The Town of Ware
Hazard Mitigation Plan

Adopted by the Ware Select Board on _____

The Ware Hazard Mitigation Committee

and

Pioneer Valley Planning Commission
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Acknowledgements

The Ware Select Board extends special thanks to the Ware Hazard Mitigation Planning Committee as follows:

Ed Wloch, Deputy Fire Chief
Thomas Coulombe, Fire Chief
Karen Cullen, Director of Planning and Community Development
Stuart Beckley, Town Manager

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The Pioneer Valley Planning Commission

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1: PLANNING PROCESS

Introduction

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

Planning efforts, like the one undertaken by the Town of Ware 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 hazard mitigation plan before a disaster, can save the community money and facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the plan.

FEMA requires that a community adopt a pre-disaster mitigation plan as a condition for mitigation funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Pre-Disaster Mitigation Program are programs with this requirement.

Hazard Mitigation Committee

Planning for natural hazard mitigation in Ware involved a 4-member committee:

- Ed Wloch, Deputy Fire Chief
- Thomas Coulombe, Fire Chief
- Karen Cullen, Director of Planning and Community Development
- Stuart Beckley, Town Manager

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

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

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

Committee Meetings

Meetings of the Hazard Mitigation Committee, all of which took place at the Ware Fire Station, were held on the dates listed below. Agendas for these meetings are included in Appendix B.

January 7, 10:00 a.m.
Work group meeting included hazard mitigation planning overview, identify and organizing of the planning team, identifying critical facilities, and an initial discussion of hazard identification and risk assessment.

January 21, 10:30 a.m.
Work group revisited critical facilities list, discussed existing hazard mitigation strategies, and list of future mitigation strategies to be implemented.

February 10, 10:30 a.m.
Work group reviewed list of current mitigation strategies undertaken by the Town and draft of prioritized list of mitigation strategies, based on conversation at previous meeting. Work group

reviewed revised vulnerability assessment, reviewed map of location of critical facilities and natural hazards, prioritized the identified mitigation strategies, defined plan implementation process and discussed public outreach process.

Agendas and sign-in sheets for each meeting can be found in Appendix B. While not all members of the Hazard Mitigation Committee were able to attend each meeting, all members collaborated on the plan and were updated on progress by fellow Committee members after meetings occurred.

Participation by Public and Neighboring Communities

Two public planning sessions were held as part of the development of the Ware plan – on January 21st, 2015 and February 10th, 2015. 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 Ware Town Hall in compliance with the Commonwealth of Massachusetts' open meeting law. Public meeting agendas and notices can be found in Appendix B.

On January 16th, 2015, the Pioneer Valley Planning Commission sent a press release to relevant media outlets to announce that there would be a first public outreach meeting about the plan on January 21st, 2015. This release was sent to those media identified by the Hazard Mitigation Committee as most relevant to the development of the plan. These media organizations are: Daily Hampshire Gazette in Northampton, the Springfield Republican in Springfield, and the Ware River News in Ware.

On February 5th, 2015 PVPC sent out a press release indicating that a second public outreach meeting would take place on February 10th, 2015, and also to inform the public that a draft of the Ware Hazard Mitigation Plan had been placed on PVPC's website. A list of media organizations that were sent the second press release is included in Appendix B, which are the television stations, radio stations, and newspapers located in western Massachusetts, northern Connecticut, and southern Vermont. The screen capture of PVPC's website showing the link to the press release can be found in Appendix B. The release also indicated that hard copies were available at PVPC's offices and at Ware Town Hall, and that all residents, businesses and other concerned parties of Ware were encouraged to comment on the plan by e-mailing or calling staff contacts at PVPC or the Town.

Citizens from adjacent municipalities were encouraged to comment on Ware's plan by e-mailing or calling staff contacts at PVPC or the Town of Ware. The Pioneer Valley Planning Commission's regional scope ensured that residents and government officials throughout the Pioneer Valley saw the press release and request for comments.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Committee will hold all future meetings in accordance with Massachusetts open meeting laws.

Select Board Meeting

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

2: LOCAL PROFILE

Community Setting

Geography

Ware is located in southeastern Hampshire County and is approximately 40 square miles in area. It is bordered by New Salem to the northwest, Hardwick to the northeast, New Braintree and West Brookford to the east , a small portion of Warren to the southeast, Palmer to the south, and Belchertown to the west. Downtown Ware lies 24 miles from Northampton, the county seat of Hampshire County, and 67 miles west of Boston.

Population Characteristics

According to the U.S. Census, there are 9,872 residents and a total of 4,752 housing units. The median household income is $50,467 with 13.5 percent of residents living in poverty (American Community Survey 2009-13).

Climate

Ware is located in southeastern Hampshire County, where annual rainfall averages 44 inches and is distributed throughout the year. In addition to rain, snowfall averages 40 inches per season. Prevailing winds from the south (and from the north/northwest to a lesser extent) reach their highest average speed during the month of April. In the past few decades, New England has seen an increase in the number of extreme rainfall events, defined as large amounts of rain in a short period of time. In Massachusetts, the increase since 1948 has been 81 percent (Environment America Research & Policy Center, 2012). Extreme rainfall is a cause of flooding, which is a major concern of this plan. In the last five years, there has also been an increased occurrence of tornadoes and large storms that generate strong wind gusts.

Development

Zoning

The Town of Ware has 11 zoning districts and 2 overlay districts:

- RQ - Rural Quabbin
- RR - Rural Residential
- SR - Suburban Residential
- BLR - Beaver Lake Residential
- DTR - Downtown Residential
- RB - Residential Business
- DTC - Downtown Commercial
- MY - Millyard
- HC - Highway Commercial
- CI - Commercial Industrial
- I - Industrial
- FP - Floodplain Overlay District
- AP - Aquifer Protection Overlay District

The Floodplain Overlay District applies to land that is part of FEMA's Flood Insurance Rate Map and prohibits various industrial and business development.

Current Development Trends

The major commercial development in Ware is located along the town's two highways. Route 9 is the major east-west traverse, and Ware's historic district is located along this road. Route 32 runs north and south through town and has served as the spine of more recent commercial development.

Ware's topography has resulted in the construction of critical facilities along the banks of the many rivers that pass through its center. The same is true for residential and commercial development. The Hazard Mitigation Committee indicated that potential flooding from Ware's rivers and streams presents a risk to a large percentage of Ware's population. Development and infrastructure expansion in Ware's northern outlying areas is limited, due to the presence of the Quabbin Reservoir. The watershed lands for Boston's drinking water supply are permanently protected and, therefore, not likely location for growth. For this reason, Ware will continue to experience development of in its southern areas and its town center.

National Flood Insurance Program Status

Ware 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 Ware Planning Board.
- FIRMs have been effective since August 17th, 1981, which is also the date the current map went into effect.
- Ware has 32 in-force policies in effect for a total of $7,503,700 worth of insurance.
- There have been a total of 7 NFIP claims for which $13,250 has been paid.
- As of 2014, there have been no Repetitive Loss Properties in Ware.

The Town will maintain compliance with the NFIP throughout the next five-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).

Infrastructure

Roads and Highways

Ware is not easily accessible by either Interstate 91 or Interstate 90. The primary east-to-west route in through town is Route 9, which connects Ware to Boston to the east and Amherst, Hadley, and Ware to the west. Route 32 connects ware to Palmer to the south, providing access to the east-to-west routes afforded by Interstate 90, which eventually links up with Springfield, providing north-to-south access to points located along Interstate 91. In total, Ware has 85 miles of roads.

Rail

Unlike many cities and towns in Massachusetts, Ware is served by an active rail carrier. The Massachusetts Central Railroad has provided efficient and critical transportation services to businesses in Ware since 1979. It operates on a right of way between Barre, Ware, Hardwick, and Palmer and is primarily owned by MassDOT.

Public Transportation

The Pioneer Valley Transit Authority operates the Ware Shuttle, which travels between key destinations in town.

Public Drinking Water Supply

Ware's water supply is provided by six wells at two sources - Barnes Street and Dismal Swamp. The Barnes Street source consists of four gravel-packed wells that discharge into a large diameter brick cistern that is also an active supply source. The Dismal Swamp source consists of a single gravel-packed well located on Gilbertville Road. During 2012, these two sources provided 228.5 million gallons of potable water to 2,235 residential, commercial, municipal, and industrial accounts. The two sources also provide water for fire protection to 345 public and 57 private fire hydrants. The water distribution system consists of approiximately 42 miles of water mains.

