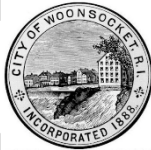


2018 Hazard Mitigation Plan Update

City of Woonsocket, Rhode Island

PREPARED FOR



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JUNE/JULY 2018

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Executive Summary

This Hazard Mitigation Plan (HMP) is a product of the Woonsocket Hazard Mitigation Plan Working Group (WG). It has been approved by the Woonsocket City Council, the Rhode Island Emergency Management Agency, and the Federal Emergency Management Agency in accordance with the Disaster Mitigation Act of 2000.

The WG's overview of past natural hazard occurrences verifies that the City is vulnerable to diverse events including Nor'easters, winter weather, and high wind. The discussion puts the likelihood of these events into historical perspective and recognizes that although the probability of lightning may be higher, the intensity and potential impacts from less likely events such as hurricanes or extreme heat can be far greater.

The risk assessment portion of the plan confirms that the City has much to lose from these events. The most vulnerable assets include flood prone drainage systems, water, dams, critical facilities, populations, businesses, schools, recreation facilities, and historic resources.

To address these risks the 2018 HMP has put forth a clear mission, a distinct set of goals and 17 specific mitigation actions. The City's hazard mitigation mission is to protect and enhance the quality of life, property and resources by identifying areas at risk and implementing appropriate mitigation actions. The specific goals include protecting the lives and property of the City of Woonsocket's residents, protecting the City's critical facilities and infrastructure, and protect the City's cultural, historical, natural, and economic resources. Each of the subsequent mitigation actions for achieving these goals summarizes specific problems and possible solutions, details the primary tasks to be undertaken, identifies an appropriate lead and anticipated funding sources.

1

Introduction

Plan Purpose

The purpose of The Hazard Mitigation Plan is to set forth guidelines of short-term and long-term actions, which will reduce the actual or potential loss of life or property from hazardous events. This plan was constructed using input from a variety of municipal and private stakeholders and the general public was involved in the planning process. This plan serves as guidance to help the City reduce their losses and vulnerabilities relating to natural hazards. The goal of this planning effort is to identify a range of mitigation actions through discussions among working group members.

Hazard Mitigation and Benefits

Hazard mitigation planning consists of a series of actions taken to identify specific areas that are vulnerable to natural and man-made hazards within a town, and seeks to permanently reduce or eliminate the long-term risk to human life and property. It coordinates available resources and identifies community policies, actions, and tools for implementation that will reduce risk and the potential for future losses city-wide. The process of natural hazard mitigation planning sets clear goals, identifies appropriate actions, and produces an effective mitigation strategy that can be updated and revised to keep the plan current. In short, 'it's where we were, where we are and where we're going' in terms of hazard mitigation.

States and communities across the country are slowly, but increasingly, realizing that simply responding to natural disasters, without addressing ways to minimize their potential effect, is no longer an adequate role for government. Striving to prevent unnecessary damage from natural disasters through proactive planning that characterizes the hazard, assesses the community's vulnerability, and designs appropriate land-use policies and building code requirements is a more effective and fiscally sound approach to achieving public safety goals related to natural hazards.

In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 (DMA 2000) is the latest federal legislation to improve this planning process. It reinforces the importance of natural hazard mitigation planning and establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP) or other annual funding opportunities. Section 322 of the Act specifically addresses mitigation planning at the state and municipal levels of government. It identifies new requirements that allow HMGP funds to be used for planning activities. As a result of this Act, states and communities must now have a FEMA approved natural hazard mitigation plan in place prior to receiving post-disaster HMGP funds. In the event of a natural disaster, municipalities that do not have an approved natural hazard mitigation plan will not be eligible to receive post-disaster HMGP funding.

The purpose of this plan is to recommend actions and policies for the City of Woonsocket to minimize social and economic loss and hardships resulting from natural hazards. These hardships include the loss of life, destruction of property, damage to critical infrastructure and facilities, loss/interruption of jobs, loss/damage to businesses, and loss/damage to significant historical structures. Hazardous events that affect Woonsocket include Nor'easters, winter weather, extreme temperatures, and dam failure. To protect present and future structures, infrastructure and assets and to minimize social and economic hardships, the City of Woonsocket implements the following general actions and policies:

- › Revisions to the City's comprehensive plan.
- › Incorporation of hazard mitigation into the site plan review process.
- › State and local building code review.
- › Public education/outreach.
- › Post-disaster recovery opportunities/strategies.

The City of Woonsocket also recognizes the important benefits associated with hazard mitigation, its interaction with municipal land use and infrastructure planning, and the need for a comprehensive planning approach, which accommodates these interdependencies. Woonsocket's Comprehensive Plan Update (2012) addresses natural and cultural resources, land use, housing, services and facilities, traffic circulation, open space, economic development, and future development trends. While the entire hazard mitigation plan will not be formally incorporated into the Comprehensive Plan updates, certain, applicable mitigation

actions will be incorporated during the update process. The City recognizes coordination between the Hazard Mitigation Plan and the Comprehensive Plan to be of benefit because it will ensure a unified planning approach into the future and ensure that risk reduction remains a critical element of municipal planning. This is also in alignment with current goals of Rhode Island Statewide Planning which requires a natural hazards component to be included in the Comprehensive Plan.¹

A second benefit of hazard mitigation allows for a careful selection of risk reduction actions through an enhanced collaborative network of stakeholders whose interests might be affected by hazard losses. Working side by side with this broad range of stakeholders can forge partnerships that pool skills, expertise, and experience to achieve a common goal. Proceeding in this manner will help the City ensure that the most appropriate and equitable mitigation projects are undertaken.

A third benefit of hazard mitigation would be endorsing a proactive planning approach focused on sustainability, whereby the City of Woonsocket could minimize the social and economic hardships that have resulted from the occurrence of previous natural disasters. These social and economic hardships include: the loss of life, destruction of property, interruption of jobs, damage to businesses, and the loss of historically significant structures and facilities. This proactive planning approach would look for ways to combine policies, programs, and design solutions to bring about multiple objectives and seek to address and integrate social and environmental concerns. Linking sustainability and loss reduction to other goals can provide a framework within the state and local governments that will bring the comprehensive planning process full circle.

Lastly, the participation in a hazard mitigation planning process will establish funding priorities. The formal adoption and implementation of this plan will allow the City of Woonsocket and its residents to become more involved in several programs offered by the Federal Emergency Management Agency (FEMA) including: the Community Rating System Program (CRS); the Pre-Disaster Flood Mitigation Assistance Program (FMA); and the Hazard Mitigation Grant Program (HMGP). Money spent today on preventative measures can significantly reduce the cost of post-disaster cleanup tomorrow.

Goals

The City of Woonsocket has established the following mission statement:

"Preserve and enhance the quality of life, property, and resources by identifying areas at risk from natural hazards and implementing prioritized hazard mitigation strategies designed to protect Blackstone Valley's infrastructure, historical, cultural, natural and economic resources".

¹ Rhode Island Statewide Planning, *Rhode Island Comprehensive Planning Standards Manual, Section 12. Planning For Natural Hazards and Climate Change*. January 14, 2016.

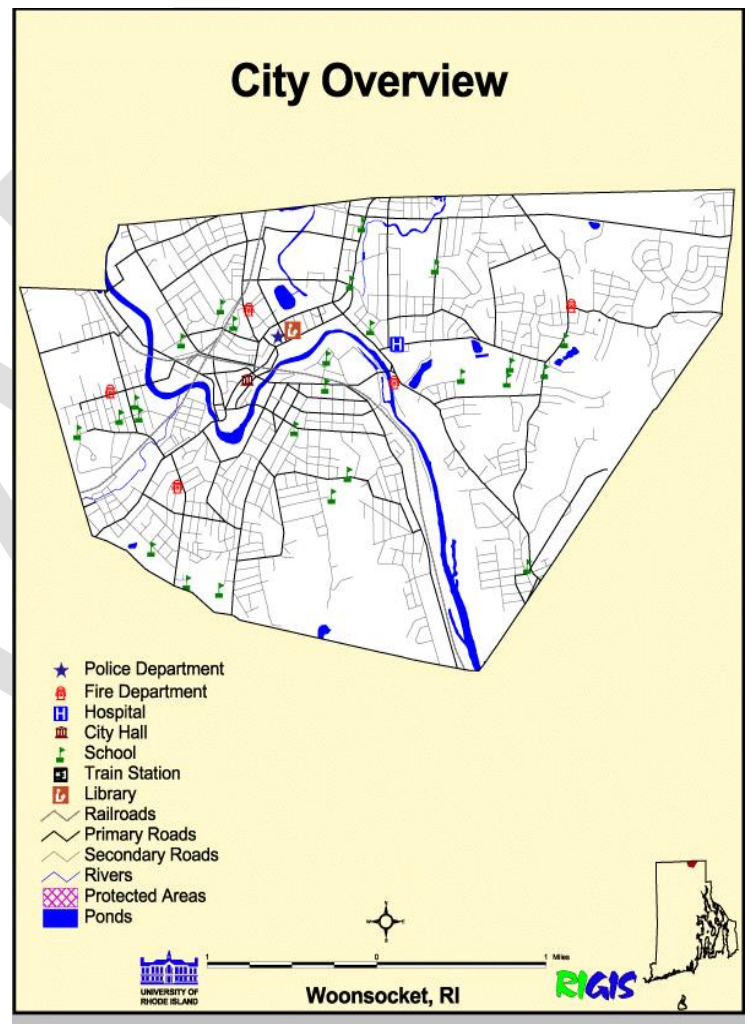
- › The City of Woonsocket has established the following mitigation goals:
Implement actions which protect the lives and property of Woonsocket's residents.
- › Implement actions which protect Woonsocket's critical facilities and infrastructure.
- › Implement actions which protect Woonsocket's cultural, historical, natural and economic resources.

Background

The City of Woonsocket is surrounded by the growing suburban communities of Lincoln, Cumberland and North Smithfield, and boasts a positive business climate where City officials and the business community can work together to build a strong economy. Companies moving to Woonsocket will find the area affordable, with diverse housing choices, quality health care, a skilled labor force, a modern public-school system, and access to five private schools, including the prestigious Mount Saint Charles Academy. Today, Woonsocket is served by 11 Roman Catholic and 3 Baptist churches, as well as Apostolic-Pentecostal, Assembly of God, Church of Christ, Eastern Orthodox, Episcopal, Jewish, Lutheran, Ukrainian Catholic, United Methodist, and Universalist congregations. The City is home to Landmark Medical Center, a full-service medical facility, offering quality care to area residents for over 100 years. CVS Corporation, a fortune 500 company, is headquartered in the City.

Woonsocket is centrally located in the Boston/Worcester/Providence Triangle, with direct interstate connection to Route 146 and I-295 by way of the newly constructed Route 99. Driving time between Woonsocket and Providence is 15 to 20 minutes.

Map 1 Woonsocket, RI



Boston can be reached via I-295 or I-495 to I-95 in about an hour, while travel time to Central Worcester via Route 146 is approximately 40 minutes. State routes 114, 122 and 126 run through the City, providing connections to the Interstate System.

A base map of the City of Woonsocket can be found in Map 1.

History

Demographics

The City of Woonsocket has seen a slight decrease in population since the 2000 U.S. Census. The estimated population for the City in 2010 is 41,186, a decrease of 4.7%. In the tables below are some of the available demographic and social characteristics of the City. These tables are based on a population total of 41,186

Age	Number	%
Under 5	3,118	7.6
65+	5,448	13.2

Race	Number	%
Not Hispanic or Latino, White alone population	29,365	71.3
Hispanic or Latino	5,845	14.2
Black or African American	2,621	6.4
Asian	2,240	5.4

Government

The City of Woonsocket is managed by a mayoral form of government. The City of Woonsocket City Council established rules and regulations within the Code of Ordinances that specify the guidelines that the City and its residents must abide to. The seven (7) City Council members are elected every two years. The City Council and the Mayor's office have the responsibility of setting City policy with regard to roads and bridges, as carried out in their approval of general fund and special fund budgets, and the Finance Department provides financial control and purchasing services.

Land Use Patterns

The total area of Woonsocket approximately 25% forested, 46% residential, <1% agriculture, 2% water, and 13% commercial/industrial. Most of the City is developed, with areas of deciduous forest near the southern, western, and eastern borders. The major body of water is the Blackstone River which flows generally north to south through the City. It is also a tributary for a number of reservoirs which are controlled by a series of dams.

Woonsocket's pattern of land use has changed since the early time of industrialism. During the industrial era, the City's commercial and manufacturing land uses were concentrated in the downtown core and the riverfront area. Now these land uses are primarily located on the outskirts of the city in the Highland Corporate and Woonsocket Industrial Parks and along the major commercial artery, Diamond Hill Road. Mill complexes built along the river now present opportunities to meet such differing needs as light industry, retail, and housing. Several recent successful mill-

to-condominium conversion projects in the city highlight the changing land-use patterns in the community.

