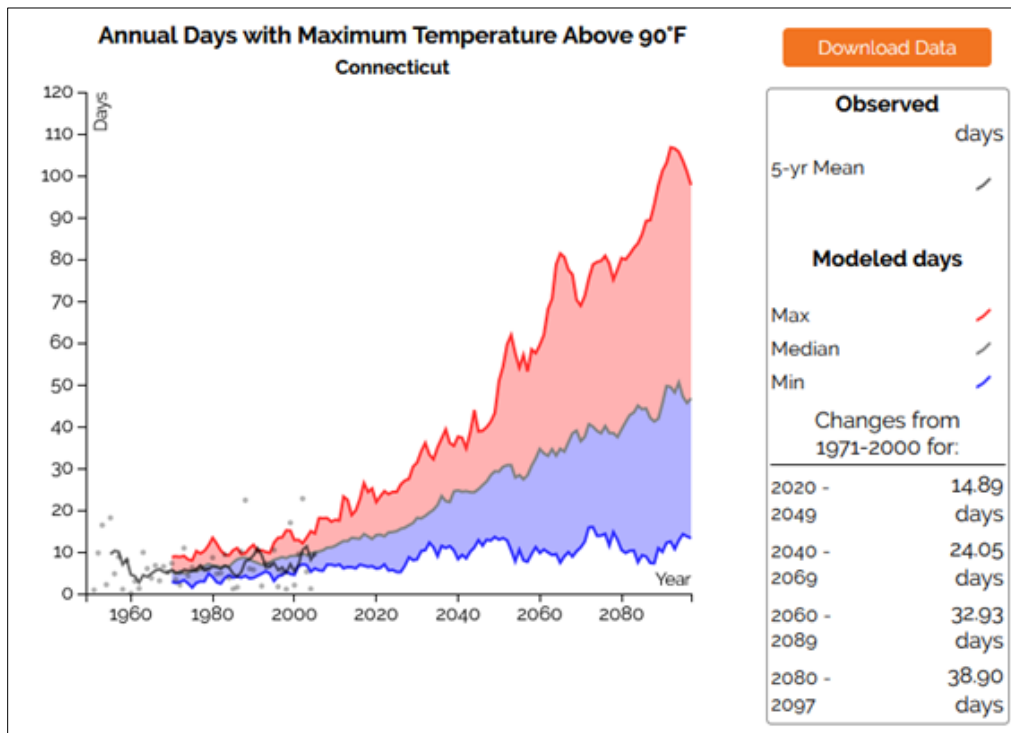
The buildings used for cooling centers in South Hadley are the Senior Center and the Library. According to the Council on Aging director, there seems to be greater use of the Senior Center on hot days, although the use for that purpose is difficult to track. She has noticed that more people stay for the entire day rather than just to attend a program, most likely for the cooling. She has also noticed that on hot days there are adults younger than 60 who use the Senior Center, again most likely for cooling. The COA will work on getting better data on use as a cooling center in the future. Similarly, the Library has been unable to track the use of residents for cooling, but the director noticed some families spending time in the library on very hot days who are not regular visitors.

Probability of Future Events

The probability of future extreme heat and extreme cold is considered by the HMP Committee to be "very high," or between 70 and 100 percent in any given year.

Extreme heat events that can result in illness or loss of life have been relatively rare in South Hadley, although the probability of such events is increasing due to the impacts of climate change. The average temperature for the Lower Connecticut River watershed is projected to increase by up to 3 - 8°F by 2050, depending on greenhouse gas emissions, and the number of days above 90°F could increase by up to 12 - 41 days.⁴ Figure 8 below from Resilient MA shows the projected annual days with maximum temperatures above 90 degrees for the Connecticut River watershed.

Figure 8: Projected annual days with maximum temperatures above 90°F



⁴ Resilientma.org

Vulnerability Assessment

Impact to the Built Environment

The impact of extreme heat or cold in South Hadley is considered to be "limited," with no property damage and limited effect on humans. Extreme heat is unlikely to impact physical structures, although it can negatively affect agricultural operations and cause unsafe conditions for those working outside. Extreme cold can cause water pipes to freeze and burst. Increased temperature fluctuations in the winter can cause more freeze-thaw issues with roads and other infrastructure.

Population Impacts

The largest concern in South Hadley during heat waves is the health impact on vulnerable populations. This includes older adults (over 65) that make up 22% of the population and are more likely to have pre-existing health conditions. There are also individuals with medical conditions who are vulnerable to extreme heat, and children and even young adults and healthy individuals can succumb to heat if they participate in strenuous physical activities during hot weather. Other vulnerable individuals include the homeless, those who work outside, and renters and low-income individuals, who are less likely to have air conditioning or may not use it due to the cost.

The primary concern during extreme cold events is residents who may also have lost power due to a snow or ice storm, especially vulnerable groups such as older adults. During both extreme heat and cold events, the Town opens cooling/warming centers for any residents who don't have adequate cooling or warmth at home. It is important for Emergency Management, the Board of Health, the Council on Aging, and other Town departments to have processes in place to mitigate risk and provide assistance to individuals who are particularly vulnerable during both extreme heat and extreme cold events. This could include home checks and rides to cooling/warming centers. The Town is also looking at strategies to mitigate the impacts of extreme heat such as planting more shade trees and providing cooling stations.

Land Use/Development Impacts

The limited amount of new residential and commercial development in South Hadley will not have a significant impact on the Town's vulnerability to extreme heat or cold events.

Hazard Risk Index Rating

South Hadley's vulnerability from extreme heat and cold is considered to be "3 - Medium Risk."

Flooding

Hazard Description

Flooding in Massachusetts is generally the result of weather events such as heavy rain, thunderstorms, snowmelt, coastal storms or nor'easters, tropical storms, and hurricanes. Some of these events occur infrequently, such as hurricanes, while others such as heavy rain, occur very frequently. In an inland community such as South Hadley, flooding often occurs as a result of intense precipitation over a short period of time, or moderate to heavy precipitation over a longer period of time, such as several days. Increases in precipitation as a result of climate change are projected to cause an increase in inland flooding.

Floods can be classified as one of two types: flash flooding (also described as localized flooding) and riverine flooding.

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).

Riverine 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).

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.

There are three major types of storms that can generate flooding in South Hadley: 1) 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; 2) 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; 3) 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.

Location

Areas along the Connecticut River, Bachelor Brook and Stony Brook are in the 100-year and 500-year floodplain. According to FEMA data, there are 622 acres in the 100-year floodplain and 158 acres in the 500-year floodplain. These include the following locations:

- Bachelor Brook—Pearl Street south along Route 47, Moody Corner to the Connecticut River, Pearl Street to the South Hadley Town Line;
- Stony Brook—Town Line to Granby Road continuing on to the Mount Holyoke Campus Ponds continuing on to Route 116 and draining into the Connecticut River between Ferry and Alvord Streets;
- Connecticut River—Smith’s Ferry area, the majority of the Town’s western boundary, most especially within the White Brook Area;
- South Hadley’s Town Center is located within the Connecticut River’s 100 year flood plain, which places the Town Police Station and the Town Hall in a flood-prone area.

According to the MVP Summary of Findings from the Community Resilience Building workshops in 2020, areas subject to flooding include much of South Hadley Falls, Cove Island, East Street, Hadley Street, Westbrook Road, Bridge Street, and Lower River Road. Undersized culverts on River Road, Pearle Street and New Ludlow Road have also contributed to localized flooding.

The 100-year floodplain covers about 5.4 percent, or approximately 642 acres of the town and, 1.4 percent, or roughly 160 acres, in the 500-year floodplain. However, including areas that are subject to localized flooding, the area of the Town potentially affected by flooding can be classified as “medium,” with 10 – 50% of the land area at risk. This includes areas generally subject to both riverine and localized flooding.

Extent

The average annual precipitation for South Hadley and surrounding areas in western Massachusetts is 40 to 45 inches. Climate change is projected to result in higher average levels of precipitation, with more falling as rain and less as snow, and more intense periods of rainfall.

Water levels in 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.

The frequency and severity of flooding are measured using a discharge probability, which is the probability that a certain river discharge (or flow) will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. A “100-year discharge” has a 1 percent chance of being equaled or exceeded in any given year, meaning that a “100-year flood” has a 1 percent chance of occurring in any given year. These

probabilities reflect statistical averages; it is possible for two or more “100-year” floods to occur in the same year or even within the same month.

The “100-year flood” is the standard used by the National Flood Insurance Program (NFIP) to guide floodplain management and determine the need for flood insurance. The extent of flooding associated with a 1% annual probability of occurrence is called the 100-year floodplain, which is considered the regulatory boundary by most state and federal agencies. The 100-year floodplain is also referred to as the Special Flood Hazard Area (SFHA), and is used as a tool for assessing vulnerability and risk in flood-prone areas. A “500-year flood” is a flood that has a 0.2% chance of being equaled or exceeded each year. Base flood elevations and the boundaries of the 100-year floodplains (1% annual probability) and the 500-year floodplains (.2% annual probability) are shown on Flood Insurance Rate Maps (FIRMs), which are the primary tools for identifying the extent and location of flood hazards.

The National Weather Service classifies flooding events as minor, moderate, or major, depending on the extent of the impacts. The following definitions of minor, moderate, and major flooding describe the possible extent of flooding events:

Minor Flooding

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, basements, or homes themselves if they are not elevated

Moderate Flooding

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

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 through town that could cause structural damage
- high damage estimates and high degree of danger to residents

The flood categories for the Connecticut River at the Northampton station are:

- Major flood stage: 120 feet
- Moderate flood stage: 115 feet
- Flood stage: 112 feet
- Action stage: 110 feet

The previous occurrences of these flooding categories being reached by the Connecticut River in Northampton are as follows:

Table 17: Historic crests of the Connecticut River in Northampton, MA

Crest (feet)	Date	Stage
129.4	3/19/1936	Major flood
125.0	9/22/1938	Major flood
120.8	5/31/1984	Moderate flood
119.9	4/06/1960	Moderate flood
118.6	01/01/1949	Flood

Source: National Weather Service, <http://water.weather.gov/ahps2/hydrograph.php?wfo=box&gage=spgm3>

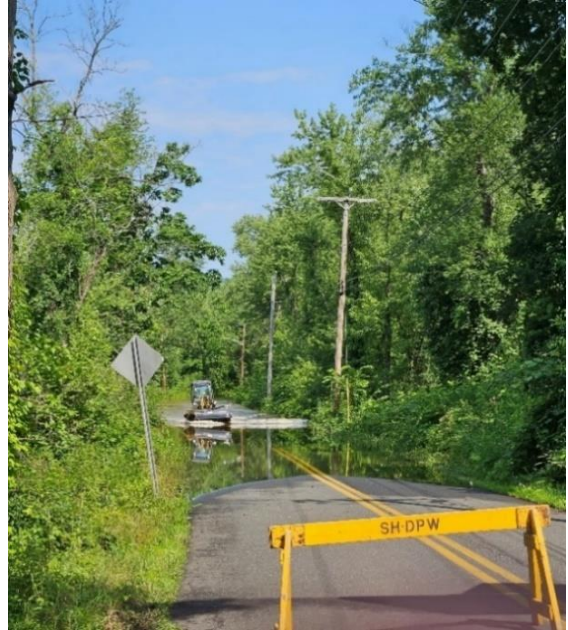
Previous Occurrences

The worst flooding in South Hadley's history happened in March of 1936. South Hadley and many of the surrounding towns experienced major flooding. This flooding also coincided with the largest historic crest of the Connecticut River, as shown in the table above. The river crested on March 19, 1936 at 129.4 feet. (Flood stage for this segment of the river is 112 feet and major flood stage is 120 feet).

