THE CITY OF NORTHAMPTON
MULTI-HAZARD MITIGATION PLAN

Adopted by the Northampton City Council on August 13, 2015

Prepared by:

The Northampton Hazard Mitigation Committee

and

Pioneer Valley Planning Commission
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City of Northampton

MASSACHUSETTS

In City Council, August 13, 2015

Upon the recommendation of Planning and Sustainability and Dept. of Public Works

Ordered, that

WHEREAS, The ***Sustainable Northampton Comprehensive Plan*** sets a goal of "Develop strategies to protect the City from the impacts of natural hazards" and other actions to prepare for climate change; and

WHEREAS, The City of Northampton established a Committee to prepare the ***Northampton Multi-Hazard Mitigation Plan***, made up of representatives from Fire, Emergency Management, Planning and Sustainability, Public Works, Central Services, and Building; and

WHEREAS, The Committee held two public hearings, on April 29, 2014 and June 18th, 2014 regarding the development and review of the ***Northampton Multi-Hazard Mitigation Plan***, to replace the previous expired plan; and

WHEREAS, The ***Northampton Multi-Hazard Mitigation Plan*** contains several potential future projects to mitigate hazard damage in the City of Northampton, which makes the City eligible for significant hazard mitigation funding; and

WHEREAS, FEMA has determined that the City's plan is approvable, pending City Council approval; and

WHEREAS, A duly-noticed public hearing was held by the Northampton City Council on August 13, 2015 to formally approve and adopt the ***Northampton Multi-Hazard Mitigation Plan;***

NOW, THEREFORE BE IT ORDERED,
The Northampton City Council hereby adopts the ***Northampton Multi-Hazard Mitigation Plan (2015)*** attached hereto by reference.

In City Council, August 13, 2015
Passed First Reading, on Roll Call Vote of 8 Yes, 0 No, 1 Absent (Councilor Murphy)
Attest: Pamela L. Powers, Clerk of Council

In City Council, August 13, 2015
Passed Second Reading, on Roll Call Vote of 8 Yes, 0 No, 1 Absent (Councilor Murphy)
Attest: Pamela L. Powers, Clerk of Council

Approved: David J. Narkewicz, Mayor

Rules suspended, passed two readings and enrolled

I hereby certify that the above Order passed the Northampton City Council on August 13, 2015
David J. Narkewicz, Mayor approved the Order on August 19, 2015
Attest: Pamela L. Powers, Clerk of Council

15.486

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Acknowledgements

The Northampton City Council extends special thanks to the Northampton Hazard Mitigation Committee as follows:

Jon Davine, Fire Department

Wayne Feiden, Department of Planning and Sustainability

Ned Huntley, Department of Public Works

Sarah LaValley, Department of Planning and Sustainability

Josh Shanley, Emergency Management

Chris Mason, Energy Officer in Central Services

Louis Hasbrouck, Building Commissioner

The Northampton City Council offers thanks to the Massachusetts Emergency Management Agency (MEMA) for developing the Massachusetts Hazard Mitigation Plan which served as a model for this plan. In addition, special thanks are extended to the staff of the Pioneer Valley Planning Commission for professional services, process facilitation and preparation of this document.

Pioneer Valley Planning Commission

Catherine Ratté, Principal Planner/Co-Project Manager
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Todd Zukowski, Senior Planner/GIS Specialist
Jacob Dolinger, GIS Specialist

1: PLANNING PROCESS

Introduction

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

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

Preparing a Local Natural Hazards Mitigation Plan before a disaster occurs can save the community money and 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 pre-disaster mitigation plan as a condition for mitigation funding, including the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Pre-Disaster Mitigation Program (PDM).

Hazard Mitigation Planning Committee

In 2014, the City of Northampton completed an update of their 2007 Hazard Mitigation Plan, in collaboration with the Pioneer Valley Planning Commission. All portions of the plan were reviewed and updated as necessary. Planning for hazard mitigation in Northampton involved a seven-member workgroup:

- Jon Davine, Fire Department
- Wayne Feiden, Department of Planning and Sustainability
- Ned Huntley, Department of Public Works
- Sarah LaValley, Department of Planning and Sustainability

- Josh Shanley, Emergency Management
- Chris Mason, Energy Officer in Central Services
- Louis Hasbrouck, Building Commissioner

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

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

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

Hazard Mitigation Committee Meetings

Meetings of the Hazard Mitigation Planning Committee, all of which took place at Northampton City Hall, were held on the dates listed below. Agendas for each meeting are included in Appendix A. After review by MEMA, the Hazard Mitigation Committee met to review and incorporate MEMA feedback.

- April 17, 2014, 2:30 p.m., Northampton City Hall
- May 15, 2014, 2:30 p.m., Northampton City Hall
- May 27, 2014, 3:00 p.m., Northampton City Hall
- June 13, 2014, 2:30 p.m., Northampton City Hall

Agendas and sign-in sheets for each meeting can be found in Appendix A. 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.

Participation by Stakeholders

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

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

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

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

- Developing the Pioneer Valley Climate Action and Clean Energy Plan, which assesses the impact that climate change will have on the region and recommends strategies for mitigation that can be implemented by local municipalities and businesses.

- Collaborating with state agencies, such as the Department of Conservation and Recreation, to maintain inventories of critical infrastructure throughout the region.

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

In addition, the Pioneer Valley Planning Commission and several representatives of the Northampton Hazard Mitigation Committee (Josh Shanley and Jon Davine) are actively involved in the Western Region Homeland Security Advisory Council (WRHSAC). WHRSAC, which includes representatives from Western Massachusetts municipalities, Fire Departments, Public Works Departments, Police Departments, area hospitals and regional transit from throughout the four counties of western Massachusetts, is responsible for allocating emergency preparedness funding from the US Department of Homeland Security. The representatives of these disciplines who serve on the WRHSAC are charged with sharing the information discussed at meetings with their colleagues at their regular meetings. PVPC staff and the Police Chief from Northampton attend all WRHSAC meetings and all WRHSAC members are aware of the fact that Northampton was updating their Hazard Mitigation plan. Meetings of WRHSAC regularly involve discussion about how to improve emergency preparedness in western Massachusetts, and hazard mitigation activities are included in this discussion.

For the update of this Hazard Mitigation Plan, several members of the Hazard Mitigation Committee asked fellow members of WRHSAC for feedback on regional mitigation activities and natural hazards pertaining to Northampton. This was the method through which WRHSAC was engaged in the 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 Northampton's hazard mitigation plan update process and encouraged to comment.

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

Agencies that have the authority to regulate development

Several City staff who participated in the Northampton Hazard Mitigation Committee have direct connections to various municipal commissions, boards, and committees within Northampton that have the authority to regulate development. These commissions and the Hazard Mitigation Committee members involved in each are as follows:

- **Bicycle and Pedestrian Committee** - Wayne Feiden, Department of Planning and Sustainability
- **Public Works Commission** - Ned Huntley, Department of Public Works
- **Conservation Commission, Historical Commission, Planning Board** - Sarah LaValley, Department of Planning and Sustainability
- **Local Emergency Planning Committee** - Josh Shanley, Emergency Management and Jon Davine, Fire Department
- **Energy and Sustainability Commission** - Chris Mason, Energy Officer in Central Services

Feedback from the stakeholder agencies listed above was ensured through the participation of the Hazard Mitigation Committee members, who were able to attend the Hazard Mitigation Committee meetings representing their respective groups.

In addition, the Pioneer Valley Planning Commission, as a regional planning authority, works with all agencies that regulate development in Northampton, including the municipal entities listed above and state agencies, such as Department of Conservation and Recreation and MassDOT. This regular involvement ensured that during the development of the Northampton

Hazard Mitigation Plan, the operational policies and any mitigation strategies or identified hazards from these entities were incorporated into the Hazard Mitigation Plan.

Participation by the Public, Businesses, and Neighboring Communities

Two public planning sessions were held as part of the development of the Northampton plan – on April 29th, 2014 at 6:15 p.m. and June 18th, 2014 at 7:00 p.m. Both meetings occurred after the Hazard Mitigation Committee had provided input on hazards and mitigation strategies relevant to the community. Notice of both public meetings was posted at Northampton City Hall in compliance with the Commonwealth of Massachusetts' open meeting law. Public meeting agendas and notices can be found in Appendix A.

On June 16, 2014 the Pioneer Valley Planning Commission sent a press release to all area media outlets to inform the public that a draft of the Northampton Hazard Mitigation Plan had been placed on PVPC's website. The release also indicated that hard copies were available at PVPC's offices and at Northampton City Hall, and that all residents of Northampton were encouraged to comment on the plan by e-mailing or calling staff contacts at PVPC or the City of Northampton.

The press release and a screen shot of PVPC's website showing the link to the press release can be found in Appendix A.

A list of media organizations that were sent all press releases is included in Appendix A, which are the television stations, radio stations, and newspapers located in western Massachusetts, northern Connecticut, and southern Vermont.

The press releases generated stories in both local newspapers and television news outlets. These stories are included in Appendix A. The Hazard Mitigation Committee determined that the most effective outreach strategy for engaging with the public, businesses and neighboring communities was through the media, and so this was the outreach strategy employed for reaching out to all three groups of stakeholders. The press release indicated that residents of Northampton were invited to attend the event, which was also intended to include representatives of businesses in Northampton and residents of neighboring communities.

Businesses and neighboring communities were also provided with an opportunity to provide feedback through the Pioneer Valley Planning Commission. PVPC is regularly involved in land use, transportation, and environmental planning initiatives in Northampton and surrounding communities. Regular feedback received from these other initiatives were incorporated into the hazard mitigation planning process.

Additional outreach to surrounding communities occurred through the regular quarterly newsletter that PVPC sends out to its member communities about its recent activities. In these

articles, adjacent municipalities were encouraged to reach out to PVPC about hazard mitigation plans by e-mailing or calling staff contacts at PVPC. These notices are included in Appendix A.

No feedback was received from the public, businesses, or neighboring communities during the planning process. Any future input received from the public, as well as any other stakeholders, will be incorporated into the plan during future regular updates.

City Council Meeting

In 2013, the City Council agreed to begin the process of developing a Hazard Mitigation Plan. Once the plan was provisionally approved by FEMA, the City Council held a public hearing on the plan and adopted it.

2: LOCAL PROFILE

Community Setting

The City of Northampton, home to 28,549 residents as per the 2010 U.S. Census, is approximately 35.7 square miles and is mid-way between Connecticut to the south and Vermont to the north. The City is also mid-way between Albany, N.Y. to the west and Boston to the east.

Located on the west side of the Connecticut River, Northampton sits in the valley between the Connecticut and the glacial formed hills to the west and has three distinct villages: Downtown Northampton, Florence and Leeds. The land nearest the Connecticut River has rich, fertile soils and a deep agricultural history. Adjacent to these fertile floodplains of the Connecticut River is the deep, flat glacial outwash, which underlies much of the historic residential, commercial and industrial development in downtown, Florence and Northampton.

According to 1999 MacConnell land use data, the total land area of Northampton is approximately 22,849 acres with roughly 24 percent of those acres developed land. The remaining land is classified as undeveloped with forest as the largest category (49 percent of all land in City) with 11,237 acres. Cropland is the second largest category with 2,903 acres compared to Urban Open Land and Open Land, which represent individually, the third and fourth largest amount of undeveloped land in the city with 650 and 635 acres, respectively.

Development

During the past five years, Northampton has seen four significant areas of development: Most significant is the redevelopment of the former Northampton State Hospital, now Village Hill. Two smaller residential projects have advanced, in Leeds along Chestnut Avenue extension and along Burts Pit Road near Florence Road. Finally, there has been significant redevelopment of sites along King Street on the City's highway oriented commercial strip. In addition, downtown Northampton has seen modest development of individual commercial and residential properties. There has not been any development in flood zones or other areas determined to be at high risk from the hazards identified in this plan, though downtown Northampton is located in the inundation area that would be affected by a failure of the Connecticut River levee system.

Infrastructure

Northampton's location on the Connecticut River was a strong determinant on the growth of the city. The river bottom provided rich alluvial soils for agriculture and the river itself provided power and shipping opportunities for the silk industry. The gentle sloping terrain of the

Berkshire foothills, in the western section of the city, helped keep development concentrated in the downtown center that grew along the banks of the river. The existing infrastructure reflects the influence of this geography.

Roads and Highways

Northampton sits in the heart of the crossroads of New England and, therefore, has many major thoroughfares running through its borders. The most significant transportation route, Interstate 91, has four exits in Northampton. Other major roadways are Routes 5, 9, 10 and 66. Route 9 connects Northampton with towns to the east including Hadley Amherst, Belchertown, Ware and all points east as well as the westerly towns of Williamsburg, Cummington and Pittsfield. Route 66 connects Northampton with Westhampton, Huntington and the Hilltowns to the West. Routes 5 and 10 converge in Northampton, providing connection to Hatfield, Greenfield and Brattleboro, Vermont. Route 10 runs south from Northampton to connect with Easthampton and Route 141; Route 5 runs south from Northampton to connect with Holyoke, Springfield, and Enfield, Connecticut.

The relationship between the City's on-road traffic, especially large truck traffic, and the existing network of rail infrastructure limits the City's ability to move large loads along Route 9. Over the course of any given year, there will be several incidents at a railroad underpass along Route 9 that result in large semi-trucks becoming lodged underneath the railroad underpass. In the event of an emergency situation, any large vehicles that block the bridge would result in a serious delay in the amount of time available for evacuating residents. For this reason, the Committee has identified mitigation of this condition as a priority. Factors to include are the grade requirements for the railroad, the restriction on lowering the road because it would bring it into a stream bed—which would expose it to flooding—and the periodic accumulation of snow, water and ice, which makes it difficult to move emergency vehicles through this section of Route 9.

Rail

Freight traveling on the Boston and Maine Rail Line runs through the center of downtown Northampton on a daily basis. This is the line that has a bridge over Route 9. The City of Northampton is situated within the Sustainable Knowledge Corridor, a region of New England that includes the Hartford and Springfield metropolitan regions connected by Amtrak's New Haven Rail Line, which runs north-south from Connecticut to Vermont. With the completion of rail improvements in 2015, Northampton will see the construction of a new Amtrak station that will provide residents with local access to passenger rail.

Public Transportation

Served by regional transit of 85 busses a day, including Greyhound and Peter Pan, downtown Northampton is the pulse point for public transportation in the city. Northampton also has multiple linkages to surrounding communities through both the Pioneer Valley Transit

Authority (PVTA) and the Franklin Regional Transit Authority (FRTA). Bus lines operated by the PVTA travel roundtrip east-to-west along Route 9 en route to and from Amherst, Hadley and South Hadley. These fixed routes run hourly throughout the day and primarily serve Five College commuters. Bus stops are located in both high-volume sections of the city as well intermittent locations along served routes. A PVTA bus route runs between downtown Northampton and downtown Florence during regular business hours. A PVTA bus route runs between downtown Northampton and the Holyoke Mall. Neighboring Easthampton has two bus routes that connect with Northampton, PVTA's Nashawannuck Express, which operates as a flex route shuttle, and a PVTA bus route.

A bus route maintained by FRTA runs between Northampton and Greenfield six times during regular business hours. The PVTA provides demand-response transportation services for the elderly and disabled residents within their jurisdiction, which includes Northampton.

Public Drinking Water Supply

City Water is available to Florence, Baystate, Leeds and Northampton and along those routes where development has occurred. The Northampton Water Department provides drinking water to approximately 85 percent of the community.

In 2012, approximately 99 percent of the drinking water supply came from three surface water reservoirs: the Francis P. Ryan, the West Whately Reservoirs, located in Conway and West Whately, and the Mountain Street Reservoir, located in Williamsburg and Hatfield.

In 2008, the new Mountain Street Water Treatment Plant went on line. With a maximum design flow of 6.5 MGD, this plant incorporates alum addition followed by clarification (Siemens Tricon, HDPE media), GAC filtration and free chlorination.

Another surface water source, the Roberts Meadow Reservoir, is an emergency backup supply. Additionally, Northampton gets approximately 1 percent of its drinking water supply from wells in the Florence section of Northampton. These wells have the capacity to provide up to half of the City's supply under demand, and have chlorination systems installed.

In 2012, the City supplied 1.069 billion gallons of water to customers, or an average of 2.93 million gallons per day. The most water used in one day was 3.96 million gallons. The design capacity of the water filtration plant is 6.5 million gallons, which can easily meet the city's peak demand.

In April 2010, the City's DPW adopted a water restriction policy in order to comply with the state DEP's requirements. DEP requires that water use be restricted when average daily stream flow in the Mill River drops below 26.3 cubic feet per second for a 3-day period or when the State issues a drought advisory. The Water Use Restriction can be lifted when the stream flow average meets or exceeds the minimum flow for 7 consecutive days. When a Water Use Restriction is in place, there is a ban on non-essential outdoor watering.

The City has and continues to work with surrounding communities to acquire water supply lands and jointly preserve the watersheds. Additionally, much of Hatfield's drinking water aquifer is located in Northampton, and the City has aggressively regulated this area and acquired open space to protect Hatfield's water supply.

Sewer Service

Northampton, Baystate, Leeds, and Florence have municipal sewer services, as do the connecting points in between. The City has a sewer treatment facility that treats effluent from both Northampton and neighboring Williamsburg.

Schools

Public Schools in Northampton include Bridge Street School, Jackson Street School, Leeds School, Ryan Road School, Smith College Campus School, Smith College, Montessori School of Northampton, JFK Middle School, Northampton High School and Smith Vocational & Agricultural High School.

Natural Resources

The rich alluvial floodplains of the Connecticut River define Northampton's eastern boundary. In the bottomlands, wetlands and farm fields continue to provide the same scenic and ecological benefits to Northampton that have existed for thousands of years since the end of the last ice age (and the corresponding formation and draining of Glacial Lake Hitchcock) some 12,000 years ago. On the city's western boundary, the foothills of the Berkshires begin their slow, steady rise to the peak of Mount Greylock. To the north and south, the Connecticut River Valley stretches north to Vermont and South to Connecticut. These features, the river, the valley and the hills, frame Northampton and provide a home to not only Northampton's dynamic population of 28,000 individuals but also to hundreds of species of flora and fauna.

Forests

Forty-nine percent of Northampton is forested. These forests provide an abundance of timber, opportunities for recreation, wildlife habitat, the benefits of climate moderation, and the protection of water quality. The forest and intermixed agricultural land also provide a visually pleasant landscape for residents and visitors too. The City's forests are mainly closed-canopied and middle-aged, having a great diversity of species, but no diversity of horizontal or vertical structural.

Tree species and forest composition reflect this variety of landforms. Because of Northampton's latitude, those species associated with northern hardwood forests are most common. In Northampton's floodplain, elms, willows, silver maples, sycamores, green ash and

cottonwood, along with other species common to frequently inundated areas, are common. In higher, drier terrain, oaks, hickories, maples, black birch and scarlet oak are common species in fields, front lawns and gentle hills. On shady hillsides, it is commons to find oaks, hickories, white birch and other species associated with transitional hardwood forests.

The forests and wetlands that fill Northampton's landscape also play host to a wide variety of wildlife. Bear, bobcat, minx, fishers, moose and deer have all been sited in Northampton, and the city's wetlands and water bodies are important homes for salamanders, frogs, turtles and snakes as well as many fish species.

Water Resources

Northampton water resources include open water bodies, wetlands, floodplain, and drinking water supply and aquifers. These water resources are all sensitive ecological resources, but they also provide excellent agricultural, forest, open space, scenic, recreation, and wildlife habitat resources for the city's residents.