A sensitive relationship clearly exists between increasing and enhancing transportation systems while preserving the historic, cultural and natural landscapes. Alternative and multi-modal methods of transportation such as bus service, bike paths, and the commuter rail provide opportunities in the future to better connect Woonsocket with the surrounding Blackstone Valley communities

Table 1 Land Use

Land Use Type ²	2003/2004 Acres	2011 Acres	% Change
Residential	2,294	2,330	+1.6%
Commercial/Industrial	648	684	+5.6%
Forested	1,389	1,278	-8%
Agriculture/Pasture	6	4	-33%

Public Safety

The Public Safety Director is the liaison between the Police and Fire Chiefs and the Mayor. Employees of this department deal with all public safety issues and planning.

Law enforcement and protection of persons and property is provided by the Police Department's 101 sworn officers supported by 19 professional employees. The Police Department operates a twenty-four-hour patrol. The City's Emergency Management Agency (EMA) at 5 Cumberland Hill Road serves as the center for preparation and response to a disaster or crises situation. Through grants its' computer and communication capabilities have been enhanced. Timothy P. Walsh currently serves as the Emergency Management Director, appointed by the City Mayor.

Woonsocket businesses and residents are protected from fires and other emergencies by 107 staff. The Department is led by the Fire Chief, and four Deputy Fire Chiefs. The 4 fire stations are equipped with 4 engines, 2 ladders, 3 rescues, and a bucket truck. All personnel (including fire alarm division, fire marshal and education personnel) are trained to respond to all emergencies. The Deputy EMA Director led the recent hazard mitigation plan update process. It is likely that they will retain that role in the future. These volunteer departments provide quality protection to residents and businesses.

The Fire Department has 80 EMTs and 3 rescues throughout the four stations that are geographically located throughout the city.

2 RIGIS Land Use Data from 2003/2004 and 2011 (most recent).

Roads and Bridges

Woonsocket is centrally located in the Boston/Worcester/Providence Triangle, with direct interstate connection to Route 146 and I-295 by way of Route 99. Driving time between Woonsocket and Providence is 15 to 20 minutes. Boston can be reached via I-295 or I-495 to I-95 in about an hour, while travel time to Central Worcester via Route 146 is approximately 40 minutes. State routes 114, 122 and 126 run through the City, providing connections to the Interstate System. Improved roadway capacity will be necessary for economic expansion.

Utilities (as per the Woonsocket Comprehensive Plan 2012)

"Woonsocket's water supply system consists of three reservoirs, Reservoir #1, Reservoir #3, and Harris Pond. (The former Reservoir No. 2 is no longer in use.) Map E-2 shows the location of these reservoirs. Reservoir No. 1 is located approximately 2.5 miles downstream, along Crookfall Brook in North Smithfield and Manville, Rhode Island. The reservoir is 10.2 acres in area, and contains 33.2 million gallons at the dam spillway elevation of 170.30 feet (City of Woonsocket. 1999. Infrastructure Rehabilitation Plan). Reservoir No. 3 lies in the towns of Smithfield and North Smithfield is the largest of the three reservoirs at 263 acres, and a total storage volume of 1,173 million gallons (Infrastructure Rehabilitation Plan). Harris Pond, just over the state line in Blackstone, Massachusetts, has a total surface area of 108 acres, and stores 340 million gallons at the dam spillway elevation of 167.5 feet (Infrastructure Rehabilitation Plan). Harris Pond was developed as a supplementary water supply for the City during the 1960's. A main from the Harris Pond Pump Station sends water south of the City to Reservoir No. 1 where it is aerated. This water supply must be prechlorinated prior to its use. Before using water from Harris Pond, the City must notify the Rhode Island Department of Health."

"... The Woonsocket Regional Wastewater Commission serves the City of Woonsocket, RI, The Town of North Smithfield, RI, The Town of Blackstone, MA and the Town of Bellingham, MA. Woonsocket's modern wastewater employ state-of-the-art treatment techniques. The city has recently begun construction of a 56-million-dollar state of the art water treatment facility that will replace an end of life process. The City has made a priority commitment to the on-going maintenance and upgrades of these important utilities in recent years."

Forest and Open Space

The following is from the 2012 Comprehensive Plan.

"The City of Woonsocket has 25 separate parks, playgrounds, and playing field areas, as well as 4 conservation areas, 3 publicly-owned open space areas, and several riverfront open space parcels. The City's forested land is a natural resource which has significantly diminished over the past century as development spread to outlying areas of the City. There are approximately 1,278 acres of forested areas in

Woonsocket (RIGIS Land Cover database 2011). Most of the forested land is located along the southern, eastern, and western borders.

Woonsocket has four remaining large tracts of undeveloped, privately held land:

- 1) The first of these tracts is located north of Rhodes Avenue in the northwest corner of the City and includes several small parcels the City acquired as tax lien lots. The area across Rhodes Avenue to the south is currently designated as a conservation area and represents a large spatial commitment. Extending this conservation area north across Rhodes Avenue would not presently be in the City's best interest in part because Rhodes Avenue forms a natural barrier between the two tracts of land.
- 2) The second tract of land is located west of the Booth Pond Conservation Area, in the southern portion of Woonsocket. This land is not suitable for development as it is largely constrained by rock outcrops and wetlands.
- 3) The third large tract of privately owned land is located east of Jillson Avenue in the southern portion of the City. Much of the area east of Jillson Avenue is in a groundwater recharge area. Conservation of the most sensitive parcels would therefore be in the best interest of the public.
- 4) The fourth tract is the area around Iron Rock Brook in the eastern portion of the City.

Of particular concern to the City is the protection and expanded use of its dominant geographical feature, the Blackstone River. Woonsocket sees the Blackstone River Valley National Heritage Corridor and the building of related parks, bicycle paths and developments, as a great opportunity to create a resource that will improve the quality of life of its residents. The City has an opportunity to capture its river frontage and create a continuous parkway, which can be incorporated into the Heritage Corridor system."

Water Resources

The City of Woonsocket is traversed by rivers, brooks and streams. The rivers and ponds cover an area of 128 acres. These waters provide essential habitat and many support fishing and swimming criteria. Water bodies of significance include:

- Blackstone River
- Mill River
- Peters River
- Theresa Brook
- Iron Rock Brook
- Cherry Brook
- Booth Pond
- Cass Pond
- Darling Pond
- Harris Pond

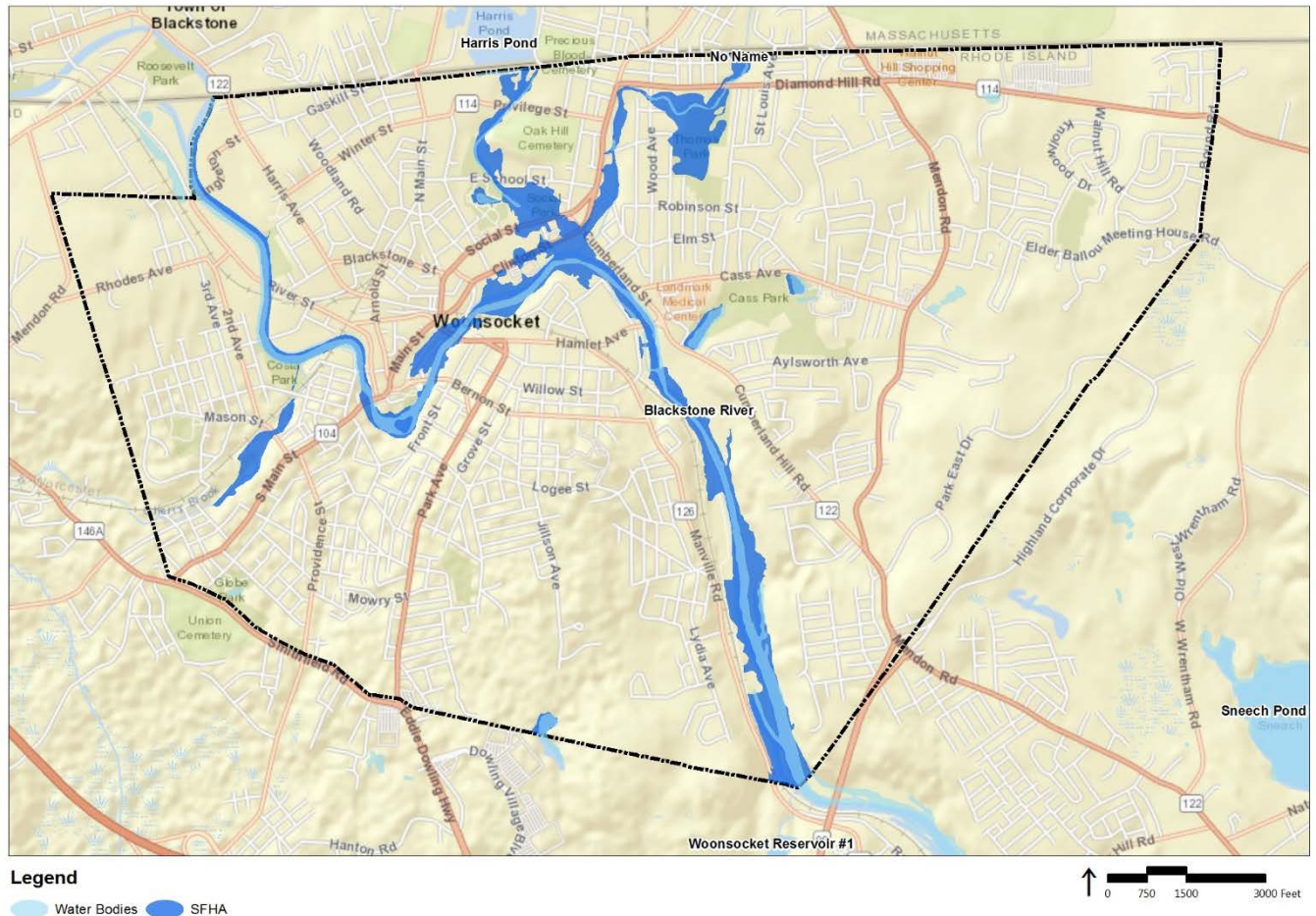
Holding Ponds and Other

- Globe Park Pond- receives surface runoff from the adjacent embankment from Smithfield Road/Route 146A
- Highland Park Holding Pond- stormwater retention pond
- Patton Road Holding Pond- stormwater retention pond

- Social Pond (most popular recreational body of water)
- Sylvester Pond

The City is located wholly within the Lower Blackstone River Watershed. Sub-watersheds include the Mill River, Peters River-Blackstone River, and the Emerson Brook-Blackstone River.

Map 2: Woonsocket Water Resources and Special Flood Hazard Area (SFHA)



Cultural and Historic Resources

Woonsocket's cultural and historic resources contribute to the history and quality of life in the Blackstone River Valley. There are 31 properties and 8 Historic Districts listed with the National Register of Historic Places (2009). Over time Woonsocket has lost many historic properties to disrepair, abandonment, and demolition.

Two important historic preservation and cultural developments anchor the City's Main Street. At the southern terminus of Main Street sits the former Lincoln Textile mill, which has been redeveloped into the Museum of Work and Culture. Second,

the historic Stadium Theatre anchors Main Street's northern terminus. In the 1990's this historic 1920's theatre was renovated and re-opened after decades of neglect.

Development Trends Since the 2011 Plan

There have been no notable development trends since the 2011 Hazard Mitigation Plan.

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Planning Process

Overview

The City of Woonsocket initiated the hazard mitigation planning effort in June 13, 2017 at the recommendation of the Emergency Management Officials. This Hazard Mitigation Plan Update is the result of a dedicated group of individuals working for six (6) months identifying natural hazards and proposing ways to improve Woonsocket's resiliency.

Woonsocket Hazard Mitigation Plan Working Group

This Hazard Mitigation Plan (HMP) is a product of the Woonsocket Hazard Mitigation Plan Working Group (WG). Working Group members included:

- N. David Bouley, Director of Planning and Development
- Steven D'Agostino, Public Works Director
- Mike Debrousse, Engineering
- Peter Fontaine, School Department
- Gino Jalette, Public Safety Director
- Carl Johnson, Zoning Official
- Roger Perreault, Fire Department
- Dennis Rainville, Parks and Recreation

- Chief Paul Shatraw, Fire Chief (lead)
- Tim Walsh, Deputy Fire Chief/EMA Director

The Planning Process

This 2018 HMP is the result of a 7-step process that was initiated in June 2017 with the establishment of the WG by invitation from EMA Officials. The City hired VHB as a consultant to assist with this planning effort.

Step two started the plan development process and included the first meeting of the WG on June 28, 2017. The WG met regularly monthly at the City Hall.