Very heavy rains in July 2023 caused the Connecticut River to crest at just below flood stage, and the high water and debris in the fast-moving water caused extensive damage at Brunelle's Marina in South Hadley. The docks were destroyed, and the parking lot was flooded.

There have been a number of other relatively minor incidents of roads and yards flooding, often with the temporary closure of roads such as River Road. Figure 9 to the right shows flooding on River Road from the above-mentioned heavy rains in July 2023.

Figure 9: Flooding on River Road, July 2023



Probability of Future Events

Based upon previous occurrences and observable effects from changes in the climate, the HMP Committee suggested that there is a high probability (40 – 70%) of general or localized flooding occurring in South Hadley in the next year. The probability of flooding has been increasing due to the impacts of climate change and will likely continue to increase. Resilientma.org projects that South Hadley will see an eight percent increase in total annual precipitation by the year 2050, and more than a 10% increase in the 99th percentile storm rainfall, meaning 24-hour periods in which the depth of rainfall exceeds 99% of all 24-hour periods of rainfall during an average year. Projections for 2030 are for a 6 percent increase in both total annual precipitation and 99th percentile storm rainfall.⁵ These increases in precipitation will likely lead to greater impacts from flooding in South Hadley. Future floodplains may be larger than the currently FEMA modeled floodplains, and the Town will need to consider these changes in regulations and permitting of new development. New FEMA flood maps are scheduled to be completed by the end of 2024.

According to the First Street Foundation, which analyzes the risk levels from floods, wildfire, high wind, extreme heat, and poor air quality, the neighborhood of South Hadley Falls has an extreme risk of flooding over the next 30 years. The First Street Flood Model predicts that 446 properties in South Hadley Falls have a risk of flooding during the next 30 years, due to both riverine and localized flooding from intense precipitation.⁶

⁵ <https://resilientma-mapcenter-mass-eoeaa.hub.arcgis.com/#ClimateDashboard>

⁶ https://firststreet.org/neighborhood/south-hadley-falls-chicopee-ma/879838_fsid/flood

Vulnerability Assessment

Impact to the Built Environment

According to the HMP Committee, the Town would face a minor impact from flooding, with less than 10% of the property likely to be damaged or destroyed, and few injuries, if any. According to the Assessor's GIS data, there are 573 parcels of land within the 100-year floodplain, or Special Flood Hazard Area (SFHA). The total value of all residential structures on these parcels is \$176,684,000.

Utilizing this total value of all residential structures within the SFHA, and assuming 10% damage to these structures, up to \$17,668,400 worth of damage could occur from flood events. The damage estimate is a rough estimate and likely reflects a worst-case scenario. Computing more detailed damage assessments based on assessor's records is a labor-intensive task and beyond the scope of this project.

In addition to residential structures, there are commercial and municipal buildings in South Hadley's town center, which is located within the Connecticut River's 100-year flood plain, including the Police Station and the Town Hall. Damage to these buildings would result in additional costs as well as possible losses of data.

Population Impacts

The most vulnerable groups in South Hadley may be more seriously impacted by flooding – this includes elderly adults, especially those who live alone and are lower income, low-income individuals, and disabled residents. These individuals may be unable to physically or financially prepare for or respond to hazard events and require additional assistance. The Town will need to ensure that the vulnerable individuals in South Hadley have information about flooding, can adequately prepare, and can be assisted after a flooding event in the event that evacuation or other type of help is necessary. A secondary impact of flooding is increased instances of standing water leading to larger mosquito populations and greater risk of disease vectors. The Health Department and DPW are taking mitigation measures to reduce this risk.

The area of South Hadley Falls is of particular concern as much of it is at a low elevation, and is more subject to localized flooding as well as having some sections that fall within the SFHA. In addition, South Hadley Falls contains an Environmental Justice community that meets the low-income criteria. The Town should provide outreach to residents of The Falls about resources and assistance with minor or significant flooding.

In determining the flooding impact, the First Street model described above analyzes the impact on residential and commercial structures, infrastructure, roads, and social facilities such as schools, municipal operations, and historic structures. While the impact to residential and commercial structures are considered minor in this model, the impacts to infrastructure, roads, and social facilities are considered to be extreme. This is likely based on the fact that there are critical facilities such as the Town Hall, Police Station (which is also the Emergency Operations Center), and two schools, as well as evacuation routes, located in the floodplains.⁷

⁷ <https://firststreet.org/methodology/flood>

Based on recent trends, the population of the Town is not likely to increase significantly over the next five years. Over time, there is the possibility of climate migrants from coastal areas and other highly vulnerable areas of the country settling in South Hadley and surrounding towns and cities, and that is a scenario that the Town should prepare for. In the near term, however, this is not a population change that will significantly impact flooding hazards in South Hadley.

Changes in Land Use/Development

As discussed in Section 2 and the Capabilities Assessment table, the town has made significant efforts to mitigate flooding through the development of a stormwater bylaw, culvert assessments and replacements, and implementation of green infrastructure.

While any new development increases the amount of paving and stormwater runoff, the moderate amount of new residential development and very limited amount of commercial development will not significantly increase the risk of flooding in South Hadley. In addition, new residential and commercial development must adhere to stormwater regulations that reduce flooding risk through improved drainage and implementation of green infrastructure.

Hazard Risk Index Rating

Based on the above analysis, South Hadley faces a hazard index rating of “3 - medium risk” of flooding.

Hurricanes

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 South Hadley is at risk from hurricanes, and thus the location size would be classified as "large." Areas at high elevation are more susceptible to wind damage that accompanies hurricanes. Flooding is one of the primary risks of hurricanes and could occur in the areas identified previously under the flooding hazard if there are high totals of rainfall.

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 (shown in Table), which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense. The table also describes the damages that could occur at each level of wind intensity.

As ocean and air temperature have increased with climate change, there is evidence that hurricanes are becoming stronger. The warmer air can hold more moisture, which can result in large amounts of precipitation accompanying the strong winds. Over the past 15 years, the heavy precipitation and flooding caused by many of the hurricanes have resulted in larger impacts and damages than those caused by wind. This has certainly been true in the northeast, with flooding caused by Hurricane Irene, Hurricane Sandy, and Hurricane Lee as examples.

Table 18: Saffir-Simpson Hurricane Wind Scale and Damage Classifications

Storm Category	Damage Level	Description of Damages	Wind Speed (MPH)
1	MINIMAL	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
	Very dangerous winds will produce some damage		
2	MODERATE	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
	Extremely dangerous winds will cause extensive damage		
3	EXTENSIVE	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
	Devastating damage will occur		
4	EXTREME	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
	Catastrophic damage will occur		
5	CATASTROPHIC	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+
	Catastrophic damage will occur		

Previous Occurrences

Hurricanes that have affected the Pioneer Valley are shown in Table. According to the National Oceanic and Atmospheric Administration, only one hurricane has tracked directly through South Hadley. Hurricane Belle tracked through the town on August 10, 1976, but there were no notable impacts.

Table 19: 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
Henri	2021	Tropical Storm

Source: National Hurricane Center, 2023

The 1938 and 1985 hurricanes were major events and caused wind damage and flooding statewide. The large amount of rainfall from Tropical Storm Irene caused localized flooding in South Hadley. While Tropical Storm Sandy in late October of 2012 had severe impacts on much of the Northeastern United States, there was minimal damage that occurred due to the storm locally in South Hadley. No roads were flooded or washed out. No residents encountered long-term displacement due to the storm's impacts. In nearby areas of western Massachusetts, there were modest impacts, with localized flooding and downed power lines. Overall, western Massachusetts was able to send emergency response resources to other states where the storm had a larger impact.⁸

Probability of Future Events

South Hadley's location in Western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes, although it can experience heavy precipitation, as noted above. Based upon past occurrences as well as the impacts of climate change, the HMP Committee

⁸ "Western Massachusetts escapes Hurricane Sandy's wrath, but impact elsewhere still being felt." http://www.masslive.com/news/index.ssf/2012/10/western_massachusetts_escapes.html. October 30, 2012. Accessed March 6, 2015.

suggested that there is a low probability of hurricanes affecting South Hadley (1 to 10 percent chance of occurrence in the following year.

Vulnerability

Impact to the Built Environment

The HMP Committee suggested that the impact from a hurricane or tropical storm in South Hadley could be critical, resulting in 25 percent or more of total property being damaged. Areas prone to flooding would be particularly vulnerable. The Town Hall and Emergency Operations Center could be damaged by flooding, impacting the town's ability to operate in response to a hazard event. High winds could impact the town's communication and energy infrastructure.

Using a total value of all structures in town of \$1,522,697,600 and an estimated damage of 10 percent damage to 25 percent of all structures, an estimated \$38,067,440 of damage could occur. This could include damage from both wind and flooding. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Population Impacts

Damage to homes and property and power outages are impacts from high winds that could affect all South Hadley residents. Flooding from excessive rainfall would impact South Hadley residents as well. As with all hazards, underserved and vulnerable populations are more likely to be impacted by damages from wind and/or flooding. These individuals may be physically or financially less able to both prepare for and respond to this hazard. It is important for Emergency Management, the DPW, the Council on Aging, and other Town departments to have strategies in place to provide assistance to vulnerable individuals impacted by hurricanes and tropical storms.

Changes in Land Use/Development

The limited amount of new residential and commercial development is not likely to impact the Town's vulnerability to hurricanes and tropical storms. The mitigation measures described for flooding will also help to mitigate any flooding that would occur from hurricanes or tropical storms.

Hazard Risk Index Rating

Based on the above analysis, South Hadley faces a hazard index rating of "3 - medium risk" from hurricanes.

Severe Snowstorms/Ice Storms

Hazard Description

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 type of severe snowstorm 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.

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
- Damage to buildings and infrastructure from heavy snow and ice loads, or from falling trees and branches, as well as 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.

Location

The entire town of South Hadley is susceptible to severe snowstorms. Because these storms occur regionally, they would impact the entire town, so the location impacted is considered “large.” There are no known areas with site-specific snow and ice problems.

Extent

The Northeast Snowfall Impact Scale (NESIS), shown in Table below, was developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) and 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.

Table 21: 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 mid-October through late April.

On October 30, 2011, an early winter storm dumped more than one foot of heavy wet snow. Because many trees still had leaves, the snow load caused trees and limbs to fall, downing power and phone lines, and crippling travel. A town wide power outage left many without electricity for up to five days. A very large amount of debris was removed and hauled. There have been other heavy snowfalls and ice storms in the last 10 years, however none of them have caused extensive power outages or structural damage.

Based on data available from the National Oceanic and Atmospheric Administration, there are 14 winter storms in the Pioneer Valley between 2010 and 2022 that have registered on the NESIS scale and resulted in snowfalls of at least 10 inches. These storms are listed in Table below in order of their NESIS severity.

Table 23: Winter Storms Producing Over 10 inches of Snow in the Pioneer Valley, 2010–2022

Date	NESIS Value	NESIS Category	NESIS Classification
12/16/2022	8.52	4	Crippling
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>

Probability of Future Events

Based upon previous occurrences of severe snow and ice storms, as well as the impacts of climate change, the HMP Committee suggested that the likelihood of a severe snow or ice storm affecting South Hadley in the next year is “high, or 70–100 percent. Research on climate change indicates that there is greater potential for stronger, more frequent storms as the global temperature increases. While there may be lower annual snowfall amounts as more precipitation falls as rain, the snowstorms that do occur may be more severe. There is also the likelihood that the occurrence of ice storms and sleet will increase.