Sewer Service

Ware's wastewater treatment plant and public sewer system serve primarily the downtown and central business district. Sewers serve about 1,500 homes and between approximately 4,500 and 5,000 residents. The town's wastewater treatment plant and most of the sewer system is aging and is in need of maintenance attention. Of particular concern are the old vitrified clay sewer pipes which still exist in some areas of town. There are also areas served by asbestos cement pipe and newer PVC plastic pipe.

All outlying areas of Ware are served by on-site septic systems. Ware has many areas of poorly draining soils, and consequently proper on-site sewage disposal is a challenge. Stormwater management is also handled on-site, and Ware does not have a Stormwater Management Bylaw to address the construction of these systems.

Schools

Ware has the following public schools: Head Start School, Kidstop Preschool, Koziol Elementary School, Ware High School and Ware Middle School. The following private schools are also located in Ware: St. Mary's School, the First Step School, and Trinity Christian Nursery School.

Natural Resources

Ware is located in the eastern most part of Hampshire County, and encompasses 25,585 acres, or approximately 40 square miles. The maximum elevation areas are a peak in the southeastern corner of the town (1050 ft.) and Quabbin Hill (1026 ft.). Most of Ware's lands are severely limited by slope for small scale commercial sites, and large rocks, shallow depth to bedrock, drought, or occasionally high water table conditions pose serious problems for forest or agriculture development.

Surface Water

Ware is located in the Chicopee River Watershed. A number of rivers flow through the town including the Swift River, which flows along the Ware-Belchertown boundary until it joins the Ware River at the Three Rivers junction. The Ware River originates in Hubbardston, Massachusetts and flows southwest through the town. The Quabbin Reservoir, located in Ware, Pelham, and Belchertown, is owned by the Massachusetts Water Resources Authority, and covers 24,705 acres. The Reservoir was built in 1927 to provide water to the residents of Boston.

Beaver Dams

Beaver activity has been increasing over the past decade and several wetland areas have been flooded by beaver dam construction. As a result, their vegetation has changed from forested wetland to marshy habitat. Sometimes beaver activity is detrimental to property, causing problems for local 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

There are a number of aquifer recharge areas in Ware, all of which are located around the major bodies of water. One is located along the Swift River toward River Road and Scygal Road. Another is found from Ware Center along Flat Brook toward the Worcester County Line. The major recharge area is along Beaver Brook until it meets the Ware River where it continues through the center of town as it branches to also include Muddy Brook. Development is limited in the aquifer's recharge area to protect drinking water quality and supply.

Floodways

The major floodplain areas in Ware are located primarily along the Ware River and the Quabbin Reservoir. Other floodplain areas are located along the Swift River, Flat Brook, Muddy Brook, and in the Beaver Lake and Peppers Mill Pond area. Ware has restrictions on development in these areas to protect the community against resource degradation when unsuitable uses occur along these waterways, and also to prevent an increase in the extent and severity of flooding. These restricted development areas are:

- Swift River - from the Quabbin Reservoir south along River Road
- Beaver Brook - the section of the brook that runs between Beaver Lake and Route 9, from Beaver Lake south to where Beaver Brook flows into the Ware River
- Penny Brook - length of Penny Brook to Ware River
- Ware River- from Ware's fire station along Main Street/Gilbertville Road into Ware Center, continuing past the St. Williams Cemetery to Gibbs Crossing and the Palmer Town Line
- Muddy Brook - mixed commercial along its length, runs parallel to Greenwich Road

Forests

As of 1999 (the most recent year for which land use data is available), 62 percent of Ware was forest. Over 1,000 acres of forested lands are already in conservation, including 89 acres of Town-owned forest, 268 acres of the State-owned Swift River Wildlife Area, and over 700 acres of privately-owned Chapter 61 forests.

Wetlands

Wetlands include rivers, ponds, swamps, wet meadows, beaver ponds, and land within the FEMA-defined 100-year flood area. There are approximately 396 acres of wetlands in Ware. Wetland habitats in town occur primarily along the streams and rivers as well as in lands adjacent to the major ponds. Wetlands areas are shown on Ware's Water Resources Map. Currently, development of some wetland areas in Ware is limited by the Massachusetts Wetlands Protection Act. However, Ware currently has no local wetlands bylaw, and as a result, protection of these critical natural areas is not guaranteed.

3: HAZARD IDENTIFICATION AND ANALYSIS

The following section includes a summary of disasters that have affected or could affect Ware. 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
- Drought

Natural Hazard Analysis Methodology

This chapter examines the hazards in the Massachusetts State Hazard Mitigation Plan which are identified as likely to affect Ware. 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 Ware 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 Town Impacted by Natural Hazard	
Land Area Affected by Occurrence	**Percentage of Town Impacted**
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

Extent

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

Previous Occurrences

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

Probability of Future Events

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

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 – Very high risk
2 – High risk
3 – Medium risk
4 – Low risk
5 – Very low 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 Risk Analysis				
Type of Hazard	**Location of Occurrence**	**Probability of Future Events**	**Impact**	**Hazard Risk Index Rating**
Flooding	Small	Low	Limited/Critical	3 – Medium Risk
Severe Snowstorms/Ice Storms	Large	Moderate	Limited	3 – Medium Risk
Severe Thunderstorms/Winds/Tornadoes	Small	Severe Thunderstorms: Moderate Winds: Moderate Tornadoes: Low	Severe Thunderstorms/Winds: Minor / Limited Tornadoes: Critical	Severe Thunderstorms: 3 – Medium Risk Winds: 2 – High Risk Tornadoes: 2 – High Risk
Hurricanes	Large	Low	Critical	2- High Risk
Wildfire / Brushfire	Medium	Moderate	Minor	4 – Low Risk
Earthquakes	Large	Very Low	Critical	2 – High Risk
Dam Failures	Small	Very Low	Limited / Critical	3 – Medium Risk
Drought	Large	Low	Minor	5 - Very Low Risk

Flooding

Hazard Description

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

- 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.

Location

There are approximately 1,228 acres of land within the FEMA mapped 100-year floodplain and 246 acres of land within the 500-year floodplain within the Town of Ware. The narrow bands of level floodplain land along the banks of the Swift River, Ware River, Beaver Brook, Penny Brook, and Muddy Brook are at risk from flooding during a 100-year storm. The 500-year flood zone tracks along the same boundaries with a wider swath. Additionally, the Flat Brook and Peppers Mill Pond areas contain floodplain acreage in Ware.

In addition, various parts of Ware have issues with localized flooding, described below. Property damage is based on the median home value in Ware of $197,400 (American Community Survey 2009-2013)

- **Church Street /Ware River** - There are no structures located in this area.

- **Greenwich Road/Snow Pond** - There are an estimated 4 structures in this area; 100 percent damage to 100 percent of the structures would result in $789,600 of damage. These properties were affected by Hurricane Irene.

- **Pine Street/Ware River** - There are an estimated 7 properties in this area; 100 percent damage to 100 percent of the structures would result in $789,600 of damage.

- **Quarry Street** - There are an estimated 4 properties in this area; 100 percent damage to 100 percent of the structures would result in $789,600 of damage.

- **Morse Avenue** - There are an estimated 5 properties in this area; 100 percent damage to 100 percent of the structures would result in $987,000 of damage.

- **Route 32/Flat Brook** - There are an estimated 2 properties in this area; 100 percent of damage to 100 percent of the structures would result in $394,800 of damage.

- **Route 9/Flat Brook** - There are an estimated 3 properties in this area; 100 percent of damage to 100 percent of the structures would result in $592,200 of damage.

In addition, beaver dams are a regular cause of flooding along brooks and streams throughout Ware.

Based on these locations, flooding has a "small" location of occurrence, with less than 10 percent of land area affected.

Extent

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).

The average annual precipitation for Ware and surrounding areas in western Massachusetts is 46 inches.

Previous Occurrences

The major floods recorded in Ware have been the result of rainfall alone or rainfall combined with snowmelt. Key floods are:

- 1938 - Great Hurricane of 1938
- 1955 - Hurricane Diane
- 2005 - Beaver Dams
- 2011 - Hurricane Irene caused flooding along Greenwich Street and West Warren Road.