Rivers and Streams

The Connecticut River forms Northampton's eastern boundary and is the city's most significant river. The Mill River and the Manhan River are two smaller, but important, rivers for the City to monitor and protect. The Mill River runs parallel to downtown Northampton, was once diverted, and has had an Army Corps impoundment and levee system constructed to reduce flooding risk. The Connecticut River and Mill River both have floodplains, and each has a pumping station that works in conjunction with their levee systems. The Manhan River flows through Northampton's southwestern edge, enters Easthampton, and then drains into Northampton's Oxbow Lake. There are 9 major brooks: Marble Brook, Turkey Brook, Beaver Brook, Day Brook, Roberts Meadow Brook, Clark Brook, Broad Brook, Hannum Brook and Parsons Brook.

Wetlands

Among other items, Northampton's *Flood and Natural Hazards Mitigation Plan* inventories the City's available water resources, a process that recorded 1,729 acres of mapped wetlands in Northampton. This figure captures only those wetlands that have been mapped and recorded as official data points, so there are several hundreds of acres that have not yet been documented and mapped. For this reason, the City estimates that there is a total of 3,000 acres of wetlands in Northampton.

Beaver Dams

Beaver activity has been increasing over the past decade. 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 land owners (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.

Aquifers

Northampton has an aquifer located in Florence. The City also shares an aquifer with Hatfield, which is in the Broad Brook area of Northampton, and neighboring Easthampton's aquifer is located in the West Farms area of Northampton.

3: HAZARD IDENTIFICATION AND ANALYSIS

The following section includes a summary of disasters that have affected or could affect Northampton. Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to develop this list. Identified hazards are the following:

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

Natural Hazard Analysis Methodology

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

Hazard Description

The natural hazards identified for Northampton are: floods, severe snowstorms/ice storms, hurricanes, severe thunderstorms / wind / tornadoes, wildfire/brushfire, earthquakes, dam failure / levee breech, and drought. 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 wild fires. Classifications are based on the area that would potentially be affected by the hazard, on the following scale:

Percentage of City Impacted by Natural Hazard	
Land Area Affected by Occurrence	**Percentage of City Impacted**
Large	More than 50% of the city affected
Medium	10 to 50% of the city affected
Small	Less than 10% of the city affected

Extent

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

Previous Occurrences

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

Probability of Future Events

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

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

Impact

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

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

Vulnerability

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 through 5 as follows:

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

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

Hazard Identification and Analysis Worksheet for Northampton

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Hazard Risk Index Rating
Flooding	Medium	High	Limited (with loss of key transportation routes)	2 - High risk
Severe Snowstorms / Ice Storms	Large	High	Limited	3 - Medium risk
Severe Thunderstorms / Winds / Tornadoes	Small	Severe thunderstorms: Moderate Winds: Moderate Tornadoes: Very low	Limited	Severe thunderstorms: 2 – High Risk Winds: 2 – High Risk Tornadoes: 4 – low risk
Hurricanes	Large	Low	Limited	2 - High risk
Wildfire / Brushfire	Medium	Low	Minor	4 - Low risk
Earthquakes	Large	Very low	Critical	4 - Low risk
Dam Failure / Levee Breech	Medium	Very low	Critical	5 - Very low risk
Drought	Large	Low	Minor	5 - Very low risk

Source: Massachusetts Hazard Mitigation Plan

Flooding

Hazard Description

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

- Continental storms are typically low-pressure systems that can be either slow or fast moving. These storms originate from the west and occur throughout the year.

- Coastal storms, also known as nor'easters, usually occur in late summer or early fall and originate from the south. The most severe coastal storms, hurricanes, occasionally reach Massachusetts and generate very large amounts of rainfall.

- Thunderstorms form on warm, humid summer days and cause locally significant rainfall, usually over the course of several hours. These storms can form quickly and are more difficult to predict than continental and coastal storms.

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large "sponges" to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain area is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard.

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

- **Flash floods** are the product of heavy, localized precipitation in a short time period over a given location. Flash flooding events typically occur within minutes or hours after a period of heavy precipitation, after a dam or levee failure, or from a sudden release of water from an ice jam. Most often, flash flooding is the result of a slow-moving thunderstorm or the heavy rains from a hurricane. In rural areas, flash flooding often occurs when small streams spill over their banks. However, in urbanized areas, flash flooding is often the result of clogged storm drains (leaves and other debris) and the higher amount of impervious surface area (roadways, parking lots, roof tops).

- **General floods** may last for several days or weeks and are caused by precipitation over a longer time period in a particular river basin. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the

floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff (e.g., the loss of wetlands and the higher amounts of impervious surface area in urban areas).

Location

The 100-year flood zone covers narrow bands of level floodplain land along the Mill River, the Mill River Diversion, Basset Brook / Parsons Brook, Broad Brook, Manhan Brook, Roberts Meadow Brook, and the Connecticut River. In several areas, the flood zone widens out to encompass farmland, some residential land, and industrial lands. There are also significant areas of localized flooding, including on Prospect Street and Avis Circle.

When ice storms occur, water flow can be backed up in the Connecticut River and flood nearby low lying lands.

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

(1) Mill River
(2) Mill River Diversion
(3) Parsons Brook / Basset Brook
(4) Broad Brook
(5) Marble Brook
(6) Connecticut River
(7) Roberts Meadow Brook

Together, these areas mean that a "medium" amount of area (10 to 50 percent of the City) could be affected by flooding in any given year.

Extent

The average annual precipitation for Northampton and surrounding areas in western Massachusetts has been 50 to 56 during the past several years.

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

The following are the historical flooding crests, or highest recorded water levels, for the Mill River. The River's minor flood stage is 11 feet, a height which it has reached 16 times in

Northampton since 1950. The River's action stage is 9 feet, a height which has been reached 15 times in Northampton since 1950.

Historical Crests for the Mill River in Northampton

8/28/11	16.42 ft	Minor flooding
4/16/07	15.58 ft	Minor flooding
10/9/05	13.72 ft	Minor flooding
4/3/05	12.73 ft	Minor flooding
3/7/11	12.26 ft	Minor flooding
9/29/11	12.2 ft	Minor flooding
9/28/03	12.11 ft	Minor flooding
3/31/10	11.83 ft	Minor flooding
3/9/08	11.81 ft	Minor flooding
8/19/55	11.78 ft	Minor flooding
12/12/08	11.55 ft	Minor flooding
9/7/11	11.5 ft	Minor flooding
9/17/99	11.42 ft	Minor flooding
9/8/11	11.38 ft	Minor flooding
12/8/11	11.27 ft	Minor flooding
12/21/12	11.18 ft	Minor flooding
6/6/82	10.98 ft	Action stage
10/15/05	10.81 ft	Action stage
2/14/08	10.58 ft	Action stage
11/9/06	10.47 ft	Action stage
3/23/10	10.46 ft	Action stage
4/5/84	10.42 ft	Action stage
5/13/06	10.39 ft	Action stage
10/28/06	10.3 ft	Action stage
12/27/09	10.29 ft	Action stage
4/24/05	10.27 ft	Action stage
2/7/08	10.11 ft	Action stage
10/25/05	10.02 ft	Action stage
10/15/55	9.81 ft	Action stage
3/31/51	9.38 ft	Action stage
9/12/60	9.1 ft	Action stage

Source: National Weather Service

The following are the historical flooding crests for the Connecticut River. The major flood stage for the river is 120 feet, which has been reached three times since 1935. The moderate flood stage is 115 feet, which has been reached 16 times since 1935. The minor flood stage is 112 feet, which has been reached 60 times since 1935. The action stage is 110 feet, which has been reached 11 times since 1935.

Historical Crests of the Connecticut River in Northampton

3/19/36	129.4 ft	Major flooding
9/22/38	125 ft	Major flooding
5/31/84	120.8 ft	Major flooding
4/6/60	119.9 ft	Moderate flooding
1/1/49	118.6 ft	Moderate flooding
4/1/87	118 ft	Moderate flooding
3/23/48	117.7 ft	Moderate flooding
3/29/53	117.6 ft	Moderate flooding
8/30/11	117.16 ft	Moderate flooding
5/5/40	117 ft	Moderate flooding
10/9/05	116.3 ft	Moderate flooding
3/15/77	116.2 ft	Moderate flooding
6/3/52	116 ft	Moderate flooding
4/3/76	115.7 ft	Moderate flooding
4/23/69	115.5 ft	Moderate flooding
4/1/51	115.4 ft	Moderate flooding
4/24/58	115.3 ft	Moderate flooding
3/24/68	115.2 ft	Moderate flooding
5/1/56	115 ft	Moderate flooding
7/2/73	114.9 ft	Minor flooding
4/7/52	114.8 ft	Minor flooding
4/19/82	114.8 ft	Minor flooding
3/27/79	114.6 ft	Minor flooding
4/4/05	114.6 ft	Minor flooding
3/19/73	114.6 ft	Minor flooding
4/17/96	114.6 ft	Minor flooding
4/1/98	114.6 ft	Minor flooding
4/17/07	114.5 ft	Minor flooding
12/16/83	114.5 ft	Minor flooding
4/18/94	114.4 ft	Minor flooding
4/13/47	114.4 ft	Minor flooding
4/5/59	114.3 ft	Minor flooding
4/24/01	114.3 ft	Minor flooding
12/22/73	114.2 ft	Minor flooding

5/14/96	114.2 ft	Minor flooding
2/26/81	114.2 ft	Minor flooding
4/2/62	114.1 ft	Minor flooding
4/2/04	114 ft	Minor flooding
4/2/77	114 ft	Minor flooding
3/18/90	113.9 ft	Minor flooding
5/6/72	113.9 ft	Minor flooding
1/19/06	113.7 ft	Minor flooding
4/8/84	113.7 ft	Minor flooding
3/22/45	113.5 ft	Minor flooding
4/1/86	113.5 ft	Minor flooding
4/1/93	113.5 ft	Minor flooding
4/14/11	113.46 ft	Minor flooding
11/30/59	113.4 ft	Minor flooding
3/29/76	113.4 ft	Minor flooding
4/17/93	113.4 ft	Minor flooding
4/21/72	113.3 ft	Minor flooding
10/30/03	113.2 ft	Minor flooding
4/17/14	113.12 ft	Minor flooding
3/31/03	113 ft	Minor flooding
10/27/05	113 ft	Minor flooding
1/10/98	112.9 ft	Minor flooding
4/15/08	112.9 ft	Minor flooding
4/18/11	112.81 ft	Minor flooding
4/17/55	112.8 ft	Minor flooding
3/31/10	112.8 ft	Minor flooding
9/8/11	112.7 ft	Minor flooding
4/6/50	112.7 ft	Minor flooding
9/8/11	112.7 ft	Minor flooding
10/21/75	112.6 ft	Minor flooding
4/4/67	112.5 ft	Minor flooding
5/26/79	112.5 ft	Minor flooding
5/7/89	112.5 ft	Minor flooding
4/16/64	112.4 ft	Minor flooding

4/8/89	112.4 ft	Minor flooding
1/28/96	112.4 ft	Minor flooding
12/19/00	112.4 ft	Minor flooding
4/4/63	112.4 ft	Minor flooding
5/5/71	112.2 ft	Minor flooding
4/6/74	112.2 ft	Minor flooding
3/24/10	112.2 ft	Minor flooding
4/26/70	112.1 ft	Minor flooding
8/20/55	112 ft	Minor flooding
4/11/80	112 ft	Minor flooding
4/19/54	112 ft	Minor flooding

12/13/08	111.9 ft	Action Stage
4/5/90	111.8 ft	Action Stage
4/6/00	111.8 ft	Action Stage
5/21/06	111.8 ft	Action Stage
12/1/59	111.8 ft	Action Stage
4/17/02	111.7 ft	Action Stage
12/26/90	111.7 ft	Action Stage
4/30/88	111.6 ft	Action Stage
5/5/83	111.6 ft	Action Stage
4/4/73	111.6 ft	Action Stage
12/26/03	111.5 ft	Action Stage

Source: National Weather Service

Previous Occurrences

In the past 100 years, 16 flooding events have caused damage in Northampton. These are shown in the table below:

Floods Causing Significant Damage in Northampton, 1914-2014			
Date	**Description**	**Cost of Damage**	**Cost Adjusted for Inflation**
8/27/2011	Hurricane Irene	$96,400	$101,600
4/15/07 – 4/16/07	100-year flood Mill River Floodplain	NA	NA
5/13/2006	Heavy rainfall caused the Mill River to flood	$5,000	$5,900
9/16/1999	Tropical Storm Floyd, Flooding to Mill River Floodplain	$900,000	$1,281,000
3/31/87/ - 4/7/87	Connecticut River Floodplain	$126,000	$2,633,000
5/28/84 – 6/5/84	50-year flood Connecticut River Floodplain	$377,000	$860,000
6/6/82	50 to 100 year flood Mill River Floodplain	$104,000	$255,000
3/15/77	10-year flood; Connecticut River Floodplain	$112,000	$438,000
4/6/60	10-year flood; Connecticut River Floodplain	$38,000	$304,000
10/15/55	50 to 100-year flood Mill River Floodplain	$48,000	$425,000
3/29/53	10-year flood Connecticut River Floodplain	$40,000	$355,000
6/3/52	10-year flood Connecticut River Floodplain	$38,000	$340,000
1/1/49	10-year flood Connecticut River Floodplain	$37,000	$369,000
3/23/48	10-year flood Connecticut River Floodplain	$32,000	$315,000
9/22/38	100-year flood Connecticut River Floodplain	$81,500	$1,370,000
3/13/36	100-year flood Connecticut River Floodplain	$200,000	$3,411,000

Probability of Future Events

Based upon previous data, there is a "high" chance (between 40 percent and 70 percent in the next year) of flash flooding or general flooding occurring in Northampton. This is partly a function of the presence of the Connecticut River and the Mill River, both of which contain significant floodplain acreage in Northampton.

Flooding frequencies for the various floodplains in Northampton are defined by FEMA as the following:

- 10-year floodplain – 10 percent chance of flooding in any given year
- 25-year floodplain – 2.5 percent chance of flooding in any given year
- 100-year floodplain – 1 percent chance of flooding in any given year
- 500-year floodplain – 0.2 percent chance of flooding in any given year

In actuality, flooding occurs more frequently than this because the current FEMA-defined flood zones are based on historical patterns of rainfall intensity and frequency, and do not take into account the impacts that climate change will have on Northampton. In future years, it is likely that the currently designated 10-year, 25-year, 100-year and 500-year floodplains will flood more frequently due to climate change.

Impact

The City faces a "limited" impact, with 10 percent or less of total city area affected, from flooding.

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

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

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

- water over banks and in yards
- no building flooded, but some water may be under buildings built on stilts (elevated)
- personal property in low lying areas needs to be moved or it will get wet

- water overtopping roads, but not very deep or fast flowing
- water in campgrounds or on bike paths
- inconvenience or nuisance flooding
- small part of the airstrip flooded, and aircraft can still land
- one or two homes in the lowest parts of town may be cut off or get a little water in the crawl spaces or homes themselves if they are not elevated

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

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

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

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

Various critical facilities are at risk within Northampton's floodplain:

100-year floodplain

- EPA Tier II Facility on Island Road in the Oxbow Lake area
- The Northampton Airport
- Fair Grounds—potential gathering spot for thousands of people and livestock during the Three County Fair. In addition, the area is also susceptible to localized flooding.
- Sections of Route 10, cutting off southbound access to city. Portions of Route 10 are also in the 10-year floodplain.
- Waterlines and sewer lines mounted on the City's bridges—a flood that destroyed a bridge could result in a potential loss of services for residential populations.
- Road adjacent to the Mill River (causing destruction to road)
- Power substations at Smith College, King Street, and Route 5 at Easthampton line

500-year floodplain

- Group Home/Assisted Living Facility and Paradise Pond Transitional Apartments within the Mill River's floodplain on West Street

In addition, there are several facilities that are located outside the floodplain because of the City's levee system. Should this system fail, these facilities would be at risk:

- Power facilities located on West Street
- The City's wastewater treatment facility
- Much of downtown

Localized flooding

During the Hazard Mitigation Committee's meetings, several points in the City were identified as areas that flood frequently but are outside of the community's Flood Insurance Rate Map boundaries. The locations of these areas and the impact of flooding to them are the following:

- The intersections of Church Street, Stoddard Street, State Street, and Perkins Avenue to Route 5 & 10.
- The area surrounding Elm Street, Riverside Drive, Nutting Avenue, Ormond Street, and Federal Street.
- Austin Circle.
- Reservoir Road. The road was closed during Hurricane Irene.
- Denise Court area.
- Ice Pond off of Rocky Hill Road and Ice Pond Drive.
- Bright Street.
- King Street Brook.
- Elm Street Brook.
- Williams Street Brook.

Flooding can also cause damage to bridges, especially the lowest bridges in the city which are located in Florence at Pine Street and Meadows Street. Many water lines in the city are located on bridges and damage to these could disrupt the water supply.

Vulnerability

Based on the above analysis, Northampton has a hazard index rating of "2 – high risk" for flooding.

There are approximately 4,150 acres of land within the FEMA mapped 100-year floodplain and 82 acres of land within the 500-year floodplain within the City of Northampton. There are 90 residential structures located within the 100-year flood plain in Northampton.

Utilizing the City's median home value of $278,600 (American Community Survey, 2008-2012), up to $25,074,000 worth of damage could occur from a 100-year flood. 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.

The intersections of Church Street, Stoddard Street, State Street, and Perkins Avenue to Route 5 & 10 are susceptible to localized flooding. This neighborhood is medium density residential. Approximately 18 structures could be affected by a flood incident. At a rate of 100 percent damage to 100 percent of the structures, the estimated cost of repairing or replacing these properties would be $5,014,800.

The area surrounding Elm Street, Riverside Drive, Nutting Avenue, Ormond Street, and Federal Street is susceptible to localized flooding. Approximately 68 structures could be affected by a flood incident. At 100 percent damage to 100 percent of the structures, the estimated cost of repairing or replacing would be $18,944,800.

The City of Northampton's levee protection system, designed after the 1936 Hurricane, is designed to prevent flooding from up to a 500-year flood. The damage estimates above are based on one of two scenarios: 1) the levee system is structurally compromised or 2) flooding occurs that exceeds the design height of the levee system.

Severe Snowstorms / Ice Storms

Hazard Description

Severe winter storms can pose a significant risk to property and human life. Severe snowstorms and ice storms can involve rain, freezing rain, ice, snow, cold temperatures and wind.

Location

The entire City of Northampton is susceptible to severe snowstorms, which means the location of occurrence is "large." Because these storms occur regionally, they would impact the entire city.

Extent

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

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

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

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

Previous Occurrences

Based on data available from the National Oceanic and Atmospheric Administration, there are 47 winter storms since 1958 that have registered on the NESIS scale. Of these, approximately 26 storms resulted in snow falls in the Pioneer Valley of at least 10 inches. These storms are listed in the table on the next page, in order of their NESIS severity.