Vulnerability Assessment

Impact to the Built Environment

The HMP Committee suggested that the impact of a severe snow or ice storm could be critical, in which 25 percent or more of property damaged. To approximate the potential impact to property that could be affected by this hazard, the total value of all residential property in town, \$1,522,697,600, is used. An estimated 10 percent of damage could occur to 25 percent of structures, resulting in a total of \$38,067,440 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate. The impact of an ice storm could be catastrophic in South Hadley. No critical facilities or evacuation routes are expected to be affected significantly by snowstorms. Heavy snow and ice build-up on roads can, however, make travel in the winter months dangerous and challenging. The town’s energy infrastructure is extremely vulnerable to ice storms, which have been known to cause power outages across the region.

Population Impacts

Traffic accidents associated with severe snow and ice storms are primary impacts that can affect all South Hadley residents, as well as blocked roadways and power outages. As with all hazards, vulnerable populations in South Hadley are more likely to be impacted by severe winter storms. These individuals may be physically or financially less able to both prepare for and respond to hazard impacts such as power outages, poor roads, lack of public transportation, heavy snow or ice loads damaging buildings, an inability to clear snow, and extreme cold, among others. It is important for Emergency Management, the Council on Aging, the DPW, and other Town departments to have strategies in place to provide assistance to vulnerable individuals impacted by severe snow and ice storms.

Changes in Land Use/Development

The limited amount of new residential and commercial development in South Hadley since the last plan is not likely to impact the Town’s vulnerability to severe snow and ice storms.

Hazard Risk Index Rating

Based on the above assessment, South Hadley faces a hazard index rating of “1 - highest risk” from severe snowstorms and ice storms. Ice storms are expected to cause greater damage than severe snow.

Severe Thunderstorms / Wind / Tornadoes

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 the 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. Ridgetops are most likely to sustain damage from high winds.

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.

Microbursts are typically less than three miles across. They can last anywhere from a few seconds to several minutes. Microbursts cause damaging winds up to 170 miles per hour in strength and can be accompanied by precipitation.

Tornadoes are measured using the enhanced Fujita Scale, shown in Table with the following categories and corresponding descriptions of damage:

Table 24: 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. As per the SMHCAP, the best available data, there are approximately 10 to 30 days of thunderstorm activity in the state each year.

Tornadoes do not occur frequently in Western Massachusetts, but they do form in the atmosphere and touch down occasionally, and may become more frequent due to the effects of climate change. There are no known tornadoes that have touched down in South Hadley, but there have been a number of microbursts that have caused damage to trees, power lines, buildings, and vehicles. The Town also experiences severe thunderstorms, high-wind events, and hail events relatively frequently. The 2011 that tornado touched down in Springfield and continued on an eastward path occurred about 10 miles south of South Hadley.

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 Table below.

Table 25: Tornado Index for Hampshire County

Tornado Index	
Hampshire County	125.73
Massachusetts	87.60
United States	136.45

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

Based upon the available historical record, as well as the probable effects of climate change, the HMP Committee suggested that there is a “very high” (70 – 100 percent) probability of severe thunderstorms, high-wind events, or tornadoes occurring in South Hadley in any given year.

Vulnerability Assessment

Impact to the Built Environment

The potential for locally catastrophic damage is a factor in any tornado, severe thunderstorm, or high wind event. In South Hadley, a tornado that hit residential areas would leave much more damage than a tornado with a travel path that ran along agricultural or forested areas. Most buildings in the Town of South Hadley 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. High wind can also damage energy and communication infrastructure in town.

To approximate the potential impact to property that could be affected by this hazard, the total value of all property in town, \$1,522,697,600, is used. An estimated 100 percent of damage could occur to 1 percent of structures, resulting in a total of \$15,226,976 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Population Impacts

Damage to homes and property and power outages are impacts from high wind events that could affect all South Hadley residents. Flooding from excessive rainfall with severe thunderstorms impact residents as well, and is probably the most frequent impact from thunderstorms. A tornado that hits a residential area could cause major damage, as well as potentially injuries or even deaths. As with all hazards, vulnerable populations in South Hadley are more likely to be impacted by damages from severe storms, high wind and flooding. These individuals may be physically or financially less able to both prepare for and respond to this hazard. It is important for Emergency Management, the DPW, the Council on Aging, and other Town departments to have strategies in place to provide assistance to vulnerable individuals impacted by severe thunderstorms, high wind events, or a tornado or microburst.

Changes in Land Use/Development Impacts

The limited amount of new residential and commercial development is not likely to impact the Town’s vulnerability to severe thunderstorms, high wind events, tornadoes and microbursts.

Hazard Risk Index Rating

Based on the above assessment, South Hadley has a hazard index rating of “1 – highest risk” overall for severe thunderstorms and winds and tornadoes.

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 lightning
- Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

Location

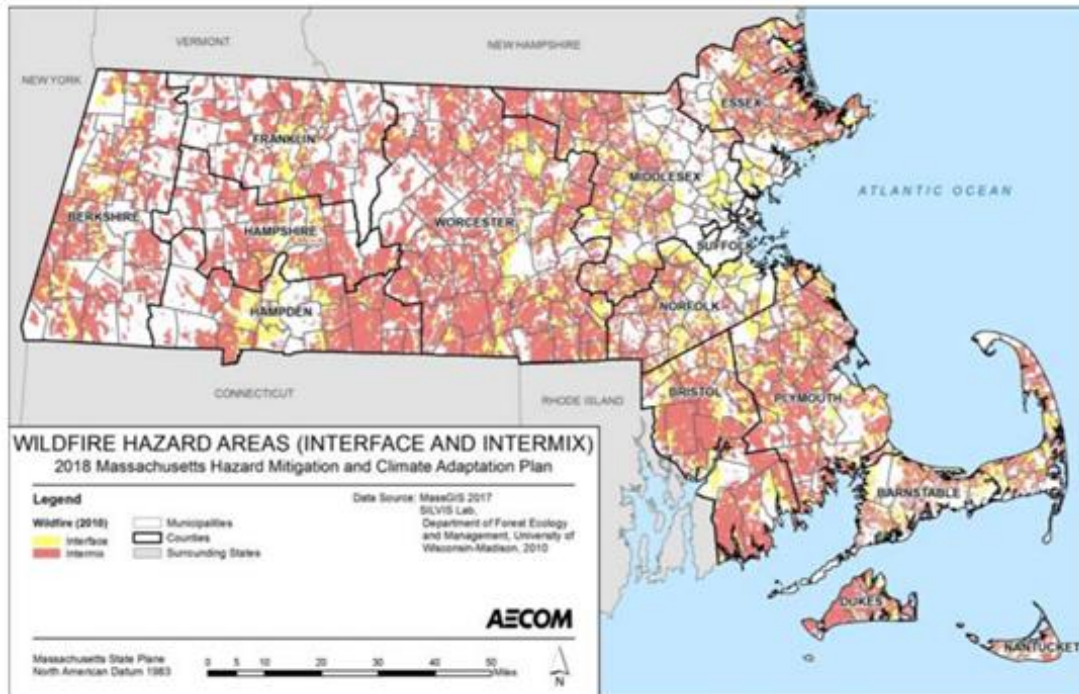
In South Hadley, approximately 48% of the town's total land area is forest, or about 5,562 acres, and is therefore at risk of fire. The largest swath of contiguously forested land in South Hadley is the J.A. Skinner State Park. This state park poses the greatest risk of wildfires in South Hadley. Any homes in the vicinity of the State Park would also therefore be at risk, however there are not many homes that border the state park.

The State Hazard Mitigation and Climate Adaptation Plan (EEA and EOPPS, 2018) states:

Portions of the Commonwealth susceptible to wildfire, particularly at the urban-wildland interface..., are defined as those in the vicinity of contiguous vegetation, with more than one house per 40 acres and less than 50 percent vegetation, and within 1.5 miles of an area of more than 500 hectares (approximately 202 acres) that is more than 75 percent vegetated.

Figure 10 below shows wildland-urban interface and hazard areas in the state. A relatively small area of South Hadley, approximately 30%, is located in this interface and hazard area. Thus, the Town is not considered to be a significant risk for forest fire. The HMP Committee determined that the total amount of town that could be affected by wildfire is "medium," or 10 – 50 percent of the total area.

Figure 10: Wildland- Urban Interface and Hazard Areas in Massachusetts



Source: SMHCAP, 2018

Extent

Wildfires can cause widespread damage to the areas that they impact. They can spread rapidly, depending on conditions and local wind speeds, and be difficult to get under control. Fires can last for several hours up to several days. As mentioned above, South Hadley has approximately 5,652 acres of forested land and is approximately 48% forestland. A large wildfire in South Hadley could cause serious damage to homes that are in the most vulnerable areas. Based on wildfires that have occurred in western Massachusetts, it is estimated that wildfires would destroy around 50 to 500 acres of forested area. The overall extent of wildfires is shown in Table below:

Table 26: Wildfire Severity Rating Scale

Rating	Basic Description	Detailed Description
CLASS 1: Low Danger (L) Color Code: Green	Fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
CLASS 2: Moderate Danger (M) Color Code: Blue	Fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woods fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
CLASS 3: High Danger (H) Color Code: Yellow	Fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small.
CLASS 4: Very High Danger (VH) Color Code: Orange	Fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
CLASS 5: Extreme (E) Color Code: Red	Fire situation is explosive and can result in extensive property damage	Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens.

Source: MA State Hazard Mitigation and Climate Adaptation Plan

Previous Occurrences

During the past 100 years, there have not been many wildfires occurring in the Pioneer Valley or South Hadley specifically, although there was a wildfire in the Lithia Springs watershed in 2000, listed below. These are wildfires that have burned between 50 and 500 acres that have occurred in the last 30 years:

- 1995 – Russell, 500 acres burned on Mt. Tekoa
- 2000 – South Hadley, 310 acres burned over 14 days in the Lithia Springs Watershed

- 2001 – Ware, 400 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
- 2019 – Russell and Montgomery, 200 acres burned on Mt. Tekoa

Both Districts issue burn permits. In District 2, they may have approximately five unpermitted burns for every 100 permits issued.

Probability of Future Events

In accordance with the SHMCAP, the Hazard Mitigation Committee found it is difficult to predict the likelihood of wildfires in a probabilistic manner due to the number of variables involved. However, based on previous occurrences as well as the effects of climate change, such as the increased probability of drought and higher temperatures, the Committee determined the probability of wildfires in South Hadley within the next year to be medium, or 10 – 40 percent chance of occurrence.

Climate scenarios project summer temperature increases between 2°C and 5°C and precipitation decreases of up to 15 percent. The increased probability of higher average temperatures as well as more and longer periods without rainfall (interspersed with periods of intense rainfall, which is more likely to run off the surface of the soil rather than sink in), would also increase the likelihood of brushfires and wildfires. In addition, increased deadfall from wind, and the increase of invasive pests in South Hadley has resulted in an increase of downed branches and dead trees in the forests, adding more fuel for fires.

Vulnerability Assessment

Impact to the Built Environment

The HMP Committee has determined that the town faces a “moderate” impact from wildfires, with potentially 10 – 50 percent damage to all structures, most likely the lower end of that range. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, \$1,522,697,600, is used. An estimated 50 percent of damage could occur to 10 percent of structures, resulting in a total of \$ worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate. The land in and near the J.A. Skinner State Park in South Hadley is most vulnerable to wildfires. Because most of this land is designated as a state forest, development is extremely limited. The historic Mt. Holyoke Summit House, an historic icon in the town and region, and a radio communications tower could be vulnerable to damage from a wildfire. Additionally, depending on the location of the burn, Route 47 would not be a viable evacuation route.