Probability of Future Events

Based on previous occurrences, the probability of flooding in Ware is "low," with a 1 to 10 percent probability in any given year. Flooding frequencies for the various floodplains in Ware 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

Climate scientists predict that in the next few decades, climate change will increase the frequency and intensity of all storms that can cause flooding. Currently, floods are the most costly natural hazard in the United States, and climate change will only increase this damage. 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 impact of a flood event would fall between "limited" and "critical," dependent on event severity and precise location. This equates to approximately 20 percent or more of property in affected area damaged. The total property damage, based on the damage to individual flooding locations discussed in the "location" section, is $4,935,000. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above analysis, Ware faces a vulnerability of "medium risk" from flooding.

Severe Snowstorms / Ice Storms

Hazard Description

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

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

Location

The entire town of Ware is susceptible to severe snowstorms. Because these storms occur regionally, they impact the entire town. As a result, the location of occurrence is “large,” with over 50 percent of land area affected.

The following areas have been identified by the Hazard Mitigation Committee as areas where snow drifts form during winter storm events:

- Portions of the west side of Fisherdick Road
- Northwest corner of the west side of Old Gilbertville Road
- Upper Church Street Bridge

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

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

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.

During the October 2011 ice storm, Upper Church Street was inundated with ice from the adjacent Ware River, requiring extensive resources to clean up.

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

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 hit Ware in any given year is “moderate," or a 10 to 40 percent probability 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 impact of an event would be “limited,” with more than 10 percent of property in the affected area damaged. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all residential property in town, $938,044,800, is used.

An estimated 20 percent of damage would occur to 10 percent of structures, resulting in a total of $18,760,896 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Ware faces a "medium" vulnerability from severe snow storms and ice storms.

Hurricanes / Tropical Storms

Hazard Description

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

Location

Because of the hazard's regional nature, all of Ware is at risk from hurricanes and tropical storms, meaning the location of occurrence is "large," with over 50 percent of land area affected. Ridgetops are more susceptible to wind damage.

Extent

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

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

Source: National Hurricane Center, 2012

Previous Occurrences

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

Major Hurricanes and Tropical Storms Affecting Ware		
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

These hurricanes and tropical storms did not cause any significant damage to Ware.

Probability of Future Events

Ware'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 of hurricanes or tropical storms, or a 1 to 10 percent probability in any given year.

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 Town of Ware faces a “critical” impact from hurricanes, with more than 25 percent of property in the affected area damaged.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $938,044,800 is used. Wind damage of 5 percent with 10 percent of structures damaged would result in an estimated $4,690,224 of damage. Estimated flood damage to 10 percent of the structures with 20 percent damage to each structure would result in $18,760,896 of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above analysis, Ware faces a "high" vulnerability from hurricanes and tropical storms.

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.

Location

As per the Massachusetts Hazard Mitigation Plan, the entire Town is at risk of high winds, severe thunderstorms, and tornadoes. However, the actual area that would be affected by these hazards is "small," or less than 10 percent of total land area.

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

In the mid 1980's, a microburst occurred in the southern portion of town.

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. Most occur in the late afternoon and evening hours, when the heating is the greatest. The most common months are June, July, and August, but the Great Barrington, MA tornado (1995) occurred in May and the Windsor Locks, CT tornado (1979) occurred in October.

Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester. In 2011, a tornado ranked F3 (Severe Damage) on the Fujita Scale of Tornado Intensity, blew through the towns of West Springfield, Westfield, Springfield, Monson, Wilbraham, Brimfield, Sturbridge, and Southbridge. The tornado and related storm killed 3 people and resulted in hundreds of injuries across the state. Nine incidents of tornado activity (F3 or less) have occurred in Hampshire County since 1954 and one known tornado has touched down in Ware.

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, the estimated probability of a tornado in Ware is "low," or between 1 and 10 percent in any given year. 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 percent to 40 percent change in any given year) of a severe thunderstorm or winds affecting the town.

Impact

Overall, the Town of Ware faces a “limited” impact from severe thunderstorms, winds, or tornadoes, with 10 percent or more of the town affected. The potential for locally catastrophic damage is a factor in any severe weather event. In Ware, a tornado that hit residential areas would leave much more damage than a tornado with a travel path that ran along the town’s forested areas, where little settlement has occurred. Most buildings in town have not been built to Zone 1, Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, with most of the town’s housing built before this date.

To approximate the potential impact to property and people that could be affected by severe weather, tornado, or wind, the total value of all residential property in town, $938,044,800 is used. An estimated 100 percent of damage would occur to 1 percent of structures, resulting in a total of $9,380,448 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Ware has a vulnerability of "medium" from severe thunderstorms, and a "high" vulnerability from tornadoes and severe winds.

Wildfire / Brushfire

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. Both wildfires and brushfires can consume homes, other buildings and/or agricultural resources. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson.

FEMA has classifications for 3 different classes of 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

Approximately 24.8 square miles of Ware (62 percent) is forested and therefore at risk of wildfire. The location of occurrence is "medium," with between 10 and 50 percent of land area affected.

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 Ware, 62 percent of the land is forested (24.8 square miles), and is therefore at risk of fire. A large wildfire could damage almost all of the town's land mass in a short period of time. However, Massachusetts receives more than 40 inches of rain per year and much of the landscape is fragmented, and together these two traits make wildfires uncommon in Massachusetts. Nevertheless, in drought conditions, a brushfire or wildfire would be a matter of concern. A large wildfire could damage a large swath of Ware's landscape, including vital watershed lands, in a short period of time. The forested land in Ware, during a wildfire, may render emergency personnel unable to counter the fire due to the terrain.

In 2001, Ware experienced a large wildfire that resulted in the burning of approximately 400 acres of forested area. Based on this instance, as well as 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.

Previous Occurrences

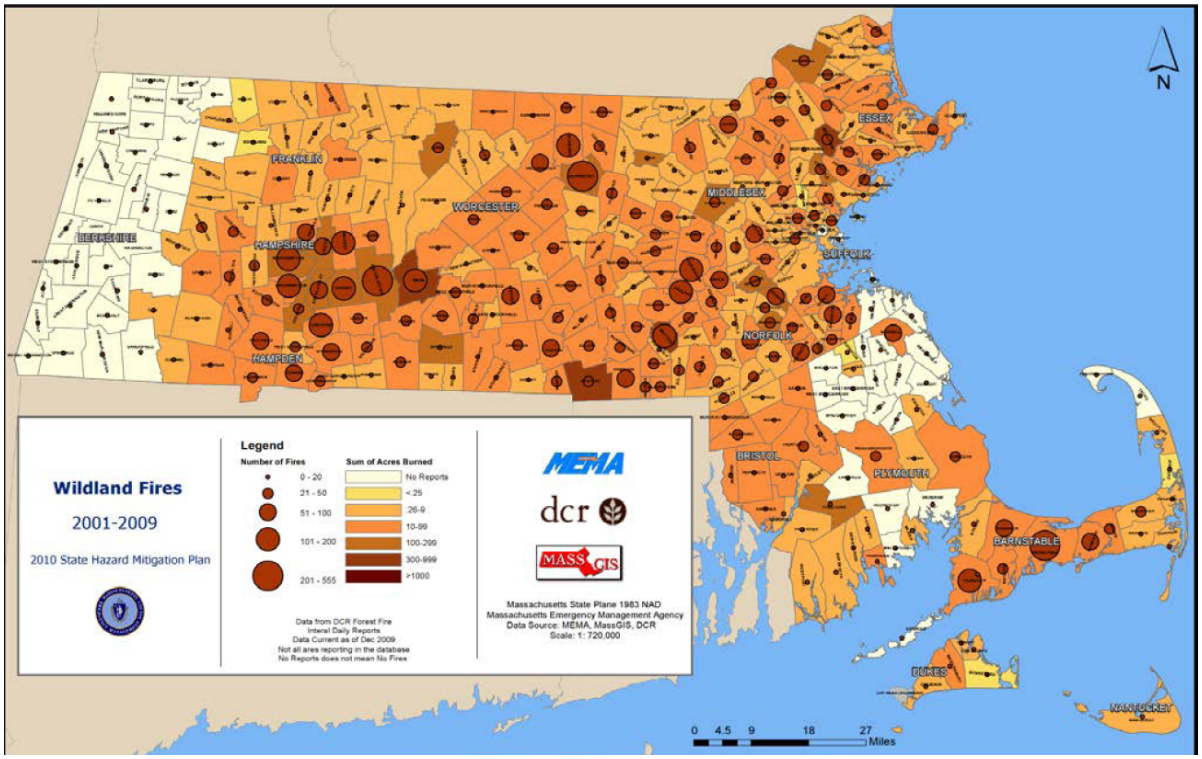
During the past 100 years, there have not been many wildfires occurring in the Pioneer Valley. However, several have occurred during the past 20 years, as shown in the list below:

- 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

Total Fire Incidents in Ware	
2008	67
2009	51
2010	56
2011	45
2012	70

Source: Massachusetts Fire Incidence Reporting System, County Profiles, 2012 Fire Data Analysis

Wildland Fires in Massachusetts, 2001-2009



Source: Massachusetts Hazard Mitigation Plan

Probability of Future Events

In accordance with the Massachusetts Hazard Mitigation Plan, the Hazard Mitigation Committee found it is difficult to predict the likelihood of wildfires in a probabilistic manner because the number of variables involved. However, given the proximity of previous wildfires, and their proximity to the Town, the likelihood of a future wildfire is determined to be "moderate," or between a 10 and 40 percent probability in any given 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.