Winter Storms Producing Over 10 inches of Snow in Northampton, 1958-2014			
Date	**NESIS Value**	**NESIS Category**	**NESIS Classification**
3/4/2013	3.05	2	Significant
2/7/2013	4.35	3	Major
10/29/2011	1.75	1	Notable
1/9/2011	5.31	3	Major
2/23/2010	5.46	3	Major
3/15/2007	2.54	2	Significant
1/21/2005	6.8	4	Crippling
2/15/2003	7.5	4	Crippling
3/31/1997	2.29	1	Notable
2/2/1995	1.43	1	Notable
2/8/1994	5.39	3	Major
3/12/1993	13.2	5	Extreme
1/25/1987	1.19	1	Notable
2/10/1983	6.25	4	Crippling
4/6/1982	3.35	2	Significant
2/5/1978	5.78	3	Major
1/19/1978	6.53	4	Crippling
2/18/1972	4.77	3	Major
12/25/1969	6.29	4	Crippling
2/22/1969	4.29	3	Major
2/8/1969	3.51	2	Significant
2/5/1967	3.5	2	Significant
2/2/1961	7.06	4	Crippling
1/18/1961	4.04	3	Major
12/11/1960	4.53	3	Major
3/2/1960	8.77	4	Crippling
2/14/1958	6.25	4	Crippling

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

Probability of Future Events

Based upon the availability of records for Hampshire County, the likelihood that a severe snow storm will affect Northampton is "high" (between 40 and 70 percent in any given year).

Research on climate change indicates that there is great potential for stronger, more frequent storms as the global temperature increases. More information about the effect of Climate Change can be found in the Pioneer Valley Planning Commission's Climate Action Plan, available at www.sustainableknowledgecorridor.org.

The Massachusetts State Climate Change Adaptation Report has additional information about the impact of climate change and can be accessed at www.mass.gov/eea/air-water-climate-change/climate-change/climate-change-adaptation-report.html.

Impact

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

The weight from multiple snowfall events can test the load ratings of building roofs and potentially cause significant damage. For example, the roof of JFK Middle School is not designed for multiple heavy snowfalls. Multiple freeze-thaw cycles can also create large amounts of ice and make for even heavier roof loads.

Other impacts from snowstorms and ice storms include:

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

Vulnerability

Based on the above assessment, Northampton has a hazard index rating of “3 — medium risk” from snowstorms and ice storms.

Using an estimated value of $3,475,545,000 for all property in the city and an estimated 5 percent of damage to 10 percent of residential structures, approximately $ 17,377,675 worth of damage could occur from a severe snowstorm. This 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. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

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 Northampton is at risk from hurricanes, meaning the location of occurrence is "large." Ridgetops are more susceptible to wind damage. Areas susceptible to flooding are also likely to be affected by heavy 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, which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense.

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

Source: National Hurricane Center, 2012

Previous Occurrences

Hurricanes that have affected Northampton are shown in the following table.

Major Hurricanes and Tropical Storms Affecting Northampton		
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

While Superstorm 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 Northampton. No roads were flooded or washed out. While shelters were opened temporarily in town, no residents encountered long-term displacement due to the storm's impacts. In nearby, more rural 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. [1]

Probability of Future Events

Northampton's location in western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes, although it can experience some high wind events. Based upon past occurrences, it is reasonable to say that there is a "low" probability (1 percent to 10 percent in any given year) of hurricanes in Northampton. Climate change is projected to result

[1] "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.

in more severe weather, including increased occurrence of hurricanes and tropical storms. Because of this, the occurrence of hurricanes will increase in the future.

Impact

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

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

The City faces a “limited” impact from hurricanes, with 10 percent or less of Northampton affected.

Vulnerability

Based on the above analysis, Northampton has a hazard index rating of “2 – high risk” from hurricanes.

Using a total value of all structures in Northampton of $3,475,535,000 and an estimated 10 percent of damage to 5 percent of all structures, the estimated amount of wind damage from a hurricane is $17,377,675. Estimating that flooding would create 10 percent of damage to 20 percent of structures, the resulting damage would be $69,510,700. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

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 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 City is at risk of high winds, severe thunderstorms, and tornadoes. The plan also identifies Northampton and the surrounding communities as having a high frequency of tornados occurrence within Massachusetts. However, the actual area affected by thunderstorms, wind, or tornadoes is "small," with less than 10 percent of the City affected.

Extent

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

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

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

Previous Occurrences

Because thunderstorms and wind affect the town regularly on an annual basis, there are not significant records available for these events. As per the Massachusetts Hazard Mitigation Plan, there are approximately 10 to 30 days of thunderstorm activity in the state each year.

Between 1950 and 2004, three tornadoes have touched down in Northampton; of the three, a category F1, F2 and F3 tornado were represented. No records contained information about damage, but the Tornado was documented in southeastern Northampton.

A tornado touched down in Leeds in June of 2000.[2] This tornado was ranked F1 (Moderate Tornado) on the Fujita Scale of Tornado Intensity. Since the 1950s, there have been close to 9 tornadoes in Hampshire County.

Probability of Future Events

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

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

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

Based upon the available historical record, as well as Northampton's location in a high-density cluster of state-wide tornado activity, there is a "very low" probability (less than 1 percent chance in any given year) of a tornado affecting the City.

As per the Massachusetts Hazard Mitigation Plan, there are approximately 10 to 30 days of thunderstorm activity in the state each year. Thus, there is a "moderate" probability (10

[2] National Climactic Data Center

percent to 40 percent chance in any given year) of a severe thunderstorm or winds affecting the City.

Impact

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

As indicated as part of the Enhanced Fujita Scale Levels for tornados, the following impacts can result from a tornado:

- EFO - Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.

- EF1 - 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 - Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.

- EF3 - Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.

- EF4 - Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

Vulnerability

Based on the above assessment, Northampton has a hazard index rating of "2- high risk" from severe thunderstorms and winds, and a "4 – low risk" from tornadoes.

The potential for locally catastrophic damage is a factor in any tornado, severe thunderstorm, or wind event. In Northampton, a tornado that hit the residential areas would leave much more damage than a tornado with a travel path that ran along the city's forested uplands, where little settlement has occurred. Most buildings in the city have not been built to Zone 1, Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, and 85 percent of the city's housing was constructed prior to this date.

Using a total value of all structures in Northampton of $3,475,535,000 and an estimated 10 percent of damage to 5 percent of all structures, the estimated amount of damage from a tornado is $17,377,675. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Wildfires / Brushfires

Hazard Description

Wildfires 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. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson.

FEMA has classifications for 3 different classes of wildfires:

- Surface fires are the most common type of wildfire, with the surface burning slowly along the floor of a forest, killing or damaging trees.

- Ground fires burn on or below the forest floor and are usually started by lightening

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

Location

While Northampton is a city with a dense, well-defined downtown, it still contains several thousand acres of largely undeveloped space. The rural-urban interface is most pronounced in those sections of city that are experiencing development, most notably Florence and Leeds. The total amount of city that could be affected by wildfire is categorized as "medium," at between 10 percent to 50 percent of the total area.

Extent

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

In Northampton approximately 49 percent of the city's total land area is in forest, or about 11,237 acres, and is therefore at risk of fire. Forested areas in Northampton cover many of the city's outlying areas, which can be remote and difficult for emergency crews to access. In drought conditions, a brushfire or wildfire would be a matter of concern. A large wildfire could damage much of the land mass, including vital watershed lands, in a short period of time.

As described in the next section describing previous occurrences of wildfire, there have not been any major wildfires recorded in Northampton. However, based on other major wildfires that have occurred in western Massachusetts, it is estimated that such a fire would likely destroy around 50 to 500 acres of forested area.

The overall extent of wildfires is shown in the table below:

Extent of Wildfires

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.

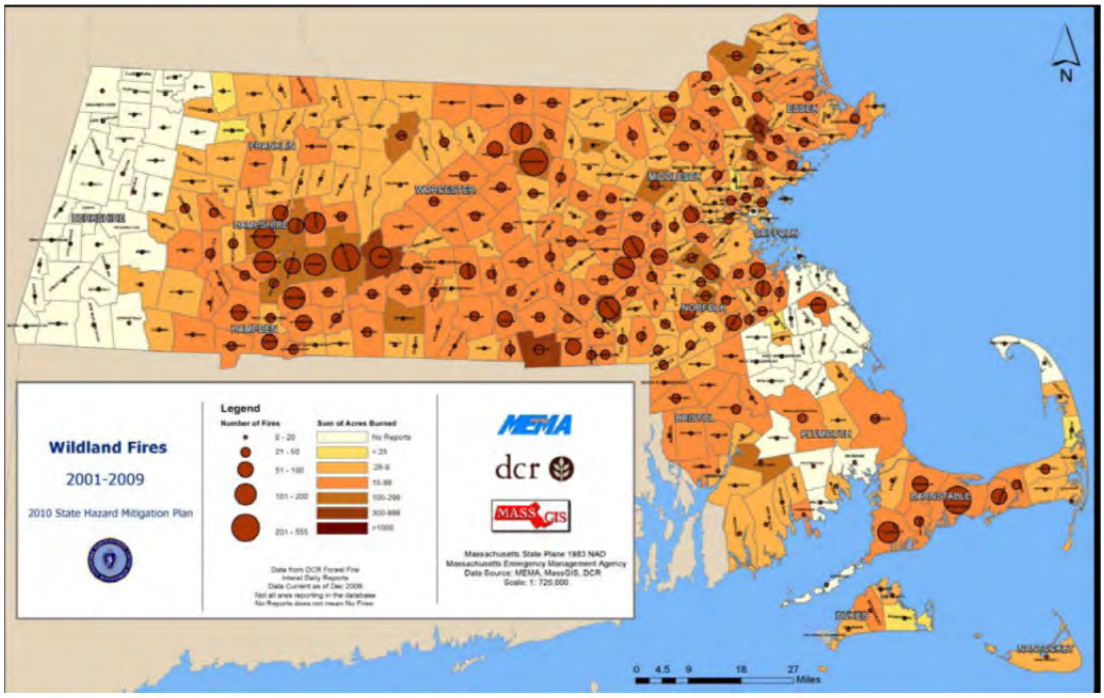
Previous Occurrences

Northampton has a professional Fire Department, and there have not been any major forest fires in Northampton. There have not been any brushfires other than for small backyard burning of brush, for which the City issues permits.

During the past 100 years, there have not been many wildfires occurring in the Pioneer Valley. However, several have occurred during the past 20 years, as shown in the list below:

- 1995 – Russell, 500 acres burned on Mt. Tekoa
- 2000 – South Hadley, 310 acres burned over 14 days in the Litihia Springs Watershed
- 2001 – 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

Wildland Fires in Massachusetts, 2001-2009



Source: Massachusetts Hazard Mitigation Plan

Probability of Future Events

In accordance with the Massachusetts Hazard Mitigation Plan, the Northampton Hazard Mitigation Committee found it is difficult to predict the likelihood of wildfires in a probabilistic manner because the number of variables involved. However, based on previous occurrences, the Committee determined the probability of future events to be "low" (1 percent to 10 percent probability in the next year).

Climate scenarios project summer temperature increases between 2ºC and 5ºC and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildfires, releasing stores of carbon and further contributing to the buildup of greenhouse gases. Forest response to increased atmospheric carbon dioxide—the so-called "fertilization effect"—could also contribute to more tree growth and thus more fuel for fires, but the effects of carbon dioxide on mature forests are still largely unknown.

Climate change is also predicted to bring increased wind damage from major storms, as well as new types of pests to the region. Both increased wind and the introduction of new pests could potentially create more debris in wooded areas and result in a larger risk of fires.

Impact

While a large wildfire could damage much of the landmass of Northampton, these areas are not populated by people, meaning that wildfire affected areas are not likely to cause damage to property. For this reason, the City faces a "minor" impact from wildfires, with very few damages likely to occur.

Both wildfires and brushfires can consume homes, other buildings and/or agricultural resources. The impact of wildfires and brushfires are as follows:

- Impact to benefits that people receive from the environment, such as food/water and the regulation of floods and drought
- Impact on local heritage, through the destruction of natural features
- Impact to the economy, due to damage to property and income from land following a wildfire
- Impact through the destruction of people and property

Vulnerability

Based on the above assessment, Northampton has a hazard risk index of “4 – low risk” from wildfires.

Using a total value of all structures in Northampton of $3,475,535,000 and an estimated 50 percent of damage to 1 percent of all structures, the estimated amount of damage from a forest fire is $17,377,675. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

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.[3] 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.[4]

Location

Because of the regional nature of the hazard, the entire City of Northampton is susceptible to earthquakes. This makes the location of occurrence "high," or over 50 percent of the total area.

Extent

The magnitude of an earthquake is measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times. The intensity of an earthquake is measured using the Modified Mercalli Scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII denoting a earthquake that causes almost complete destruction.

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

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

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

Source: US Federal Emergency Management Agency

Previous Occurrences

The most recent earthquakes to affect Northampton are shown in the table below.

Largest Earthquakes Affecting Northampton, MA, 1924 – 2014		
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

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

New England States Record of Historic Earthquakes		
State	**Years of Record**	**Number Of Earthquakes**
Connecticut	1668 - 2007	137
Maine	1766 - 2007	544
Massachusetts	1668 - 2007	355
New Hampshire	1638 - 2007	360
Rhode Island	1776 - 2007	38
Vermont	1843 - 2007	73
New York	1840 - 2007	755
Total Number of Earthquakes within the New England states between 1638 and 1989 is 2262.		

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

Probability of Future Events

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

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

Source: USA.com

Based upon existing records, there is a “very low” frequency (less than 1 percent probability in any given year) of a earthquake in Northampton.

Impact

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. This is particularly true for a large number of the buildings in downtown Northampton, most of which could likely be completely destroyed by a significant earthquake. The seismic standards have also been upgraded with the 1997 revision of the State Building Code. Liquefaction of the land near water could also lead to extensive destruction.

The City faces a “critical” impact from significant earthquakes, with more than 25 percent of Northampton affected.

While a significant earthquake, estimated to be approximately of magnitude 6.1 or higher, would cause the impact described above, a smaller earthquake would have "minor" impact from a smaller earthquake, with only small damage to property. As shown in the table of the Richter Scale above, an earthquake of 6.0 or lower would result in at most slight damage to well-designed buildings, which are the vast majority of structures in Northampton. Earthquakes between 3.5 and 5.4 would be felt but rarely cause damage, and earthquakes smaller than 3.5 would not be noticed.

Vulnerability

Based on the above analysis, Northampton has a hazard index rating of "4- low risk" from earthquakes. Using a total value of all structures in Northampton of $3,475,535,000 and an estimated 100 percent of damage to 25 percent of all structures ("critical" impact), the estimated amount of damage from an earthquake is $868,883,750. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Dam Failure / Levee Breech

Hazard Description

Dams and levees and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control. However, they also pose a potential risk to lives and property. Dam or levee failure is not a common occurrence, but dams do represent a potentially disastrous hazard. When a dam or levee fails, the potential energy of the stored water behind the dam is released rapidly. Most dam or levee failures occur when floodwaters above overtop and erode the material components of the dam. Often dam or levee breeches 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.

The City of Northampton's levees are maintained by the U.S. Army Corps of Engineers in collaboration with the City's Department of Public Works.

Location

The City of Northampton has 18 dams on public and private land, as well as levee systems along the Mill River and Connecticut River. The names and hazard levels of the individual structures are:

Dams and Levees in Northampton or Affecting Northampton		
Dam	**Street Name**	**Hazard Level**
Vaznis Farm Pond Dam	Unknown	NA
Howards Ice Pond Dam	Dimock Street	NA
Mill River Dam	NA	NA
Florence Ice Pond Dam	Spring Street Extension	NA
Fitzgerald Lake Dam	North Farms Road	Low
Yankee Hill	Ladd Avenue	Low
Chartpac Dam (Orange Dam)	River Road	Significant
Clear Falls Pool Dam	Drury Lane	Significant
Mill River Diversion Dam	South Street	Significant
Vistron Pro Corporation Dam	Pine Street	Significant
Country Club Dam (Cook Dam)	Arch Street, Main Street	Significant
Button Shop #2 Dam	Main Street, Leeds	Significant
Button Shop #1 Dam	Main Street, Leeds	Significant
Upper Reservoir Dam – Robert Meadows Brook	Chesterfield Road	High
Lower Roberts Meadow Dam	Reservoir Road	High
Roberts Meadow Middle Dam	Reservoir Road	High
Ryan Dam	West Whately	High
Paradise Pond	College Lane	High
Connecticut River levee system	Along Connecticut River	NA
Mill River levee system	Along Mill River	NA

The failure of a high hazard dam could affect a “medium” amount of the land area in Northampton, or between 10 and 50 percent of the total land area.

While the state does not evaluate the hazard level of levees, the Hazard Mitigation Committee assessed both the Mill River levee system and Connecticut River levee system and determined the percent of City affected by their failure to be 5 percent and 25 percent respectively, meaning they would affect a "medium" amount of the total land area.

Extent

Often dam or levee 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 will likely 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 catastrophic dam or levee failures in Northampton.

Probability of Future Events

As Northampton's high hazard dams age, and if maintenance is deferred, the likelihood of a dam bursting will increase, but currently the frequency of dam failures is "very low" with a less than 1 percent chance of a dam bursting in any given year.

Northampton's levee systems along the Mill River and Connecticut River are regularly maintained, though a sufficiently large flood could cause structural damage to the levee and cause it to partially breech. However, due to rarity of major floods during the last few decades, the frequency of levee breech is "very low," with a less than 1 percent chance in any given year.

Impact

The City faces a "critical" impact from failure of dams or levees with a high hazard level, with 25 percent of Northampton affected.

The estimated property loss of each high hazard and significant hazard dam in Northampton is shown below. Other dams are not expected to have a risk to property and people. Costs are based on the total value of all property in Northampton of $3,475,535,000.

While the state does not evaluate the hazard level of levees, the Hazard Mitigation Committee assessed both the Mill River levee system and Connecticut River levee system and determined the percent of City affected by their failure to be 5 percent and 25 percent respectively.

Dams and Levees in Northampton or Affecting Northampton			
Dam	**Hazard Level**	**Percent of City Affected**	**Cost**
Clear Falls Pool Dam	Significant	5 percent	$173,776,750
Chartpac Dam (Orange Dam)	Significant	5 percent	$173,776,750
Mill River Diversion Dam	Significant	5 percent	$173,776,750
Vistron Pro Corporation Dam	Significant	5 percent	$173,776,750
Country Club Dam (Cook Dam)	Significant	5 percent	$173,776,750
Button Shop #2 Dam	Significant	5 percent	$173,776,750
Button Shop #1 Dam	Significant	5 percent	$173,776,750
Upper Reservoir Dam – Robert Meadows Brook	High	25 percent	$868,883,750
Lower Roberts Meadow Dam	High	25 percent	$868,883,750
Roberts Meadow Middle Dam	High	25 percent	$868,883,750
Ryan Dam	High	25 percent	$868,883,750
Paradise Pond	High	25 percent	$868,883,750
Mill River levee system	N/A	5 percent	$868,883,750
Connecticut River levee system	N/A	25 percent	$868,883,750

Vulnerability

Based on this analysis, Northampton has a hazard index rating of "5 – very low risk" from dam failure or levee breech.

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 city, meaning the location of occurrence is "large" or over 50 percent of the City affected.

Extent

The severity of a drought would determine the scale of the event and would vary among city 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 below.

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

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

Previous Occurrences

In Massachusetts, six major droughts have occurred statewide since 1930.[5] They range in severity and length, from three to eight years. In many of these droughts, water-supply systems were found to be inadequate. Water was piped in to urban areas, and water-supply systems were modified to permit withdrawals at lower water levels. The following table indicates previous occurrences of drought since 2000, based on the US Drought Monitor:

Annual Drought Status	
Year	**Maximum Severity**
2000	No drought
2001	D2 conditions in 21% of the state
2002	D2 conditions in 99% of the state
2003	No drought
2004	D0 conditions in 44% of the state
2005	D1 conditions in 7% of the state
2006	D0 conditions in 98% of the state
2007	D1 conditions in 71% of the state
2008	D0 conditions in 57% of the state
2009	D0 conditions in 44% of the state
2010	D1 conditions in 27% of the state
2011	D0 conditions in 0.01% of the state
2012	D2 conditions in 51% of the state

Source: US Drought Monitor

Northampton has not been impacted by any previous droughts in the state.