Population Impacts

Damage to homes and property are impacts from wildfires that could affect South Hadley residents, particularly the relatively small percentage that live in the wildland-urban interface area. There is also a small risk of injury or death as a result of wildfires. Additionally, all South Hadley

residents could be impacted by smoke from wildfires in the Town or in the region. As was experienced in 2022 and 2023, it is possible to be significantly impacted by poor air quality from wildfires from as far away as western Canada. Vulnerable populations in South Hadley, such as elderly adults, small children, outdoor laborers, and anyone with respiratory issues or compromised immune systems, are more likely to be impacted by smoke from wildfires. It is important for Emergency Management, the Fire Districts, the Board of Health, the Council on Aging, and other Town departments to have strategies in place to provide assistance to vulnerable individuals impacted by wildfires and poor air quality events due to wildfire smoke.

Hazard Risk Index Rating

Based on the above assessment, South Hadley faces a hazard index rating of “3 - medium risk” from wildfires.

CHAPTER 4 – CRITICAL FACILITIES

Facility Classification

A Critical Facility is defined as a building, structure, or location that:

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

The critical facility list from the 2007 Hazard Mitigation Plan was revised by the Hazard Mitigation Committee. The Hazard Mitigation Committee developed the nine main categories of critical facilities:

- Emergency Operation Centers
- Police Stations
- Fire Stations
- Schools
- Town Facilities
- Utilities
- Population
- Economy
- Historic Buildings/Sites

These nine categories represent the facilities necessary for emergency response for all types of disasters, facilities necessary for Town sustainability and facilities that include special populations. A table showing the location of each critical facility is shown below. The table includes the name, location and purpose of each facility. It also indicates if the facility has a generator attached to it.

Category 1 – Emergency Response Services

Table 27: Emergency Response Services Facilities

Feature Type	Name	Address	Purpose/Notes
Safety and Security			
Fire/Police/ Emergency Response	South Hadley Police Department (EOC)	41 Bridge Street	Primary EOC. 1 fixed and 1 portable generator. If Holyoke Dam were to breach, building would be flooded.
	South Hadley Fire District 1	144 Newton Street	Backup EOC, has generator
	South Hadley Fire District 2	20 Woodbridge Street	Priority Backup EOC, has

Feature Type	Name	Address	Purpose/Notes
			generator but old and needs to be replaced.
	Highway Garage/DPW	10 Industrial Drive	One fixed generator, 2 portable generators
<i>Helicopter Landing Sites</i>			
	Recreation Field behind Kendall Hall, Mount Holyoke Campus	50 College Street	
	South Hadley High School Recreational Field	153 Newton Street	
	Pioneer Valley Performing Arts School	15 Mulligan Drive	
Emergency Shelter	Michael E. Smith Middle School	100 Mosier Street	Section for pets
	South Hadley High School	153 Newton Street	
	Plains Elementary School	00 Lyman Street	
	Mosier Elementary	101 Mosier Street	
Cooling/ Warming Centers	South Hadley Public Library	2 Canal Street	
	Senior Center	45 Dayton Street	
Emergency Fuel	South Hadley Electric Light Department	85 Main Street	
	Diesel for Districts #1 and #2 Fire Departments		
	DPW- 1,000 gallon diesel tank	10 Industrial Drive	
	Haydocy Gas Station -Police, Ambulance and DPW	72 Lamb Street	Generator
	Marion Excavating	500 New Ludlow Road	
	Mt Holyoke College – Gas	Facility Management – 47 Morgan Street	
	Ledges Golf Course – Gas and Diesel	18 Mulligan Drive	
Communications			
Cell Towers	3 cell carriers	Industrial Drive, Water Tank	
	4 cell carriers	Mulligan Drive, Water Tank	
	2 cell carriers	Skinner Lane, Water Tank	
	Shattuck Hall, Mt. Holyoke College	50 College Street	
	1 Cell Carrier	260 Amherst Road (Camp Perkins Road)	
	1 Cell Carrier	258 – 276 Hadley Street	
Wired Telephone Service	Telephone Cross Boxes	Woodbridge Street at Silverwood Terrace, West Summit Street, Morgan Street at College	

Feature Type	Name	Address	Purpose/Notes
		Street, Main Street at Pump Station, Alvord Street Extension	
Public Service/Safety Communication Towers	Fire Station 1 and 2, Water Tanks in District 1 and 2		
Transportation			
Public Transportation	PVTA Routes		
Evacuation Routes	Routes 47, 116, 202, 33		
Bridges on Evacuation Routes	Bachelor Brook Bridge	Route 47	
	Bachelor Brook Bridge	Route 116	
	Veterans Memorial Bridge	Route 116	
	Stony Brook Bridge	Route 116	
	Muller Bridge	Route 202	
Critical Needs/Utilities			
Electric Generation	South Hadley Electric Light Department	85 Main Street	
Natural Gas	Eversource	Compressor Station located in Chicopee but serves S. Hadley	
Potable Water	Water District #1 Office	438 Granby Road	Office and Garage
	District #1 Quabbin Trunk		
	District #1 Mulligan Drive Water Tank	14 Mulligan Drive	
	District #1 Industrial Drive Water Tank	8 Industrial Drive	
	District #2 Office	20 Woodbridge Street	Generator
	District #2 Sullivan Lane Pump Station		
	District #2 Park Street Water Tank		
	District #2 Skinner Lane Water Tank		Generator
Non-Potable Water Sources/Dry Hydrants	Leaping Wells Reservoir	438 Granby Road	
	Upper and Lower Lake	Mt Holyoke Campus	
Wastewater	Wastewater Treatment Plant	2 James Street, Chicopee	
	Main Street Pump Station		
	Stony Brook Pump Station		
	Morgan Street Pump Station		
	Toper Station	14 Sycamore Park	
	Old Sycamore Knolls Pump Station	21 North Sycamore Knolls	

Feature Type	Name	Address	Purpose/Notes
Dams	Queensville Dam at Titus Pond	Route 116	
	Leaping Well Reservoir Dam		
	Hillside Beach Dam		
	Lithia Springs Reservoir Dam		
	Mt Holyoke College Upper Pond Dam		
	Mt Holyoke College Lower Pond Dam		
	Marcalus Manufacturing Company Dam		
Transfer Station	South Hadley Transfer Station	10 Industrial Drive	
Problem Culverts	River Road – White Brook crossing		
	Pearl Street – In planning process to be replaced		
	Route 47 – at Sullivan Lane/Titan’s Pier		
	Rt. 202 across from Leaping Wells		

Category 2 – Potential Resources

Table 28: Potential Resources

Feature Type	Name	Address	Purpose/Notes
Food, Water, and Fuel			
Food/Grocery	Big Y	44 Willimansett Street	
	Delaney’s Market	459 Granby Road	
	Tailgate Picnic	7 College Street	
	7-Eleven	426 Newton Street	
	Dollar General	501 Newton Street	
Gas Stations	Haydocy Gulf	72 Lamb Street	
	Mobil	483 Granby Road	
	Cumberland Farms	507 Newton Street	
	Big Y Express	467 Newton Street	
	White Wing Liquor Gas	568 Newton Street	
	Shell Station	17 Bridge Street	
Charging Stations	Senior Center	45 Dayton Street	
	Village Commons	Rear of 29 College Street	
	Mt Holyoke	Gorse Parking Lot, 38 Morgan Street	
Hospitals and Veterinary Services			
Hospitals/ Health Services	Holyoke Medical Center	575 Beech Street, Holyoke	
	Baystate Medical Center Springfield	759 Chestnut Street, Springfield	

Feature Type	Name	Address	Purpose/Notes
	Cooley Dickinson Hospital	30 Locust Street, Northampton	
	Mercy Hospital		
	Raymond Medical Center	470 Granby Road, South Hadley	
Veterinarians	VCA South Hadley Animal Hospital	511 Newton Street	
	All Creatures Great and Small Animal Hospital	500 Granby Road	
Animal Shelters	Granby Animal Shelter		
	TJ O'Connor Animal Shelter		
Building/Construction Materials			
Building Material Suppliers	Home Depot – Chicopee and Hadley		
Heavy Material Suppliers	Materials at DPW (concrete, jersey barriers, fill, hardpack)		
Gravel Pits	Marion Excavating	749 New Ludlow Road	
	Chicopee Concrete	296 Hadley Street	

Category 3 – Populations and Facilities to Protect

Table 29: Populations and Facilities to Protect

Feature Type	Name	Address	Purpose/Notes
Housing			
Housing for Elderly/ Disabled	Hubert Place	93 Canal Street	
	Lathrop Village	69 Lathrop Street	
	Loomis Village	20 Bayon Drive	
	Newton Manor	643 Newton Street	
	Pioneer Valley Health and Rehab	573 Granby Road	
	South Hadley Housing Authority - Abbey Lane	Abbey Street/Lane	
Apartment and Condominium Complexes	Stoneybrook Village Condominiums	118 Stonybrook Way	
	Rivercrest Condominiums	20 Ferry Street	
	Jacob's Edge Condominiums	Rt. 202	
	Riverboat Village Apartments	173 Riverboat Village Drive	
	Falls Woods Condominiums	41 West Summit Street	
	Hillcrest Condominiums	Lawrence Avenue	
	Pine Grove Condominiums	195 Pine Grove Drive	
	Hadley Village Condominiums	129 Hadley Village Road	
	Shadowbrook Condominiums	Shadowbrook Estates	
	Strong Farm Condominiums	North Main Street	
	Kenlee Gardens	50 West Summit Street	

Feature Type	Name	Address	Purpose/Notes
	Stony Brook Condos	128 College Street	
Educational Institutions			
Public Schools	Plains Elementary	00 Lyman Street	Shelter
	Mosier Elementary	101 Mosier Street	This facility needs renovation. The generator only powers the kitchen.
	Michael E. Smith Middle School	100 Mosier Street	Shelter
	South Hadley High	153 Newton Street	Shelter
	Pioneer Valley Performing Arts Charter Public School	15 Mulligan Drive	
Private Institutions	Mount Holyoke College	50 College Street	
	Berkshire Hills Music Academy	48 Woodbridge Street	
	R. F. K. Girls Program	Canal Street	
	Gorse Child Study Center	27 Morgan Street	
	The Canal Village School	30 Carew Street	
Preschools/ Daycares	Criterion/Rise & Shine Academy	30 Old Lyman Road	Early intervention services, no daycare
	Brighter Beginnings	411 Granby Road	
	Tree of Life	11 North Main Street	
	The Canal Village School	30 Carew Street	
	The Gorse Children's Center	27 Morgan Street	
	Alphabet Soup Preschool Plus	5 Ferry Street	
	Tree of Life	1 Church Street	
	St Theresa's Church	9 East Parkview Drive	
Places of Worship			
	All Saints Episcopal Church	7 Woodbridge Street	
	Christ Life Fellowship Church	15 Lincoln Avenue	
	First Congregational Church	1 Church Street	
	Joshua Generation Fellowship	616 Amherst Road	
	Morning Start Baptist Church	11 North Main Street	
	New Life Presbyterian Church	411 Granby Road	
	Our Savior Lutheran Church	319 Granby Road	
	Second Baptist Church	589 Granby Road	
	St. Patrick Church	30 Main Street	
	St. Theresa Church	9 East Parkview Drive	
	Stony Brook Community Church	5 Ferry Street	
	United Methodist Church	30 Carew Street	

Feature Type	Name	Address	Purpose/Notes
Major Employers			
	Mt Holyoke College		
	Big Y		
	South Hadley High School		
	South Hadley Middle School		
	Pioneer Valley Performing Arts School		
	Town of South Hadley		
	Pioneer Valley Health and Rehabilitation		
	Loomis Village		
	Marion Excavating		
Natural Resource Assets			
	Watershed Protection Districts		
	Mt Holyoke Range State Forest		
	Buttery Brook	Gaylord Street	
Historic Buildings/Sites			
National Register of Historic Places	First Congregational Church	Church Street	
	South Hadley Canal Historic District	Canal Street	
	U. S. Post Office - South Hadley Main Branch	Canal Street	
	Woodbridge Street Historic District	Woodbridge Street	
Other Historic Sites	Evergreen Cemetery	Hadley Streer	
	Gaylord Memorial Library	College Street	
	Old Meeting House	3 Hadley Street	
	South Hadley Civil War Monument	College Street	
	South Hadley Falls Cemetery	South Main Street	
	South Hadley Firehouse District #1	4 North Main Street	

Critical Facilities in Hazard Areas

The table below lists critical facilities in high hazard areas. The Fire District #2 (backup EOC) and the Town Hall are each at risk of dam failure and flooding. This is one of the reasons that installing generators at these locations and other critical facilities is the highest priority in the list of mitigation actions.