The City's previous plan was dated 2011, so the first meeting focused on re-ranking hazards and discussing the process for updating the plan. At this initial meeting, the group reviewed a set of questions to be included in an online public survey. The purpose of the survey was to capture the local residents' perception of natural hazards.

The link to the survey was widely distributed on social media and on the City's website. Sixty-five people participated. See Appendix D for survey results.

Step three began with the WG meeting on July 19, 2017. After reviewing the hazards of concerns and survey results, the WG identified critical infrastructure and community assets within the city. Fourteen areas of vulnerability were discussed: Flood prone drainage systems, bridges spanning rivers, wastewater, water supply systems, flood control projects, utilities, communication towers, dams, critical facilities, populations, businesses, schools, recreation facilities, and historic resources. During discussions, the group decided that although important for the function of the City, the following were not identified as being particularly vulnerable:

- Bridges Spanning Rivers- Kendrick Ave. (pedestrian bridge with water main) has gone out to bid, Privilege Street/ Mill River project is being bid out, and regular sandblasting maintenance is needed on other bridges.
- Wastewater- Recent significant (\$40 million) upgrades have been completed to the Woonsocket Regional Wastewater Facility.
- Water Supply Systems- Woonsocket Water Treatment Plant is in the process of an upgrade
- Flood Control Project- owned by the U.S. Army Corps of Engineers

During this early phase, the City's consultant reviewed the existing Comprehensive Plan, local ordinances, StormReady plan, and gathered information on current infrastructure projects going on within the City.

Current city capabilities were discussed at the meeting on August 29, 2017. Many different departments, committees, and programs already engage in activities that help the city become more resilient to a variety of hazards. It is important to

highlight these capabilities and show how they support the City's hazard mitigation efforts.

Step four was creating an updated list of mitigation actions to reduce the impact to the identified vulnerable areas. On September 19, 2017, the WG reviewed the mitigation items that were proposed in the 2011 plan. Status updates were given for all the previous actions. The incomplete actions that were still important were rolled into the list of actions for this 2017 plan update.

Step five was completed at the September 19, 2017 meeting where the group brainstormed additional mitigation actions they wanted to include. During this meeting, the group decided that not all critical infrastructure needs a mitigation action within the lifespan of this plan (5 years). Included in this step was proposing new actions, establishing action timelines, costs, and identifying responsible parties.

Step six focused on the prioritization of the mitigation actions. On October 16, 2017, the WG met as a group to prioritize their proposed actions and confirm additional action details. After this meeting, the consultant finished the draft of the plan for Working Group review.

Step seven furthered the public input and review process with the Woonsocket Planning Board and the general public for review and comment. The plan was posted on the City's website, promoted on social media, and made available at City Hall and Library for public review. The Hazard Mitigation Plan was also emailed to Emergency Management Directors in the neighboring towns of Cumberland, North Smithfield, and Blackstone, MA for their review and comments. **Note if comments were received.**

Table 1 below provides a summary of the Working Group's meeting dates and the activities that they conducted:

Table 1 Working Group Meetings

Date	Meeting Summary
06/16/2017	Re-formation of the Hazard Mitigation Plan Working Group
06/28/2017	Kick-off Meeting: review of hazards
07/29/2017	Vulnerability discussion
08/29/2017	Current capabilities
09/19/2017	Review of 2011 mitigation actions and creation of new actions.
10/16/2017	Prioritize mitigation actions

Public Input

This hazard mitigation plan benefits from various distinct types of public input strategies that were utilized by the WG during the drafting process and prior to its adoption by the City Council. Public input for the Woonsocket hazard mitigation

plan was primarily collected through a public survey, public meetings and an invitation to comment.

Early in the planning process, the WG promoted and distributed a "Hazard Perceptions" survey online. The purpose of the anonymous survey was to hear from residents about the hazards and neighborhoods they are most concerned about. Sixty-five individuals participated in the survey; over 75% have lived in Foster for 20 years or more. Not surprisingly, most were concerned about snow/blizzards, Nor'easters, hurricanes/tropical storms, ice storms, and high winds. The survey also provided the WG with a list of problematic areas that are susceptible to flooding. The WG used the input from the survey to focus their mitigation planning efforts.

The 2018 WG included City personnel as well as residents. One non-City employee was asked to join the group but they were unable to commit to the meeting schedule. The WG's roles focused on reviewing the content of the risk assessment matrix to ensure proper classification of problems and estimates of potential impacts; formulation of mitigation actions and sequencing of primary tasks; and identification of feasible implementation methods and schedules. Their comments were incorporated into the final 2018 hazard mitigation plan.

Prior to public release of the 2018 HMP, the WG drafted the plan through a series of Working Group meetings. While these meetings did not rise to the level of public hearings and were not advertised, they were open to the public.

Another public input strategy was geared toward the general public as opposed to specific stakeholders. During the draft review portion of the plan development, an electronic copy of the draft 2018 HMP was posted to the City's website. The public was informed of both the webpage posting and encouraged to submit comments electronically, by phone, or in person. See **Appendix C**.

Review and comments from the Federal Emergency Management Agency and the Rhode Island Emergency Management Agency were also incorporated prior to adoption by the City Council.

Before the WG began meeting regularly, the City was working on updating their Comprehensive Plan which includes discussions on floodplains, resource protection districts, and development trends. Members of the WG will be involved in the Comprehensive Plan update and will be incorporating elements of this document into the Comprehensive Plan.

3

Natural Hazards

Hazards of Concern

The Rhode Island 2016 Hazard Identification and Risk Assessment and 2011 Woonsocket Hazard Mitigation Plan were used as a starting point for identifying hazards that pose the largest threat to the City. The following table summarizes the hazards identified by the Woonsocket Hazard Mitigation Plan Working Group.

Table 2 Hazards Identified by the Woonsocket Hazard Mitigation Plan Working Group

Natural Hazards Identified by the State	Identified by the HMP Working Group
Severe Winter Weather	
<i>Ice Storm</i>	✓
<i>Snow</i>	✓
Flood	
<i>Riverine</i>	✓
<i>Coastal</i>	-
<i>Flash</i>	-
<i>Urban</i>	✓
High Wind	✓
Extreme Heat	✓

Natural Hazards Identified by the State	Identified by the HMP Working Group
Hurricane and Tropical Storms	
<i>Nor'easter</i>	✓
<i>Storm Surge</i>	-
Extreme Cold	✓
Thunderstorm	
<i>Hail</i>	✓
<i>Lightning</i>	✓
Dam Failure	✓
Fire	
<i>Urban</i>	✓
<i>Wildfire</i>	✓
Sea Level Rise	-
Epidemic	-
Drought	✓
Earthquake	✓
Tornado	✓
Human-Caused Hazards	
Cyber Security	-
Chemical Incident	✓
Terrorism	✓
Biological Incident	-
Radiological Incident	-
Civil Unrest	-
Technological Hazards	
Infrastructure Failure	✓

This plan will focus primarily on the natural hazards.

During the beginning phases of the planning process, the WG participated in an exercise that captured the frequency of various hazards, their potential damage extent, and their impacts (i.e. to populations, infrastructure, natural environment, etc.). The following scales were used during the analysis:

Frequency

Highly likely: near 100% probability within the next year;

Likely: between 10% and 100% probability within the next year or at least one chance in next 10 years;

Possible: between 1% and 10% probability within the next year or at least one chance in next 100 years;

Unlikely: less than 1% probability in next 100 years

Damage Extent

Low: some local property damage not city wide, minor injuries/ loss of life

Medium: 50% of property could be damaged and possible injuries/ loss of life

High: major city-wide property damage, injuries and loss of life

Level of Concern/Risk Rank

Developed by the WG to rank the various hazards based on frequency and damage potential.

Low - Not expected to occur with any frequency, damages will be limited.

Medium - Will occur within the next 10 years but the City has resources to reduce risks.

High - Expected to occur within the next 5 years, and is a major concern for the City.

Based on a combination of frequency, damage extent and impacts, the team assigned each hazard a Level of Concern. The table below summarizes the hazards of concern for the City of Woonsocket, ranked from a high concern to low concern

Table 3 Hazards Ranked

Hazard	Level of Concern/Risk Rank
Terrorism- Wastewater security	High
Nor'easter	Medium
Hurricane	Medium
Winter Storm	Medium
Ice Storm	Medium
Extreme Heat and Cold	Medium
High Winds	Medium
Infrastructure Failure- water supply safety	Medium
Fire (urban)- vacant homes pose a fire and safety risk	Medium
Flooding (Riverine)	Low
Flooding (Street)	Low
Dam Failure	Low
Fire (Brushfire)	Low
Lightning	Low
Hail	Low
Drought	Low
Tornadoes	Low

Hazard	Level of Concern/Risk Rank
Earthquake	Low
Infrastructure Failure- Hospital Power Loss	Low
Chemical Incident- Plating Shops, Environmental Health and Safety (EHS) facilities	Low
Fire (Dump Fires)	Unknown

The above human-caused hazards were discussed as a concern for the WG. Mitigating these hazards requires a highly facility-specific approach not explored in depth in this plan. However, including them in this plan was important for the WG to explore all the hazards that they are concerned about.

The following sub-sections are organized by the level of risk as identified in the table above.

Terrorism- Wastewater Security

The Woonsocket Regional Wastewater Facility is located in Woonsocket. This aging facility processes effluent from Woonsocket, North Smithfield; Blackstone, MA; and Bellingham, MA.

There have been recent significant upgrades to the wastewater treatment facility totaling \$40 million. These improvements will extend the operating capacity, and improve the quality of the effluent discharged into the Blackstone River.

Intentional tampering with the facility is a concern for the City.

Nor'easter

Description

A strong low pressures system along the Mid-Atlantic and New England can form over land or over coastal waters. The storm radius is often as large as 1,000 miles, and the horizontal storm speed is about 25 miles per hour, traveling up the eastern United States coast. Sustained wind speeds of 10-40 MPH are common during a nor'easter, with short term wind speeds gusting up to 70 MPH. Typically a winter weather event, Nor'easters are known to produce heavy snow, rain and heavy waves along the coast. Unlike hurricanes and tropical storms, nor'easters can sit off shore, wreaking damage for days.

Also called East Coast Winter Storms, Nor'easters are characterized by:

- › A closed circulation.
- › Located within the quadrilateral bounded at 45N by 65W and 70W, and at 30N by 85W and 75W.
- › Show a general movement from the south-southwest to the north-northeast.
- › Contain winds greater than 23 mph.

- › The above conditions must persist for at least a 12-hour period³.

The magnitude or severity of a severe winter storm or Nor'easter depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (e.g., weekday versus weekend) and time of season.

The extent of a severe winter storm (including Nor'easters that produce snow) can be classified by meteorological measurements and by evaluating its combined impacts. For measuring wind effects, the Beaufort Wind Scale is a system that relates wind speed to observed conditions at sea or on land. (See Table 8). The snow impact of a Nor'easter can be measured using NOAA's Regional Snowfall Index (See Section 3.1.7 Snow Storm).

Location

The City's close proximity to the Atlantic Ocean renders it particularly susceptible to Nor'easters and the resulting loss of human life and property.

Probability of Future Occurrence

Likely

Extent

On average, Woonsocket experiences or is threatened by a Nor'easter every couple of years.

Impact

Woonsocket is an inland community; most damage would be from downed power lines, downed trees, and damage to mobile homes or older structures. Nor'easters may result in advanced evacuations, an interruption in resources, and a strain on mutual resources coming in. The Blizzard of 1978 was the largest Nor'easter on record. Many people were without heat, food, and electricity for over a week.

Climate Change Impacts

Similar to hurricanes, changes in air and water temperatures will lead to stronger Nor'easters along the Atlantic Ocean. Woonsocket should expect stronger Nor'easters, but not necessarily more frequent storms.

3 Hersher, et al. An East Coast Winter Storm Climatology. Northeast Regional Climate Center, Cornell University, Ithaca, NY, 2001.

History

Table 4 Nor'easter History

Date	Comments
02/10/1969	Up to 20 inches of snow in parts of Rhode Island.
02/07/1978	27 inches of snow in Providence. State of emergency declared in RI and in surrounding MA and CT.
05/25/2005	Late season Nor'easter brought strong winds and heavy rains, some gusts as high as 60 mph.
02/12/2006	Heavy snow (9.4 inches at T.F. Green) and windy conditions
10/29/2011	A rare and historic October Nor'easter brought very heavy snow to portions of southern New England on Saturday October 29. Low pressure tracked northeast from the North Carolina coast Saturday morning, rapidly strengthening as it passed well south of Nantucket Saturday evening. As the storm intensified, colder air from aloft was drawn into New England resulting in heavy snow in the interior. 3-6 inches of snow fell across eastern Providence County.
02/08/2015	Long duration snow storm that dumped 7-13 inches of snow in southeast Providence County.
03/14/2017	Heavy wet snow followed by plunging temps hampered roads. 5.5 inches of snow reported in neighboring Pawtucket.