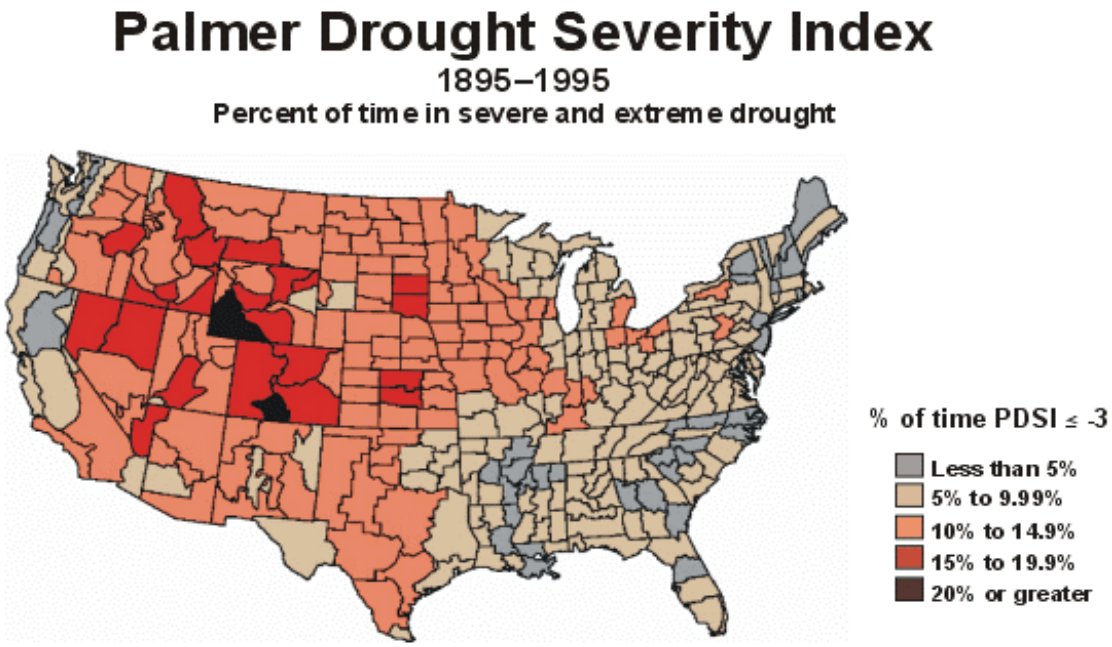
Probability of Future Events

In Northampton, as in the rest of the state, drought occurs at a "low" probability (1 to 10 percent in the next year). Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, it appears that western Massachusetts may be more vulnerable than eastern Massachusetts to severe drought conditions. However, many factors, such as water supply sources, population, economic factors (i.e., agriculture based economy), and infrastructure, may affect the severity and length of a drought event. When evaluating the region's risk for drought on a national level, utilizing a measure called the Palmer

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

Drought Severity Index, Massachusetts is historically in the lowest percentile for severity and risk of drought.[6]

Due to the water richness of western Massachusetts, Northampton 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.



Impact

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

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

[6] National Drought Mitigation Center – http://drought.unl.edu

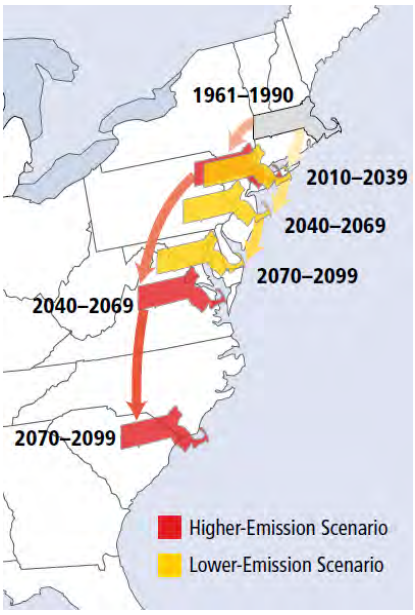
However, the City's local aquifer supply would help to reduce the effects of widespread drought on the local water supply. The impact of a drought is thus "minor," with very few damages to people or property likely to occur.

Vulnerability

Based on the above assessment, Northampton has a hazard index rating of "5 – very low risk" from drought. No loss of property, or damages to people or property is expected due to this hazard.

Impacts of Climate Change

Climate change is already causing natural hazards to have more of an impact on Northampton, with hotter summers, wetter winters, more severe storms, and more frequent flooding. In the future, general climatic changes are projected to result in Northampton experiencing higher temperatures and more precipitation. There will also be wider variability in weather extreme and more days of extreme heat above 90 degrees, more heat waves, more floods, more droughts, and more tornados, hurricanes and heavy storms.



At current rates of greenhouse gas accumulation and temperature increases, the climate of Massachusetts will become similar to those of present-day New Jersey or Virginia by 2040-2069, depending on future GHG emissions..
Source: NECIA 2006

This change in climate will expand the area of Northampton that is within the 100-year and 500-year floodplain, affect critical resources and vulnerable populations, alter local food production, increase the risk of wildfires, and result in increased damage to people and property.

This section identifies the impacts that climate change will have to the various identified hazards affecting Northampton. The information included is derived from several accepted sources:

- The 2007 report of the Northeast Climate Impacts Assessment (NECIA)
- The Pioneer Valley Planning Commission's *Our Next Future: An Action Plan for Building a Smart, Resilient Pioneer Valley*, which includes climate change projections
- The Massachusetts Climate Change Adaptation Report
- The Massachusetts Multi-Hazard Mitigation Plan

The mitigation strategies included in Chapter 5 also take into account the impacts of climate change and provide adaptation strategies where appropriate.

While the exact extent is still uncertain, it is clear that climate change is occurring and will greatly affect Northampton in the upcoming decades. In order to prepare for changes in severe weather and flooding, the City of Northampton has adopted the 500-year floodplain standard in place of a 100-year floodplain, since it is expected that storms currently considered to be 500-year floods will occur more frequently in the future. As additional climate change research is completed, the City will continue to refine its flooding estimates.

Increased Flooding

By the end of the 21st century, annual precipitation is expected to increase by 14 percent – however, this increase will be a result of more winter precipitation – an increase of 30 percent– while summer precipitation will actually slightly decrease. Additionally, most of this winter precipitation is projected to be in the form of rain rather than snow. This will result in a continuation of the current trend of an overall decrease in total snowfall, as well as the number of days that have snow cover. The increased amount of strong precipitation events and overall increase in rainfall will likely result in more flooding in the region.

Expected Climatic Variations Due to Climate Change

Category	Current (1961-1990 avg.)	Predicted Change 2040-2069	Predicted Change 2070-2099
Average Annual Temperature (°F)	46°	50°to 51°	51° to 56°
Average Winter Temperature (°F)	23°	25.5° to 27°	31° to 35°
Average Summer Temperature (°F)	68°	69.5° to 71.5°	74° to 82°
Days over 90 °F	5 to 20 days	-	30 to 60 days
Days over 100 °F	0 to 2 days	-	3 to 28 days
Annual Precipitation	41 inches	43 to 44 inches	44 to 47 inches
Winter Precipitation	8 inches	8.5 to 9 inches	9 to 10.4 inches
Summer Precipitation	11 inches	10.9 to 10.7 inches	10.9 to 11 inches

Sources: Massachusetts Climate Adaptation Report 2011, NECIA

Increased flooding will have the following projected impacts to people and property:

- Currently designated 10-year, 25-year, 100-year and 500-year floodplains of the Mill River and Connecticut River will flood more frequently. Currently 573 people live in the 100-year flood plain and 132 people live in the 500-year flood plain. The City of Northampton believes this to be a severe risk.

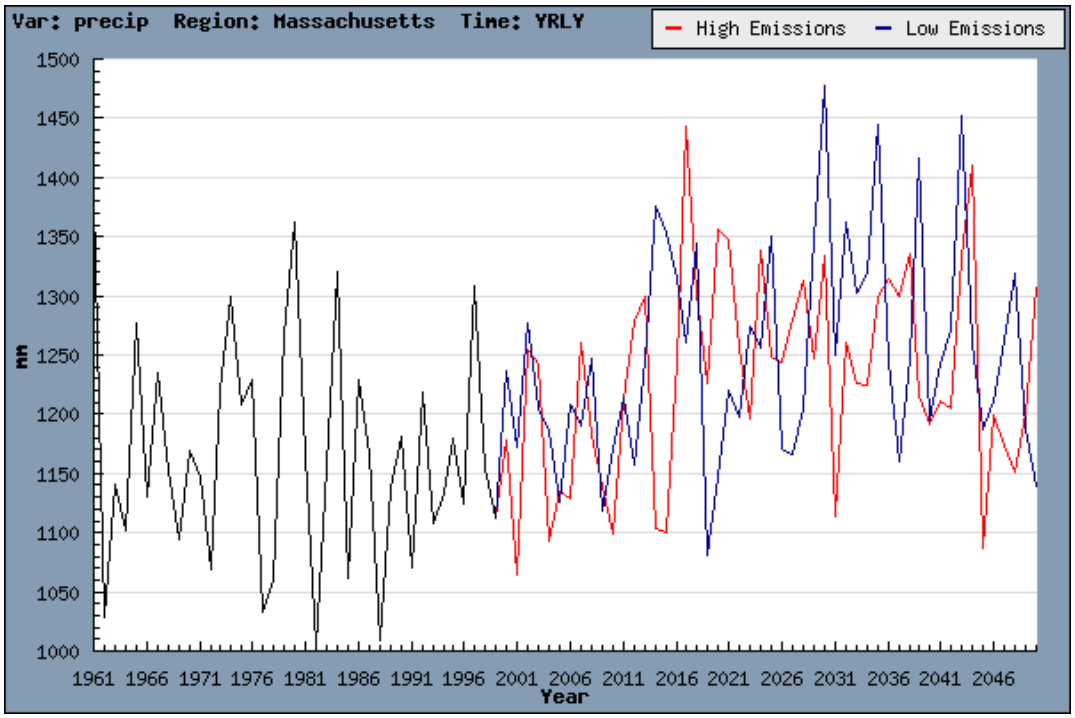
- More damage to areas too small to have FEMA floodplain designation and not already zoned floodplain, such as Roberts Meadows Brook. Currently 284 people live in this area and could be affected. Many of these areas already flood consistently, and so climate change will be potentially very damaging to these areas. The City of Northampton believes this to be a severe risk.

- Increased occurrences of localized flooding, in areas designated on the Hazard Identification map. The City of Northampton believes this to be a minor risk.

- Increased stress on the City's flood pumps and levee system.

- Increased instances of standing water will lead to increased mosquito populations and greater risk of disease vectors.

Massachusetts Rainfall 1961-2050



Rainfall has increased approximately 10% during the past 50 years, and is expected to continue to increase. *Source: NECIA*

The increased flooding due to climate change will have disproportionate impacts to several special populations in Northampton. The socioeconomic status of residents in the floodplains is lower than the city as a whole, meaning that flooding will have more of an impact on lower income residents. Several facilities that serve special populations are located near the City's levee system, and would be within the floodplain should the levee system be compromised. These facilities include: Salvo House, ServiceNet, the Hampshire Dialysis Center, and the Northampton Senior Center. Flooding in this area will affect both low-income and market rate housing development.

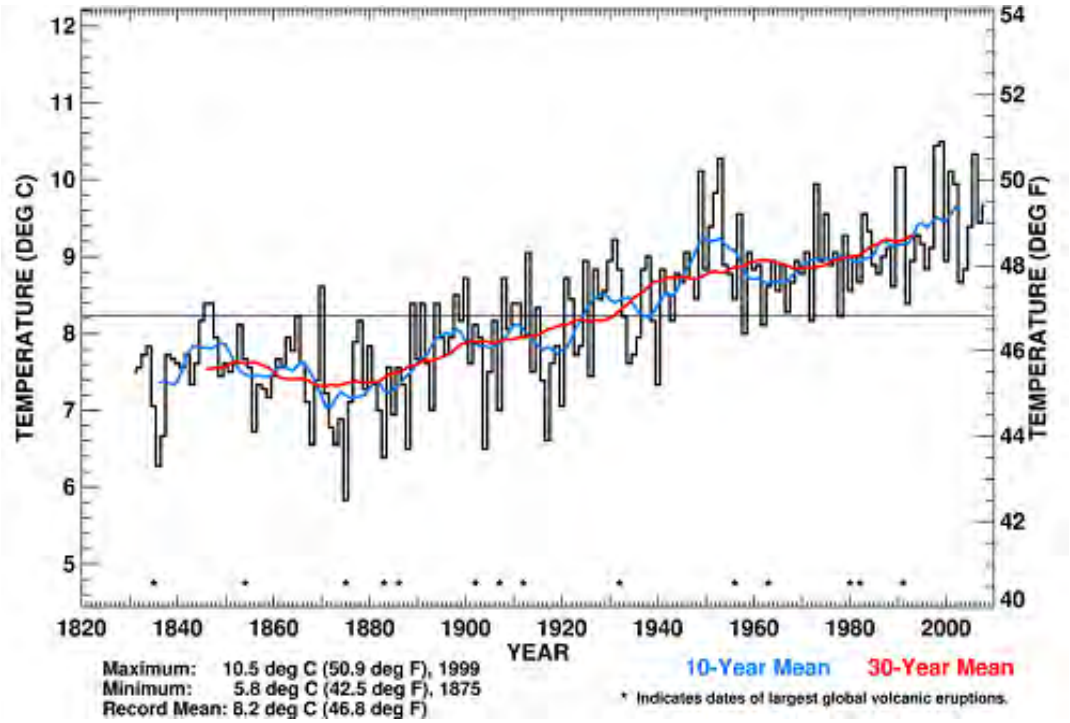
Increased Temperatures

Average temperatures in the Pioneer Valley have been increasing over time in the Pioneer Valley due to climate change, and this trend is likely to continue in the future. Higher temperatures due to climate change will likely have an effect on future drought risk in Northampton. The climate of the Pioneer Valley is strongly influenced by the weather patterns of the larger Northeast United States, a region ranging from Pennsylvania to Maine. Average temperatures in the Northeast have been increasing since the late 1800s. The overall average

annual temperature increase in this area has been approximately .9 degrees C (1.5°F) since approximately 1900.

According to records of the United States Historical Climatology Network, most of this temperature increase has occurred recently, with an average increase of about 0.2 degrees C (0.5°F) per decade since 1970. These higher average temperatures have primarily been the result of warmer winters (December through March), during which there has been an increase of 1.3°F per decade since 1970. In addition to average temperature increases, the number of extremely hot and record heat days has also increased: the number of days with temperatures of 90°F and higher throughout the Northeast has doubled during the past 45 years. The northern portion of the Northeast currently sees about 5 days per year with temperatures over 90°F and no days over 100°F, while the southern portion sees up to 20 days over 90°F and 2 days over 100°F.

Northeast U.S. Region Annual Average Temperatures 1831-2008



From 1831 to 2008, there was a trend in temperatures steadily increasing at the National Weather Service's Blue Hill Observatory, the home of the oldest continuously recorded weather records in the U.S. *Source: Michael J. Iacono, Atmospheric and Environmental Research, Inc./ Blue Hill Observatory, MA. Plot includes temperature data for 1831–1884 from Milton and Canton that were adjusted to the Blue Hill summit location.*

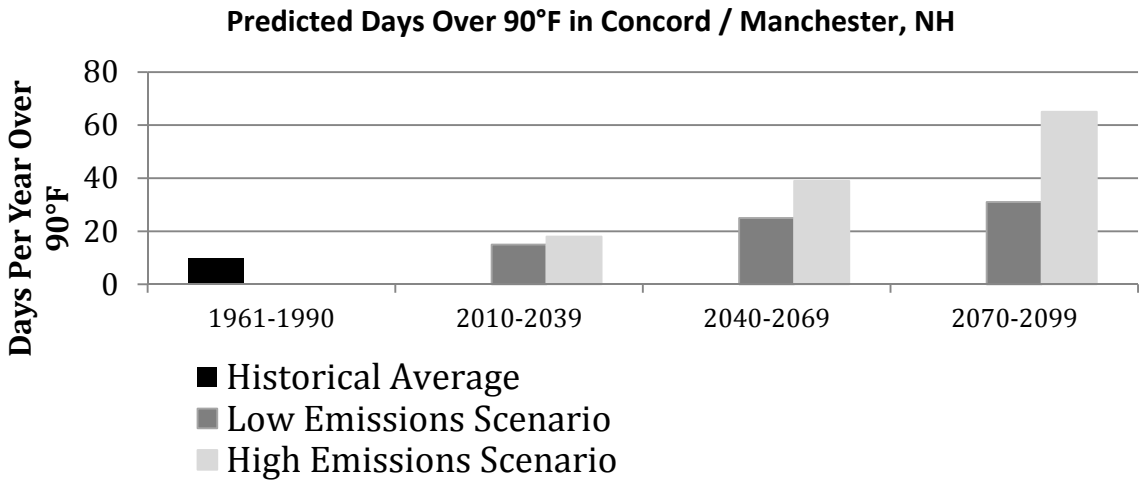
Increased temperatures will have the following projected impacts to people and property:

- Increased temperatures will put stress on current food production and require farming operations to adjust by planting new varieties of crops.

- Changes are also likely to introduce new insect species, pests, and invasive plant species to the region, which will result in further threats to food production and also aversely affect natural systems and biodiversity. Additional prominence of ticks may potentially also lead to more occurrence of Lyme disease.

- Increased energy usage in order to cool buildings in the summer and long-term electrical needs will increase. The City of Northampton commissioned a study by Rivermoor Systems detailing ways in which critical facilities can be made more resilient, including the installation of backup generators.

- Greater stress on special populations, such as senior citizens, without access to air conditioning during heat waves.



Severe Weather

Temperature and precipitation changes in the region will lead to increased severe and extreme weather events, including:

- Slight decrease in summer precipitation that will result in an increase in the number of droughts. Short-term (1 to 3 month) droughts are likely to increase in their frequency in the Northeast to the level of once per year. According to the Connecticut Climate Adaptation Report, "Facing Our Future," the occurrence of drought in that state is already increasing, with shallower lakes drying up.[7]

- Decreased rainfalls will potentially create more occurrences of wildfires.

- Less dependable rainfall will also impact the Pioneer Valley's food systems, in the form of less dependable rainfall and require the region's farming operations to evolve.

- Increased occurrences of major snowstorms, especially during times previously considered unseasonably warm. Should storms occur when there are still leaves on trees, there could be great damage due to broken limbs, as happened during the snowstorm of 2011.

- Increased occurrences of severe thunderstorms and hurricanes, which will result in more wind damage from major storms and greater flooding.

Secondary Effects

- Disruption of communications services due to damage to cellular phone towers and other communications devices.

- Increased costs of home ownership due to higher flood insurance premiums, which will disproportionally affect low income residents.

- Higher difficulty in the ability of residents to obtain basic services that are heavily reliant on electricity after severe weather events, including gasoline and perishable food items.

[7] State of Connecticut Department of Environmental Protection. Facing Our Future: Adapting to Connecticut's Changing Climate. March 2009.

Other Hazards

In addition to the hazards identified above, the Hazard Mitigation Committee reviewed the full list of hazards listed in the Massachusetts Hazard Mitigation Plan. Due to the location and context of the City, coastal erosion, landslides, and tsunamis, were determined to not be a threat.