Table 30: Critical Facilities in Hazard Areas

Hazards	Critical Facilities Impacted
Dam Failure	The EOC and Town Hall could flood if the Holyoke Dam breaches.
Drought	Whole planning area equally impacted.
Earthquake	Whole planning area equally impacted.
Extreme Temperatures	Whole planning area equally impacted.
Flood	The EOC and Town Hall could flood.
Hurricane	Whole planning area equally impacted.
Severe Snowstorm/Ice Storm	Whole planning area equally impacted.
Severe Thunderstorm/Wind/ Tornado	Whole planning area equally impacted.
Wildland Fire	Wooded portions of town. (J.A. Skinner State Park most likely.)

CHAPTER 5 – MITIGATION STRATEGIES

One of the steps of this Hazard Mitigation Plan update process was to evaluate all of the Town’s existing policies and practices related to natural hazards and identify potential gaps in protection. South Hadley’s HMP committee worked with PVPC to complete a Capability Assessment using the FEMA Capability Assessment worksheet as a guide, and to update Table 5.1, Existing Mitigation Capabilities.

South Hadley prioritizes hazard mitigation and emergency preparation and has many hazard mitigation capabilities in place. The Town is a certified MVP Community by the Commonwealth of Massachusetts. The Town implements hazard mitigation best practices through land use zoning, subdivision regulations and an array of specific policies and regulations, such as limitations on development in floodplains, stormwater management, and tree maintenance, among others. South Hadley’s most obvious hazard mitigation need is for additional state and federal funds to implement prioritized actions. While the Town is a well-managed and fiscally sound, it is not a wealthy community and with state constraints on municipalities raising their own funds, South Hadley has very limited financial resources to invest in costly hazard mitigation measures. The Town is, however, committed to locally matching all FEMA and other federal or state grants it receives.

Planning and Regulatory

South Hadley has many recommended plans in place, including a Comprehensive Emergency Management Plan, a Resilient Master Plan, a Capital Improvement Plan, a Stormwater Management Plan, and an updated Open Space and Recreation Plan. They adhere to current State level building codes. Their Zoning Ordinance covers floodplain management. They do have a specific Subdivision Ordinance and a Wetlands Protection plan. They have in the past purchased land for the purpose of open space and recreation.

Administrative and Technical

South Hadley has appropriate staff dedicated to hazard mitigation-related work for a community its size, including a Town Administrator, an Emergency Management Director, a professionally run Department of Public Works, a Building Inspector, a Planner, a Conservation Agent, and a Tree Warden. They do not have a civil engineer on staff. Within the Town of South Hadley are two Water Districts and Fire Districts. Those districts maintain Memorandums of Understanding (MOUs) with bordering communities. The Town also has a very committed and dedicated base of volunteers who serve on Boards and Committees. The Town collaborates closely with surrounding communities and is party to Mutual Aid agreements through MEMA. South Hadley is also an active member community of the Pioneer Valley Planning Commission (PVPC) and can take advantage of no cost local technical assistance as needed provided by the professional planning staff at the PVPC.

Financial

The Town is sound financially. They have received Community Development Block Grant Funding, MVP funding, as well as other State and Federal funding in the past. They maintain a Capital Improvements funding budget.

Education and Outreach

The Town and the Fire and Water Districts regularly educate their constituents about hazard mitigation and preparedness. The Fire Districts have a relationship with the School Department and Senior Center, and provide education services on a regular basis. The Public Health Administrator is also actively involved in education and outreach. The Town website includes mitigation and preparedness information.

Agencies That Have the Authority to Regulate Development

The Planning Board and Zoning Board are the primary Town agencies responsible for regulating development. Other Town commissions, boards, and committees that have the authority to regulate development include the Select Board, the Conservation Commission, and the Building Commissioner. Several town staff who participated in the Hazard Mitigation Committee have direct connections to various municipal commissions, boards, and committees within South Hadley that have the authority to regulate development. These included the Town Planner, the Conservation Agent, and the Town Administrator. Feedback from these stakeholder agencies was ensured through the participation of the HMP Committee members representing their respective groups.

In addition, the Pioneer Valley Planning Commission, as a regional planning authority, works with all agencies that regulate development in South Hadley, including the municipal entities listed above and state agencies, such as Department of Environmental Protection, the Department of Housing and Community Development, the Department of Conservation and Recreation and MassDOT. This regular involvement ensured that during the development of the 2024 Hazard Mitigation Plan Update, the operational policies and any mitigation strategies or identified hazards from these entities were incorporated into the Plan. PVPC is regularly involved in land use, transportation, and environmental planning initiatives in South Hadley and surrounding communities. Regular feedback received from these other initiatives were incorporated into the hazard mitigation planning process.

For the extent of this analysis, PVPC and the Hazard Mitigation Committee reviewed the following Town documents:

- Zoning Bylaws
- Subdivision Rules and Regulations
- Comprehensive Emergency Management Plan
- Town Open Space and Recreation Plan

After reviewing the community's existing policies and mitigation capabilities, as well as the hazard identification and assessment, the Hazard Mitigation Committee developed a set of hazard mitigation strategies it will work to implement over the next five years. The committee also agreed to

adhere to the goals outlined below, which will serve as a framework for mitigation of the hazards identified in this plan.

Hazard Mitigation and Climate Adaptation Goals

The Town of South Hadley’s HMP Committee convened to discuss, review, and endorse the following hazard mitigation and climate adaptation goals for the MVP-HMP:

The Town of South Hadley aims to minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to flooding, severe snowstorm and ice storms, severe thunderstorms, hurricanes, tornadoes, brushfires, earthquakes, dam failures, drought, and extreme temperatures through the following avenues:

Protection

Develop programs, strategies, and actions to protect the following Town assets from natural hazards and climate change impacts:

- Residents, with an emphasis on supporting the elderly, young, and low-income populations
- Critical infrastructure
- Utilities, including electric power, water, and wastewater
- Public facilities and services
- Homes and businesses
- Cultural and historic Resources
- Open space and other environmental features
- Future development

Planning

Incorporate climate adaptation and hazard mitigation measures into local plans, bylaws, regulations, and practices to protect critical infrastructure and property and to encourage resilient development, based on up-to-date information on climate change projections and emerging risks.

Nature-based Solutions

Investigate, design, and implement hazard mitigation and climate adaptation measures that employ nature-based solutions and protect the natural environment.

Coordination

Collaborate in hazard mitigation planning and climate adaptation with utility providers, local businesses, institutions, non-profits, surrounding communities, and state, regional and federal agencies.

Capacity

Increase the capacity for all Town departments, committees, and boards to respond to climate change impacts and natural hazard events with adequate data, guidance, staff, training, and equipment.

Public Outreach

Increase awareness and provide resources for hazard mitigation and climate resilience to businesses and residents through outreach and education.

Funding

Identify and seek funding for measures to mitigate or eliminate each known significant hazard area and reduce the impacts of climate change.

Table 31: Mitigation Capabilities

Capability	Action Type	Description	Hazards Mitigated	Effectiveness/Possible Changes
Flood Control Structures	Capital Construction	There are thirteen (13) dams in South Hadley	Flooding	Effective
Site Plan Review	Zoning Bylaws	Site Plan Review requires measures to reduce stormwater runoff and potential for flooding	Flooding	Effective
Floodplain Regulations	Regulations	Areas delineated as part of the 100-year flood plain are protected by strict use regulations	Flooding	Effective
Stormwater Management Bylaw	Regulations	Establishes minimum requirements and procedures to control the adverse impacts associated with stormwater runoff pre- and post-construction and site development. Updated in 2022 to include NOAA Atlas 14 or most recent.	Flooding	Effective
Flexible Development	Zoning Bylaws	Flexibility in defining dimensional standards and density for residential developments with a focus on open space and cultural space preservation.	Flooding	Effective
Definitive Plan for Subdivision	Subdivision Regulations	Requires a Definitive Plan for new subdivisions, including location of all wetlands, flood plains and proposed storm drainage, and water supply system	Flooding, Fire, Drought	Effective
Development Impact Statement	Subdivision Regulations	Requires a Development Impact Statement (DIS) detailing the impacts of the subdivision on surface water and subsurface conditions	Flooding	Effective
Compliance with Zoning Bylaw	Subdivision Regulations	Requires compliance with Zoning Bylaw including Floodplain Regulations	Flooding	Effective
Water Supply Protection District	Zoning bylaws	Areas delineated as primary recharge areas for groundwater aquifers, and watershed areas for reservoirs are protected by strict use regulations. Provisions to control soil erosion.	Flooding	Effective
Design Standards for Roads	Subdivision Regulations	Standards include street grade regulations (4 to 9 percent maximum)	Severe Snowstorms / Ice Storms	Effective
South Hadley Open Space and Recreation Plan	Planning Document	Inventories natural features and promotes natural resource preservation in the Town, including areas in the floodplain; such as wetlands aquifer recharge areas, farms and open space, rivers, streams and brooks.	Floods, Severe Snow/Ice Storms, Thunderstorms, Hurricanes, Tornadoes,	Effective

Capability	Action Type	Description	Hazards Mitigated	Effectiveness/ Possible Changes
			Wildfire / Brushfire, Dam Failure	
South Hadley 2020 Master Plan Update	Planning Document	A comprehensive plan, goals and actions that increase the Town's resiliency to natural hazards and climate change impacts, as well as to other economic and social stressors.	Floods, Severe Snow/Ice Storms, Thunderstorms, Hurricanes, Tornadoes, Wildfire / Brushfire, Dam Failure	Effective
Participation in the National Flood Insurance Program	Operational Strategy	As of 6/13/2023, there were 47 active NFIP policies in South Hadley, with 24 losses to date and a total net payment of \$124,607.43.	Flooding	Effective. Consider joining the Community Rating System
State Building Code	State regulation	The Town of South Hadley has adopted the Massachusetts State Building Code which promotes construction of buildings that can withstand hazards to a certain degree	Floods, Severe Snowstorms / Ice Storms, Thunderstorms, Hurricanes, Tornadoes, Wildfire / Brushfire, Earthquakes, Dam Failure	Effective
Zoning Regulations for Telecommunications Facilities	Zoning bylaws	Provides for placing wireless communications facilities in locations without negative impacts on safety	Floods, Severe Snowstorms / Ice Storms Thunderstorms, Hurricanes, Tornadoes, Earthquakes	Effective
Utilities	Subdivision Regulations	Electric, cable, communications, and gas utility lines are to be placed underground in new subdivisions	Severe Snowstorms / Ice Storms	Effective