Impact

Ware faces a “minor” impact from wildfires, with minimal damage anticipated in such an event. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $938,044,800 is used.

An estimated 100 percent of damage would occur to 1 percent of structures, resulting in a total of $9,380,448 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Ware faces a "low" vulnerability from wildfire and brushfires.

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.[1] 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.[2]

Location

Because of the regional nature of the hazard, the entire town is susceptible to earthquakes, and the location of occurrence is "large," with over 50 percent of land affected. There is potential for the most damage in village portions of Routes 9 and 32.

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.

[1] Northeast States Emergency Consortium Web site: *www.nesec.org/hazards/earthquakes.cfm.*
[2] 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 Ware are shown in the table below.

Largest Earthquakes Affecting Ware, 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

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

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. 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.

Because engineering studies have determined that the greatest threat to the Quabbin Reservoir’s dam system is from an earthquake, the committee decided to rank earthquakes as having a “critical" impact, with over 25 percent of property in the affected area damaged or destroyed. This is due to the fact that an earthquake could result in the devastation of Ware’s town center if the Quabbin Reservoir’s dams were to fail as a result of an earthquake.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $938,044,800 is used.

An estimated 100 percent of damage would occur to 25 percent of structures, resulting in a total of $234,511,200 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on this analysis, Ware maintains a "high" vulnerability from earthquakes.

Dam Failure

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.

Location

Ware has 17 dams located within its boundaries, most of which are located on the Ware River. The location of occurrence for a dam failure has been determined to be "small," with less than 10 percent of land area affected.

Dams in Ware	
Dam	**Hazard Level**
Hardwick Pond Dam	Low
Quabbin Spillway	Low
Peppers Mill Pond Dam	Low
Juda Dam	Low
Ware Industries - Upper	Low
Lower Canal Dam	Low
Pilchs #3 Dam	Low
Martowski Farm Pond	Low
Flat Brook Pool Dam	Low
Skowron Dam	Low
Pines Dam	Low
Snow Pond Dam	Significant
Beaver Lake Dam	Significant
Arthur J Bousquet	Significant
Disantis Farm Pond	Significant
O'Brien Pond Dam	Significant
Quabbin Goodnough Dike	High

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 dam or levee failures in Ware.

Probability of Future Events

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

As described in the Massachusetts Hazard Mitigation Plan, dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams are already seeing increases in stream flows from earlier releases from dams. Dams are constructed with safety features known as "spillways." Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as "design failures," result in increased discharges downstream and increased flooding potential. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

Impact

An impact from a dam failure event could range from "limited" to "critical," with approximately 20 percent of property in the affected area damaged or destroyed. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $938,044,800 is used. An estimated 100 percent of damage would occur to 20 percent of structures, resulting in a total of $187,608,960 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on this analysis, Ware has a "medium" vulnerability from dam or levee failure.

Drought

Hazard Description

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

Location

Because of this hazard's regional nature, a drought would impact the entire town, resulting in a "large" location of occurrence, or more than 50 percent of total land area affected.

Extent

The severity of a drought would determine the scale of the event and would vary among town residents depending on whether the residents' water supply is derived from a private well or the public water system. Ware's Public Water Supply is supplied by six wells; these six wells supply 70 percent of the town's water needs. Massachusetts' wells are permitted according to their ability to meet demand for 180 days at maximum capacity with no recharge; if these conditions extended beyond the thresholds that determine supply capacity the damage from a drought could be widespread due to depleted groundwater supplies.The U.S. Drought Monitor also records information on historical drought occurrence. Unfortunately, data could only be found at the state level. The U.S. Drought Monitor categorizes drought on a D0-D4 scale as shown below.

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

Previous Occurrences

In Massachusetts, six major droughts have occurred statewide since 1930.[3] 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

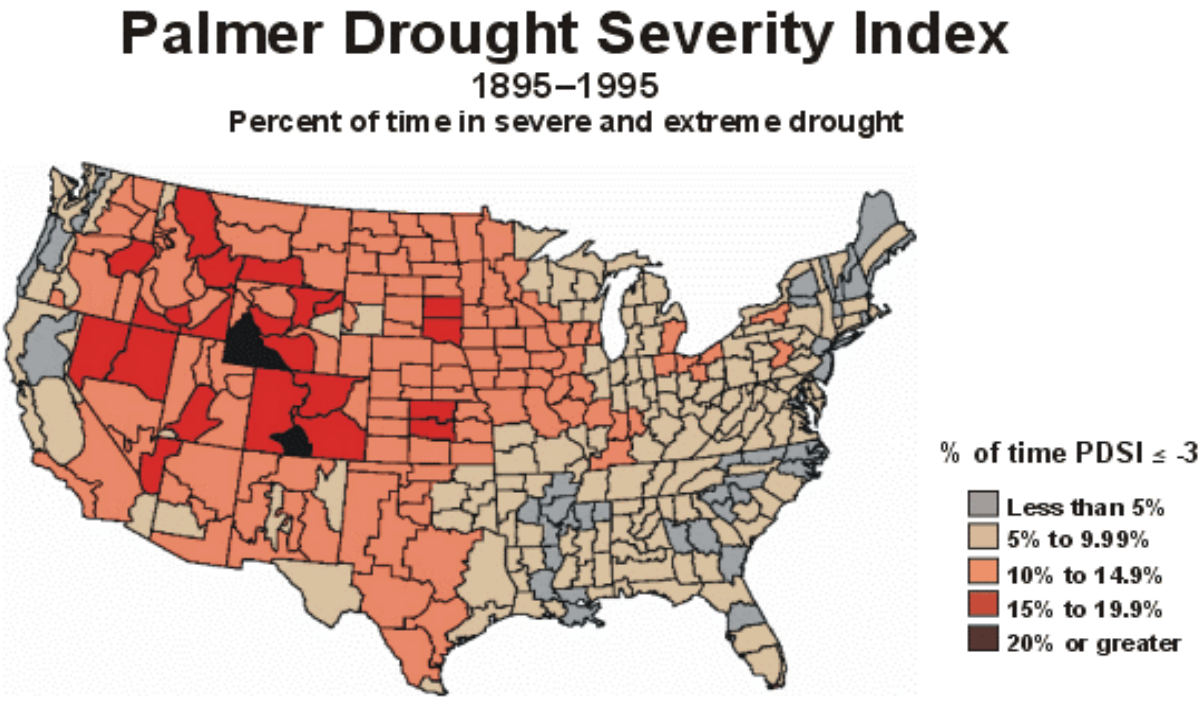
To date, Ware has not been impacted by any previous droughts in the state.

Probability of Future Events

In Ware, as in the rest of the state, drought has a "low" probability of future occurrence, or between 1 and 10 percent in any given 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 Drought Severity Index, Massachusetts is historically in the lowest percentile for severity and risk of drought.[4]

[3] US Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., US Geological Survey.
[4] National Drought Mitigation Center – http://drought.unl.edu



Impact

Due to the water richness of western Massachusetts, Ware 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. As a result, the impact of a drought would be “minor,” with only minor property damage or disruption on quality of life.

Vulnerability

Based on the above assessment, Ware has a vulnerability of "very low" from drought.