Hurricanes (Tropical Cyclones)

Description

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics. These storms are referred to as "cyclones" due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage (Rhode Island State Hazard Mitigation Plan 2014).

There are three categories of tropical cyclones:

1. Tropical Depression: maximum sustained surface wind speed is less than 39 mph
2. Tropical Storm: maximum sustained surface wind speed from 39-73 mph
3. Hurricane: maximum sustained surface wind speed exceeds 73 mph

Once a tropical cyclone no longer has tropical characteristics it is classified as an extratropical system (State of Rhode Island Hazard Identification and Risk Assessment 2016).

Most Atlantic tropical cyclones begin as atmospheric "easterly waves" that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the north, it begins to leave the area

where the easterly trade winds prevail and enters the temperate latitudes where the westerly winds dominate. This situation produces the eastward curving pattern of most tropical storms that pass through the Mid-Atlantic region. When the westerly steering winds are strong, it is easier to predict where a hurricane will go. When the steering winds become weak, the storm follows an erratic path that makes forecasting very difficult (State of Rhode Island Hazard Identification and Risk Assessment 2016).

Hurricanes are categorized according to the Saffir/Simpson scale (Table 8) with ratings determined by wind speed and central barometric pressure. Hurricane categories range from one (1) through five (5), with Category 5 being the strongest (winds greater than 155 mph). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 24 hours or sooner (State of Rhode Island Hazard Identification and Risk Assessment 2016).

The Saffir-Simpson scale below is based primarily on wind speeds and includes estimates of barometric pressure and storm surge associated with each of the five categories. It is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall."

Table 5 Saffir/Simpson Hurricane Wind Scale⁴

Wind Speed	Typical Effects
Category 1 – Weak 74-95 MPH (64-82kt)	Minimal Damage: Damage is primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage occurs in building structures. Some damage is done to poorly constructed signs.
Category 2 – Moderate 96-110 MPH (83-95kt)	Moderate Damage: Considerable damage is done to shrubbery and tree foliage; some trees are blown down. Major structural damage occurs to exposed mobile homes. Extensive damage occurs to poorly constructed signs. Some damage is done to roofing materials, windows, and doors; no major damage occurs to the building integrity of structures.
Category 3– Strong 111-130 MPH (96-113kt)	Extensive damage: Foliage torn from trees and shrubbery; large trees blown down. Practically all poorly constructed signs are blown down. Some damage to roofing materials of buildings occurs, with some window and door damage. Some structural damage occurs to small buildings, residences and utility buildings. Mobile homes are destroyed. There is a minor amount of failure of curtain walls (in framed buildings).

⁴ Source: National Weather Service, National Hurricane Center

Wind Speed	Typical Effects
Category 4 – Very Strong 131-155 MPH (114-135kt)	Extreme Damage: Shrubs and trees are blown down; all signs are down. Extensive roofing material and window and door damage occurs. Complete failure of roofs on many small residences occurs, and there is complete destruction of mobile homes. Some curtain walls experience failure.
Category 5 – Devastating Greater than 155 MPH (135kt)	Catastrophic Damage: Shrubs and trees are blown down; all signs are down. Considerable damage to roofs of buildings. Very severe and extensive window and door damage occurs. Complete failure of roof structures occurs on many residences and industrial buildings, and extensive shattering of glass in windows and doors occurs. Some complete buildings fail. Small buildings are overturned or blown away. Complete destruction of mobile homes occurs.

Storm surge is the abnormal rise in water level caused by the wind and pressure forces of a hurricane or nor'easter (State of Rhode Island Hazard Identification and Risk Assessment 2016). Nationally, storm surge flooding has caused billions of dollars in damage and hundreds of deaths. Given today's ever-increasing population densities in coastal states, the need for information about the potential for flooding from storm surge has become even more important. Further discussion on storm surge is not included in this plan, due to Woonsocket's inland location over 12 miles from the mouth of the Providence River.

Location

The City's close proximity to the Atlantic Ocean renders it particularly susceptible to hurricanes and the resulting loss of human life and property.

Probability of Future Occurrence

Likely.

Extent

Hurricanes that likely make it up to Rhode Island are usually weak (Category 1) or downgraded tropical systems. The wind speeds may be less but the storms can still bring a lot of rain.

Impact

Woonsocket is an inland community; most damage would be from downed power lines, downed trees, flooding and damage to older structures. May require advanced evacuations, interruption in resources, and a strain on mutual aid resources coming in.

Climate Change Impacts

Increasing air and water temperatures will lead to stronger hurricanes along the Atlantic Ocean. It is uncertain if changing climatic conditions will affect the storm tracks, allowing for more storms to head towards Rhode Island. Woonsocket should expect stronger hurricanes, but not necessarily more frequent hurricanes.

History

The unforeseen Great New England Hurricane of 1938 is the most catastrophic weather event in Rhode Island's history. The event occurred slightly before high tide and brought with it winds upward of 120 mph. A tidal surge inundated the nearby city of Providence with over 10' of water.

Woonsocket suffered loss of power, fires, flooding, and damage to houses and buildings. The top floor of a brick factory was demolished.

A Category 1 hurricane struck Rhode Island in August 1954 (Carol). The hurricane resulted in house and tree damage around Woonsocket.

In 1955 hurricanes Connie (August 11-15) and Diane (August 17) brought some of the worst flooding along the Blackstone River. In Woonsocket, the combined rainfall for both storms was 14-16 inches. The Blackstone River, normally 70 feet wide, swelled to over 1.5 miles wide in Woonsocket.⁵ The central social/business district was flooded.

In October 1991, Hurricane Bob hit Rhode Island as a Category 2 storm. The hurricane damaged business and homes as well as took down numerous trees and utility lines in Woonsocket. The hurricane barrier in Providence successfully prevented storm surge from coming up Narragansett Bay.

In 2011, Hurricane Irene hit Woonsocket as a tropical storm. Despite the relatively low wind speeds, sustained winds over a 6 to 12-hour long duration resulted in widespread tree damage and resulted in power outages to roughly half a million customers throughout the state. Numerous trees, poles, and wires were downed throughout Woonsocket. Wind gusts of 52 knots were observed locally. Collective effects throughout Massachusetts and Rhode Island resulted in 1 fatality, no injuries, and \$127.3 million in property damage.⁶



Woonsocket Falls Dam during TS Irene, August 28, 2011.

In October 2012, Hurricane Sandy severely impacted coastal Rhode Island as it came ashore with Tropical Storm strength winds. Peak wind speeds in Woonsocket were

⁵ Blackstone Daily <http://www.blackstonedaily.com/History&Heritage/naturaldisasters.htm>

⁶ NOAA Storm Event Database. <https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=345189>

65-69 mph. Being inland, Woonsocket was spared the storm surge but suffered minor damage throughout the city due to high winds and rain. There were widespread power outages and a backlog of requests for downed tree removal which restricted access to roads and private property.

Snow Storm

Description

The majority of Rhode Island lies outside the heavy snow and ice regions of the northeast. Due to its maritime climate, Rhode Island generally experiences cooler summers and warmer winters than inland areas. However, snow does occur and can be more than an inconvenience and cause extensive damage. The two major threats from heavy snow are stranded populations and snow loading on rooftops. Additionally, loss of power could mean loss of heat for many residents.

Winter storms vary in size and strength and can be accompanied by strong winds that create blizzard conditions and dangerous wind chill. There are three categories of winter storms. A blizzard is the most dangerous of the winter storms. It consists of low temperatures, heavy snowfall, and winds of at least 35 miles per hour. A heavy snow storm is one which drops four or more inches of snow in a twelve-hour period.



Blizzard of 1978, Maple Street

Location

All of Woonsocket is susceptible to snow storms. Roads and trees will be the most affected.

Probability of Future Occurrence

Highly Likely

Extent

The Regional Snowfall Index (RSI) is a scale that uses the area of snowfall, the amount of snowfall, and the number of affected people to rank high-impact storms.⁷

⁷ NOAA Regional Snowfall Index <https://www.ncdc.noaa.gov/snow-and-ice/rsi/>

On average, Woonsocket receives an average 37 inches of snow throughout the year. The average winter temperature in Woonsocket is 42 ° Fahrenheit.⁸

NOAA's RSI Scale

CATEGORY	RSI VALUE	DESCRIPTION
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18.0+	Extreme

Impact

Heavy snow can cause damage to private and public buildings, and strand motorists. During a heavy snow storm, the City may activate their shelters for people without power. There may be limited road access and slower emergency response times. Although expected to occur more frequently, snow is expected to have a less crippling effect on the City than an ice storm.

Climate Change Impacts

Warming temperatures will mean less moisture falls as snowfall. Rising temperatures will melt snow earlier in the spring. Woonsocket should experience fewer heavy snow events.

History

Woonsocket has been subjected to annual snowstorms. The Great Blizzard of 1978 blanketed Woonsocket with over 30 inches of snow and closed businesses for several days.⁹

The last significant windstorm to affect the City of Woonsocket occurred in December 2010 during a winter blizzard. In a separate winter storm, just two weeks after that in January 2011, over 15 inches of snow fell in a 15-hour period of time. Rhode Island, Connecticut, and Massachusetts were all impacted with over one hundred thousand homes without power due to downed trees and power lines from the heavy snow. The lack of heat forced many residents to leave their homes and seek shelter in hotels or emergency facilities. The power outages closed many businesses. The snow limited the ability of people and services to move around the City. Police officers had difficulty responding to calls in some neighborhoods.

⁸ U.S. Climate Data. <https://www.usclimatedata.com/climate/woonsocket/rhode-island/united-states/usri0113>

⁹ Remembering the Blizzard of '78 <https://www.weatherworksinc.com/remembering-blizzard-1978>

In 2015, Woonsocket experienced a substantial amount of snow in the Blizzard of 2015, and subsequent smaller weather events within a short timeframe between January and February of 2015. In the months of January and February, Woonsocket accumulated 60.2 inches of snow, ice pellets, and hail.¹⁰

Table 6 History of Significant Snow Events in Woonsocket

Date	Inches	Comments
02/18/2000	7-8	Some snowfall totals from the storm include 8 inches in Smithfield; 7 inches in Burrillville and North Kingstown; and 6 inches in downtown Providence, Warwick, Woonsocket, Cranston, and Hopkinton. Dozens of accidents were reported, many due to excessive speed.
12/30/2000	6-9	The season's first winter storm dumped 6 to 9 inches of snow in western Kent and northwest Providence Counties. Since the storm occurred on a Saturday, no major problems with travel were noted.
01/20/2001	7-8	Since the storm occurred over the weekend, impact on travel was kept to a minimum, but there were still several minor accidents throughout the state.
03/05/2001	6-10	Schools and businesses were shut down for three days in some communities; Woonsocket had 10 inches of snow.
12/25/2002	4-7	The weight of the snow, combined with strong northeast winds, brought down tree limbs and power lines. Woonsocket received 4 inches.
02/07/2003	7-13	No significant storm damage was reported, mainly due to the fluffy, light nature of the snow as temperatures fell into the teens and 20s during the height of the storm. Woonsocket reported totals of 13 inches.
02/17/2003	14-22	Snowfall totals of one to two feet were widely observed throughout Rhode Island. No significant damage was reported due to the storm, primarily since the snow was fluffy and light with temperatures in the teens and 20s.
12/05/2003	10-20	Two deaths were indirectly attributed to the storm. One man was killed when the inner tube he was riding in, towed behind a truck, hit a utility pole. Another man was killed when he was hit by a train while crossing the tracks on a snowmobile in Exeter. Woonsocket reported between 14-16 inches.
12/26/2004	6-10	There were dozens of reports of accidents due to the combination of slick roads and poor visibility. Woonsocket totaled 8 inches.
2/24/2005	5-8	Snowfall totals averaged 5 to 8 inches throughout the Ocean State, with locally as much as 10 inches near Woonsocket.
03/01/2005	4-8	Heavy snow and gusty winds affected Rhode Island and all of southern New England, as low pressure reformed off the mid-Atlantic coast and tracked southeast of the region. Snowfall totals of 4 to 8 inches were widely observed.
3/12/2005	7-9	Dozens of minor accidents and spinouts were reported, but no major problems occurred.
2/14/2007	2-4	Although snowfall totals only averaged 2 to 4 inches, this was the season's first winter storm, and the combination of snow and ice resulted in hazardous travel conditions.