Capability	Action Type	Description	Hazards Mitigated	Effectiveness/ Possible Changes
			Thunderstorms Hurricanes Tornadoes	
Burn Permits	Regulation	Requires Fire District #1 and #2 notification and permits. Burn Permits issued through Fire Departments according to DEP and MassAir Online requirements.	Wildfire / Brushfire	Very Effective
Public Education / Outreach	Operational Strategy	The Fire Department has an ongoing educational program in the schools, senior center, senior housing. Funding from SAFE and Senior SAFE programs.	Wildfire / Brushfire	Effective
New Dam Construction Permits	Regulation	State law requires a permit for the construction of any dam	Flooding Dam Failure	Effective
Dam Inspections	Operational Strategy	DCR has an inspection schedule that is based on the hazard rating of the dam (low, medium, high hazard). Get inspection reports for Mt. Holyoke, Queensville, and Holyoke Dams. Towns get EAPs for Mt Holyoke and Holyoke Dams.	Flooding Dam Failure	Effective
Mobile Homes	Zoning Bylaw	Mobile homes are an allowed use in all districts. Have to be installed on a foundation. Trailers are only allowed on a temporary basis.	Hurricanes Tornadoes	Effective
Catch Basin and Storm Drain Clearing	Operational Strategy	In accordance with the MS4 permit, the DPW regularly inspects and clears catch basins and storm drains. Street sweeping is done at a minimum of once per year.	Flooding, Hurricanes, Severe Storms, Snow and Ice Storms	Effective
Culvert replacements	Operational Strategy	The Town has a list of priority culverts to replace, and regularly seeks funding to implement this work.	Flooding, Hurricanes, Severe Storms, Snow and Ice Storms	Effective, but additional funding is needed
Emergency Power/back-up generators	Operational Strategy	Generators at Fire Districts, Police Department, DPW, Schools, COA. One backup generator still needed at Fire Department #2/Backup EOC Library could use generator	All hazards except drought	Effective, but need funding for replacement generator at FD #2 and generator for library

Capability	Action Type	Description	Hazards Mitigated	Effectiveness/ Possible Changes
CEMP	Operational Strategy	Plan is in place but may be redone to meet new MEMA standards	All hazards	Effective
Tree Management	Operational Strategy	Conducting townwide street tree inventory and will put together tree management plan, identify hazards trees.	Snow and ice storms, hurricanes, thunderstorms, wind, tornadoes	Effective, but tree management plan will make it more effective
Public Education and Outreach	Operational Strategy	Winter preparedness program at COA. Other emergency preparedness programs throughout the year. Publicized to entire community and get good turnout (a couple hundred). With meals on wheels send out go bags with information. Triad (Police, Fire, EMS and Seniors) give out sand for winter, house numbers, Files of Life, lockboxes.	All hazards	Effective
Emergency Warning System – Civic Ready	Operational Strategy	Messaging supposed to go to TA from Police and TA puts it out. Some residents don't want to get the messages and prefer to go on website. Put all emergency messages in news alerts. Schools have their own emergency messaging system	All hazards	Somewhat effective. Need to improve protocol for putting messages out, and outreach on how to sign up. Sign people up at COA events.

Mitigation Strategy

After reviewing existing mitigation capabilities and the hazard identification and risk assessment, the Town Hazard Mitigation Committee developed a set of hazard mitigation strategies to implement over the next five years.

2016 Mitigation Action Status

The table below provides the status of the mitigation strategies from the 2016 Hazard Mitigation Plan. The Status column on the far right indicates whether each strategy has been completed or not, and an explanation is provided for all of the strategies that were not completed. Some of the mitigation actions, those indicated, have moved forward into the 2024 Hazard Mitigation Plan Update.

2019 MVP Community Resilience Building Workshop

In 2019 the Town held a Community Resilience Building (CRB) workshop as part of the Municipal Vulnerability Preparedness (MVP) planning grant. Key concerns that emerged from the workshop included flooding from both rivers as well as from drainage infrastructure not equipped to handle increasing amounts of precipitation; damage and outages from snow and ice storms, and the impact of extreme high temperatures on vulnerable populations. The following are some of the highest priority actions identified at the workshop:

- Conduct a field inventory of culverts and bridges
- Conduct dam assessments, identify privately-owned dams, and study feasibility of dam removals
- Coordinate across departments and organizations to develop an emergency plan
- Establish a comprehensive emergency awareness plan for residents
- Develop transportation planning for vulnerable populations during hazard events
- Conduct a feasibility study for relocation of the EOC
- Assess cost-effective green infrastructure opportunities for stormwater management
- Evaluate opportunities to provide improvements at critical facilities, especially emergency backup power.
- Increase public awareness programs related to vector-borne diseases
- Develop a comprehensive tree and forests management program
- Address flooding on Route 47/Pearl Street near Bachelor Brook
- Formalize or increase recognition of the collaboration between departments during day-to-day operations and hazard events.

A number of these actions have been implemented or in the process of being implemented, and some of them have been incorporated into the HMP Action Plan. The Town is also participating in the MVP 2.0 program to focus on strategies for increasing social resiliency and to identify additional actions that can qualify for MVP funding.

Table 32: Status of 2016 Mitigation Actions

Priority	Mitigation Action	Hazards Addressed	Responsible Department/ Board	Potential Funding Source(s)	Estimated Cost	Status
High	Purchase and install generators at the following critical facilities: Fire District #2 (Backup EOC), Middle School, Town Hall and the Mosier School.	All hazards	District #2	Town, State, District #2	High	Generators installed at the schools and Town Hall. Generators still needed at FD#2 and at Library.
High	Add a dry hydrant on River Road and Tigger Lane where the water main ends	Drought Extreme Temperatures Wildfire/Brush Fire Severe Thunderstorms	District #1	District #1, Town, FEMA Grant	Low	Not completed, due to a lack of funding for implementation and concern about funding for maintenance. Keep in update.
High	Evaluate and then if deemed feasible re-establish emergency access route on River Road (gates need to be on conservation land)	Floods Hurricanes Severe Thunderstorms	District #1, DPW, Conservation	Town, Districts #1 and #2	Medium	Done
High	If warranted, raise the road, and replace the culvert and water main on Pearl Street to avoid flooding and the need to evacuate homes	Floods Hurricanes Severe Thunderstorms	DPW, District #2	DPW Chapter 90 Funds, District #2, FEMA and/or State Grant	High	In process – Town received MVP funding in 7/2024 to replace culvert.
High	If deemed cost effective and beneficial, implement mitigation measures identified to mitigate flooding on River Road.	Floods Hurricanes Severe Thunderstorms	DPW	DPW Chapter 90 Funds	High	Done
High	Replace culverts on Mosier Street at #136 and on New Ludlow Road about 750’ north of Old Lyman Road.	Floods Hurricanes Severe Thunderstorms	DPW	DPW Chapter 90 Funds, FEMA, MVP, DER	High	New
Medium	Evaluate cost effectiveness of raising the road, and replacing the culvert and water main on Pearl Street to avoid flooding and the need to	Floods Hurricanes Severe Thunderstorms/	DPW, District #2	DPW Chapter 90 Funds, District #2, FEMA and/or	Low	Done

Priority	Mitigation Action	Hazards Addressed	Responsible Department/ Board	Potential Funding Source(s)	Estimated Cost	Status
	evacuate homes	Wind/Tornadoes		State Grant		
Medium	Conduct a flood study to determine the best solution to mitigate flooding on River Road. If necessary replace the culvert on River Road.	Floods Hurricanes Severe Thunderstorms/ Wind/Tornadoes	DPW	DPW Chapter 90 Funds	Low	Done
Medium	Invite Mount Holyoke College to join in Town emergency management planning efforts.	All hazards	EMD Director	Town	Low	Done
Medium	Conduct table-top exercises in collaboration with Mount Holyoke College.	All hazards	EMD Director	Town	Low	Done. Add new action to conduct exercises with businesses.
Low	Develop oversight strategy to ensure that retention ponds and detention basins are maintained by appropriate agency	Floods Hurricanes Severe Thunderstorms/ Wind/Tornadoes	Planning Board, Conservation Department, DPW	Town	Low	Done
Low	Town should evaluate whether to become part of FEMA's Community Rating System	Floods	Selectboard, LEPC	State	Low	Not done due to staff capacity limitations. Not feasible at this time.
Low	Continue to monitor and maintain culverts that collect debris and may cause localized flooding. Identify those that may need replacing.	Floods Hurricanes Severe Thunderstorms/ Wind/Tornadoes	Selectboard, DPW	DPW Chapter 90 funds	Low	Done, keep in as ongoing.
Low	Consider participation in a regional Debris Management Plan	Floods Hurricanes Severe Thunderstorms/ Wind/Tornadoes	Selectboard, Emergency Management Director	State	Medium	Not done. Unable to identify communities or locations where debris can be stored.

Prioritized Implementation Plan

The Hazard Mitigation Committee developed a list of mitigation actions based on the need for mitigation actions to address current and future hazards. 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. The new mitigation actions are based on experience with currently implemented actions, as well as the hazard identification and risk assessment in this plan.

The table below identifies all of the mitigation actions for this plan. As the Hazard Mitigation Committee discussed each mitigation action, they identified a responsible party or agency responsible for securing funding and implementing the mitigation action. Many of the mitigation actions require a collaborative effort as indicated by the listing of several departments or organizations. They also identified potential funding sources, also indicated in the table below. Finally, the Hazard Mitigation Committee sought to mitigate risk to all of the hazards the Town may experience so the list of hazards that each mitigation action addresses is included. Several actions are considered relevant to “all hazards” and are so indicated.

Prioritization Methodology

The mitigation actions are listed in priority order. This order was developed by the Hazard Mitigation Committee. The Town of South Hadley recognizes that projects may be implemented in the order that they are funded, not necessarily in the order of priority. The Committee prioritized the list of new mitigation strategies and strategies carried over from the previous plan 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 and other programs** – 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:

- **High** – Strategies that provide mitigation of one or several hazards and have a large benefit that warrants their cost and time to complete.
- **Medium** – Strategies that would have some benefit to people and property and are somewhat cost effective at reducing damage to property and people.
- **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.

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 \$25 per hour)
- Consultant design and construction cost (based on estimates for projects obtained from town and general knowledge of previous work in town)
- Town staff time for construction, maintenance, and operation activities (rate of \$25 per hour)

Project Timeframe

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.