Extreme temperatures, while identified in the state Hazard Mitigation Plan, was determined by the Northampton Hazard Mitigation Committee to not currently be a primary hazard to people, property, or critical infrastructure in Northampton. While extreme temperatures can result in increased risk of wildfire, this effect is addressed as part of the "Wildfire/Brushfire" hazard assessment. As described in the hazard assessment of climate change, extreme temperatures are likely to have a larger effect on the City in the future. The Hazard Mitigation Committee will continue to assess the impact of extreme temperature and update the Hazard Mitigation Plan accordingly.

4: CRITICAL FACILITIES

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

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

Critical Facilities within Hazard Areas

The Critical Facilities List for the City of Northampton has been identified utilizing two sources:

- Northampton's Comprehensive Emergency Management Plan

- Critical infrastructure mapping undertaken by PVPC under contract with the Western Region Homeland Security Advisory Council, which is charged by the Executive Office of Public Safety and Security to administer and coordinate the State Homeland Security Grant for western Massachusetts.

Northampton's Hazard Mitigation Committee has broken up this list of facilities into three categories:

- Facilities needed for Emergency Response in the event of a disaster.

- Non-Emergency Response Facilities that have been identified by the Committee as non-essential. These are not required in an emergency response event, but are considered essential for the everyday operation of Northampton.

- Facilities/Populations that the Committee wishes to protect in the event of a disaster.

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

Category 1 – Emergency Response Services

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

1. Emergency Operations Center

Northampton Fire Department – Carlon Drive

2. Fire Station

Northampton Fire Station – Carlon Drive
Substation at JFK Middle School – Bridge Road

3. Police Station

Northampton Police Station – Center Street

4. Highway Garage

City Municipal Garage – Locust Street

5. Water Department

Northampton Department of Public Works – Locust Street
Northampton Water Department – Prospect Street
Water Treatment Plant
Waste Water Treatment Plant

6. Emergency Fuel Stations

Northampton Department of Public Works
Northampton Fire Station
Northampton Police Station
Municipal Building
Smith Vocational and Agricultural High School
Water Treatment Plant
Wastewater Treatment Plant
Wastewater Treatment Plant Flood Control System
JFK Middle School
Northampton High School

7. Emergency Electrical Power Facility

Northampton High School
JFK Middle School
Northampton VA Medical Center
Cooley Dickinson Hospital
Smith College Campus School

Hampshire County House of Correction
Fire Department /
Emergency Operations Center
Northampton Police Department
Northampton Department of Public Works
Municipal Building
Smith Vocational & Agricultural High School
Water Treatment Plant
Smith College (multiple)
Wastewater Treatment Plant
Wastewater Treatment Plant Flood Control System
Waste Water Remove Pumps (7)

8. Emergency Shelters

Smith Vocational and Agricultural High School – 80 Locust Street
Northampton High School – 380 Elm Street
JFK Middle School – 100 Bridge Road, Florence
Senior Center (cooling center) – 67 Conz Street

9. Transfer Station

Northampton Transfer Facility – Locust Street

10. Wastewater

Northampton Wastewater Treatment Plant – Hockanum Road

11. Helicopter Landing Sites

Northampton Airport – Old Ferry Road
Cooley Dickinson Helicopter Pad – Hospital Road

12. Primary Evacuation Routes

Interstate 91
MA Route 5
MA Route 10
MA Route 9
MA Route 66
MA Route 5 &10

13. Bridges Located on Evacuation Routes

MA Route 10, Earle Street
MA Route 9, Calvin Coolidge Bridge
Old Ferry Road Bridge
Hockanum Road Bridge
Interstate 91 – Exit 18
Island Road Bridge
South Street Mill River Bridge
West Street Bridge
Clement Street Bridge
Florence Pond Road Bridge
Oxbow Road Bridge
Meadow Street Bridge
Dimmock Street Bridge
Reservoir Road Bridge
Leeds Main Street Bridge
Spring Street Bridge
Audubon Road Bridge over Mill River
Chesterfield Road Bridges

Category 2 – Non Emergency Response Facilities

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

1. Water Supply

Minor water supplies are obtained from the Florence Wells
Francis P. Ryan Reservoir
West Whately Reservoirs
Mountain Street Reservoir
Water Treatment Plant

2. Sewer Infrastructure (Pump Stations) [8]

Northampton Wastewater Treatment Plant – Hockanum Road
Flood control pump stations that are located at the plant are fairly old and showing signs of wear. They are essential to keeping facility operating and if they failed, they could create severe damage to both the plant and the surrounding low-lying neighborhood.

3. Problem Culverts

A list of potential problem culverts is compiled by the Highway Superintendent and on file with the Northampton DPW.

[8] The Northampton DPW maintains a list for official purposes, but will not compromise this list in a public plan.

Category 3 – Facilities/Populations to Protect

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

1. Medical Facilities

Cooley Dickinson Hospital – Elm Street
Hampshire County Dialysis Center – Conz Street
VA Medical Center Hospital – North Main Street

2. Special Needs Population

Individuals without a reliable form of private evacuation
Smith College – 2,500 students living on campus, several without transportation
Elderly – Significant population in Downtown Areas

3. Elderly Housing

Walter Salvo House – Conz Street
Frank J. Cahill – Fruit Street
Harold J. Forsander – High Street
Joan Tobin Manor – Maple Street
Joseph McDonald House – Old South Street
Calvin Coolidge Nursing Home – Elm Street

4. **Nursing Homes / Assisted Living**

Linda Manor / Zoe Life Retirement Community – Haydenville Road
Lathrop Retirement Community – South Street
Rockbridge – North King
River Valley Rest Home – Pine Street
Christopher Heights (Planned) – Hospital Hill

5. Recreation Areas

Look Park – Route 9
Childs Park – Route 9
Arcanum Field – Bridge Road, Florence
Maines Field – Riverside Drive, Florence
Musante Beach – Reservoir Road, Florence
Sheldon Field – Route 9
Veterans Field – West Street
Norwottuck – Damon Road
Florence Field – Meadows Street
Connecticut River Greenway

6. Schools

Northampton High School – Elm Street
Smith Vocational and Agricultural High School – Locust Street
John F Kennedy Middle School - Bridge Road
Jackson Street School – Jackson Street
Bridge Street School – Bridge Street
Leeds School – Florence Street
Ryan Road School – Ryan Road

7. Churches

Blessed Sacrament Church – Elm St
College Church – Pomeroy Terrace
Congregation B'Nai Israel – Prospect Street
Edwards Church – Main Street
First Church-Christ Scientist – 79 Masonic Street
First Churches – 129 Main Street
Kingdom Hall – Jehovah's Witness – Bridge Street
St. Elizabeth Ann Seton – King Street
St. John's Episcopal Church – Elm Street
Unitarian Society – Main Street

8. Historic Buildings/Sites

Northampton VA Medical Center – North Main Street
Graves Avenue – 8—22 Graves Avenue
Memorial Hall – Main Street
First Congregational Church – Main Street
West Farms Church – West Farms Street
Hampshire County Court House – Gothic Street
Fort Hill Historic District
Elm Street Historic District
Sylvester Graham House – Pleasant Street
Calvin Coolidge House – Massasoit Street
Northampton Downtown Historic District
Hotel Northampton – King Street
Unitarian Church – Main Street
The Manse – Prospect Street

9. Employment Centers

Smith College – Elm Street
Cooley Dickinson Hospital – Elm Street
L-3 KEO – MA Route 66
Downtown — Routes 5 & 9

10. Camps

Hampshire Educational Collaborative Camp Hodgkins – Riverbank Road

11. Mobile Home Parks

None in Northampton

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas			
Hazard Type	**Hazard Area**	**Critical Facilities Affected**	**Evacuation Routes Affected**
Flooding	Mill River Connecticut River	Should the levy system fail, the entire downtown would be flooded, including emergency operations from the police station	Route 10 in extreme conditions, Route 5; Route 66; Route 9.
Severe Snowstorms / Ice Storms	Entire City	Cooley Dickinson-possible power outage Nursing Homes-Rock Ridge	Route 10 in extreme conditions, Route 5; Route 66; Route 9.
Severe Thunderstorms / wind / tornadoes	Entire City	Site Specific	Site Specific
Hurricanes	Mill River Connecticut River	Should the levy system fail, much of downtown would be flooded, including emergency operations from the police station	Route 10 in extreme conditions, Route 5; Route 66; Route 9.
Wildfire/Brushfire	Spring Street Ryan Road Chesterfield Road	Site Specific	Site Specific
Earthquakes	Entire City	Emergency operations; residential and commercial structures; emergency shelters; waste management and treatment plants	Route 91 in extreme conditions, Route 5; Route 66; Route 9.
Dam Failure	Varies depending on structure	Site Specific	Site Specific
Drought	Entire City	Fire fighting operations	None

(Critical Facilities Map Located In Back of Plan)

5: MITIGATION STRATEGIES

One of the steps of this Hazard Mitigation Plan is to evaluate all of the City's existing policies and practices related to natural hazards and identify potential gaps in protection. After reviewing these policies and the hazard identification and assessment, the Hazard Mitigation Committee developed a set of hazard mitigation strategies it would like to have implemented moving forward.

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

Goal Statement

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

Existing Mitigation Strategies

The City of Northampton had many mitigation strategies in place prior to the update of this Hazard Mitigation Plan in 2014. These strategies are included on the following pages and have been evaluated in the "Effectiveness" column.

Strategies that were completed since the last version of the plan are listed in bold. For a list of completed strategies that were previously identified as part of the prioritized implementation list, see the table of "Deleted and Completed Strategies" later in this section.

Flooding

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

Management Plans

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

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

Subdivision Rules and Regulations

Northampton's most recent draft of its Subdivision Rules and Regulations which govern the subdivision of land were adopted for the purpose of "protecting the safety, convenience and welfare of the inhabitants of Northampton by regulating the laying out and construction of ways in subdivisions providing access to the several lots there [and]…for securing safety in the case of fire, flood, panic, and other emergencies." The Subdivision Rules and Regulations contain several provisions that mitigate the potential for, and impact of, flooding.

Northampton Zoning Ordinance

The City of Northampton has adopted several land use regulations that serve to limit or regulate development in floodplains, to manage stormwater runoff, and to protect groundwater and wetland resources, the latter of which often provide important flood storage capacity. To review the City of Northampton's Zoning Ordinance, visit www.northamptonma.gov.

The City of Northampton has established a set of ordinances designed in part to "lessen congestion in the streets; to conserve health; to secure safety from fire, flood, panic, and other dangers" The Zoning Ordinance include several provisions that mitigate the potential for flooding, including:

- Any body of water or wet area that is proposed for filling and is proposed to receive 500 cubic yards of fill, or where the proposed area exceeds 10,000 s.f., must receive permission from the Conservation Commission and must: a) not be located within the Special Conservancy District, b) be executed within the context of existing plans, c) sufficiently document the impacts on downstream locations, d) be designed not to impair surface drainage or increase erosion, e) be designed to minimize off-site accumulation of fill materials, f) must not impair any septic disposal systems, and g) no filling shall cause water or other materials to intrude upon a neighboring property without the express permission of the neighbor.

- The site plan review process shall: have all stormwater systems approved, floodplains and water bodies must be delineated, an erosion control plan that prevents infill of water bodies must be approved, not result in water damage to surrounding properties, not result in an increase in surface water runoff from 1, 2 or 10 year storm events in the Central Business District.

- The Special Conservancy zoning district has been created in Northampton to maintain the natural and safe flow of floodwaters, and to protect persons and property by ensuring that development does not interfere with flood storage capacity. The District also prevents the construction of residencies and the addition of fill; these preserve the

natural hydrology of the city's watershed lands and provides storage areas for rain waters. Construction of new residential development is prohibited in this district within the 500-year flood plain. The 500-year flood plain is used as an estimate for the increased precipitation predicted due to climate change.

- The Farms, Forest and Rivers Overlay District (FFR) encourages the preservation of open space and caps impervious surface area at 25 percent of the total lot size. The FFR works to maintain open space and rainwater storage areas and, as such, makes the City less susceptible to damage from flooding.

- The Water Supply Protection District prohibits the use of toxic chemicals and restricts the excavation land within those lands that are critical to the city's drinking water supplies. This works to maintain natural hydrology.

- The Open Space Residential Development (OSRD) ordinance requires that 50 percent of a new subdivision (when ordinance is used) be preserved as open space. This preserves open space and can slow and store rain waters.

Open Space Acquisition Program

The City is currently purchasing about 0.5 percent of the city's land area either in fee or by agriculture and conservation restrictions. This includes floodplain and flood prone areas. Specific actions involved in the City's Open Space Acquisition Program are identification of high-risk flooding areas, working with land owners, and acquiring land in conjunction with land owners and state conservation programs.

River and Stream Protection

The City of Northampton follows the standards established by the Wetlands Protection Act, which protects water bodies and wetlands through the city Conservation Commission. The City also has instituted its Wetlands Ordinance and Special Conservancy District, an overlay district that provides restrictions on use categories, the use of septic tanks and leach fields, as well as on the impacting of the flood storage capacity of the land. The City also has a Water Supply Protection District, which prohibits the use of septic tanks within the city's aquifer protection district and creates greater buffer distances from certain wetlands.

Stormwater Utility and Flood Control Ordinance
Passed by the City Council in 2014, the Ordinance will pay for necessary stormwater system construction and maintenance. Property owners in Northampton will be billed based on the amount of stormwater runoff their land generates, with the calculation based on the amount of impervious and pervious surface on site. The utility will be fully implemented over the next few years.

There is a range of regulatory techniques available to prevent flood damage in Northampton. These include:

- When a Definitive Plan is submitted, proponents must delineate natural waterways and floodways.
- All subdivision must comply with the Massachusetts' Wetlands Protection Act (Chapter 131, Section 40) and retain all wetlands and flood lands if the Conservation Commission determines that the WPA applies to the proposed subdivision.
- When permitting the subdivision, the planning board must ensure that the regulations of the Water Supply Protection District are met, when the development is located within the WSP. This works to retain flood and rainwater storage capacity in Northampton's critical waterways.
- Stormwater drainage and infiltration systems must be designed to withstand 1, 2, 10 and 100 year storms in Northampton
- When a plan is developed and submitted to the planning board, all definitive plans must indicate, clearly, any floodplain lands and demonstrate compliance with the City's Floodplain District.

National Flood Insurance Program

The National Flood Insurance Program has produced maps that identify floodways across America. Northampton is a participating member of the National Flood Insurance Program, and had the following NFIP policy and claim statistics as of 2014:

- Flood Insurance Maps (FIRMs) are used for flood insurance purposes and are on file with the Northampton Planning Board.

- FIRMs have been effective since May 31, 1974 with the current map in effect since April 3, 1978.

- Northampton has 120 in-force policies in effect for a total of $28,190,200 worth of insurance.

- There have been a total of 60 NFIP claims for which $603,372 has been paid.

- As of 2014, there have been 8 Repetitive Loss Properties in Northampton, all of which were residential.

- The City will maintain compliance with the NFIP throughout the next 5-year Hazard Mitigation Planning cycle by monitoring its Flood Plain Overlay District and ensuring that the district accurately reflects the 100-year flood plain and FEMA Flood Insurance Rate Map (FIRM).

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

Flood Control Structures

FEMA has identified the following flood control structures in Northampton: Northampton Connecticut and Mill River Flood Control Dikes, constructed by the U.S. Army Corps of Engineers. The City regularly maintains these dikes as per U.S. Army Corps of Engineers requirements.

Northampton Open Space, Recreation, and Multiuse Trail Plan 2011-2018

The Open Space, Recreation, and Multiuse Trail Plan inventories the City's natural features and promotes natural resource preservation in the City, including areas in the floodplain. Wetlands, aquifer recharge areas, farms, open space, rivers, streams, and brooks are addressed in the plan, which encourages forestland and farmland protection to help conserve the City's flood storage capacity.

Existing Flood Hazard Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEM Plan lists the following measures for flood planning: Identify areas in the community that are flood prone, review National Flood Insurance Maps, disseminate emergency public information and instructions concerning flood preparedness and safety, adhere to land use and building codes, ensure that flood control works are in good condition, and preservation of natural are in good operating condition at all times.	Entire City.	Effective.	None.

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Subdivision Rules and Regulations	Definitive plan requires delineating natural waterways and floodways The subdivision regulations must comply with zoning protections for natural features. Subdivision drainage must be designed to withstand 1, 2 10 and 100 year storms. Utilities must be buried. Stormwater management in new development must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.	Entire City.	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure. Somewhat effective for controlling impacts from stormwater runoff. Prevents flood damage to infrastructure. Effective for preventing increased stormwater discharge.	None.

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Zoning Ordinance: Site Plan Review	Requires the site plan to show erosion control, drainage facilities, stormwater runoff, no net change to water supply.	Entire City.	Somewhat effective.	None.
Special Conservancy	**Preserves the floodplain through preventing new residential development in 500-year flood plain. Planning Board and Conservation Commission approval for construction, while allowing conservation by right. Commercial development is also severely restricted.**	**Area designated on Zoning Map.**	**Effective.**	
Floodplain Overlay	Preserves and protects for various commercial areas not protected by Special Conservancy District.	Area designated on Zoning Map.	Somewhat effective.	
Farm, Forest and Rivers Overlay District	Protects vulnerable, sensitive and important ecosystems through requiring that all construction be sited to minimize a project's footprint on the land; allows clustering and sets a 25% maximum footprint for infrastructure.	Area designated on Zoning Map.	Somewhat effective.	
Water Supply Protection District	Preserves primary and secondary recharge areas through preventing the use of hazardous chemicals—either through strict conditions or outright prohibitions.	Area designated on Zoning Map.	Somewhat effective.	

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Open Space Residential Development Ordinance	Allows development while conserving valuable open space.	Entire City.	Effective at maintaining flood storage land.	Consider adding more specific impacts to address including topographic change, removal of cover vegetation, risk of erosion or siltation and increased storm water runoff.
Open Space Acquisition Program	The City is currently purchasing about 0.5 percent of the city's land area either in fee or by agriculture and conservation restrictions. Specific actions involved in the City's Open Space Acquisition Program are identification of high-risk flooding areas, working with land owners, and acquiring land in conjunction with land owners and state conservation programs.	Areas within the 100-year Floodplain.	Effective.	None.
Wetlands Ordinance	Protects wetlands, including floodplains, rivers and wetlands.	All wetlands and floodplains.	Effective at limiting development that would harm these resources.	None.

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Stormwater Utility and Flood Control Ordinance	**Charges property owners for stormwater runoff based on amount of impervious and pervious surface on their land, in order to pay for improvements to stormwater system and flood control system.**	**Entire City.**	**Effective.**	**None.**
Northampton Open Space, Recreation, and Multiuse Trail Plan 2011-2018	**Inventories natural features and promotes natural resource preservation in the City, including areas in the floodplain; such as wetlands, aquifer recharge areas, farms and open space, rivers, streams and brooks.**	**Entire City.**	**Effective in identifying sensitive resource areas, including floodplains.** **Encourages forestland and farmland protection, which will help conserve the City's flood storage capacity.**	**Consider implementing the Seven-Year Action Plan strategies, particularly those dealing with protection of forests, farmland and floodplain forests.**

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Participation in the National Flood Insurance Program	As of 2014, there were 120 homeowners with flood insurance policies.	Areas identified by the FEMA maps.	Somewhat effective, provided that the City remains enrolled in the National Flood Insurance Program.	The City should consider re-applying for Community Rating System status and continue to work with MEMA regarding flood mitigation requirements.
Maintenance of Northampton Connecticut and Mill River Flood Control Dikes	The City regularly maintains the flood control dikes along the Connecticut and Mill Rivers, as required by the U.S. Army Corps of Engineers. The City is current completing a study to assess necessary improvements to this infrastructure to keep it in good maintenance.	Mill River and Connecticut River flood plains	Effective.	Improvements to flood control structures (see list of future strategies)
Maintenance of channel behind Fire Department	Department of Public works maintains the channel behind the Fire Department to prevent the marsh from flooding the Fire Department building.	Fire Department and nearby marsh.	Effective.	None.