Other Hazards

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

Extreme temperatures, while identified in the state Hazard Mitigation Plan, was determined by the Ware Hazard Mitigation Committee to not currently be a primary hazard to people, property, or critical infrastructure in Ware. 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 Town 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

Facility Classification

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 community residents and property
- Would create a secondary disaster if a hazard were to impact it

The Critical Facilities List for the Town of Ware has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. Ware's Hazard Mitigation Committee has broken up this list of facilities into three categories:

- Facilities needed for emergency response in the event of a hazard event.

- Facilities identified as non-essential and not required in an emergency response event, but which are considered essential for the everyday operation of the Town.

- Facilities or institutions that include special populations which would need additional attention in the event of a hazard event.

The critical facilities and evacuation routes potentially affected by hazard areas are identified following this list. The Past and Potential Hazards/Critical Facilities Map (Appendix D) also identifies these facilities.

Category 1 – Emergency Response Services

The Town has identified the emergency response facilities as the highest priority in regards to protection from natural hazards:

1. Emergency Operations Center

Primary: Ware Fire Station - 200 West Street
Alternate: Ware Police Department - 22 North Street
Alternate: Ware High School - 237 West Street

2. Fire Station

Ware Fire Department - 200 West Street

3. Police Station

Ware Police Department – North Street

4. Highway Garage

Ware Highway Department – Mechanic Street

5. Water Department

Department of Public Works – Church Street

6. Emergency Fuel Stations

Diesel - Highway Department - Mechanic Street
Gasoline - Ware Fire Station - 200 West Street (4000 gallons)

7. Emergency Electrical Power Facility

Ware Town Hall
Department of Public Works
Police Station
Fire Department
Ware High School

8. Emergency Shelters

Ware High School – West Street (access may be blocked during flood)
Koziol Elementary School – Gould Road

9. Dry Hydrants, Fire Ponds, and Water Sources

Numerous locations

10. Transfer Station or Landfill

None

11. Utilities

Water Treatment Plant #1 – Barnes Street
Water Treatment Plant #2 – Gilbertville Road
Massachusetts Water Resource Authority – Belchertown Road
Waste Water Treatment Plant – Robbins Road

12. Water

Wells #1-4 and collection cistern - Barnes Street
Dismal Swamp Well - near Upper Church Street and State Route 32
Drinking Water Storage Distribution Tank – Old Gilbertville Road
Drinking Water Storage Distribution Tanks – Dugan Road
Water Storage Tank - Church Street
Water Storage Tank - Anderson Road

13. Helicopter Landing Sites

Mary Lane Hospital – 85 South Street
Private Airport – Route 32
Wal-Mart - 352 Palmer Road

14. Communications

Microwave Police Communications Tower – Gilbertville Road
Microwave Police Communications Tower – Quabbin Reservoir
Old Gilbertville Road
Department of Public Works -Church Street
Coffey Hill Road
Route 9 at town line
Belchertown Road
Desantis Garage
Mary Lane Hospital

15. Primary Evacuation Routes

Route 32 and Route 9 into surrounding communities

16. Bridges Located on Evacuation Routes

Bridge over Swift River – Route 9, Belchertown Line
Church Street Bridge – Upper Church Street
Muddy Brook Bridge – West Main Street
Beaver Lake Bridge – Babcock Tavern Road
Flat Brook Bridge #1 – Belchertown Road
Ware/Hardwick Covered Bridge – Old Gilbertville Road
Hardwick Pond Road Bridge – Hardwick Pond
Flat Brook Bridge #2 – West Street
South Street Bridge #2 – South Street

Category 2 – Non Emergency Response Facilities

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

- **Sewer Infrastructure**

  Wastewater Treatment Facility – Robbins Road

Category 3 – Facilities/Populations to Protect

The following populations and facilities may require special attention during a hazard event.

1. **Hospitals**
   Mary Lane Hospital - 85 South Street

2. **Special Needs Population**
   Upper Church Street
   4 Wildflower Drive
   16 Wildflower Drive
   40 Chestnut

3. **Elderly Housing/Assisted Living**
   Town of Ware Housing Authority - 20 Valley View
   Town of Ware Housing Authority - 161 West Street
   Town of Ware Housing Authority - 68 Church Street

4. **Recreation Areas**
   Veterans Memorial Park - Main St
   Memorial Athletic Field - South St
   Greenville Park - Church St.
   Barnes Street Field
   South Street School Area
   Ware Junior-Senior High
   Water Tower Field
   Reed Pool
   Banas Property
   Pleasant Street

5. **Schools**
   Kidstop Preschool – Church Street
   Kidstop Preschool – West Street
   Kidstop Preschool – Pleasant Street
   Koziol Elementary School – Gould Road
   St. Mary's School – South Street
   The First Step School – Malboeuf Road
   Ware High School – West Street
   Ware Middle School – West Street

6. Places of Worship

All Saint's Church – North Street
Reach Ministries – Main Street
Ware Community Church – Main Street
Saint Mary's Church – South Street
United Church – Church Street
Holy Cross Church – Maple Street
Kingdom Hall of Jehovah's Witness – Gilbertville Road
Quabbin Valley Baptist Church – Malboeuf Road
Trinity Episcopal Church – Park and Pleasant Streets
United Church of Ware – Church Street

7. Historic Buildings/Sites

Ware Center Meeting House – Route 9
Ware/Hardwick Covered Bridge – Old Gilbertville Road
Young Men's Library – Main Street
Church Street area
Main Street area
Ware Center area
Mill Yard area

8. Apartment Complexes

Colonial Village Apartments – 181 West Street
Highland Village Apartments – Highland Street
Hillside Village Apartments – Convent Hill Road
Desantis Apartments – West Street
Laurel Drive – South Street
Ware Brook Village

9. Employment Centers

Main Street / West Street Area
Country Bank and Savings Campus
Kanzaki Paper – Cummings Street
Gibbs Crossing – Palmer Road

10. Camps

None

11. Mobile Home Parks

Oakwood Mobile Home Park – Monson Turnpike Road
Pond Brook Mobile Home Park – North Street

5: MITIGATION STRATEGIES

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

The Town of Ware 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.

Overview of Mitigation Strategies by Hazard

An overview of the general concepts underlying mitigation strategies for each of the hazards identified in this plan is as follows:

Flooding

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

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 Town'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. The Town has adopted the State Building Code, which ensures minimum snow load requirements for roofs on new buildings.

Hurricanes

Hurricanes provide the most lead warning time of all identified hazards, because of the relative ease in predicting the storm's track and potential landfall. MEMA assumes "standby status" when a hurricane's location is 35 degrees North Latitude (Cape Hatteras) and "alert status" when the storm reaches 40 degrees North Latitude (Long Island). Even with significant warning, hurricanes cause significant damage – both due to flooding and severe wind.

The flooding associated with hurricanes can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Flood protection measures can thus also be considered hurricane mitigation measures. The high winds that often accompany hurricanes can also damage buildings and infrastructure, similar to tornadoes and other strong wind events.

Severe Thunderstorms / Winds / Tornadoes

Most damage from tornadoes and severe thunderstorms come from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly, hail. According to the Institute for Business and Home Safety, the wind speeds in most tornadoes are at or below design speeds that are used in current building codes, making strict adherence to building codes a primary mitigation strategy. In addition, current land development regulations, such as restrictions on the height of telecommunications towers, can also help prevent wind damages.

Wildfires / Brushfires

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

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 Town's recovery from an earthquake.

Dam Failure

Dam failure is a highly infrequent occurrence, but a severe incident could prove catastrophic. In addition, dam failure most often coincides with flooding, so its impacts can be multiplied, as the additional water has nowhere to flow. The only mitigation measures currently in place are the state regulations governing the construction, inspection, and maintenance of dams. This is managed through the Office of Dam Safety at the Department of Conservation and Recreation.

Drought

Although Massachusetts does not face extreme droughts like many other places in the country, it is susceptible to dry spells and drought. The primary mitigation strategy currently in place is to require subdivisions to provide an environmental review that assesses the impact that the development will have on groundwater.

Existing Mitigation Strategies

The Town of Ware had many mitigation strategies in place prior to the update of this Hazard Mitigation Plan in 2015. 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 "Completed and Deleted Mitigation Strategies" later in this section.