Table 33: New Hazard Mitigation Actions

Priority Order	Mitigation Action	Hazards Addressed	Responsible Department/ Board	Potential Funding Source(s)	Estimated Cost	Status	Proposed Completion Date
High	Purchase and install generators at Fire District #2 (Backup EOC) and at the Library.	All hazards	District #2	FEMA, District #2, Legislative earmark	High	Carried over from last plan	2027
High	Add a dry hydrant on River Road and Tigger Lane where the water main ends.	Drought Extreme Temperatures Wildfire/Brush Fire Severe Thunderstorms	District #1	District #1, Town, FEMA Grant	Low	Carried over from last plan	2029
High	Replace the culvert and water main on Pearl Street to avoid flooding and the need to evacuate homes	Floods Hurricanes Severe Thunderstorms	DPW, District #2	DPW Chapter 90 Funds, District #2, FEMA and/or State Grant	High	In process – Town received DER and MVP funding in 2024 to replace culvert.	2026
High	Replace culverts on Mosier Street at #136 and on New Ludlow Road about 750’ north of Old Lyman Road.	Floods Hurricanes Severe Thunderstorms	DPW	DPW Chapter 90 Funds, FEMA, MVP, DER	High	New	2028
High	Continue outreach and education about preparing for natural hazards/climate change impacts	All Hazards	Emergency Management Director, Health Department, COA	Emergency Management, Health Department and COA budgets	Low	New	2025 and ongoing
High	Plant trees townwide for shade and for flood mitigation.	Extreme Heat Floods	Tree Warden, Conservation Commission, DPW	Conservation Commission and DPW budgets, MVP	Medium	New	2024 and ongoing

Priority Order	Mitigation Action	Hazards Addressed	Responsible Department/ Board	Potential Funding Source(s)	Estimated Cost	Status	Proposed Completion Date
Medium	Increase enrollment in Civic Ready	All Hazards	Emergency Management Director, Police Department	Emergency Management and Police Department Budgets	Low	New	2025 and ongoing
Medium	Conduct table-top exercises in collaboration with South Hadley businesses on an annual basis	All Hazards	Emergency Management Director	Emergency Management Department Budget	Low	New	2025 and ongoing
Medium	Targeted outreach about SHELDT and Mass Save programs to LMI residents and seniors – rebates for weatherization and air source heat pumps (i.e. mini splits)	Extreme Heat	SHELDT, Planning Department, Health Department, COA	MVP, SHELDT Budget	Low-Medium	New	2025 and ongoing
Medium	Provide resources on prevention of vector-borne diseases	Floods, Hurricanes, Severe Thunderstorms, High temperatures	Health Department	Health Department Budget	Low	New	2025 and ongoing
Medium	Continue to monitor and maintain culverts that collect debris and may cause localized flooding. Identify those that may need replacing.	Floods, Hurricanes, Severe Thunderstorms/ Wind/Tornadoes	Selectboard, DPW	DPW Chapter 90 funds	Low	Carried over from last plan	2025 and ongoing
Medium /Low	Ensure receipt of EAPs and review. High hazard dams must have an EAP approved by the Office of Dam Safety that includes a list of equipment, procedure for informing emergency agencies, inundation map and procedure for warning residents.	Dam Failure	Emergency Management, DPW	Emergency Management Budget, Holyoke Gas and Electric	Low	New	2024 and ongoing

Priority Order	Mitigation Action	Hazards Addressed	Responsible Department/ Board	Potential Funding Source(s)	Estimated Cost	Status	Proposed Completion Date
Low	Develop a drought communication plan and early warning system to facilitate timely communication of relevant information to officials, emergency management and the general public.	Drought	Emergency Management, Fire/Water Districts #1 and #2	Emergency Management Budget, Fire/Water District #1 and #2 budgets	Low	New	2025-2026
Low	Evaluate critical facilities for earthquake resistance, and consider seismic retrofitting for those that need it. Use FEMA evaluation tool and seismic rehabilitation guidelines.	Earthquakes	Building Department	FEMA, Building Department budget	Low for evaluation, medium-high for retrofitting	New	2028

CHAPTER 6 – PLAN REVIEW, EVALUATION, IMPLEMENTATION, AND ADOPTION

Plan Adoption

Upon completion of the draft 2024 Hazard Mitigation Plan Update, a public meeting was held on December 3, 2024, by the HMP Committee to present the plan and to receive public comments. The plan was also made available on the Town website and at the Town Hall for public review for a 30-day period. The 2024 Hazard Mitigation Plan Update was then submitted to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA) for their review. Upon receiving conditional approval of the plan by FEMA, the plan was presented to the Town's Select Board and adopted.

Plan Implementation

The implementation of this plan begins upon its formal adoption by the Town Select Board after approval by MEMA and FEMA. Those town departments and boards responsible for ensuring the development of policies, bylaw revisions, and programs as described in the Mitigation Strategy of this plan will be notified of their responsibilities immediately following approval. The Town's HMP Committee, led by the Emergency Management Director, will oversee the implementation of the plan. They will meet yearly at a minimum to ensure the implementation of the mitigation actions.

Incorporation with Other Planning Documents

During yearly update meetings for the Hazard Mitigation Plan, the Hazard Mitigation Committee will review whether any of the plans or documents listed below are in the process of being updated or revised, as well as whether any new plans are being developed. If so, the Hazard Mitigation Committee will provide the Hazard Mitigation Plan to relevant Town staff and brief them on the contents of the Plan, and work with them on incorporating the data and actions from the plan into their planning efforts. 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.

- *Comprehensive Emergency Management Plan*
- *Zoning Ordinance and Subdivision Regulations*
- *Open Space and Recreation Plan*
- *Resilient Master Plan*

After this plan has been approved by both FEMA and the local government, links to the plan will be emailed to all Town staff, boards, and committees, with a reminder to review the plan periodically and work to incorporate its contents, especially the action plan, into other planning processes and documents.

Plan Monitoring and Evaluation

The Town's Emergency Management Director will call meetings of all responsible parties to review plan progress on an annual basis and as needed (*i.e.*, following a natural disaster). The public will be notified of these meetings in advance through a posting of the agenda at Town Hall and on the Town website. Responsible parties identified for specific mitigation actions will be asked to submit their reports in advance of the meeting.

Meetings will involve evaluation and assessment of the plan, regarding its effectiveness at achieving the plan's goals and stated purpose. The following questions will serve as the criteria that is used to evaluate the plan:

Plan Mission and Goal

- Is the Plan's stated goal and mission still accurate and up to date, reflecting any changes to local hazard mitigation activities?
- Are there any changes or improvements that can be made to the goal and mission?

Hazard Identification and Risk Assessment

- Have there been any new occurrences of hazard events since the plan was last reviewed? If so, these hazards should be incorporated into the Hazard Identification and Risk Assessment.
- Have any new occurrences of hazards varied from previous occurrences in terms of their extent or impact? If so, the stated impact, extent, probability of future occurrence, or overall assessment of risk and vulnerability should be edited to reflect these changes.
- Is there any new data available from local, state, or Federal sources about the impact of previous hazard events, or any new data for the probability of future occurrences? If so, this information should be incorporated into the plan.

Existing Mitigation Strategies

- Are the current strategies effectively mitigating the effect of any recent hazard events?
- Has there been any damage to property since the plan was last reviewed?
- How could the existing mitigation strategies be improved to reduce the impact from recent occurrences of hazards? If there are improvements, these should be incorporated into the plan.

Proposed Mitigation Strategies

- What progress has been accomplished for each of the previously identified proposed mitigation strategies?
- How have any recently completed mitigation strategies affected the Town's vulnerability and impact from hazards that have occurred since the strategy was completed?
- Should the criteria for prioritizing the proposed mitigation strategies be altered in any way?
- Should the priority given to individual mitigation strategies be changed, based on any recent changes to financial and staffing resources, or recent hazard events?

Review of the Plan and Integration with Other Planning Documents

- Is the current process for reviewing the Hazard Mitigation Plan effective? Could it be improved?
- Are there any Town plans in the process of being updated that should have the content of this Hazard Mitigation Plan incorporated into them?
- How can the current Hazard Mitigation Plan be better integrated with other Town planning tools and operational procedures, including the zoning bylaw, the Comprehensive Emergency Management Plan, and the Capital Improvement Plan?

Next Steps

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 Hazard Mitigation Plan every five years.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The HMP Committee will hold all meetings in accordance with Massachusetts open meeting laws and the public will be invited to attend. The public will be notified of any changes to the Plan via the meeting notices board at Town Hall and on the Town website, and copies of the revised Plan will be made available to the public at Town Hall and on the Town website.

CHAPTER 7 – APPENDICES

Appendix A – Technical Resources

Agencies

Massachusetts Emergency Management Agency (MEMA).....	(508)820-2000
Hazard Mitigation Section	(617)626-1356
Federal Emergency Management Agency (FEMA)	(617)223-4175
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 (SRPED).....	(508)823-1803
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.....	(508)824-5116
US Department of the Interior: US Fish and Wildlife Service	(413)253-8200
US Geological Survey.....	(508)490-5000

Mitigation Funding Resources

The identification of funding sources is the initial step in seeking funds and may vary depending on numerous factors. These factors include, but are not limited to, if a mitigation measure is conceptual or has been studied, evaluated, or designed. In most cases, the measure will require a combination of funding sources. The funding sources identified are not a guarantee that a specific project will be eligible for, or receive, funding. Upon adoption of this plan, the local representatives responsible for implementation should begin to explore potential funding sources in more detail.

Traditional funding sources within the Town of South Hadley, such as funding from the operating and capital budgets, may be able to cover some of the costs associated with the action items. State revolving funds and other no- or low-interest loans may also be of interest. There is a great variety of funding available for Massachusetts municipalities, both through the state and federal governments. A full list of funding opportunities can be found on the [Community Grant Finder webpage](#). The Community Grant finder provides a streamlined interface where municipalities can easily learn about grant opportunities. Specific funding options related to action items developed by South Hadley are listed in the table below.

Category	Agency/Grant	Description	Limitations & Stipulations
Community Development	MassWorks Infrastructure Program	Provides grants to communities to help them prepare for success and contribute to the long-term strength and sustainability of the Commonwealth.	None
Dam Repair and Removal	Dam and Seawall Program, EOOEA	Provides funding for repair or removal of dams	None
Dam Removal	Division of Ecological Restoration (DER)	Provides funding to remove dams and restore river processes.	Must provide a high enough ecological benefit
Drinking Water Supply Protection	Drinking Water Supply Protection (DWSP) Grant Program, MassDEP	Financial assistance for the purchase of land for protection of existing DEP-approved public drinking water supplies; protection of planned future public drinking water supplies; or groundwater recharge	For public water systems and municipal water departments
Emergency Management and Planning	Flood Mitigation Assistance Grant Program (FMA)	Implement cost-effective measures that reduce or eliminate the long-term risk of flood damage.	For buildings and other structures insured under the NFIP
Emergency Management and Planning	Hazard Mitigation Grant Program (HMGP)	Provides funding after a disaster to significantly reduce or permanently eliminate future risk to lives and property from natural hazards.	Requires a Cost-Benefit Analysis
Emergency Management and Planning	Building Resilient Infrastructure & Communities (BRIC)	Provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event, with a focus on infrastructure projects and “community lifelines.” Replaced FEMA’s Pre-Disaster Mitigation (PDM) Program.	Required a Cost-Benefit Analysis
Emergency	MEMA Citizen Corps	Supports local Community Emergency	None

Category	Agency/Grant	Description	Limitations & Stipulations
Management and Planning	Program (CCP) Grant	Response Teams (CERT) and Volunteers in Police Service (VIPS) in preparing for all-hazards. Can be used for planning activities, equipment, training, and exercises.	
Energy	Department of Energy Resources (DOER)	The DOER provides grant funding for clean energy-related programs.	None
Energy	Green Communities Designation and Grant Program	Provides a road map along with financial and technical support to municipalities that pledge to cut municipal energy and meet other criteria.	Towns must be designated Green Communities in order to apply for funding.
Environment	Community Forest Grant Program	Funding to establish community forests.	None
Environment, Flood Mitigation	Culvert Replacement Municipal Assistance Grant Program	Grant to replace undersized, perched, and/or degraded culverts located in an area of high ecological value.	Culvert replacements must meet Massachusetts Stream Crossing Standards to the maximum extent feasible.
Environment	US Forest Service Community Forest Grant Program	Funding to acquire private forest land threatened by conversion and establish community forests.	None
Environment	Conservation Assistance Grant Program	Provides funding for property appraisals, OSRPs, other land conservation planning.	Towns with 6,000 residents or fewer
Environment	604b Grant Program	Water quality assessment and management planning.	None
Environment	Land Use Planning Grants	Support effort to plan, regulate, and act to conserve and develop land consistent with the Massachusetts' Sustainable Development Principles.	None
Environment	LAND Grant Program (Division of Conservation Services)	Helps cities and towns acquire land for conservation and passive recreation.	Municipality must have an approved OSRP
Environment	Federal Land & Water Conservation Fund (DCS)	Funding for the acquisition, development, and renovation of parks, trails, and conservation areas.	Municipality must have an approved OSRP
Environment	MassTrails Program	Trail protection, construction, and stewardship projects.	None