Severe Snowstorms / Ice Storms

Winter storms can be especially challenging for emergency management personnel. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected. Even though the storm has usually been forecast, there is no certain way for predicting its length, size or severity. Therefore, mitigation strategies must focus on preparedness prior to a severe snow/ice storm.

The City's current mitigation tools and strategies focus on preparedness, with many regulations and standards established based on safety during storm events. To the extent that some of the damages from a winter storm can be caused by flooding, flood protection mitigation measures also assist with severe snowstorms and ice storms.

Management Plans

The Comprehensive Emergency Management (CEM) Plan for Northampton lists the following mitigation measure for severe winter storms:

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

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

Restrictions on Development

There are no restrictions on development that are directly related to severe winter storms. However, the Subdivision Rules and Regulations do set grade limits on driveways and address frontage variances for flag lots to ensure that roads and driveways will be passable in the winter.

The City of Northampton Subdivision Rules and Regulations set grade limits on streets that are included in an Section 7:01: Streets and Ways and as part of Section 7:22: Underground Utility Systems, which, although not specified as weather hazard mitigation, can serve to minimize accident potential and power loss from severe winter storms. The City of Northampton Zoning Ordinance also regulates common driveways.

State Building Code

For new or recently built structures, the primary protection against snow-related damage is construction according to the State Building Code, which addresses designing buildings to withstand snow loads. Northampton has a full-time, professional building inspector on its staff.

Improvements to Backup Power Supply

The City is currently working to improve the electrical resiliency of its emergency facilities, in case of power loss from hazards such as snowstorms. As part of this work, the City commissioned a study by Rivermoor Systems to make recommendations for improvements, such as adapting current buildings to backup power generators and photovoltaic facilities. The City is also working to improve the resiliency of the microgrid that provides emergency services.

Existing Severe Snowstorms/Ice Storms Hazard Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEM Plan lists the following mitigation measure for severe winter storms: Develop and disseminate emergency public information concerning winter storms, especially material which instructs individuals and families how to stock their homes, prepare their vehicles, and take care of themselves during a severe winter storm.	Entire City.	Effective.	None.
Subdivision Regulations – Design Standards for Roads Standards for Flag Lots	Standards include street grade regulations (five to eight percent maximum). Requires that snow management strategy be a clear part of the conditions to permit a flag lot.	Entire City.	Effective.	None.
Subdivision Regulations – Utilities (electric and telephone)	The City requires all utilities for new subdivisions to be underground.	Entire City.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Work with utility companies to underground existing utility lines in locations where repetitive outages occur.
State Building	Northampton follows the Massachusetts	Entire City.	Effective.	None.

Code	State Building Code.			
Resiliency of electrical grid	**Implementing improvements to electrical systems of emergency facilities.**	**Entire City.**	**Effective.**	**None.**
Electrical grid for emergency services	**Working to ensure resiliency of microgrid for emergency service facilities, and reviewing Smith College as a model.**	**Entire City.**	**Effective.**	**None.**

Hurricanes / Severe Thunderstorms / Wind / Tornadoes

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

Management Plans

The Comprehensive Emergency Management (CEM) Plan for Northampton includes the following mitigation measures for hurricanes, severe thunderstorms, wind, and tornadoes:

- Develop and enforce building codes to enhance structural resistance to high winds.
- Develop and disseminate emergency public information and instructions concerning disaster safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.

Zoning

The Telecommunications Facilities Zoning Ordinance requires that telecommunications towers be setback from adjacent property lines. This requirement prevents telecommunications facilities from falling and damaging neighboring properties.

Restrictions on Development

The City's Subdivision Ordinance requires that all new subdivisions have buried utility lines.

Mobile Homes

According to the Northampton Zoning Ordinance, mobile homes are not an allowed use. However, all regulations and legal protections given to victims of fires or other natural disasters must be followed, and such regulations are located in M.G.L. Chapter 40A.

State Building Code

For new or recently built structures, the primary protection against wind-related damage is construction that adheres to the State Building Code, which, when followed, results in buildings that withstand high winds. The City of Northampton employs a building inspector for all inspection duties and responsibilities.

Flood Mitigation Strategies

Because one of the primary impacts of hurricanes and severe thunderstorms is intense rainfall that generate flooding, all of the flood mitigation strategies discussed above are also mitigation strategies for hurricanes and severe thunderstorms.

Existing Hurricane / Thunderstorm / Wind / Tornado Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEM includes the following mitigation measures: 1) Develop and enforce building codes to enhance structural resistance to high winds and 2) develop and disseminate emergency public information and instructions concerning disaster safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.	Entire City.	Effective.	None.
Zoning regulations for tele-communications facilities	No facility shall exceed 220 feet in height as measured from the mean finished grade at facility base. No tower exclusive of any attachments, shall be erected nearer to any property line than a distance equal to twice the vertical height.	Entire City.	Effective.	Consider adding safety and prevention of wind-related damage as a stated purpose.

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Subdivision Regulations – Utilities (electric and telephone)	The City requires all utilities for new subdivisions to be underground.	Entire City.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Work with utility companies to underground new utility lines in general and existing utility lines in locations where repetitive outages occur.
Zoning Regulations regarding new mobile homes	Mobile homes are not an allowed use in all districts.	Entire City.	Does not address the potential for wind-related damage to mobile homes.	None.
State Building Code	The City of Northampton has adopted the Massachusetts State Building Code.	Entire City.	Effective.	None.

Wildfires/Brushfires

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

Management Plans

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

Regulatory Measures

Burn Permits*:* The City of Northampton does allow open burning under the guidelines of the Department of Environmental Protection. Open Burning is authorized from January 15 to May 1. Burning is permitted between the hours of 10 a.m. and 4 p.m. The Officer in Charge of the Fire Department will determine if burning will be allowed at the beginning of the shift and can suspend burning if weather conditions change.

Subdivision Review: The procedures for the submission of preliminary and definitive subdivision plans require that the fire department be an active participant in the review of proposed subdivision plans. This involves verifying that proficient water supplies exist and that access routes to and from a given subdivision adequately meet public safety needs.

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

Restrictions on Development

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

Existing Wildfire/Brushfire Hazard Mitigation Measures

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

Earthquakes

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

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

Management Plans

The Northampton Comprehensive Emergency Management Plan lists the following mitigation measures for earthquakes:

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

State Building Code

State and local building inspectors are guided by regulations put forth in the Massachusetts State Building Code. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975 and included specific earthquake resistant design standards. These seismic requirements for new construction have been revised and updated over the years and are part of the current, 8th edition of the Massachusetts State Building Code. Given that most structures in Massachusetts were built before 1975, of many buildings and structures do not have specific earthquake resistant design features. In addition, built areas underlain by artificial fill, sandy or clay soils are particularly vulnerable to damage during an earthquake.

Restrictions on Development

There are no seismic-related restrictions on development beyond that in the building code.

Existing Earthquake Hazard Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEM Plan includes measures for earthquake preparation that include keeping an assessment of structures and land areas that are especially vulnerable to earthquakes, strict adherence to building code, periodic evaluation, repair, and/or improvement to older public structures, and dissemination of public information about how to prepare for earthquakes.	Entire City.	Effective.	None.
State Building Code	The City of Northampton has adopted the 8th Edition of the State Building Code.	Entire City.	Effective for new buildings only.	Evaluate older structures to be used as shelters and determine if they are earthquake resistant as per 8th Edition of the State Building Code.

Dam Failures / Levee Breech

Dam or levee failure is a highly infrequent occurrence, but a severe incident could prove catastrophic. In addition, dam failure most often coincides with flooding, so its impacts can be multiplied, as the additional water has no where to flow.

Management Plans and Regulatory Measures

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

- Develop and conduct public education programs concerning dam hazards.
- Maintain up-to-date plans to deal with threat and actual occurrence of dam over-spill or failure.
- Emergency Management and other local government agencies should familiarize themselves with technical data and other information pertinent to the dams which impact Northampton. This should include determining the probable extent and seriousness of the effect to downstream areas.
- Dams should be inspected periodically and monitored regularly.
- Repairs should be attended to promptly.
- As much as is possible burdens on faulty dams should be lessened through stream re-channeling.
- Identify dam owners.
- Determine minimum notification time for down stream areas.
- Contaminate-laden waste (including dams that hold back pollution from traveling downstream).

Permits Required for New Dam Construction

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

Dam Inspections and Removal of Dams

The DCR requires that dams rated as Low Hazards are inspected every ten years and dams that are rated as Medium/Significant Hazards are inspected every five years. High Hazard dams must be inspected every two years. The City has carried out inspection of Lower Reservoir Dam, Middle Reservoir Dam, and Upper Reservoir Dam and determined that Upper Reservoir Dam is in poor condition. The City is currently beginning the process of permitting and design to remove this structure.

Zoning

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

Restrictions on Development

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

Levee Maintenance

The City regularly maintains the levee systems on the Mill River and Connecticut River in accordance with the U.S. Army Corps of Engineers requirements to ensure the flood control system is in good repair.

Existing Dam Failure Hazard Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Comprehensive Emergency Management Plan	The CEM Plan includes a variety of public education and regular maintenance initiatives for dam and levee safety.	Entire City.	Effective.	None.
Permits required for new dam construction	State law requires a permit for the construction of any dam.	Entire City.	Effective. Ensures dams are adequately designed.	None.
Dam Inspections	DCR has an inspection schedule that is based on the hazard rating of the dam (low, medium, high hazard).	Entire City.	Dams located on private land must be inspected by property owner. The City's Conservation Commission is responsible for inspecting two City-owned dams and DPW for three City-owned dams.	None.
Evacuation Plans	Comprehensive evacuation plans ensure the safety of the citizens in the event of dam failure.	Inundation areas in City.	Effective.	None.

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Identification of inundation zones	Mapped inundation zones identify areas where dam breaches would result in a loss of life and damage to property.	Inundation areas in City.	Effective.	None.
Emergency Action Plans	EAPs are in place for the three Roberts Meadows dams, which includes identification of City inundation areas	Inundation areas in City.	Effective.	None.
Levee maintenance	The City regularly maintains the levee systems on the Mill River and Connecticut River in accordance with the U.S. Army Corps of Engineers requirements to ensure the flood control system is in good repair.	Inundation areas in City.	Effective.	None.

Drought

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

State Regulations

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

City Operations

The City of Northampton routinely works to identify and repair water system leaks. Current water loss due to leakage is less than 10 percent of the total consumption. In addition, the City is considering the installation of an irrigation well at Florence Field, and is also working with Smith College to determine the feasibility of irrigation wells on campus, which would further conserve the City's water supply.

Existing Drought Mitigation Measures

Existing Action	Description	Area Covered	Effectiveness	Potential Changes
Massachusetts Water Management Act	Regulates amount of water that can be used during a Water Emergency Declaration.	Entire City.	Effective.	None.
Identification and reduction of water system leaks	The Department of Public Works routinely inspects and repairs water system leaks.	Entire City.	Effective.	None.
Intermunicipal emergency water connections	**The City is working with Easthampton, Hatfield, Williamsburg, and Southampton to develop a Memorandum of Agreement for emergency intermunicipal water supply connections, as well as developing a hydraulic study to determine where connections between municipalities would be best suited.**	**Entire City.**	**Effective.**	**None.**
Water System Emergency Response Plan	Plan includes information about what City will do in response to water emergencies, including droughts.	Entire City.	Effective.	None.

Deleted or Completed Mitigation Strategies

Several mitigation strategies listed in the 2007 version of the Northampton Hazard Mitigation Plan have been removed or completed in the time since this 5-year update. Deleted and completed strategies, and their status, are indicated in the table below.

Deleted or Completed Mitigation Strategies				
Action Name	**Description**	**Hazards Mitigated**	**Responsible Agency**	**Status**
Trash rack culverts	Apply for HMPG funds for installation of trash racks on undersized culverts.	Flooding	Department of Public Works	Determined to not be a significant number of sites on which to install trash racks.
Disaster Planning Committee	Create a Northampton Disaster Planning Committee composed of City officials to ensure coordination of mitigation efforts	All hazards	Emergency Management Director, City Council, Mayor's Office	Role of Disaster Planning Committee would be duplicative with existing City operations.
Monitoring of hazardous materials sites	Electronic monitoring and tracking software for EPA Tier II locations	Man-made hazards	Emergency Management Director, Fire Department	Not applicable to the mitigation of natural hazards. Routine monitoring already occurs by City.

Deleted or Completed Mitigation Strategies				
Action Name	**Description**	**Hazards Mitigated**	**Responsible Agency**	**Status**
Inventorying of supplies at shelters	Inventory supplies at existing shelters and develop a needs list, then establish a needs list with local or neighboring vendors for supplying shelters.	None	Emergency Management Director	Does not pertain to hazard mitigation, though still addressed as part of City's emergency response operations.
Fuel and pharmaceutical agreements	Review current agreements with suppliers of fuel and pharmaceuticals to ensure adequate provision of short-term supplies	None	Emergency Management Director	Does not pertain to hazard mitigation, though still addressed as part of City's emergency response operations.
Reverse 911	Develop a Preliminary Project Proposal and Cost Estimate for Updating Current 911 System including Feasibility of Reverse 911	All	City Council, Mayor's Office	Completed.
Generators	Retrofit existing back-up government buildings to accommodate external generators	All	Emergency Management Director, Department of Public Works, Fire Department, Police Department	Strategy was included twice on previous plan's strategy list.
Sprinkler systems	Revision of subdivision regulations to require sprinkler systems and water storage in houses that are not connected to city water lines	Wildfire/Brushfire	Fire Department, Office of Planning and Development, City Council, Mayor's Office	Determined to not be a feasible requirement for buildings not connected to city water lines.

Deleted or Completed Mitigation Strategies				
Action Name	**Description**	**Hazards Mitigated**	**Responsible Agency**	**Status**
Tier II monitoring software	Purchase electronic monitoring and tracking software for EPA Tier II locations and to ensure proper registration	None	EMD	Does not pertain to natural hazard mitigation.
Preventing flood zone development	Acquire undeveloped properties within flood zones	Flooding	City Council, Mayor's Office, Office of Planning and Development, Conservation Commission	Deleted because strategy duplicates implementation of Open Space and Recreation Plan. Now considered an existing strategy. Completed on a regular basis.
Preventing flood zone development	Acquiring undeveloped parcels located within flood zones	Flooding	City Council, Mayor's Office, Office of Planning and Development, Conservation Commission	Deleted because strategy duplicates implementation of Open Space and Recreation Plan. Now considered an existing strategy. Completed on a regular basis.
Preventing flood zone development	Implement five-year action plan for Northampton's Open Space and Recreation Plan	Flooding	Conservation Commission, Office of Planning and Development, City Council, Mayor's Office	Strategy was included twice on previous plan's strategy list and is now considered an existing strategy. Now considered an existing strategy. Completed on a regular basis.

Deleted or Completed Mitigation Strategies				
Action Name	**Description**	**Hazards Mitigated**	**Responsible Agency**	**Status**
Preventing flood zone development	Implement five-year action plan for Northampton's Open Space and Recreation Plan	Flooding	Conservation Commission, Office of Planning and Development, City Council, Mayor's Office	Strategy was included twice on previous plan's strategy list and is now considered an existing strategy. Now considered an existing strategy. Completed on a regular basis.
Snow storage	Purchase land for a new snow storage location	Snowstorm / Ice storm	City Council, Mayor's Office, Department of Public Works	Determined to not be a mitigation strategy and therefore not in purview of this plan.
Hazard Mitigation Plan update	Hazard Mitigation Committee will meet to update the City's Hazard Mitigation Plan, as per MEMA and FEMA requirements	All hazards	Emergency Management Director, Department of Planning and Sustainability, Department of Public Works, Fire Department, Police Department, City Council	Now considered an existing strategy. Completed on a regular basis.
Maintenance of channel behind Fire Department	Maintain channel behind Fire Department to prevent marsh from flooding the Fire Department	Flood	Department of Public Works	Now considered an existing strategy. Completed on a regular basis.

Prioritized Implementation Plan

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

Prioritization Methodology

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

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

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

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

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

Eligibility Under Hazard Mitigation Grant Program – The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Funding is made available through FEMA by the Massachusetts Emergency Management Agency. Municipalities apply for grants to fund specific mitigation projects under MEMA requirements

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

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

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

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

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

Cost Estimates

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

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

Cost estimates take into account the following resources:

- City 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 city and general knowledge of previous work in city)
- City staff time for construction, maintenance, and operation activities (at a rate of $25 per hour)

Project Timeline

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

Mitigation Strategies to be Implemented								
Mitigation Action	**Status**	**Action Type**	**Hazards Mitigated**	**Responsible Department/Board**	**Timeframe**	**Potential Funding Source(s)**	**Estimated Cost**	**Priority**
Continue current study of replacement strategies for flood control facility and implement recommendations.	Continuing. CDM Consulting conducted initial review as part of City study, in line with requirements of US Army Corps of Engineers.	Capital construction	Flooding, Hurricanes, Thunderstorms	City Council, Mayor's Office, Department of Public Works	2 years	Department of Public Works	$200,000	High
Install real-time rain gauges on Mill River to measure water flows and predict flooding.	Continuing. City currently has a 10-year old USGS flow device in use. Over the past 5 years, the City's DPW has researched gauge technologies, as well as investigated and developed cost estimates for this strategy.	City operations	Flooding, Hurricanes, Thunderstorms	Department of Public Works	4 years	Department of Public Works, HMGP funds	< $25,000	High
Retrofit existing back-up government buildings to supplement existing fuel sources with external generators and photovoltaic cells.	Continuing. DPW, Fire, and Police Departments have had new generators installed over the past 5 years. DPW is continually monitoring installations and assessing their needs to make upgrades as necessary, including use of PV cells to complement diesel generators.	City operations	All hazards	Emergency Management Director, Department of Public Works, Fire Department, Police Department	4 years	HMGP funds	<$250,000	High (previously medium)
Evaluate and make needed improvements to King Street Brook drainage area from Round Hill through Barrett Street marsh to the Connecticut River	New strategy. DPW is in the process of short term improvements to the King Street Brook area of flooding, including cleaning out the culverts and removing beaver dams and impediments to stormwater storage before it floods Church Street, as well as exploring longer term options such as driveway aprons and a designed overflow to the adjacent park/playground area	City operations	Flooding, Hurricanes, Thunderstorms	Department of Public Works	4 years	HMGP funds	High	High
Make needed improvements to address flooding of Elm Street Brook and Williams Street Brook	New strategy. The Williams Street Brook had a conceptual design completed by CDM and city is pursuing funding to take this to the next stage. Elm Street Brook is still in more conceptual stage and no design has yet emerged.	City operations	Flooding, Hurricanes, Thunderstorms	Department of Public Works	4 years	HMGP funds	High	High