Existing Mitigation Strategies				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Flooding Provisions in Subdivision Rules and Regulations	Regulations	Requires a definitive plan that shows layout of water and sewer as well as 100-year flood elevation. Development Impact Statement requires a description of existing natural and man-made hydrological features; descriptions of alterations of water bodies; soil and water limitations. Requires stormwater drains on streets be designed to meet 10 year storm; 25 year storm when near natural waterways. Requires easements for natural waterways; 20 foot buffer from natural course and no less than 5 feet of annual high water mark.	Flooding	Conservation Commission Order of Conditions-Requiring annual inspection of waterways to clean out debris.

Existing Mitigation Strategies				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Flooding Provisions in Zoning Bylaws	Regulations	Site Plan Review requires drainage structures that are designed for 25-year storm Flood Hazard District restricts development, allows only conservation, farming and forestry, and passive recreation, and reconstruction of residential; mobile homes in Flood Plain in AS1 – AS130 must be elevated. Water Supply Protection District restricts hazardous chemicals, industrial uses and minimizes impervious surfaces on lot (max 50%); as well as limits sedimentation. Rural Quabbin Zoning District the Commonwealth owns this land, and development is not permitted.	Flooding	Adoption of a Sedimentation Bylaw that is in compliance with NPDES Phase II regulations. Increasing lot size to reduce development pressures in critical resource areas.
Special Permits	Regulations	Planning Board evaluates impacts of local flooding.	Flooding	Maintain commitment to evaluating flood hazards.
Town of Ware Open Space and Recreation Plan	Planning	The Town's Open Space and Recreation Plan preserves pervious surfaces and allows for stormwater infiltration	Flooding / Drought	Prioritize funding according to ecological benefit and mitigation potential.

Existing Mitigation Strategies				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Participation in the National Flood Insurance Program	Operations	The Town participates in the NFIP and follows all requirements of the program.	Flooding	The town should evaluate whether to become a part of FEMA's Community Rating System. Education and outreach to homeowners. As a condition of the Town's Housing Re-Habilitation Program, the first year of flood insurance is paid for by the town; modify agreement to require flood insurance to protect Ware's investment in these properties.
Subdivision Regulations – Design Standards for Roads	Regulations	Ware's subdivision regulations set a maximum grade of 6% for driveways.	Severe snowstorms / Ice storms	Increasing lot size in hilly areas of town through a Hillside Preservation Bylaw. This will give homeowners more flexibility with driveway construction. Increase the allowable units served by a common driveway to four. This will minimize damage to the landscape and result on roads that are easier to traverse in harsh weather.

Existing Mitigation Strategies				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Subdivision Regulations – Utilities (electric and telephone)	Regulations	Ware requires that all new subdivisions have buried utilities.	Severe snowstorms / Ice storms / Hurricanes / Tropical Storms / Severe Thunderstorms / Tornadoes / Wind	Work with utility companies to underground existing utility lines in locations where repetitive outages occur.
State Building Code	Regulations	Ware has adopted the Massachusetts Building Code.	All Hazards	None.
Zoning regulations for Tele-communications Facilities	Regulations	Wireless Communications Bylaw requires that the setback for a structure be 150% of the tower's maximum height	Severe snowstorms / Ice storms / Hurricanes / Tropical Storms / Severe Thunderstorms / Tornadoes / Wind	Consider adding safety and prevention of wind-related damage as a stated purpose.

Existing Mitigation Strategies				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Zoning Regulations regarding new mobile homes	Regulations	Mobile homes are prohibited unless grandfathered	Severe snowstorms / Ice storms / Hurricanes / Tropical Storms / Severe Thunderstorms / Tornadoes / Wind	Review existing bylaw, determine if existing regulations can be amended to require anchoring.
Shelters	Operations	The shelters in Ware are designated for all emergency situations.	All Hazards	Emergency generators for sites that have been designated as overflow/alternate shelters. Educated citizens about Ware's Reverse 911 dialing capacities, so that they know what to do when a call comes.
Burn Permits	Operations	Residents are issued one burn permit; required to call on he day of proposed burning to determine whether or not burning is allowed.	Wildfire / Brushfire	None.
Subdivision Review: **Fire Safety**	Regulations	The Fire Department is involved in the review of mobile home site plans, subdivision definitive plans and all other site plans.. Ware requires adequate fire safety measures on development sites	Wildfire / Brushfire	None.

Existing Mitigation Strategies				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Public Education/Outreach	Operations	Ware's Fire Department participates in the Student Awareness Fire Education Program (SAFE).	Wildfire / Brushfire	None.
Permits required for new dam construction	Regulations	State law requires a permit for the construction of any dam.	Dam Failure	None.
Dam Inspections	Operations	DCR issues inspection regulations for dams, based in their hazard (low, medium, high hazard). It is the responsibility of the dam owner to make sure they are in compliance with DCR's rules and regulations.	Dam Failure	Develop a contact for private dam owners, inform them of their obligations under the DCR's policy changes, designate a staff person who will ensure compliance. Identify sources of funding for dam safety inspections. Incorporate dam safety into development review process.

Completed and Deleted Mitigation Strategies

The Town has implemented several mitigation strategies that were identified in the previous version of this plan. In addition, the Town has decided not to pursue several mitigation strategies identified in the previous version of its Hazard Mitigation Plan. These completed and deleted strategies are described below.

Completed and Deleted Mitigation Strategies					
Action Name	**Status**	**Description**	**Hazards Mitigated**	**Responsible Agency**	**Notes**
Flooding Development	Deleted	Acquisition plan for undeveloped parcels in Ware's flood zone	Flooding	Board of Selectmen, Town Manager, Conservation Commission, Community Development	Strategy merged with strategy to purchase properties around wellhead recharge area, since restricting development in that area will also reduce development in flooding area.
Continuity of Government Plan	Completed	Establish Continuity of Government Plan for municipal government to develop alternate sites and locations for government services in the event of a devastating disaster.	All hazards	EMD, Board of Selectmen	Plan has been completed, will now be reviewed annually.
Water Buffalo Truck	Deleted	Purchase water buffalo truck to serve as an emergency distribution point in the event of a serious failure of the town's two municipal wells.	Flooding	DPW, Board of Selectmen, EMD	Equipment is not financially doable / not determine to be cost effective.

Completed and Deleted Mitigation Strategies					
Action Name	**Status**	**Description**	**Hazards Mitigated**	**Responsible Agency**	**Notes**
Evacuation Plan	Deleted	Develop an evacuation plan for Ware and publicize the findings to the Town of Ware, making special efforts to target special need populations.	All hazards	Board of Selectmen, Planning Board, Community Development, EMD, DPW	Already part of CEM Plan.
Special Needs Pamphlet	Deleted	Develop a pamphlet for special needs populations that familiarizes special needs individuals with sheltering protocol in Ware.	All hazards	EMD, Board of Selectmen, Council on Aging, School Dept.	FEMA already has produced a pamplet on this topic that will be used by the Town instead.
Flood Resistant Municipal Fuel Supply	Completed	Construction of a flood resistant municipal fuel supply depot to provide town vehicles with a fuel source in the event of a prolonged emergency situation and mitigate its impacts.	All hazards	Board of Selectmen, EMD, DPW	Construction has been completed.
Alternate Location for Town Government	Completed	Identify suitable alternate location for transferring town government for a temporary period.	All hazards	Building Inspector, EMD, Town Manager, Board of Selectmen	Location is included in COOP Plan, which is reviewed annually to ensure suitability of location.
Dam breach analysis	Deleted	Dam breach analyses for all high risk dams in Ware to map out inundation zones.	Dam failure	EMD, DPW, Board of Selectmen	Analyses is completed as part of regular inspections of dams

Completed and Deleted Mitigation Strategies					
Action Name	**Status**	**Description**	**Hazards Mitigated**	**Responsible Agency**	**Notes**
Town Hall earthquake relocation	Deleted	Relocate Town Hall to a location that is capable of withstanding an earthquake.	Earthquake	EMD, DPW, Board of Selectmen	Town Hall determined to be as effective at withstanding an earthquake as other structures in town.
Quabbin Reservoir Woodland Protection	Deleted	Protect woodland areas near the Quabbin Reservoirs vast woodlands to minimize rural-urban interface and mitigate the damage potential of wildfires before they occur.	Wildfire / Brushfire	Planning Board, Conservation Commission, EMD	Committee determined that area is already well maintained, and also is not in the town's jurisdiction.

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.