¹⁰ City of Woonsocket. Resilience, Sustainability and Energy, Livability

Date	Inches	Comments
03/16/2007	7-8	This winter storm brought heavy snow and sleet to interior sections of Rhode Island with totals of 4 to 7 inches, before an eventual change to sleet, freezing rain, and then rain. Woonsocket received around 8 inches.
1/14/2008	5-6	Heavy snow fell across northern Rhode Island, downing trees and power lines.
12/19/2008	10-12	Ten to twelve inches of snow fell across northwestern Providence County.
12/31/2008	6-10	Numerous reports of six to ten inches of snow were received.
01/18/2009	6-7	A low-pressure system in the Great Lakes redeveloped south of New England, spreading snow across the area. Six to seven inches of snow fell across northwestern Providence County.
03/02/2009	5-10	This late season storm affected most of the east coast and resulted in hundreds of flight cancellations at Boston's Logan Airport and many car accidents.
12/19/2009	14-19	Fourteen to nineteen inches of snow fell across northwest Providence County.
12/26/2010	8-15	A strengthening winter storm passed southeast of Nantucket and brought heavy snow and strong winds to much of Rhode Island, resulting in near blizzard conditions at times.
01/12/2011	18-22	A developing nor'easter coastal storm dumped nearly two feet of snow across portions of Rhode Island in a 24-hour period.
02/01/2011	6-8	A total of six to eight inches of snow fell across Northwest Providence County over the two-day period, with upwards of a tenth of an inch of ice accumulation for isolated locations falling during the morning period on the 2nd.
12/29/2012	8-13	Snowfall totals between eight and thirteen inches were reported in northwest Providence County.
02/08/2013	21-28	An historic winter storm deposited tremendous amounts of snow over all of southern New England, mainly from the mid-afternoon on Friday, February 8 and lasting into the daylight hours of Saturday, February 9. Most locations received 2 to 2.5 feet of snow! Isolated thunderstorms were common across the entire region during the height of the storm.
3/7/2013	5-12	This storm brought heavy snow and significant coastal flooding to the forecast area.
12/14/2013	4-8	Four to eight inches of snow fell across northwestern Providence County.
01/02/2014	7-8	Seven to eight inches of snow fell across northwestern Providence County.
01/21/2014	10-12	Low pressure tracked along an arctic front bringing heavy snow and strong winds to much of southern New England.
02/5/2014	5-10	This spread heavy snow across all of southern New England. Five to ten inches of snow fell across northwestern Providence County.
02/13/2014	6-10	A significant winter storm brought six to twelve inches of snow across much of southern New England. Lesser amounts fell east of the Interstate 95 corridor where snow changed to rain.
01/26/2015	24-30	The highest snowfall totals, averaging two to three feet, extended from extreme northeast Connecticut and northwest Rhode Island into much of central and northeast Massachusetts, including greater Boston.

Date	Inches	Comments
02/02/2015	3-13	Three to thirteen inches of snow fell across northwestern Providence County.
02/08/2015	10-16	Resulted in a long duration snow storm that dumped up to a foot and a half of snow across southern New England.
2/14/2015	8-13	Eight to thirteen inches of snow fell across northwestern Providence County. A 56-year-old female custodian was injured when she fell through a skylight while clearing the snow from the roof of Smithfield High School on February 18th.
01/23/2016	5-8	In addition, strong, damaging winds accompanied the snow. Five to eight inches of snow fell across northwestern Providence County.
02/05/2016	6-12	This snow was extraordinarily wet and heavy, bringing down trees and wires across portions of southern New England.
02/08/2016	6-9	Six to nine inches of snow fell across northwestern Providence County.
04/04/2016	4-7	Four to seven inches of snow fell across northwestern Providence County.
01/07/2017	8-11	Eight to eleven inches of snow fell on Northwest Providence County during the day and evening.
02/09/2017	10-15	Coastal low pressure developed off the Mid Atlantic coast and passed southeast of New England bringing strong winds and heavy snow.
03/14/2017	7-13	In Rhode Island, snowfall amounts were highest in the northwest hills, where a changeover to sleet and rain did not happen until late in the afternoon. Woonsocket reported roughly 10.5 inches.

Source: National Climate Data Center (2017)

Ice Storm

An ice storm occurs when moisture falls and freezes immediately upon impact. The term ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations.

Freezing rain most commonly occurs in a narrow band within a winter storm that is also producing heavy amounts of snow and sleet in other locations. If extreme cold conditions are combined with low or no snow cover, the cold can

better penetrate downward through the ground and potentially create problems for underground infrastructure, as well. When utilities are affected and heating systems are compromised or do not work, water and sewer pipes can freeze and even rupture.



Ice Storm. Source: NOAA.

Location

All of Woonsocket is susceptible to ice storms.

Probability of Future Occurrence

Highly Likely.

Extent

Ice storms can be the most devastating winter weather phenomena and are often the cause of automobile accidents, power and communication system outages, personal injury, and death. Moreover, they can hinder the delivery of emergency services needed in response to these catastrophes and endanger the responders. Ice storms accompanied by wind gusts cause the most damage.

The Sperry-Piltz Ice Accumulation (SPIA) Index is a scale for rating ice storm intensity, based on the expected storm size, ice accumulation, and damages on structures, especially exposed overhead utility systems. The SPIA Index uses forecast information to rate an upcoming ice storm's impact from 0 (little impact) to 5 (catastrophic damage to exposed utility systems).

Woonsocket expects at least a level 1- isolated or localized utility interruptions every year due to ice.

Table 7 SPIA Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009			
ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Impact

The WG is most concerned about ice taking down trees and power lines throughout the city. Falling trees have taken out power lines, damaged buildings, and

essentially shut down parts of the city. Icy roads can also cause dangerous driving conditions.

Climate Change Impacts

Warming temperatures will mean less snowfall but if there is enough moisture in the atmosphere, it may fall as freezing rain, coating everything in ice. Woonsocket should expect more ice events.

History

Due to the unique weather in New England, ice storms are usually part of larger snow events. The winter storm event that crippled the state in February 1978 did include a FEMA disaster declaration for snow and ice. Subsequent storms have included ice warnings when there are rapidly warming and cooling temperatures. Rhode Island was spared the brunt of the 2008 ice storm which affected more than a million people across New Hampshire, Vermont, Massachusetts, Maine, Connecticut, and New York.

Extreme Temperatures

Description

Extreme cold may accompany winter storms, be left in their wake, or can occur without storm activity. Extreme cold can lead to hypothermia and frostbite, which are both serious medical conditions. The definition of an excessively cold temperature varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." In Rhode Island, extreme cold usually involves temperatures below zero degrees Fahrenheit.¹¹

The wind chill index attempts to quantify the cooling effect of wind with the actual outside air temperature to determine a wind chill temperature that represents how cold people and animals feel, based on the rate of heat loss from exposed skin. A wind chill index of -5 indicates that the effects of wind and temperature on exposed flesh are the same as if the air temperature alone were five (5) degrees below zero (0), even though the actual temperature could be much higher. The National Weather Service issues a wind chill



¹¹ The Rhode Island State Hazard Identification and Risk Assessment 2016

advisory when wind chill temperatures are potentially hazardous and a wind chill warning when the situation can be life-threatening.¹²

The National Weather Service issues **extreme (or excessive) heat** warnings when the maximum expected heat index is expected to be 105° F or higher for at least 2 consecutive days and night time air temperatures are not expected to fall below 75°. In the northeast, this criteria are generally modified to a heat index of 92° or higher for 2 consecutive days.

Location

An extreme heat or cold event would be a regional issue affecting Woonsocket and significant portions of Southern New England. Extreme temperatures could have a serious impact on private and public structures, as well as the general population throughout Woonsocket. Those most at risk to extreme temperatures are the elderly and those who work outside.



Probability of Future Occurrence

Likely.

Extent

One excessive heat event has been reported by NOAA for Providence County since 2000. In 2011, the North Central State Airport (5.5 SE of Woonsocket) reported heat indexes of 105 to 107 over an eight-hour period.

On February 16, 2015, wind chills of 26 below zero were reported at T.F. Green Airport (19 miles south of Woonsocket). The following year, wind chills of 32 below zero were reported on February 14, 2016 at T.F. Green Airport.

Impact

Personal exposure to dangerous heat conditions may lead to heat cramps, heat exhaustion, and heat stroke. These are especially important to monitor in children, and vulnerable populations that are not able to move to cooler conditions. Extreme cold conditions may occur during, after, or without any connection to a winter storm. Exposure to extreme cold can lead to hypothermia and frostbite.

¹² The Rhode Island State Hazard Identification and Risk Assessment 2016

Climate Change Impacts

Woonsocket should anticipate more frequent occurrences of extreme heat during the summer.

History

Extreme temperatures are recorded by NOAA and are the most accurate recording of weather in and around Woonsocket. The following table summarizes extreme temperature events within Providence County. TF Green Airport, located about 19 miles south of Woonsocket and North Central State Airport (5.5 SE of Woonsocket) are the nearest recording station.

Table 8 History of Extreme Temperatures near Woonsocket, RI¹³

Date	Temperature (F)	Remarks
05/09/2000	91	3rd day in a row of high temps exceeding 90 degrees at nearby TF Green airport. Earliest heatwave on record since 1904.
05/03/2001	91	At nearby TF Green airport.
05/04/2001	92	3rd day of temperatures reaching 90 degrees or higher, making it the NEW earliest heat wave on record in greater Providence.
05/12/2001	90	At nearby TF Green airport.
07/06/2010	Heat Index 105-106	At nearby TF Green airport.
07/22/2011	Heat index 105-106	At nearby TF Green airport.
02/16/2015	Wind chills - 26 below zero	At nearby TF Green airport.
02/14/2016	Wind chills - 32 below zero	At nearby TF Green airport.

High Winds

Description

Wind is the movement of air caused by a difference in pressure from one place to another. Local wind systems are created by the immediate geographic features in a given area such as mountains, valleys, or large bodies of water. National climatic events such as high gale winds, tropical storms, thunderstorms, Nor'easters, hurricanes, and low-pressure systems produce wind events in Rhode Island. Wind effects can include blowing debris, interruptions in elevated power and communications utilities, and intensification of the effects of other hazards related to winter weather and severe storms.

¹³ National Climate Data Center (2017).

The Beaufort Wind Scale is a 17-level scale used to describe wind speed and observed wind conditions at sea and on land. A wind classification of 0 has wind speeds of less than 1 mile per hour and are considered calm. On the other end, a classification of 10 with wind speeds reaching 63 miles an hour will blow down trees and cause considerable damage.

DRAFT

Table 9 Beaufort Wind Chart**Beaufort Wind Chart – Estimating Winds Speeds**

Beaufort Number	MPH		Terminology	Description
	Range	Average		
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	Severe gale	Light structure damage.
10	55-63	60	Storm	Trees uprooted. Considerable structural damage.
11	64-73	70	Violent storm	Widespread structural damage.
12	74-95	90	Hurricane	Considerable and widespread damage to structures.

Location

Wind events are expected throughout the year in Woonsocket.

Probability of Future Occurrence

Highly likely.

Extent

Wind speeds in neighboring Providence are indicative of Woonsocket (more local data unavailable). "With an average wind speed of 9.3 MPH, Providence is a windy city, 1.00 MPH higher than the national average. The average wind speed in Providence is about the same as the [State] average. The windiest season in

Providence is spring, with spring wind speeds reaching 10.27 MPH on average, 1.17 MPH higher than in the rest of the U.S..¹⁴

Impact

Strong wind gusts of 40 miles an hour (Beaufort Scale of 8) can blow twigs and small branches from trees. Occasional gusts and sustained winds at this speed (and above) are of concern to the City. Damages from wind events range from power outages, property damage to vehicles and buildings and fallen trees/limbs. Wind events in Woonsocket have resulted primarily in power outages and downed tree limbs with minimal property damage. It is important that the City of Woonsocket maintain their public tree trimming program that will reduce the likelihood of fallen trees/limbs from disrupting transportation routes and/or taking down power lines.

Climate Change Impacts

Wind speeds are expected to decrease. "Oceanographers at the University of Rhode Island have analyzed long-term data from several anemometers in southern New England and found that average wind speeds have declined by about 15 percent at inland sites while speeds have remained steady at an offshore site."¹⁵

History¹⁶

Woonsocket experiences high wind events annually.

Table 10 History of High Wind Events in and near Woonsocket

Date	Magnitude (kts)	Comments
09/11/2002	43-45	Numerous reports of downed trees and branches which took down power lines, one of which lit a brush fire along Route 104. Twenty thousand in property damage.
10/15/2003	47-50	High winds downed trees and large limbs causing scattered power outages.
11/13/2003	50-52	Peak wind gusts of 50-60mph brought down trees and power lines causing fifty thousand in total damages.
11/5/2004	50	Brought down large tree in Woonsocket, highs of 60mph in northern Providence County.
12/23/2004	55-58	Gusts estimated near 60mph brought down trees and wires in Providence, Smithfield, and Johnston. No reports of injuries.
04/02/2005	50-53	Several trees were blown down, no reports of injuries.
05/07/2005	50	Strong coastal storm brought high winds to parts of Rhode Island, more confined to the higher elevations of Providence County.
10/16/2005	58-60	Multiple trees, limbs, and wires were reported down in Cumberland, Woonsocket, Johnston, and East Providence.