Mitigation Strategies to be Implemented								
Mitigation Action	**Status**	**Action Type**	**Hazards Mitigated**	**Responsible Department/Board**	**Timeframe**	**Potential Funding Source(s)**	**Estimated Cost**	**Priority**
Install automated debris racks at the stone arch structure in the King Street Brook Drainage Area	New.	City operations	Flooding, Hurricanes, Thunderstorms	Department of Public Works	3 years	HMGP funds	High	High
Develop a more formalized beaver management strategy to build upon current ad-hoc process.	Continuing. Sporadic conversations have occurred on the development of a formalized checklist. Over the next 5 years, City will hold community meetings and develop a formalized checklist that will include the process for monitoring beaver dams and how they should be removed.	City operations	Flooding, Hurricanes, Thunderstorms	Conservation Commission, Department of Public Works, Board of Health	4 years	Department of Public Works	Low	Medium (previously high)
Develop an outreach program to ensure that homeowners' associations are maintaining culverts and floodwater storage areas and get them replaced.	Continuing. City has been especially active in working with the Ice Pond Neighborhood Association, whose detention pond caused damage to a nearby road, and to the Tinkham Woods Neighborhood Association, whose restrictive covenants and detention pond is 30 years old and needs reinspection, and the Saw Mill Hills Neighborhood Association, who recently donated some of the common land to the city for permanently protected open space and to ensure no development that would tax the stormwater system. In the next five years, as part of the new stormwater program, the City will monitor compliance of associations with on-going drainage conditions.	City operations	Flooding, Hurricanes, Thunderstorms	Department of Public Works	2 years	Department of Public Works / Volunteers	Low	Medium (previously low)

Mitigation Strategies to be Implemented								
Mitigation Action	**Status**	**Action Type**	**Hazards Mitigated**	**Responsible Department/Board**	**Timeframe**	**Potential Funding Source(s)**	**Estimated Cost**	**Priority**
Conduct more extensive review of impacts of climate change on people, property, and critical facilities in Northampton.	New strategy. The City's Department of Planning and Sustainability is working with the Health Department to implement the CDC's BRACE: Building Resilience Against Climate Effects, the results of which will be incorporated into City's upcoming Sustainable Northampton Comprehensive Plan. The City will also begin an outline of the Climate Adaptation Strategic Plan to include in the update of the City's Comprehensive Plan. The City is also researching microgrid / hardened grid infrastructure improvements, as well as district heating efforts, in order to make electrical grid more resilient to effects of climate change.	City operations	All hazards	Department of Planning and Sustainability	3 years	HMGP funds	Low	Medium
Construct intermunicipal water supply connections with Hatfield, Williamsburg, Easthampton, and Southampton, based on findings from hydraulic survey currently being conducted.	New strategy.	Capital construction	Drought	Department of Public Works	3 years	HMGP funds	High	Medium

Mitigation Strategies to be Implemented								
Mitigation Action	**Status**	**Action Type**	**Hazards Mitigated**	**Responsible Department/Board**	**Timeframe**	**Potential Funding Source(s)**	**Estimated Cost**	**Priority**
Upgrade and repair undersized stormwater drainage system near downtown Northampton.	Continuing. Individual repairs are ongoing, such as to Pomeroy Terrace. No strategic plan has been developed and previos efforts have been based on specific needs. The City hired CDM to analyze the system and make recommendations for improvements using the new stormwater utility, and create a much more systematic approach. Stormwater pipes were upgraded and replaced as part of the full depth reconstruction of North Street. Collapsed culverts have been replaced as needed. Very little physical work has been completed because of limited funds but advanced planning for stormwater utility funding has been completed and as stormwater utility funding starts flowing we expect far more improvements in the next few years. There has been over thirty years of deferred work, however, since Massachusetts passed Proposition 2 1/2 and it will be a while to improve the system.	Capital construction	Flooding, Hurricanes, Thunderstorms	City Council, Mayor's Office, Department of Public Works, Department of Planning and Sustainability	2 years	Department of Public Works, Planning and Development, HMGP funds	Very high	Medium
Transition to underground utilities in existing commercial and business districts, to increase resiliency during storm events.	New strategy.	City operations	All hazards	Department of Public Works	3 years	Department of Public Works, HMGP funds	Medium	Medium

Mitigation Strategies to be Implemented								
Mitigation Action	**Status**	**Action Type**	**Hazards Mitigated**	**Responsible Department/Board**	**Timeframe**	**Potential Funding Source(s)**	**Estimated Cost**	**Priority**
Remove unnecessary dams and other manmade structures where feasible.	Continuing. City is in the process of identifying and removing any dam as necessary. The Upper Roberts Meadow Dam is going through the permitting and collecting funding phase currently and construction should begin in 1-2 years. No other dams are currently planned for removal.	City operations	Flooding, Hurricanes, Thunderstorms	Department of Public Works	3 years	Department of Public Works	Medium	Low
Upgrade flood control system to replace wooden battens with aluminum battens.	Continuing. City is looking for a funding source, DPW has completed due diligence for project. The CDM Stormwater and Flood Control System Assessment and Utility Plan commissioned by the City provides due diligence and cost estimates for the project.	Capital construction	Flooding, Hurricanes, Thunderstorms	City Council, Mayor's Office, Department of Public Works	5 years	Department of Public Works, HMGP funds	Low	Low (previously high)
Designate Senior Center as earthquake shelter because it is designed to meet current state Building Codes (when no flooding present).	Continuing. No actions have been completed. In the next 2 years, the City will designate the Senior Center as an emergency shelter in the City's Comprehensive Emergency Management Plan, in coordination with the Council on Aging for operational details.	City operations	Earthquake	Building Inspector, EMD, Red Cross	2 years	Fire and Police Departments	Low	Low

Mitigation Strategies to be Implemented								
Mitigation Action	**Status**	**Action Type**	**Hazards Mitigated**	**Responsible Department/Board**	**Timeframe**	**Potential Funding Source(s)**	**Estimated Cost**	**Priority**
Educate homeowners on how to prepare for a tornado or hurricane.	Continuing. The City's Emergency Management Coordinator is active in the Western Region Homeland Security Advisory Council, which regularly conducts public outreach programs for preparedness. These efforts will continue moving forward. In addition, during the past five years, the City developed a Reverse 911 e-mail/phone/texting system that allows easy notification of all residents. The City is currently upgrading the system to improve usability and provide better information to residents.	Emergency preparedness	Tornadoes, hurricanes	Emergency Management Director, DPW, Fire Department	2 years	Western Region Homeland Security Advisory Council, Capital Budget	Low	Low

6: PLAN REVIEW, EVALUATION, IMPLEMENTATION, AND ADOPTION

Plan Adoption

Upon completion of the draft Hazard Mitigation Plan, a public meeting was held on June 18th to receive comments. The Hazard Mitigation Plan was then submitted to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency for their review. Upon receiving conditional approval of the plan by FEMA, the plan was presented to the Northampton City Council and adopted.

Plan Implementation

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

Incorporation with Other Planning Documents

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

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

- ***Northampton*** **Open Space, Recreation, and Multiuse Trail Plan 2011-2018**– this Plan was used to identify the natural context within which the Northampton 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 City's mitigation efforts would be sensitive to the surrounding environment. During the OSRP update, the Northampton can use the work of the Hazard Mitigation Plan to incorporate identified hazard areas into open space and recreation planning. This could either take the form of acquiring parcels of land that are currently un-developed, but situated within an identified hazard area, as permanent

open space, thereby minimizing the likelihood that critical infrastructure components will be constructed in an area prone to damage from natural hazards.

- ***Northampton CDBG Consolidated Plan***—this Plan was used to identify any action items that might prove successful, based on previous planning efforts.

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

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

- **The *Flood and Natural Hazard Mitigation Plan for the City of Northampton*** was used to gather information on those actions and activities that the City is already undertaking in regards to pre-disaster mitigation for the City's greatest threat, flooding. This included incorporating statistical research, existing mitigation measures, and project rankings for Northampton.

- **The Sustainable Northampton Comprehensive Plan** – actions from the Hazard Mitigation Plan that promote a sustainable Northampton are incorporated.

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

- Comprehensive Emergency Management Plan
- Open Space, Recreation, and Multiuse Trail Plan 2011-2018
- Flood and Natural Hazard Mitigation Plan for the City of Northampton
- Sustainable Northampton Comprehensive Plan

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

Plan Monitoring and Evaluation

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

The Northampton Hazard Mitigation Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different City departments and/or revise the goals and objectives contained in the plan. The committee will review and update the plan every year, beginning in the fall of 2015. The meetings of the committee will be organized and facilitated by the Emergency Management Director. Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Committee will hold all meetings in accordance with Massachusetts open meeting laws. Hard copies of the plan will be available in City Hall and at Forbes Library. The Hazard Mitigation Committee will meet annually to discuss any needs and amendments. Any proposed amendments will be advertised and posted on the city's website and the Planning and Sustainability listserve newsletter. Any changes will be proceeded by a public hearing and solicitation of public comments.

7: APPENDICES

Appendix A – Documentation of the Planning Process

Northampton Hazard Mitigation Committee
Meeting Agenda

Northampton City Hall
April 17, 2014, 2:30 p.m.

1. Introductions

2. Overview of Hazard Mitigation Planning Process

    a. Background on Hazard Mitigation Planning

    b. Planning process and requirements
        i. 4-5 committee meetings
        ii. 2 public committee meetings
        iii. City Council adoption
        iv. Public outreach

    c. Overview of current Northampton Hazard Mitigation Plan
        i. Items to be updated
            1. Value of all property in city
            2. History of natural hazards in last 5 years
            3. Previously identified mitigation strategies
            4. New mitigation strategies
            5. Hazard identification map
            6. Culverts
            7. Intermunicipal emergency water connections

3. 500-year floodplain analysis

    a. Goals and objectives

4. Next Steps

    a. Proposed meeting schedule
    b. Next committee meeting agenda, time, date, and location
    c. First public meeting agenda, time, date, and location
    d. Establishment of a chairperson / point of contact

Northampton Hazard Mitigation Committee Meeting
Sign-In Sheet
April 17, 2:30pm, Northampton City Hall

Name	Position	E-mail
Jostah Neiderbach	PVPC	jneiderbach@pvpc.org
WAYNE Feiden	Northampton Planning	wfeiden@northamptonma.gov
Jon Davine	Northampton FD	jdavine@gmail.com
NED HUNTLEY	Northampton DPW	nhuntley@northamptonma.gov
Chris Mason	Energy Officer Central Services	cmason@Northamptonma.gov
Sarah LaValley	Northampton Planning	slavalley@northamptonma.gov
JOSH SHANLEY	NORTHAMPTON G.M	JSHANLEY@NORTHAMPTONMA.GOV
Catherine Ratter	PVPC	cratter@pvpc.org

Northampton Hazard Mitigation Committee
Meeting Agenda

Northampton City Hall
May 15, 2014, 2:30 p.m. – 4:00 p.m.

1. Recap of first public meeting
2. Edits to plan based on discussion from April meeting
3. Review of Chapter 3: Hazard Identification and Analysis
4. Review of Chapter 4: Critical Infrastructure and map
5. Incorporation of climate change impacts into plan
6. Next meeting date: Tuesday, May 27, 10:00 a.m. to 12:00 p.m.

Northampton Hazard Mitigation Committee Meeting
Sign-In Sheet
May 15, 2:30pm, Northampton City Hall

Name	Position	E-mail
NED HUNTLEY	DPW Director	nhuntley@northamptonma.gov
Sarah LaValley	Planning Dept.	slavalley@northamptonma.gov
Louis Hasbrouck	BUILDING DEPT	lhasbrouck@northamptonma.GOV
CHARLIE Feiden	Planning	cfeiden@northamptonma.gov
JOSH SHANLEY	NORTHAMPTON C.M	JSHANLEY@NORTHAMPTONMA.GOV
Chris Mason	Energy Officer	cmason@northamptonma.gov
Jasich Neiterbach	PVPC	jneiterbach@pvpc.org

Northampton Hazard Mitigation Committee
Meeting Agenda

Northampton City Hall
May 27, 2014, 3:00 p.m. – 4:30 p.m.

1. Review of Existing Mitigation Strategies
    a. Effectiveness
    b. Current status
    c. Improvements to implement

2. Proposed Mitigation Strategies
    a. Costs
    b. Prioritization
    c. Responsible entities
    d. Funding sources

3. Plan Review, Evaluation, Implementation, and Adoption

4. Next meeting date: Friday, June 13, 2:30 p.m. to 4:00 p.m.

Northampton Hazard Mitigation Committee
Sign-In Sheet
May 27, 3:00pm, Northampton City Hall

Name	Position	E-mail
Wayne Feiden	Planning Director	wfeiden@northamptonma.gov
NED HUNTLEY	DPW DIRECTOR	nhuntley@northamptonma.gov
Sarah LaValley	Planning Dept	slavalley@northamptonma.gov
Louis Hasbrouck	Building Dept	lhasbrouck@northamptonma.gov

Northampton Hazard Mitigation Committee
Meeting Agenda

Northampton City Hall
June 13, 2014, 2:30 p.m. – 4:30 p.m.

1. Review of revisions to prioritized list of Mitigation Strategies

2. Review of revisions to climate change impacts section

3. Review of estimated damages due to each hazard

4. Public meeting to present draft plan: Wednesday, June 18, 7:00 p.m. – 8:00 p.m.

Northampton Hazard Mitigation Committee Meeting
Sign-In Sheet
June 13th, 2:30pm, Northampton City Hall

Name	Position	E-mail
Wayne Feiden	Planning Director	wfeiden@northamptonma.gov
NED Huntley	DPW Director	nhuntley@northamptonma.gov

Northampton Hazard Mitigation Plan
Public Input and Workshop

6:15 PM, Tuesday April 29, 2014
118 Conz Street, Northampton

Agenda

1. Welcome and introductions
2. Overview of hazard mitigation planning process
3. Hazard identification and risk assessment
    a. Types of hazards affecting Northampton
    b. Previous occurrences, extent, location, impact, future probability, and vulnerability of each hazard
4. Existing mitigation measures and previous prioritized list of implementation strategies
5. Recommended new or changes to existing mitigation strategies
6. Discussion
7. Next steps

Northampton Hazard Mitigation
Public Workshop
118 Conz Street
6:15pm, April 29, 2014

Sign-In Sheet

Name	Address	E-mail
NED HUNTLEY	N'TON DPW	nhuntley@northamptonma.gov
Buck McGrath	52 Longview Dr Florence, MA	publicrutne@comcast.net

Northampton Hazard Mitigation Plan
Public Engagement

7:00 PM to 8:00 PM Wednesday June 18, 2014
Hearing Room, Room 18, City Hall, 210 Main Street, Northampton

Agenda

1. Presentation of draft Hazard Mitigation Plan
2. Questions, comments, and discussions
3. Next steps

City of Northampton Hazard Mitigation Plan Public Engagement Event Slated

Northampton residents are invited to provide comments on a completed draft of the City's updated hazard mitigation plan on Wednesday, June 18, from 7:00 p.m. to 8:00 p.m. in City Hall, Hearing Room, Room 18, 210 Main Street. The draft of the updated plan was produced by the City, along with Pioneer Valley Planning Commission. All members of the public are welcome to attend the event.

The meeting will include an introduction to the planning process, a summary of existing mitigation initiatives, and an outline of recommended strategies for addressing natural hazards in Northampton. Municipal officials and PVPC staff will be available to answer questions and listen to comments on the draft plan, which is posted at www.pvpc.org.

This planning effort is being undertaken to help the City of Northampton assess the risks faced from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

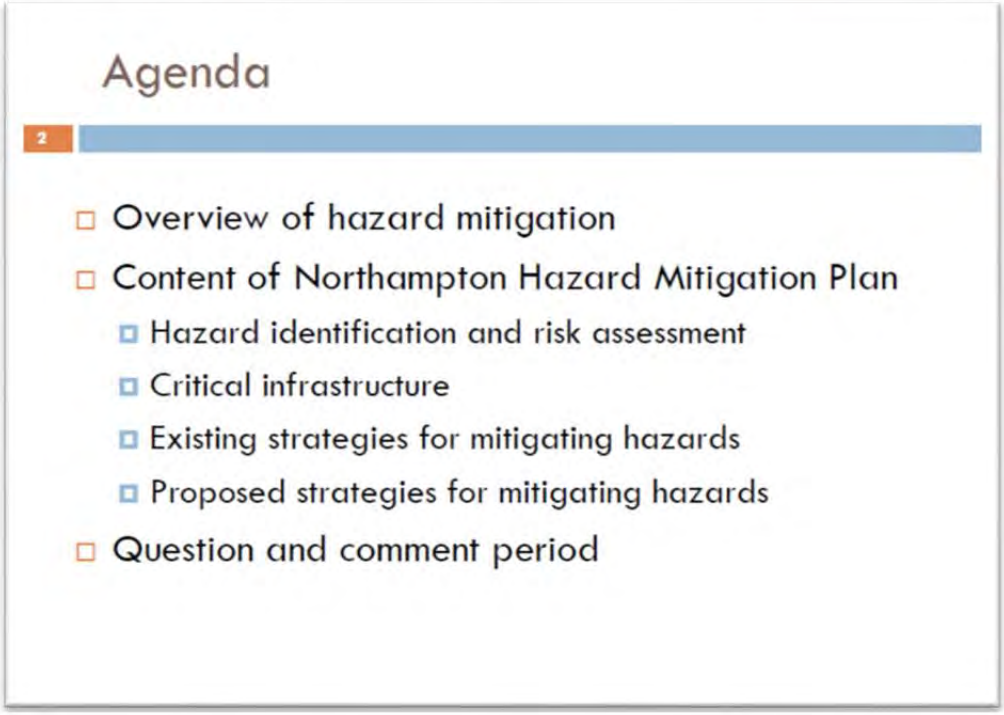
The hazard mitigation plan was developed with funding provided by the Federal Emergency Management Agency and assistance from the Massachusetts Emergency Management Agency.

Northampton Hazard Mitigation
Public Workshop
7:00pm, June 18, 2014

Sign-In Sheet

Name	Address	E-mail
Wayne Feiden	210 Main St, Northampton	wfeiden@northamptonma.gov.
GREG LEWIS	144 FEDERAL STREET FLORENCE, MA	GLEWIS@LARP.UMASS.EDU

Slides from Public Outreach Presentation on July 18, 2014



What is Hazard Mitigation?

3

According to FEMA:

> "any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards such as flooding, storms, high winds, hurricanes, wildfires, earthquakes, etc."

Benefits of Hazard Mitigation

4

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

Overview of a Hazard Mitigation Plan

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Purpose of plan:

Lessen the long-term consequences of natural disasters

Key plan components:

1. Hazard identification and assessment
2. Identification of critical infrastructure
3. Existing and proposed mitigation strategies
4. Proposed schedule for implementation of strategies

Northampton Hazard Mitigation Working Group

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Northampton municipal staff are currently reviewing and updating the City's current Hazard Mitigation Plan. Public comments will also be incorporated into this update.

Hazard Mitigation Working Group members:

- Wayne Feiden, Director of Planning and Sustainability
- Josh Shanley, Emergency Management Coordinator
- Jon Davine, Deputy Chief, Fire Department
- Ned Huntley, Director, Department of Public Works
- Sarah LaValley, Senior Land Use Planner
- Chris Mason, Energy and Sustainability Officer
- Louis Hasbrouck, Building Commissioner

The Pioneer Valley Planning Commission assisted the City with the development of the plan, through funding from FEMA via MEMA.