Prioritization Methodology

The Ware 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

- **Very High** – extremely beneficial projects that will greatly contribute to mitigation of multiple hazards and the protection of people and property. These projects are also given a numeric ranking within the category.

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

Cost Estimates

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

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

Cost estimates take into account the following resources:

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

New and Existing Mitigation Strategies to be Implemented									
Status	Action Name	Action Type	Description	Hazards Mitigated	Agency	Priority	Cost	Funding Source	Time Frame
Continuing - Town is reviewing materials about the CRS during Hazard Mitigation Planning process and assess the cost/benefit of participation. Army Corps is currently inspecting dykes along Ware River, and Town will work to be in compliance with any required changes.	Community Rating System	Operations	The town will evaluate whether to become a part of FEMA's Community Rating System	Flooding	Board of Selectmen, Town Manager	Low	Low	Town Staff	3 years
Continuing	Stormwater Pump Repair	Operations	Repair derelict stormwater pump on Pulaski Street to enhance protections to downtown in flooding events.	Flooding	Board of Selectmen, Town Manager, DPW	High	Medium	Town Staff/ HMGP	2 years

New and Existing Mitigation Strategies to be Implemented									
Status	Action Name	Action Type	Description	Hazards Mitigated	Agency	Priority	Cost	Funding Source	Time Frame
Continuing - strategy changed from developing plan to annually reviewing it	Continuity of Government Plan	Operations	Review Continuity of Government Plan annually.	All hazards	EMD, Board of Selectmen	Low	Low	EMD	1 year
Continuing - Analysis will occur at the same time as the inspection of the Upper Ware Industries Dam, since breaching is related to both dams	Dam breach analysis	Operations	Dam breach analysis for dam on East Street to determine the potential impacts on downtown Ware.	Dam failure	Emergency Management Director, Department of Public Works, Select Board	Medium	Low	DPW, EMD	5 years
New	Culvert Replacement	Operations	Replace culvert that constantly floods on Route 32	Flooding	Board of Selectmen, Department of Public Works, Town Manager	High	Medium	HMGP	3 years
Continuing - Town regularly assesses culverts to determine priority locations for drainage improvements	Culvert Replacement Prioritization	Operations	Prioritize the replacement of culverts that flood repeatedly in Ware.	Flooding	Board of Selectmen, Department of Public Works, Town Manager	High	Low	DPW	1 year

New and Existing Mitigation Strategies to be Implemented									
Status	Action Name	Action Type	Description	Hazards Mitigated	Agency	Priority	Cost	Funding Source	Time Frame
New	Culvert Inventory	Operations	Inventory of all culverts in town and assessment of their condition	Flooding	DPW	High	Low	Town	3 years
Continuing	Wellhead Recharge Area Property Purchasing	Operations	Develop long-term capital plan for purchasing properties around the wellhead recharge areas to minimize impervious surface area and provide long-term stability of municipal drinking water supplies, thereby mitigating the impacts of a drought by providing best-case-scenario water levels.	Drought	Department of Public Works, Community Development Department, Conservation Commission	Medium	High	HMGP, Town Staff	4 years
Continuing - Town currently is working to identify funding sources for construction of shed	Salt and Sand Storage Shed	Operations	Construction of municipal salt and sand storage shed for Ware highway vehicles to secure supply of road treatment chemicals prior to snowstorm; currently lacking.	Severe snowstorm / Ice storm	Emergency Management Director, Select Board, Department of Public Works.	Low	High	Town Staff	5 years

New and Existing Mitigation Strategies to be Implemented									
Status	Action Name	Action Type	Description	Hazards Mitigated	Agency	Priority	Cost	Funding Source	Time Frame
Continuing	Incident Command System	Operations	Maintain involvement in Incident Command System, Hampshire Regional Emergency Planning Commission and draw upon technical expertise of these associations.	All hazards	EMD	Medium	Low	Town Staff/Volunteers	1 Year
Continuing - Plan is being updated on a 5-year cycle and will be updated again in 2019	Hazard Mitigation Plan	Operations	Update Ware's Hazard Mitigation Plan every 5 years.	All hazards	EMD, Town Manager, Local Emergency Planning Committee.	Medium	Low	MEMA PDM Grant Program	5 years
Continuing	Hazard Education	Outreach and Education	Education and outreach to senior citizens, students and special-needs populations regarding the hazards Ware is susceptible to and mitigation activities that the town is conducting for the benefit of Ware's citizens.	All hazards	EMD, Town Manager, LEPC, School Department	Low	Low	Town Staff/Volunteers	3 years

New and Existing Mitigation Strategies to be Implemented									
Status	Action Name	Action Type	Description	Hazards Mitigated	Agency	Priority	Cost	Funding Source	Time Frame
Continuing - Fire Department conducts regular outreach to students about fire safety	Fire Safety Education	Education and Outreach	Continue education on the dangers of fire in the public schools to spread awareness about how to reduce wildfires and brushfires in Ware.	Wildfire / Brushfire	Fire Department	Low	Low	Town Staff	1 year
Continuing - Town is currently identifying funding opportunities and preparing to apply for HMGP funds for project	Well Backup Generator	Operations	Backup generator for water supply well #5	Drought Wildfire / Brushfire	Fire Department, DPW, EMD	High	Medium	HMGP	3 years
Continuing	Ware River Ice Protection	Operations	Protect road from ice at bend in Ware River by constructing increased flooding prevention infrastructure or barriers	Flooding	Fire Department, DPW, EMD	Medium	High	HMGP	3 years

6: PLAN REVIEW, EVALUATION, IMPLEMENTATION, AND ADOPTION

Upon completion of the draft Hazard Mitigation Plan, a public meeting was held by the Town staff and the Pioneer Valley Planning Commission on January 12th, 2015 to present and request comments from town officials and residents. 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 Town's Select Board and adopted.

Plan Implementation

The implementation of this plan began upon its formal adoption by the Town Select Board and approval by MEMA and FEMA. Those Town departments and boards responsible for ensuring the development of policies, bylaw revisions, and programs as described in this plan will be notified of their responsibilities immediately following approval. The Town's 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:

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

- ***Ware Open Space, Recreation Plan*** this Plan was used to identify the natural context within which the Ware 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.

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

- ***Massachusetts' State Hazard Mitigation Plan*** - This plan was used to insure that the town's HMP was consistent with the State's 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 Town staff and brief them on the content of the Hazard Mitigation Plan. The Hazard Mitigation Committee will also review current Town programs and policies to ensure that they are consistent with the mitigation strategies described in this plan. The Hazard Mitigation Plan will also be incorporated into updates of the Town's Comprehensive Emergency Management Plan.

Plan Monitoring and Evaluation

The Town's Emergency Management Director will call meetings of all responsible parties to review plan progress as needed, based on occurrence of hazard events. The public will be notified of these meetings in advance through a posting of the agenda at Town Hall. Responsible parties identified for specific mitigation actions will be asked to submit their reports in advance of the meeting. Meetings will entail the following actions:

- Review of previous hazard events to discuss and evaluate major issues, effectiveness of current mitigation, and possible mitigation for future events.
- Assess how the mitigation strategies of the plan can be integrated with other Town plans and operational procedures, including the Zoning Bylaw and Emergency Management Plan.
- Review and evaluate progress toward implementation of the current mitigation plan based on reports from responsible parties.
- Amend current plan to improve mitigation practices.

Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different town departments and/or revise the goals and objectives contained in the plan. The committee will review and update the Hazard Mitigation Plan every five years.