¹⁴ WeatherDB <https://wind-speed.weatherdb.com/l/206/Providence-Rhode-Island> accessed 3/3/2017.

¹⁵ University of Rhode Island, 2012. Wind speeds in southern New England declining inland, remaining steady on coast: Climate change, urbanization among possible causes. <https://www.sciencedaily.com/releases/2012/12/121205091044.htm>.

¹⁶ NOAA Storm Event Database and Woonsocket 2010 Hazard Mitigation Plan.

Date	Magnitude (kts)	Comments
10/25/2005	58	Strong winds knocked a large tree down on interstate 95, partially blocking the northbound side of the interstate. In addition, several trees, wires, and limbs were reported down in Woonsocket, West Greenwich, Exeter, and Tiverton.
10/29/2006	50	Radio operators and the media reported several instances of downed trees and large branches in Woonsocket and Cumberland, one of which temporarily shut down a roadway.
12/1/2006	50-55	High tension wires and trees were brought down. One person was injured in Foster when a tree fell on Barlow Trail.
2/10/2008	58-60	Winds gusted as high as 67 mph in Woonsocket, Rhode Island and downed tree limbs and wires across much of Rhode Island.
01/25/2010	52	A weather station at a spotter's home recorded a wind gust of 60 mph. This resulted in strong to damaging winds across much of eastern Massachusetts and Rhode Island.
12/8/2011	55	Low pressure off the mid-Atlantic states moved up the coast passing southeast of Southern New England. This produced heavy rainfall and strong to damaging winds across much of the area.
10/29/2012	42-45	The NWS Cooperative Weather Observer in North Foster reported wind gusts to 51 mph. The general public reported sustained wind speeds of 48 mph. Various trees and power lines were brought down.
01/31/2013	56	The media reported gusts to 51 mph in Woonsocket. A primary power line was downed on East School Street in Woonsocket.

Infrastructure Failure- Water Supply Safety

The City of Woonsocket gets their drinking water from two surface water supplies- Crookfall Brook watershed (Reservoirs 1 & 3) and Harris Pond. Both are which are located outside of the City limits. Although the City participates in an active watershed management program, the privately held lands are under intense development pressure.¹⁷ In addition to water quality and unintentional contamination, the City is concerned about infrastructure failure.

Location

Crookfall Brook Watershed (within Smithfield, North Smithfield, and Lincoln) and Harris Pond (in Blackstone, MA).

Probability of Future Occurrence

Probable

Extent

Citywide compromise of drinking water

¹⁷ Rhode Island Department of Health, Protect Your Drinking Water.
<http://www.health.state.ri.us/publications/assessments/WoonsocketWaterDept.pdf>

Impact

Loss of water pressure for fire-fighting, impacts to drinking water quality or availability.

Climate Change Impacts

Climate change may put additional pressures on the drinking water system.

History

None.

Fire- Urban

The City of Woonsocket has over 300 vacant homes. The volume and density of these structures creates a fire hazard and poses risks to health and safety.

Location

Throughout the city.

Probability of Future Occurrence

Probable

Extent

There are multiple structure fires annually. In 2017 there were 157 structure fires.

Impact

If one building catches fire, it can be fast spreading, as the buildings are located close to one another. The vacant buildings represent tougher economic times and bring down neighborhood property values.

Climate Change Impacts

It is uncertain how climate change will affect blight.

History

There is a history of fires in vacant buildings- from single family homes to large industrial buildings.

Flooding (Riverine and Urban/Street)

Description

According to the Rhode Island State Hazard Identification and Risk Assessment 2016, "Flooding is a localized hazard that is generally the result of excessive precipitation. Flooding is the most commonly occurring natural hazard, due to the widespread geographical distribution of river valleys and coastal areas, and the attraction of human settlements to these areas. Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss."

"A flood, which can be slow or fast rising but generally develops over a period of days, is defined by the National Flood Insurance Program (NFIP) as:

- › A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from: overflow of inland or tidal waters; unusual and rapid accumulation or runoff of surface waters from any source; or a mudflow; or
- › The collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above."

Severe storms with heavy rain can generate flash floods which strike and end quickly. Flash flooding isn't limited to streams and rivers but also streets.

Flooding due to runoff occurs when water runs over the land's surface impervious surfaces (paved areas, building subdivisions, and highways). Two major environmental modifications are primarily responsible for drastically altering the rain fall-runoff relationship.

4. Making the land surface impervious by covering it with pavement and construction work.
5. Installing storm sewer systems that collect urban runoff rapidly discharging large volumes of water into stream networks and/or freshwater wetland system

Location

The City's proximity to the Blackstone River and its tributaries makes it vulnerable to flooding and the effects of precipitation storms. The area most commonly affected by backwater flooding is beneath the railroad tracks along Truman By-Pass. The United States Army Corps of Engineers' flood control project in the 1960s altered the natural path of the Blackstone River to reduce flood frequency and severity of flooding in Woonsocket. Most of the SFHAs are located around the 3 rivers that converge in the center of Woonsocket. In recent years, the City has experienced minor flooding almost annually. While such flooding may occur once or twice a winter season, groundwater seepage and storm water drainage can be a consistent problem in rainy months.

Probability of Future Occurrence

Street flooding is highly likely. Riverine flooding is possible. Due to climatic changes, it is quite possible that the City may experience similar flooding events on a more frequent basis.

Extent

Localized flooding can be expected to occur on an annual basis. The flood event which occurred in March 29, 2010 was a 250 year +/- event.

Impact

Heavy rains, quick thaws and precipitation, and hurricanes accompanied by heavy winds and rain make the City vulnerable to personal, property and environmental damage occasioned by flooding.

Flood prone areas and/or areas of concern are:

- Main Street bypass
- Debris clogging stormwater drains
- Basement apartments

Vulnerable structures include dams, residential homes, facilities storing hazardous materials, historic buildings, sewer pump stations and electric substations.

Climate Change Impacts

Heavier, more frequent precipitation events may cause more riverine flooding and flash flooding events in Woonsocket.

History

Table 11 History of Flooding in Woonsocket Since 2000¹⁸

Date	Damage	Comments
03/21/2001	3M	Minor to moderate flooding occurred along the Blackstone and Pawtuxet Rivers as a result of melting snow and heavy rainfall. Damage was estimated at three million dollars, and affected nearly 1,400 homes and 37 businesses. The Blackstone River at Woonsocket crested at 11.65 feet at 225 am on the 23rd (flood stage is 9 feet).
03/31/2001	N/A	Minor flooding occurred on some rivers, as flows remained high from the previous week's flooding. The Blackstone River at Woonsocket crested at 10.21 feet at 10am on the 31st (flood stage is 10 feet), and the Pawtuxet River at Cranston crested at 11.86 feet at 715 pm on the 31st (flood stage is 9 feet).
04/16/2004	N/A	A second round of heavy rainfall caused flooding on the Blackstone and Pawtuxet Rivers. Totals of 2 to 4 inches, combined with similar amounts just the week before, resulted in minor flooding along the Blackstone River and moderate flooding along the Pawtuxet. The Blackstone River at Woonsocket crested at 9.25 feet at 730 pm EDT on April 14. Flood stage is 9 feet.
8/14/2005	10K	Flash flooding in Woonsocket submerged a car. The occupants of the car had to be rescued from their car. No known injuries directly resulted from these storms.
10/15/2005	50K	Many roads were closed region wide; and approximately 500 evacuations occurred. These evacuations were concentrated mainly along the Pawtuxet, Pocasset, Woonasquatucket, and Blackstone Rivers. Along the Blackstone River, evacuations occurred in Woonsocket and Central Falls.
03/08/2008	30K	In Woonsocket, several roads were flooded. A golf course near the intersection of Route 7 and Interstate 295 in nearby Smithfield was flooded.
03/30/2010	Unknown	During the March 2010 flood events, the Blackstone River rose to moderate flood stage. Flooding caused a national computer system failure at CVS that affected prescription services in all 7,000 pharmacy locations. Other damage was related to storm drains, road damage, and residential and commercial flooding. There were no major damages.

Dam Failure

Description

Dams are classified as high hazard, significant hazard or low hazard. The classification is not based on whether a dam is deemed safe or unsafe. As of 2015, there are 96 high hazard dams, 81 significant hazard dams and 490 low hazard dams in the state. Each dam's hazard classification determines the frequency of inspection. The higher the classification, the more frequently the inspection is conducted.

A *High Hazard* dam is one whose failure or misoperation will result in a probable loss of human life.

¹⁸ National Climate Data Center (2017) and personal accounts.

A *Significant Hazard* dam is one whose failure or misoperation results in no probable loss of human life but may cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety or welfare.

A *Low Hazard* dam is one whose failure or misoperation results in no probable loss of human life and low economic losses.

As part of each RIDEM inspection, the major components of the dam are subjectively rated as good, fair or poor. The major components are the embankment, the spillway and the low level outlet. Good means the dam meets the minimum Army Corps of Engineers (ACOE) guidelines. Fair means the dam has one or more components that require maintenance. Poor means a component of a dam has deteriorated beyond maintenance and is in need of repair.

Flood events call into question the structural integrity of dams that would affect Woonsocket. In addition to the threat of flooding downstream during a dam breach, the City is also concerned about the dam gate systems. It is suspected that most of the antiquated dam gates may not open properly to let off water, thereby flooding the areas behind the dam.

In 2016 the Rhode Island Department of Environmental Management (RIDEM) identified 13 dams in the City of Woonsocket. Two (2) of the 13 dams are classified as high hazard dams and one (1) dam is identified as significant hazard dams. The remainder are considered low hazard.

The following summaries set forth the conditions of the three dams that are classified as significant or high hazard dams.

Location

Harris Pond Dam at Mill River (high)

- 2016 Annual inspection by RIDEM: vegetation prohibited inspection, low level outlet operability unknown

Holley Lane Pond at Iron Rock Brook (high)

- 2016 Annual inspection by RIDEM: vegetation prohibited inspection, spillway flow diverted

Woonsocket Falls Dam at Blackstone River (significant)

- As per 2016 Annual Dam Safety Program Report by RIDEM, the dam was under the authority of the Federal Energy Regulatory Commission

Probability of Future Occurrence

Possible

Extent

All three dam hazard classifications are represented in Woonsocket. The extent of a failure would vary. The Woonsocket Hazard Mitigation Plan Working Group has

identified failure as a break in the dam, sending water downstream, or faulty gates which if not opened will cause flooding behind the dam.

Impact

The Woonsocket Hazard Mitigation Plan Working Group recognizes that a dam failure is not a natural hazard in itself but several of the hazards listed in the hazard list could bring dam failure upon the City of Woonsocket and areas downstream. Severe winter storms, flooding, and a hurricane could all bring enough rain and or snowfall to cause a dam failure. The age of these dams also poses a risk to the structural integrity of these dams. A failure of the antiquated gates could cause considerable loss to lives, property and economy.

Climate Change Impacts

Heavier, more frequent precipitation events may cause more riverine flooding stress the dams in Woonsocket.

History

In August 1955 after hurricanes Connie and Diane, Horseshoe Dam failed, flooding a four-square mile tenement and small store area.¹⁹ Peak flow in Woonsocket was 2.2 times the peak during the 1938 flood and the stage was 7.4 feet higher.²⁰ A state of emergency was declared later that night.²¹

Brushfire

Description

Brushfires (smaller versions of wildfires) are fueled by natural cover, including native and non-native species of trees, brush and grasses, and crops along with weather conditions and topography. While available fuel, topography, and weather provide the conditions that allow wildfires to spread, most wildfires are caused by people through criminal or accidental misuse of fire.

Brushfires pose serious threats to human safety and property in rural and suburban areas. They can destroy crops, timber resources, recreation areas, and habitat for wildlife. Wildfires are commonly perceived as hazards in the western part of the country; however, wildfires are a growing problem in the wildland/urban interface of the eastern United States, including Rhode Island.

Brushfires are dependent upon the quantity and quality of available fuels. Fuel quantity is the mass per unit area. Fuel quality is determined by a number of factors, including fuel density, chemistry, and arrangement. Arrangement influences the availability of oxygen. Another important aspect of fuel quality is the total surface

¹⁹ <http://www.gendisasters.com/rhode-island/12268/woonsocket-ri-dam-collapse-aug-1955>

²⁰ USGS Floods of August 1955 in the Northeastern States. <https://pubs.usgs.gov/circ/1956/0377/report.pdf>

²¹ <http://www.gendisasters.com/rhode-island/12268/woonsocket-ri-dam-collapse-aug-1955>

exposed to heat and air. Fuels with large area-to-volume ratios, such as grasses, leaves, bark and twigs, are easily ignited when dry.

Climatic and meteorological conditions that influence wildfires include solar insolation, atmospheric humidity, and precipitation, all of which determine the moisture content of wood and leaf litter. Dry spells, heat, low humidity, and wind increase the susceptibility of vegetation to fire. In Rhode Island, common factors leading to large fires include short-term drought, humidity below 20%, and fuel type.