Appendix B – Documentation of the Planning Process

Hazard Mitigation Committee Meetings

South Hadley Hazard Mitigation Plan Committee
Kickoff Meeting

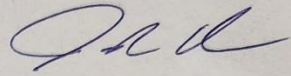
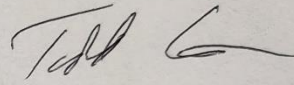
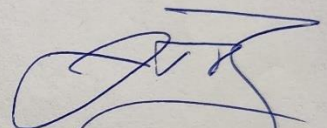
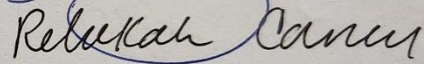
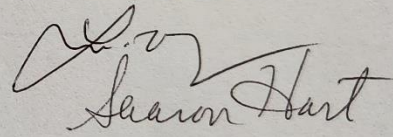
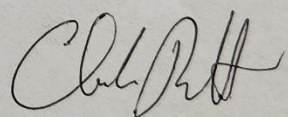
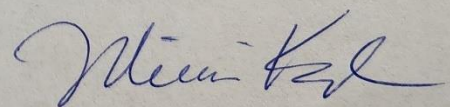
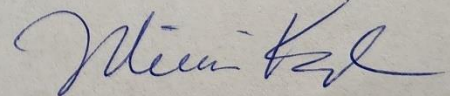
South Hadley Library
May 18, 2023, 11 am

Name	Signature
Anne Capra	Anne Capra
Todd CALEMI	Todd Calami
JOHN BRODERICK	John Broderick
Tim Cauley	Tim Cauley
Sharon Hart	Sharon Hart
Mimi Kaplan	Mimi Kaplan

South Hadley HMP Meeting #2

August 14, 2023

S. Hadley Public Library

<u>Name + Position</u>	<u>Signature</u>
JASON HOLE Captain FD #7	
TOOD CAIKENS Fire Chief SHFD2	
JOHN BRODERICK DPW	
Rebekah Cornum	
Lisa Wong	
Sharon Hart, EMD	
Chuck Bombdelti, ATA/HR Dept	
Mimi Kaplan, PVPC	

South Hadley HMP Meeting #3

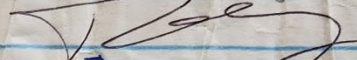
Name

Signature

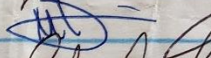
Rebekah Cornell

Rebekah

Tim Cavley



MATTHEW DELMONTE



Peter Jasionowski

Peter

John Broderick



Anne Capra

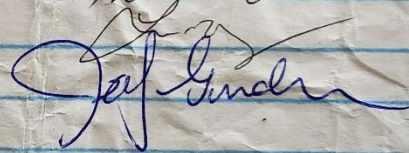
Anne Capra

Todd Carkins

Todd Car

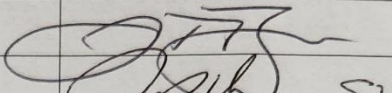
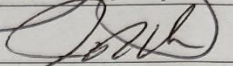
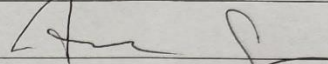


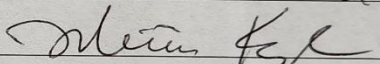
Lisa Wong

Jan Gunderson



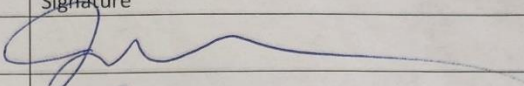
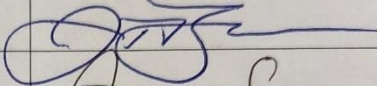
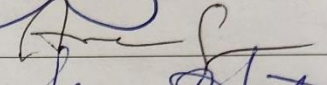
South Hadley Hazard Mitigation Plan Committee
Meeting #4

South Hadley Library
October 17, 2023, 10 am

Name	Signature
John Broderick	 DPW
Jason Houle	 SHFD 1
Rebekah Corneil	Rebekah Corneil CONSERVATION
Anne Capra	
Todd Calkins	 SHFD 2
Jen Gundersen	 SH Police
Sharon Hart	Sharon D. Hart
Mimi Kaplan, NPC	

South Hadley Hazard Mitigation Plan Committee
Meeting #5

South Hadley Library
February 29, 10 am

Name	Signature
Jennifer Gunnerson	
Rebekah Cornu	Rebekah Cornu
John Browerick	
Anne Capra	
Sharon Hart	Sharon Hart

South Hadley Hazard Mitigation Plan Public Forum

December 14, 2023, 6 pm
South Hadley Public Library
2 Canal Street, South Hadley

Are you concerned about natural hazards like flooding, strong storms, heavy snow/ice and extreme temperatures?


Come learn what the Town is doing to prepare and share your thoughts! There will be light refreshments and giveaways of T-shirts and bicycle helmets.



Photo credit: wwlp.com

SOUTH HADLEY HAZARD MITIGATION PLAN (HMP) UPDATE

PUBLIC FORUM
DECEMBER 14, 2023



1

THANK YOU TO THE HMP COMMITTEE

- Sharon Hart, Emergency Management Director
- Lisa Wong, Town Administrator
- Anne Capra, Director of Planning and Conservation
- Robert Aulihar, Fire Chief, District 1
- Todd Calkins, Fire Chief, District 2
- Jeff Cye, Superintendent, Water District 1
- Timothy Caulley, Superintendent, Water District 2
- Jennifer Gunderson, Police Chief
- Mark McLaughlin, Superintendent, South Hadley Public Schools
- Sean Fitzgerald, General Manager, South Hadley Electric Light Department
- John Broderick, Highway Superintendent
- Rebekah Cornell, Conservation Administrator

2

WHAT IS HAZARD MITIGATION?



“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



3

BENEFITS OF HAZARD MITIGATION

- Makes communities eligible to apply for Hazard Mitigation funds from FEMA
- Mitigation is less expensive than disaster clean up
- Makes communities more resilient to natural hazards and impacts of climate change
- Having a plan helps communities use limited resources more effectively



4

MITIGATION VS. PREPAREDNESS

Hazard Mitigation

- Planning and zoning
- Drainage/Building improvements
- Open space preservation
- Education and outreach

Emergency Preparedness

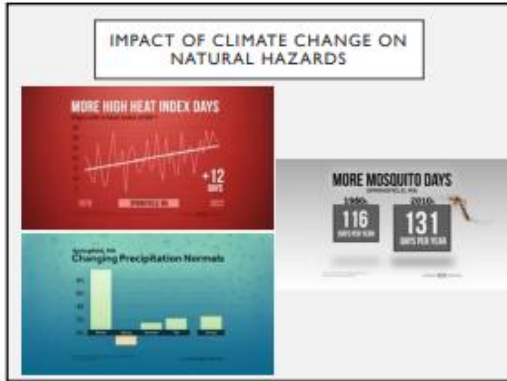
- Evacuation plans and emergency shelters
- Radio communications equipment
- Emergency response drills

5

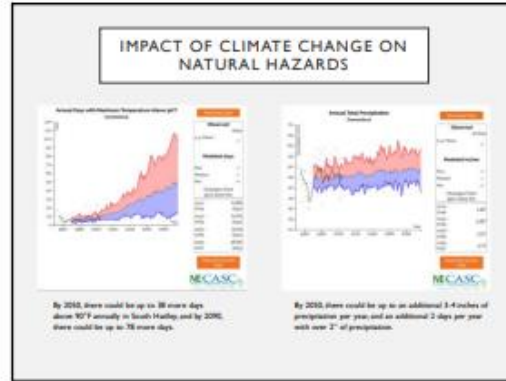
WHAT NATURAL HAZARDS ARE A RISK FOR SOUTH HADLEY?

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Vulnerability
Deer Falls	Large	Very Low	Catastrophic	3
Drought	Large	High	Minor	4
Earthquake	Large	Very Low	Catastrophic	5
Extreme Temperatures	Large	Very High	Limited	3
Flooding	Medium	High	Minor	3
Hurricanes	Large	Low	Critical	3
Severe Snowstorms/Ice Storms	Large	Very High	Critical	1
Severe Thunderstorms/ Wind/Tornadoes	Medium	Very High	Catastrophic	1
Wildfire/Brushfire	Medium	Moderate	Limited	3

6



7



8

- ### EXISTING MITIGATION CAPABILITIES
- South Hadley has many capabilities in place already to reduce the risk from natural hazards. These include:
- Use of Civic Alert Emergency Alert System
 - Culvert replacements, outfall inspections and clearing, storm drain cleaning
 - Stormwater Management Bylaw
 - Participation in the National Flood Insurance Program (47 active policies)
 - Tree Management – Conducting tree inventory, will put together management plan and identify hazard trees
 - Burn permit requirements
 - Emergency preparedness programs for residents (at COA)
 - Requirement for underground utility lines in new subdivisions

9

- ### PREVIOUS HIGH PRIORITY MITIGATION ACTIONS
- Install back-up generators at critical facilities
 - Add dry hydrant on River Road and Tigger Lane
 - Evaluate and possibly re-establish emergency access route to River Road
 - Implement flood mitigation measures on River Road
 - Raise road, and replace culvert and water main on Pearl Street (if determined to be necessary)

10

- ### PUBLIC COMMENT PERIOD
- Questions? Comments?
 - What natural hazards are you concerned about?
 - What mitigation actions would you like the town to take?

11

THANK YOU!

If you have additional comments or questions about the Hazard Mitigation Plan or general questions about natural hazards in South Hadley, please contact:

Mimi Kaplan, Pioneer Valley Planning Commission
mkaplan@pvtvc.org
 413-781-4045

Or

Sharon Mars, South Hadley Emergency Management Director
shar@southhadleyvt.com
 413-538-5030 ext 6184

12

South Hadley Hazard Mitigation Plan
Public Meeting #1

South Hadley Library
December 14, 2023, 6 pm

Name	Signature
Anne Capra	Anne Capra
Sharon Hart	Sharon Hart
Diane LaRoche	Diane LaRoche
Chris Amine	Chris Amine
Beth LACEY	B. Lacey
Jen Gundersen	Jen Gundersen
Alain Turgeon	Alain Turgeon
Liz Schwellenbach	Liz Schwellenbach
Susan Houle	Susan Houle
Philip Randazzo	P-R
Mimi Kaplan	Mimi Kaplan

MEDIA RELEASE

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

FOR IMMEDIATE RELEASE

November 30, 2023

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

South Hadley residents, businesses, and surrounding community members are invited to learn about and provide input on the Town's Hazard Mitigation Plan on Thursday, December 14, 2023 at 6 pm at the South Hadley Public Library, 2 Canal Street, South Hadley.

The Public Forum will include an overview of the hazard mitigation plan, the risks from natural hazards and climate change impacts in South Hadley, and previous mitigation actions. Food will be provided and there will be giveaways of South Hadley T-shirts and bicycle helmets. The Forum is an opportunity for you to share your opinions and participate in the mitigation planning process. Municipal officials and PVPC staff will be available to answer questions about the project. All members of the public, representatives from surrounding communities and other interested parties are encouraged to attend. Public participation and input are essential!

The purpose of the Hazard Mitigation Plan is to assess South Hadley's vulnerabilities from natural hazard and climate change risks, and to identify actions to reduce the risks. A mitigation action is any action that reduces or eliminates the risk to human life and property from natural hazards.

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 MEMA and 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.

Appendix C – Hazard Mitigation Map