Hazard Assessment

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Hazard Risk Index Rating
Flooding	Medium	High	Limited (with loss of key transportation routes)	2 - High risk
Severe Snowstorms / Ice Storms	Large	High	Limited	3 - Medium risk
Severe Thunderstorms / Winds / Tornadoes	Small	Moderate	Limited	2 / 4 - High risk / low risk
Hurricanes	Large	Low	Limited	2 - High risk
Wildfire / Brushfire	Medium	Low	Minor	4 - Low risk
Earthquakes	Large	Very low	Critical	4 - Low risk
Dam Failure / Levee Breech	Medium	Very low	Critical	5 - Very low risk
Drought	Large	Low	Minor	5 - Very low risk

Existing and New Mitigation Strategies

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- Northampton's existing Hazard Mitigation Plan includes a list of existing mitigation strategies, as well as strategies to be pursued in the future
- The Hazard Mitigation Committee evaluated each strategy in terms of its effectiveness and added additional strategies
- The list of strategies to be pursued in the future was prioritized

Next Steps in Planning Process

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- Plan available for public review at www.pvpc.org/plans/city-northampton-hazard-mitigation-plan
- Plan to be submitted for review by MEMA and FEMA, with public comments incorporated

Catalyst for Regional Progress

PVPC

Timothy W. Brennan, Executive Director

MEDIA RELEASE

CONTACT: Josiah Neiderbach, PVPC Planner, (413) 781-6045 or jneiderbach@pvpc.org
Wayne Feiden, Director of Planning and Sustainability, City of Northampton, (413) 587-1265 or wfeiden@northamptonma.gov

FOR IMMEDIATE RELEASE
April 24, 2014

City of Northampton Hazard Mitigation Plan Public Engagement Event Slated

Northampton residents are invited to provide comments on the updating of Northampton's current hazard mitigation plan Tuesday, April 29, from 6:15 p.m. to 6:45 p.m. at 118 Conz Street. The 2009 plan was produced by the City, along with Pioneer Valley Planning Commission. All members of the public are welcome to attend the event.

The meeting will include an introduction to the hazard mitigation planning process, a summary of existing mitigation initiatives, and an outline of recommended strategies for addressing natural hazards in Northampton. Municipal officials and PVPC staff will be available to answer questions and listen to comments on the draft plan, which is posted at http://www.pvpc.org/resources/landuse/mit-plans-2011/NorthamptonPDMplan_final.pdf.

This planning effort is being undertaken to help the City of Northampton assess the risks faced from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

The hazard mitigation plan was developed with funding provided by the Federal Emergency Management Agency and assistance from the Massachusetts Emergency Management Agency.

For more information, please contact PVPC's Josiah Neiderbach at jneiderbach@pvpc.org or (413) 781-6045.

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Catalyst for Regional Progress

PVPC

Timothy W. Brennan, Executive Director

MEDIA RELEASE

CONTACT: Josiah Neiderbach, PVPC Planner, (413) 781-6045 or jneiderbach@pvpc.org
Wayne Feiden, Director of Planning and Sustainability, City of Northampton

FOR IMMEDIATE RELEASE
June 16, 2014

City of Northampton Hazard Mitigation Plan Public Engagement Event Slated

Northampton residents are invited to provide comments on a completed draft of the City's updated hazard mitigation plan on Wednesday, June 18, from 7:00 p.m. to 8:00 p.m. in City Hall, Hearing Room, Room 18, 210 Main Street. The draft of the updated plan was produced by the City, along with Pioneer Valley Planning Commission. All members of the public are welcome to attend the event.

The meeting will include an introduction to the planning process, a summary of existing mitigation initiatives, and an outline of recommended strategies for addressing natural hazards in Northampton. Municipal officials and PVPC staff will be available to answer questions and listen to comments on the draft plan, which is posted at www.pvpc.org.

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For more information, please contact PVPC's Josiah Neiderbach at jneiderbach@pvpc.org or (413) 781-6045.

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Northampton to update citywide plan for flooding, other natural disasters

By CHAD CAIN
Staff Writer
Monday, April 28, 2014
(Published in print: Tuesday, April 29, 2014)

NORTHAMPTON — Regional planning officials have launched an effort to update Northampton's six-year-old plan that assesses risks from natural disasters such as flooding and other extreme weather.

In addition to risk assessment, the hazard mitigation plan is designed to identify actions the city can take to prevent loss of life and property damage caused by natural disasters such as storms, high winds, hurricanes, wildfires or earthquakes. The plan also helps prioritize funding for projects and other initiatives to reduce or eliminate long-term risks from these events.

Residents who would like to comment on the plan or are interested in learning more about it are invited to a meeting hosted by the Pioneer Valley Planning Commission from 6:15 to 6:45 p.m. Tuesday at 118 Conz St., the future home of a medical marijuana facility.

"This is a kick-off meeting so no work has been done to update the report yet," said Wayne Feiden, director of the city's Office of Planning and Sustainability.

Without an updated plan to study, Feiden anticipates few public comments Tuesday. He said the plan will be updated in time for a second public hearing scheduled for June 18.

The regional commission helped the city produce the current plan, adopted in late 2008. The document is a key requirement for the city to receive grants and other funding for hazard mitigation through the Federal Emergency Management Agency, Feiden said.

Tuesday's meeting will include an introduction to the hazard mitigation planning process, a summary of existing initiatives, and an outline of recommended strategies for addressing natural hazards in the city. Municipal officials and planning commission staff will answer questions and listen to comments on the draft plan.

The hazard mitigation plan is developed with money provided by the Federal Emergency Management Agency and assistance from the Massachusetts Emergency Management Agency.

City Updates Natural Hazard Planning

By CHAD CAIN
Daily Hampshire Gazette
Tuesday, April 29, 2014

NORTHAMPTON — Regional planning officials have launched an effort to update Northampton's six-year-old plan that assesses risks from natural disasters such as flooding and other extreme weather.

In addition to risk assessment, the hazard mitigation plan is designed to identify actions the city can take to prevent loss of life and property damage caused by natural disasters such as storms, high winds, hurricanes, wildfires or earthquakes. The plan also helps prioritize funding for projects and other initiatives to reduce or eliminate long-term risks from these events.

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The hazard mitigation plan is developed with money provided by the Federal Emergency Management Agency and assistance from the Massachusetts Emergency Management Agency.

Northampton enlists public input on hazard mitigation plan

By Fred Contrada
The Republican
June 17, 2014

NORTHAMPTON - The city is inviting residents to provide comments on the latest draft of its hazard mitigation plan Wednesday from 7-8 p.m. in the Hearing Room at City Hall. The draft was produced by the city in collaboration with the **Pioneer Valley Planning Commission.** Northampton is trying to assess the risks it faces from natural hazards, identify action steps to prevent property damage and loss of life, and prioritize funding for mitigation efforts to stem these results. The hazard mitigation plan was developed with funding provided by the **Federal Emergency Management Agency** and assistance from the Massachusetts Emergency Management Agency.

The meeting will include an introduction to the planning process, a summary of existing mitigation initiatives, and an outline of recommended strategies for addressing natural hazards in Northampton. Municipal officials and PVPC staff will be available to answer questions and listen to comments on the draft plan, which is posted at www.pvpc.org. For more information, contact Josiah Neiderbach at jneiderbach@pvpc.org or (413) 781-6045.

The City of Northampton is preparing for the worse

By Barry Kriger
WWLP Channel 22 News

Published: April 29, 2014, 11:09 pm
http://wwlp.com/2014/04/29/the-city-of-northampton-is-preparing-for-the-worse/

NORTHAMPTON, Mass. (WWLP) – Northampton is updating its plan to prepare for possible catastrophe. The Pioneer Valley Planning Commission Tuesday night welcomed comments for the city's hazard mitigation plan.

Massachusetts Emergency Management Agency, or MEMA, requires updates every five years to ensure the city is prepared for natural disasters.

Josiah Neiderbach, Pioneer Valley Planning Comm., told 22News, "Is an essential component of saving municipalities money, as well as providing an effective response to hazards that may affect Northampton: flooding, hurricanes, wildfires."

The hazard plan is updated every five years. The purpose is to assess risks from natural hazards, and identify steps to prevent property damage and loss of life.

Unfortunately for Tuesday nights event not too many people attended.

Media Organizations Sent Press Releases

Media Organization	Address	Town	State	Zip Code
African American Point of View	688 Boston Road	Springfield	MA	01119
Agawam Advertiser News	23 Southwick Street	Feeding Hills	MA	01030
Amherst Bulletin	115 Conz Street	Northampton	MA	01060
Belchertown Sentinel	1 Main Street	Belchertown	MA	01007
Berkshire Eagle	75 South Church Street	Pittsfield	MA	01202
Brattleboro Reformer	62 Black Mountain Rd.	Brattleboro	VT	05301
CBS 3 Springfield	One Monarch Place	Springfield	MA	01144
Chicopee Register	380 Union Street	West Springfield	MA	01089
CommonWealth Magazine	18 Tremont Street	Boston	MA	02108
Country Journal	5 Main Street	Huntington	MA	01050
Daily Hampshire Gazette	115 Conz Street	Northampton	MA	01060
El Sol Latino	P.O. Box 572	Amherst	MA	01004
Going Green	PO Box 1367	Greenfield	MA	01302
Hilltown Families	P.O. Box 98	West Chesterfield	MA	01084
Holyoke Sun	138 College Street	South Hadley	MA	01075
Journal Register	24 Water Street	Palmer	MA	01069
La Voz Hispana	133 Maple Street #201	Springfield	MA	01105
Ludlow Register	24 Water Street	Palmer	MA	01069
Massachusetts Municipal Association	One Winthrop Street	Boston	MA	02110
Quaboag Current	80 Main Street	Ware	MA	01082
Recorder	14 Hope Street	Greenfield	MA	01302
Reminder	280 N. Main Street	East Longmeadow	MA	01028
Southwick Suffield News	23 Southwick Street	Feeding Hills	MA	01030
State House News Service	State House	Boston	MA	02133
Tantasqua Town Common	80 Main Street	Ware	MA	01082
The Longmeadow News	62 School Street	Westfield	MA	01085
The Republican	1860 Main Street	Springfield	MA	01102
The Westfield News	62 School Street	Westfield	MA	01085
Town Reminder	138 College Street	South Hadley	MA	01075
Urban Compass	83 Girard Avenue	Hartford	CT	06105
Valley Advocate	115 Conz Street	Northampton	MA	01061
Vocero Hispano	335 Chandler Street	Worcester	MA	01602
WAMC Northeast Public Radio	1215 Wilbraham Road	Springfield	MA	01119
Ware River News	80 Main Street	Ware	MA	01082
West Springfield Record	P.O. Box 357	West Springfield	MA	01098

WFCR-Public Radio	131 County Circle	Amherst	MA	01003
WGBY-Public TV	44 Hampden Street	Springfield	MA	01103
WGGB ABC40/FOX 6 News	1300 Liberty Street	Springfield	MA	01104
WHMP-FM	15 Hampton Avenue	Northampton	MA	01060
Wilbraham-Hampden Times	2341 Boston Road	Wilbraham	MA	01095
Worcester Telegram & Gazette	20 Franklin Street	Worcester	MA	01615
WRNX/WHYN/WPKR Radio	1331 Main Street	Springfield	MA	01103
WWLP-TV 22	PO Box 2210	Springfield	MA	01102

Pioneer Valley Planning Commission Regional Reporter
January 2015

Let PVPC Guide Your Community Through the Hazard Mitigation Planning Process!

Over the past 10 years, PVPC has helped 40 communities in the Pioneer Valley develop hazard mitigation plans, making them eligible for grant opportunities from the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA).

Through the hazard mitigation planning process, communities assess their vulnerability to natural hazards, such as flooding, snowstorms, hurricanes, wildfire, and tornadoes. They also prioritize a set of mitigation strategies that will help eliminate the long-term risk to human life and property from these hazards. Common mitigation strategies that are eligible for grant funding from FEMA and MEMA include minor localized flood reduction projects, structural retrofitting of existing buildings, culvert improvements, installation of emergency backup generators, and infrastructure retrofits.

PVPC provides guidance in all aspects of the development of hazard mitigation plans, including identification and mapping of natural hazards, collaboration with municipal officials to prioritize mitigation strategies, and public outreach. PVPC can also assist communities in applying for grants to fund mitigation projects, through its Local Technical Assistance *(LTA)* program. Contact Josiah Neiderbach at jneiderbach@pvpc.org to find out more.

Pioneer Valley Planning Commission Regional Reporter
April 2013

The Pioneer Valley Planning Commission is currently working with 23 member municipalities to create new hazard mitigation plans and update expiring plans. These plans, approved by the Federal Emergency Management Agency (FEMA), make these municipalities eligible to apply for hazard mitigation grant funds to address identified top community priorities to mitigate the long-term consequences of natural disasters.

PVPC is currently in the process of creating or updating plans for 10 communities. This includes developing new hazard mitigation plans for Granville, Longmeadow, Montgomery, Russell, and Wales, as well as updating the current plans for Agawam, Easthampton, Hampden, Southwick, and Ware.

PVPC also recently applied for funds from FEMA to create or update plans for an additional 13 communities. This includes creating new plans for Blandford and Tolland, as well as updating existing plans for Chesterfield, Hadley, Hatfield, Holyoke, Ludlow, Monson, Northampton, South Hadley, Southampton, Westhampton, and Wilbraham.

Copies of approved hazard mitigation plans are available on PVPC's website at http://www.pvpc.org/activities/landuse-mitplans-2011.shtml. For more information please contact PVPC's Josiah Neiderbach at (413) 781-6045 or jneiderbach@pvpc.org.

Pioneer Valley Planning Commission Regional Reporter
December 2012

PVPC working with member communities to mitigate the long term consequences of natural hazards

PVPC is working with 10 member municipalities to update and/or develop new Hazard Mitigation plans. Granville, Longmeadow, Montgomery, Russell, and Wales are all developing their first Hazard Mitigation plans; while Agawam, Easthampton, Hampden, Southwick, and Ware are working on updates.

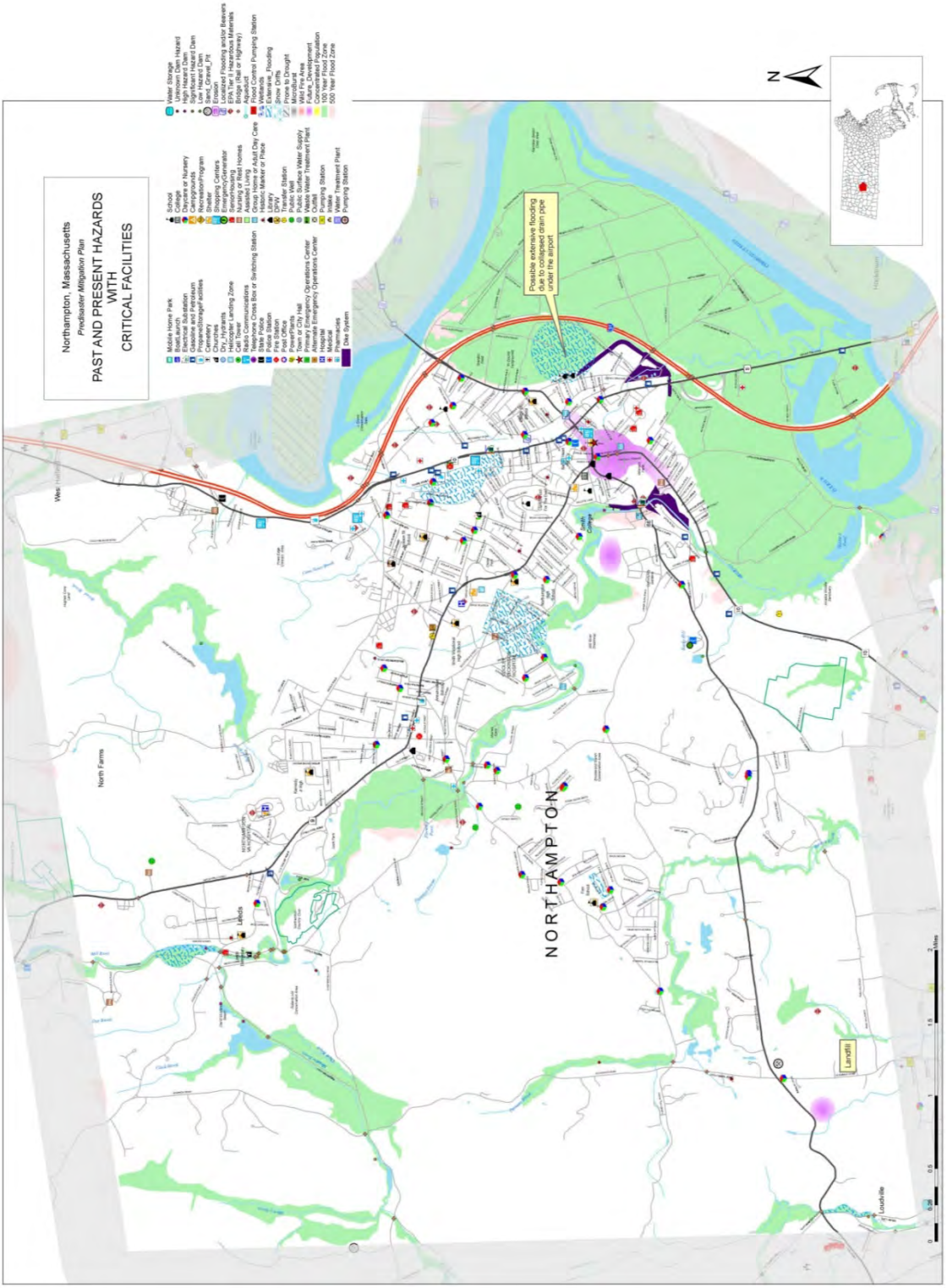
PVPC was also engaged by the University of Massachusetts Amherst campus to write their campus Hazard Mitigation plan, and PVPC has just submitted a grant application to MEMA to update plans for Hadley, Hatfield, Holyoke, Ludlow, Monson, Northampton, South Hadley, Southampton, Westhampton, and Wilbraham.

Having a FEMA approved Hazard Mitigation plan makes each municipality eligible to apply for Hazard Mitigation grant funds to address identified top community priorities to mitigate the long-term consequences of natural disasters.

For more information, please contact Catherine Ratté at cratte@pvpc.org or 413/781-6045.

Location of Draft Hazard Mitigation Plan on Website of Pioneer Valley Planning Commission
http://www.pvpc.org/plans/city-northampton-hazard-mitigation-plan

Appendix B – List of Acronyms

FEMA	Federal Emergency Management Agency
MEMA	Massachusetts Emergency Management Agency
PVPC	Pioneer Valley Planning Commission
EPA	Environmental Protection Agency
DEP	Massachusetts' Department of Environmental Protection
NWS	National Weather Service
HMGP	Hazard Mitigation Grant Program
FMA	Flood Mitigation Assistance Program
SFHA	Special Flood Hazard Area
CIS	Community Information System
DCR	Massachusetts Department of Conservation and Recreation
FERC	Federal Energy Regulatory Commission
TRI	Toxics Release Inventory
FIRM	Flood Insurance Rate Map
NFIP	National Flood Insurance Program
CRS	Community Rating System
BOS	Board of Selectmen
DPW	Department of Public Works
LEPC	Local Emergency Planning Committee
EMD	Emergency Management Director
Con Com	Conservation Commission
Ag Com	Agricultural Commission
EOC	Emergency Operations Center
CEM Plan	Comprehensive Emergency Management Plan
EMA	Emergency Management Agency
RACES	Radio Amateur Civil Emergency Service
WMECO	Western Massachusetts Electric Company
HAZMAT	Hazardous Materials

Appendix C – Past and Potential Hazards / Critical Facilities Map