Various natural and human agents can be responsible for igniting wildfires. Natural agents include lightning, sparks generated by rocks rolling down a slope, friction produced by branches rubbing together in the wind, and spontaneous combustion.

Human-caused wildfires are typically worse than those caused by natural agents. Arson and accidental fires usually start along roads, trails, streams, or at dwellings that are generally on lower slopes or bottoms of hills and valleys. Nurtured by updrafts, these fires can spread quickly uphill. Arson fires are often set deliberately at times when factors such as wind, temperature, and dryness contribute to the fires' spread.

Location

The forested outer edges of Woonsocket are susceptible to fire.

Probability of Future Occurrence

Likely

Extent

Minimal, only a couple of acres.

Impact

Individual buildings may be more or less vulnerable to damage from wildfire based on factors such as the clear distance around the structure and the structure's construction materials. Brushfires primarily impact natural ecosystems, although the threat to nearby buildings is always present.

Climate Change Impacts

Changes in precipitation patterns may shorten the dry periods that produce ideal conditions for brushfires. However, periods of drought may be more intense, increasing the fire hazard during the summer.

History

According to the 2011 Hazard Mitigation Plan, Woonsocket has experienced 0 substantial brushfires in the past 175 years. No further information was recalled by the Working Group.

Lightning/Thunderstorms

Description

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year, but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. The National Weather Service (NWS) classifies a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 MPH or greater, or a tornado. About 10 percent of the estimated 100,000 annual thunderstorms that occur nationwide are considered severe. Thunderstorms affect a smaller area compared with winter storms or hurricanes, but they can be dangerous and destructive for a number of reasons. Storms can form in less than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce flash flooding.

All thunderstorms contain lightning. Thunderstorms can occur singly, in clusters, or in lines. Therefore, it is possible for several thunderstorms to affect one location in the course of a few hours. Thunderstorms usually bring heavy rains (which can cause flash floods), strong winds, hail, lightning, and tornadoes. Lightning is caused by the attraction between positive and negative charges in the atmosphere, resulting in the buildup and discharge of electrical energy. Lightning is one of the most underrated severe weather hazards, yet ranks as the second-leading weather killer in the United States. "Hundreds of people across the nation are injured annually by lightning, most commonly when they are moving to a safe place but have waited too long to seek shelter. Lightning strike victims often suffer long-term effects such as memory loss, sleep disorders, weakness and fatigue, chronic pain, depression and muscle spasms. Lightning has the potential to start both house fires and wildfires. Lightning causes an average of 55-60 fatalities, 400 injuries, and over \$1 billion in insured losses annually nationwide." Lightning often strikes as far as 10 miles away from any rainfall.

Location

All of Woonsocket is susceptible to lightning/thunderstorms.

Probability of Future Occurrence

Highly Likely.

Extent

There is no universally accepted standard for measuring the strength or magnitude of a lightning storm. Similar to modern tornado characterizations, lightning events are often measured by the damage they produce. Building construction, location, and nearby trees or other tall structures will have a large impact on how vulnerable an individual facility is to a lightning strike. A rough estimate of a structure's likelihood of being struck by lightning can be calculated using the structure's

ground surface area, height, and striking distance between the downward-moving tip of the stepped leader (negatively charged channel jumping from cloud to earth) and the object. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles which the stepped leader can jump to.

Impact

Lightning can strike buildings and accessory structures, often causing structure fires. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communication outages for businesses, residencies, and critical facilities.

Human vulnerability is largely determined by the availability and reception of early warnings for the approach of severe storms, and by the availability of nearby shelter. Swimming, boating, and fishing are particularly dangerous during periods of frequent lightning strikes, which can also cause power outages, topple trees, and spark fires. Individuals who immediately seek shelter in a sturdy building or metal-roofed vehicle are much safer than those who remain outdoors. Early warnings of severe storms are also vital for aircraft flying through the area.

Climate Change Impacts

Changing weather patterns will lead to more severe thunder and lightning storms.

History

There has been no reported loss of human life in Woonsocket in the past 50 years due to lightning.

Hail

Hail is formed in towering cumulonimbus clouds (thunderheads) when strong updrafts carry water droplets to a height at which they freeze. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 MPH. Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long. Hail larger than 0.75 inch in diameter can do great damage to both property and crops, and some storms produce hail over two inches in diameter. Hail causes about \$1 billion in damages annually in the U.S. (Rhode Island State Hazard Identification and Risk Assessment 2016).

Table 12 Hail Size

Hail Diameter	Size Description
1/4"	Pea Size
1/2"	Mothball Size
3/4"	Penny Size

Hail Diameter	Size Description
7/8"	Nickel Size
1" (Severe Criteria)	Quarter Size
1 1/4"	Half Dollar Size
1 1/2"	Walnut or Ping Pong Ball Size
1 3/4"	Golf Ball Size
2"	Hen Egg Size
2 1/2"	Tennis Ball Size
2 3/4"	Baseball Size
3"	Teacup Size
4"	Grapefruit Size
4 1/2"	Softball Size

Location

All of Woonsocket is susceptible to hail.

Probability of Future Occurrence

Likely

Extent

The hail in Woonsocket is usually 1 inch or smaller.

Impact

Structure vulnerability to hail is determined mainly by construction and exposure. Metal siding and roofing is better able to stand up to the damages of a hailstorm than many other materials, although it may also be damaged by denting. Exposed windows and vehicles are also susceptible to damage. Crops are extremely susceptible to hailstorm damage, as even the smallest hail stones can rip apart unsheltered vegetation.

Climate Change Impacts

There is uncertainty about the effects of climate change on hail storms in Woonsocket. It is likely that the changes in weather patterns may bring more severe hail events.



History

Table 13 History of Hail in Woonsocket

Date	Type	Comments
06/30/2001	1" Hail	Severe thunderstorms dropped dime to quarter sized hail in Woonsocket, and downed trees and large branches in Woonsocket, Burrillville and Glocester.
06/28/2007	1" Hail	A large and powerful thunderstorm produced nickel to quarter size hail across a large area of Northern Rhode Island, including the cities of Woonsocket, Lincoln, and Smithfield.

Source: National Climate Data Center (2017)

Drought

Description

Drought is characterized as a continuous period of time in which rainfall is significantly below the norm for a particular area over a multi-year period. The American Meteorology Society defines drought as a period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance. Drought differs from other natural hazards in that they occur suddenly. Rather, a drought evolves over months or even years and, while causing very little structural damage, can have profound economic, environmental, and social impacts.



Drought in nearby Connecticut.

Source: Bob Luckey Jr./ Hearst Connecticut Media

There are four different ways that a drought can be defined:

1. Meteorological – A measure of departure of precipitation from normal. Due to climatic differences, what is considered a drought in one location may not be a drought in another location.
2. Agricultural – refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.
3. Hydrological- occurs when surface and subsurface water supplies are below normal.
4. Socioeconomic- refers to the situation that occurs when physical water shortage begins to effect people.

Characteristics and impacts of drought differ in many ways, so it is difficult to quantify drought. An existing index called the Palmer Drought Severity Index (PDSI)

that used temperature and precipitation levels to determine dryness, measuring a departure from the normal rainfall in a given area. The PDSI uses temperature and precipitation levels to determine dryness. The advantage of the PDSI is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions. A monthly PDSI value below -2.0 indicates moderate drought, and a value below -3.0 indicates severe drought.

Table 14 Drought Severity ²²

Severity	PDSI Index Value	Drought Level	Possible Impacts
Exceptional Drought	-5 or less	Emergency	Widespread crop/pasture losses, shortages of water creating water emergencies.
Extreme Drought	-4 to -4.9	Warning	Major crop/pasture losses, widespread water shortages or restrictions.
Severe Drought	-3 to -3.9	Watch	Crop or pasture losses likely, water shortages common, water restrictions imposed.
Moderate Drought	-2 to -2.9	Advisory	Some damage to crops/pastures, developing water shortages, voluntary water-use restrictions requested.
Mild Drought/ Abnormally Dry	-1 to -1.9	Normal	Short term dryness slowing planting or crop growth.
Incipient Dry Spell	-0.9 or less	-	-

Rhode Island, as with most states within the United States, uses both the Palmer Drought Severity Index (PDSI) and the Crop Moisture Index (CMI) as indices for a drought occurrence. The CMI (a derivative of the PDSI) provides information on the short-term or current status of purely agricultural drought or moisture surplus. The PDSI is most effective for determining long-term drought conditions, while the CMI is effective at helping determine short-term drought.

The RI Drought Steering Committee assigns drought levels for the seven designated drought regions in the state, based on hydrological indices such as precipitation, groundwater, stream flow, and the PDSI, as well as on local supply indices such as static groundwater levels and reservoir levels. The Normal, Advisory, and Watch levels are issued statewide. The Warning and Emergency levels are issued on a regional basis and consider local conditions, source of water supply, and water storage capacity issues.

Location

According to the Rhode Island Water Resource Board the potential for a drought exists every eleven years in Rhode Island. Although temporary drought conditions

²² <http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx>

may occasionally exist in Rhode Island, affecting Woonsocket devastatingly, long term drought conditions are not indicative of this temperate region.

Probability of Future Occurrence

Unlikely.

Extent

According to the National Weather Service Rhode Island receives on average 39" to 54" of rain annually. Even though the state receives more rain annually than the average for the United States (29.53 inches), Rhode Island does experience extended periods of dry weather. Some level of meteorological drought, while not frequent, does occur in Woonsocket every couple of years.

Impact

The main impact of meteorological drought is periods of very high fire danger. Drought conditions can impact water-dependent manufacturing, and reservoir levels.

Climate Change Impacts

Changes in precipitation patterns may increase the water tables, however, periods of drought may be more frequent/extended.

History

Extended droughts are rare in Rhode Island with a record of six major droughts (those lasting for more than one year) since 1929. The longest and most severe drought occurred in 1963-67 and affected most of the northeast. Water shortages affected most communities in Rhode Island and several municipal-supply wells were drilled to augment declining public supplies.²³

Table 15 History of Droughts that Have Affected Woonsocket²⁴

Date	Area Affected	Remarks
1930-31	Statewide	Stream flow of 70% normal.
1941-45	Statewide	Stream flow of 70% normal in Blackstone and Pawtuxet Rivers.
1949-50	Statewide	Stream flow of 70% normal.
1963-67	Statewide	Water restrictions/well replacements common.
1980-81	Statewide	Groundwater deficient in eastern part of state. Considerable crop damage.
1987-88	Southern part of the State	\$25 million crop damage.

²³ USGS Floods and Droughts <https://md.water.usgs.gov/publications/wsp-2375/ri/>

²⁴ National Climate Data Center (2017).

Date	Area Affected	Remarks
1998-99	Statewide	Spring through summer the State experienced 75% of normal flow.
2012	Statewide	January –April 2012. Meteorological drought due to precipitation levels one half of normal.
2016	Statewide	Drought Advisory

Tornadoes

A tornado is a violent windstorm with a twisting, funnel-shaped cloud. They are often spawned by thunderstorms or hurricanes. Tornadoes are produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year. Over 80 percent of all tornadoes strike between noon and midnight. During an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one-mile-wide and 50 miles long.

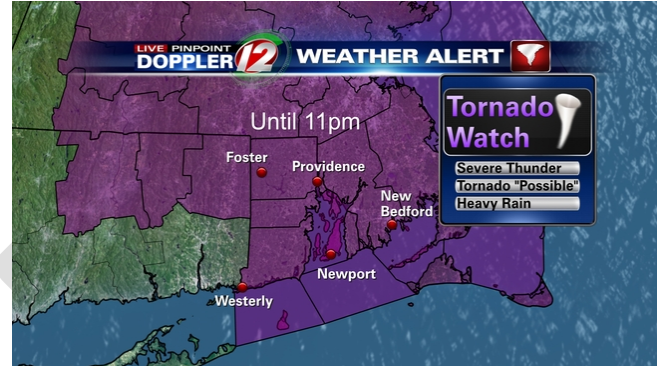


Image from WPRI dated June 23, 2015.

Tornadoes are categorized according to the damage they produce using the Fujita Scale (F-scale). Below is the Enhanced Fujita (EF) Scale and the Old Fujita (F) Scale. An F0 tornado causes the least amount of damage, while an F5 tornado causes the most amount of damage. Relatively speaking, the size of a tornado is not necessarily an indication of its intensity. On August, 7th, 1986, a rare outbreak of seven tornadoes occurred in New England. One such tornado, rated F2 on the Enhanced Fujita Scale, carved its way through Cranston, RI, and Providence, RI, causing twenty injuries and \$2,500,000 in damages. **Table 18** highlights more tornado events that have affected, Rhode Island.