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

7: APPENDICES

Appendix A - Technical Resources

1) Agencies

Massachusetts Emergency Management Agency (MEMA)…… ……..508/820-2000
Hazard Mitigation Section 617/626-1356
Federal Emergency Management Agency (FEMA) 617/223-4175
MA Regional Planning Commissions:
Berkshire Regional Planning Commission (BRPC)……..413/442-1521
Cape Cod Commission (CCC)……..508/362-3828
Central Massachusetts Regional Planning Commission (CMRPC)…….. 508/693-3453
Franklin Regional Council of Governments (FRCOG)……..413/774-3167
Martha's Vineyard Commission (MVC)……508/693-3453
Merrimack Valley Planning Commission (MVPC)……..978/374-0519
Metropolitan Area Planning Council (MAPC)……..617/451-2770
Montachusett Regional Planning Commission (MRPC)……978/345-7376
Nantucket Planning and Economic Development Commission (NP&EDC)……..508/228-7236
Northern Middlesex Council of Governments (NMCOG)……978/454-8021
Old Colony Planning Council (OCPC)……..508/583-1833
Pioneer Valley Planning Commission (PVPC)……..413/781-6045
Southeastern Regional Planning and Economic Development District (SRPED……508/823-1803
MA Board of Building Regulations & Standards (BBRS)……617/227-1754
MA Coastal Zone Management (CZM)……617/626-1200
DCR Water Supply Protection……617/626-1379
DCR Waterways……617/626-1371
DCR Office of Dam Safety……508/792-7716
DFW Riverways……617/626-1540
MA Dept. of Housing & Community Development……617/573-1100
Woods Hole Oceanographic Institute……508/457-2180
UMass-Amherst Cooperative Extension……413/545-4800
National Fire Protection Association (NFPA)……617/770-3000
New England Disaster Recovery Information X-Change (NEDRIX) – 781/485-0279
MA Board of Library Commissioners……617/725-1860
MA Highway Dept, District 2……413/582-0599
MA Division of Marine Fisheries……617/626-1520
MA Division of Capital & Asset Management (DCAM)……617/727-4050
University of Massachusetts/Amherst……413/545-0111
Natural Resources Conservation Services (NRCS)……..413/253-4350
MA Historical Commission……617/727-8470
U.S. Army Corps of Engineers……978/318-8502
Northeast States Emergency Consortium, Inc. (NESEC).....781/224-9876
National Oceanic and Atmospheric Administration: National Weather Service……508/824-5116
US Department of the Interior: US Fish and Wildlife Service 413/253-8200
US Geological Survey.....508/490-5000

2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP) ……..MA Emergency Management Agency
406 Public Assistance and Hazard Mitigation .....MA Emergency Management Agency
Community Development Block Grant (CDBG)…….....DHCD, also refer to RPC
Dam Safety Program.....MA Division of Conservation and Recreation
Disaster Preparedness Improvement Grant (DPIG) ……MA Emergency Management Agency
Emergency Generators Program by NESEC‡ .....MA Emergency Management Agency
Emergency Watershed Protection (EWP) Program.....USDA, Natural Resources Conservation Service
Flood Mitigation Assistance Program (FMAP)……..MA Emergency Management Agency
Flood Plain Management Services (FPMS).....US Army Corps of Engineers
Mitigation Assistance Planning (MAP).....MA Emergency Management Agency
Mutual Aid for Public Work.....Western Massachusetts Regional Homeland Security Advisory Council
National Flood Insurance Program (NFIP) † ……..MA Emergency Management Agency
Power of Prevention Grant by NESEC‡ .....MA Emergency Management Agency
Roadway Repair & Maintenance Program(s).....Massachusetts Highway Department
Section 14 Emergency Stream Bank Erosion & Shoreline Protection .....US Army Corps of Engineers
Section 103 Beach Erosion…… ..US Army Corps of Engineers
Section 205 Flood Damage Reduction……..US Army Corps of Engineers
Section 208 Snagging and Clearing ……..US Army Corps of Engineers
Shoreline Protection Program……..MA Department of Conservation and Recreation
Various Forest and Lands Program(s).....MA Department of Environmental Protection
Wetlands Programs .....MA Department of Environmental Protection

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

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

3) Internet Resources

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	http://www.colorado.edu/litbase/hazards/	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	http://wxp.eas.purdue.edu/hurricane	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center "Disaster Finder:	http://www.gsfc.nasa.gov/ndrd/dis aster/	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	http://ltpwww.gsfc.nasa.gov/ndrd/main/html	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	http://www.statelocal.gov/	General information through the federal-state partnership.
National Weather Service	http://nws.noaa.gov/	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	http://h20.usgs.gov/public/realtime.html	Provisional hydrological data
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/g eog/floods/	Observations of flooding situations.

Sponsor	Internet Address	Summary of Contents
FEMA, National Flood Insurance Program, Community Status Book	http://www.fema.gov/fema/csb.html	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	http://www.met.fsu.edu/explores/tropical.html	Tracking and NWS warnings for Atlantic Hurricanes and other links
The Tornado Project Online	http://www.tornadoroject.com/	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	http://www.nssl.uoknor.edu/	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	http://www.iiaa.iix.com/ndcmap.html	A multi-disaster risk map.
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state.
USDA Forest Service Web	http://www.fs.fed.us/land	Information on forest fires and land management.

Appendix B – Documentation of the Planning Process

Catalyst for Regional Progress
PVPC
Timothy W. Brennan, Executive Director

MEDIA RELEASE

CONTACT: Josiah Neiderbach, PVPC Planner, (413) 781-6045 or jneiderbach@pvpc.org
Ed Wloch, Deputy Fire Chief, Town of Ware (413) 967-5901 or ewloch@townofware.com

FOR IMMEDIATE RELEASE
January 16, 2015

Town of Ware Hazard Mitigation Plan Public Engagement Event to Be Held

Ware residents are invited to provide comments on the update of the Town of Ware Hazard Mitigation Plan **Wednesday, January 21** at 10:00 a.m., at the Ware Fire Department, 200 West Street. The plan is being produced by the Town with assistance from the Pioneer Valley Planning Commission and is funded by the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA). All members of the public are welcome to attend the event.

The meeting will include an introduction to the hazard mitigation planning process, information on the location of the Town's critical facilities, and a summary of existing mitigation initiatives. Municipal officials and Pioneer Valley Planning Commission staff will be available to answer questions and listen to comments from the public.

This planning effort is being undertaken to help the Town of Ware 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.

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

—30—

Ware Hazard Mitigation Plan
Public Input and Workshop

Agenda

Ware Fire Department
January 21, 2015, 10:00 a.m.

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

Ware Hazard Mitigation Committee
Meeting Agenda

Ware Fire Department
January 21, 2015, 10:30 a.m.

1. Review of changes from previous Hazard Mitigation Committee meeting
2. Existing mitigation strategies undertaken by Town and assessment of effectiveness
3. Assessment of proposed mitigation strategies and potential prioritization

Ware Hazard Mitigation Plan
Public Input and Workshop

Agenda

Ware Senior Center

_____

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

(No members of the public attended)

Catalyst for Regional Progress
PVPC
Timothy W. Brennan, Executive Director

MEDIA RELEASE

CONTACT: Josiah Neiderbach, PVPC Planner, (413) 781-6045 or jneiderbach@pvpc.org
Ed Wloch, Deputy Fire Chief, Town of Ware (413) 967-5901 or ewloch@townofware.com

FOR IMMEDIATE RELEASE
_____, 2015

Town of Ware to Hold Public Engagement Event for Hazard Mitigation Plan

Ware residents are invited to provide comments on a completed draft of the Town's updated hazard mitigation plan on _____ at the Ware Fire Department. The plan was produced by the Town with assistance from the Pioneer Valley Planning Commission and is funded by the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA). 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 Ware. Municipal officials and PVPC staff will be available to answer questions and listen to comments on the draft plan, which is posted at _____. A paper copy of the plan will also be available at Ware Town Hall.

This planning effort is being undertaken to help the Town of Ware 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.

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

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	Ware	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	Ware	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	Ware	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	Ware	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

Appendix C – 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 D – Past and Potential Hazards/Critical Facilities Map

<COMMUNITY LETTERHEAD>

CERTIFICATE OF ADOPTION

Town of Ware, MASSACHUSETTS

BOARD OF SELECTMEN

A RESOLUTION ADOPTING THE TOWN OF WARE HAZARD MITIGATION PLAN

WHEREAS, the Town of Ware established a Committee to prepare the Hazard Mitigation plan; and

WHEREAS, the Town of Ware participated in the development of the Town of Ware Hazard Mitigation Plan;

and WHEREAS, the Town of Ware Hazard Mitigation Plan contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Ware, and

WHEREAS, a duly-noticed public meeting was held by the Board of Selectmen on _____ for the public and municipality to review prior to consideration of this resolution; and

WHEREAS, the Town of Ware authorizes responsible departments and/or agencies to execute their responsibilities demonstrated in the plan, and

NOW, THEREFORE BE IT RESOLVED that the Town of Ware Board of Selectmen formally approves and adopts the Town of Ware Hazard Mitigation Plan, in accordance with M.G.L. c. 40.

ADOPTED AND SIGNED this _____, _____

ATTEST