Table 16 Enhanced Fujita Scale

Enhanced Fujita Scale		Damage Scale
EF Number	3 Second Gust (MPH)	
0	65-85	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.

Enhanced Fujita Scale		Damage Scale
EF Number	3 Second Gust (MPH)	
1	86-110	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
2	111-135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
4	166-200	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
5	Over 200	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

Probability of Future Occurrence

Possible.

Location

The hazard mitigation planning working group recognizes that the risk of tornadoes is low for the State of Rhode Island and City of Woonsocket but with the recent changing weather patterns and touchdowns of tornadoes, it is prudent to consider them a potential hazard.

Extent

All of Woonsocket is susceptible to tornadoes.

Impact

Tornadoes can cause significant damage to infrastructure, private property, and utilities. Flying debris can cause injuries to residents. Mobile homes are generally more vulnerable to damage than steel framed structures. The city has no mobile homes but many manufactured homes within its borders; these properties are more susceptible to the threat of a tornado.

Climate Change Impacts

It is uncertain how climate change will affect tornado outbreaks in Woonsocket.

History

Table 17 Recent Tornado Events in Rhode Island²⁵

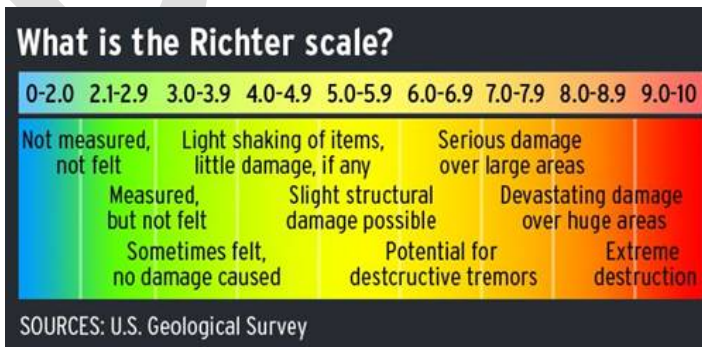
Date	F-Scale	Injuries	Damage	Location
08/16/2000	0	0	\$0	Providence County
08/7/2004	0	0	\$0	Kent County
07/23/2008	1	0	\$47,987	Bristol County
08/10/2012	0	0	\$50,000	Washington County

Earthquake

An earthquake (also known as a quake, tremor or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. The seismicity or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured with a seismometer. The size or magnitude is recorded on a device known as a seismograph. Earthquakes with a magnitude 3 or lower are mostly imperceptible (too low to recognize) and magnitude 7 earthquakes cause serious damage over large areas.

Although earthquakes are not considered to be a major problem in the Northeast United States, they are more prevalent than one might expect. **Table 20** presents historical seismic activity for Rhode Island. It highlights the earthquake epicenter, the Richter magnitude at the epicenter, and the Mercalli Intensity Level. Richter magnitudes are technical quantitatively based calculations that measure the amplitude of the largest seismic wave recorded. Richter magnitudes are based on a logarithmic scale and are commonly scaled from 1 to 8. See the graphic below. The higher the magnitude on the Richter Scale, the more severe the earthquake. Mercalli intensity levels are based on qualitative criteria that use the observations of the people who have experienced the earthquake to estimate the intensity level. The Mercalli scale ranges from I to XII. The higher the intensity level on the scale, the closer the person is to the epicenter.

Figure 1 Richter Scale



²⁵ Rhode Island Emergency Management Agency (RIEMA), Rhode Island 2014 Hazard Mitigation Plan Update. There have been no reported tornadoes in Woonsocket.

Table 18 Mercalli Scale

Modified Mercalli Intensity	Description of Intensity Level
I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level distorted. Objects thrown into the air.

Despite the low probability of a high impact earthquake, physical characteristics in Rhode Island may increase earthquake vulnerability:

- › Hard Rock: Due to the geological makeup of New England's base rock, seismic energy is conducted on a greater scale (four (4)-10 times that of an equivalent Richter magnitude earthquake in California).
- › Soft Soil: Many coastal regions of New England are made up of soft soils. These soils can magnify an earthquake as much as two times.
- › Structures: The New England region, being one (1) of the first settled areas of the United States, has an abundance of older, unreinforced masonry structures that are inherently brittle and very vulnerable to seismic forces.
- › Low Public Awareness of Vulnerability: Little public recognition of earthquake threat, and no established system of educating or informing the public of the

threat or how to prepare for or respond during an earthquake. Therefore, higher losses will occur here than in other regions of the country.

Location

Rhode Island is located in the North Atlantic tectonic plate and is in a region of historically low seismicity. Only three (3) or four (4) earthquakes of Modified Mercalli Intensity Scale (MMI) V or greater have been centered in Rhode Island, including the 1951 South Kingstown earthquake of magnitude 4.6 on the Richter scale. The City of Woonsocket is about 38 miles north of South Kingstown.

Probability of Future Occurrence

Unlikely. Damaging earthquakes do not normally occur in this region. Seismologists have estimated that there is about a 50% probability of a very damaging magnitude 5.0 earthquake occurring anywhere in New England, in a 50-year period²⁶.

Extent

Rhode Island is located in an area of “moderate” seismicity and “high” risk. Seismic risk applies to the seismic hazard, location demographics, and regional economics to the vulnerabilities of the structure or lifeline on the site. However, based on past occurrences, current geologic makeup and future climate changes, the City of Woonsocket is not anticipating any disturbances higher than a Class IV intensity.

Impact

The WG recognizes that the potential for an earthquake to strike the City of Woonsocket is low but the hazard could afflict city wide damage, causing power outages, building collapses, water main breaks, dam failures, gas leaks, fires and injuries or deaths. Buildings that are most at risk from earthquakes are the old masonry buildings and large structures such as those in the Historic Districts. Roughly 80% of the housing stock was built before 1940.

Climate Change Impacts

It is uncertain how climate change will affect earthquakes in Woonsocket.

History

No major earthquakes have happened in Woonsocket but the resulting damage it could produce makes it a threat.

26 Rhode Island State Hazard Identification and Risk Assessment, 2016.

Table 19 Historic Seismic Activity in/near Rhode Island²⁷

Date	Epicenter	Epicenter Magnitude	Mercalli Intensity Level
10/16/1963	Coastal MA	4.5	Caused some cracked plaster (MMI V) at Chepachet, Rhode Island.
06/14/1973	Western Maine	unknown	The intensities in Rhode Island were IV at Charlestown and I-III at Bristol, East Providence, Harmony, and Providence.
03/11/76	Near Newport, RI	3.5	Intensity level VI shock effects felt throughout Southern New England. This earthquake has the distinction of being the largest earthquake to originate in Rhode Island.
04/20/02	Plattsburgh, NY	5.2	Intensity level II to III shock effects felt throughout Rhode Island.
03/11/08	Central Connecticut	2.9	No data reported for Rhode Island
06/23/10	Ontario-Quebec	5.0	Felt throughout Rhode Island.
2011	Rhode Island	0.9	Felt locally
2012	Rhode Island	1	Felt locally
2013	Kingston, RI	Unknown	Felt locally
03/07/2014	Woonsocket	1.7	Felt locally, no tsunami statement issued
01/12/15	Wauregan, CT	3.3	Felt locally in RI, but maybe not in Woonsocket
07/22/15	East Providence, RI	2.3	Felt locally in RI, but maybe not in Woonsocket

Infrastructure Failure- Hospital Power Loss

Strong storms, faulty equipment, an errant mylar balloon, or some other disruptor has lead to widespread power outages. One of the most critical facilities in Woonsocket is the Landmark Medical Center.

Location

Landmark Medical Center

Probability of Future Occurrence

Probable.

Extent

Landmark Medical Center

²⁷ United States Geologic Survey http://neic.usgs.gov/neis/states/rhode_island/rhode_island_history.html and Earthquake Hazards Program "Did You Feel It" Archives.

Impact

Landmark Medical Center is anticipated to be a Level 3 trauma center (Level I is the highest designation a trauma center can receive). It is expected that half of the patients will be from Massachusetts. A power outage without sufficient backup power could tax the system with critical care patients.

Climate Change Impacts

Climate change may increase storm intensity in Woonsocket, thereby increasing the vulnerability of the electric grid.

Table 20 History

Date	Event
04/19/2017	Backup generator fails during planned power outage
08/03/2017	Power outage to Landmark Medical Center (among others) due to a squirrel on power line equipment.

Chemical Incident

Location

Plating shops, Environmental Health and Safety (EHS) facilities.

Probability of Future Occurrence

Probable

Extent

Not many plating shops in the City but a chemical release at SteriCycle or Highland Park could be dangerous if not properly managed.

Impact

Depends on location.

Climate Change Impacts

It is uncertain how climate change will affect earthquakes in Woonsocket.

History

None.

Fire (Dump Fires)

The City of Woonsocket has seen a rise in the number of fires on private property that are not related to a residential structure. A pile of debris in the backyard, although unsightly can become a fire hazard if not managed properly. Often these private dumping areas are adjacent to the property line, spreading the fire threat onto neighbors.

Location

Private property throughout the city.

Probability of Future Occurrence

Possible

Extent

Unknown

Impact

Fire and health risk to neighboring properties

Climate Change Impacts

It is uncertain how climate change will affect dump fires.

History

Recently a dump fire on private property threatened the Providence-Worcester railroad right-of-way

Climate Change

Changing climate patterns globally and in Rhode Island will worsen the effects of natural hazards and affect future planning and mitigation efforts. Long-term climate change is likely to cause the following impacts in Woonsocket:

- › Heavier, more frequent precipitation events, which may cause more riverine flooding and flash flooding events.
- › Longer periods of drought which may affect water availability and increase the threat for wildfires.
- › Increasing air and water temperatures.
- › More frequent high heat days and heat waves.

How rapidly these changes will be felt is debatable but there is certainty within the state that municipalities need to be prepared. One approach is to become more adaptable/resilient to the changing conditions. A second approach is to mitigate the impacts by being more energy efficient and reducing air pollution- a contributor to global warming.

Through the exercise of creating this plan, the City of Woonsocket is exploring ways to reduce their long and short-term risks to a variety of hazards. Fortunately, being an inland community, Woonsocket does not have to be concerned about storm surge and erosion but being in a coastal state, any storm that comes up the eastern seaboard will likely impact the city which is located approximately 12 miles from the mouth of the Providence River. As climate conditions intensify, the WG is prepared to update this plan accordingly.

4

Risk Assessment

Facilities Inventory

The first step in the assessment process was to create the inventory of facilities of special concern to the City. The WG identified the following as community assets:

- › Flood prone drainage systems/streets
- › Bridges spanning rivers
- › Wastewater facilities
- › Water supply systems
- › Flood control projects
- › Utilities
- › Communication towers
- › Dams
- › Critical facilities
- › Populations
- › Businesses
- › Schools
- › Recreational facilities
- › Historic resources

During the review of these assets, the WG came to the conclusion that not all of these are so vulnerable they require a mitigation action within the next 5 years. As

infrastructure ages, and climate conditions change, the WG will update this plan accordingly.

These most vulnerable assets are identified in the Community Assets Matrix, Section 4.8.

Hazard Mitigation Mapping

The City's GIS database, including parcel data, orthophotography and FEMA flood zone information, were utilized to complete the assessment. The use of this system allowed the WG to estimate potential fiscal and population impacts for individual parcels (see Sections 4.3 and 4.4 for results).

The final output of this exercise is the City of Woonsocket Resources map (Appendix A). The focus of the maps is not to duplicate all of the spatial information generated through the inventorying process but rather to present the location of the identified risks as they relate to the City's response facilities.

Fiscal Impact Analysis

The City of Woonsocket's parcel data and FEMA's 1% annual chance floodplain data were utilized to generate estimates of potential fiscal impacts from natural hazard events such as flooding. The information utilized from the tax assessor's database and GIS included the improvement values, land usage, and unit counts. The analysis showed that Woonsocket is comprised of 4,928 acres of land, with 62 acres (1.25%) in the regulatory floodplain. These 62 acres are mainly located along the Blackstone River and tributaries along South Main Street and Diamond Hill Road.

HAZUS-MH was used to further understand the potential risk from a large hurricane. HAZUS-MH²⁸ is a software tool that contains models for estimating potential losses from earthquakes, floods, and hurricanes. For the purpose of this plan, a scenario was run that capture the city's risk from hurricane damage. Table 21 below summarizes some of the potential damages. The hurricane scenario model uses the same path as the hurricane which tracked west of Woonsocket.

In 1954 Hurricane Carol (peak gusts at 89 mph) tore through Southern New England, causing extensive damage throughout Rhode Island. If this same storm were to strike again today, it would cause over \$44 million dollars in total economic losses (property damage and business interruption loss). About 118 buildings are expected to be at least moderately damaged, one of which would be total destroyed.²⁹

28 HAZUS modeling conducted by VHB on 11/27/2017 using HAZUS-MH 2.2.

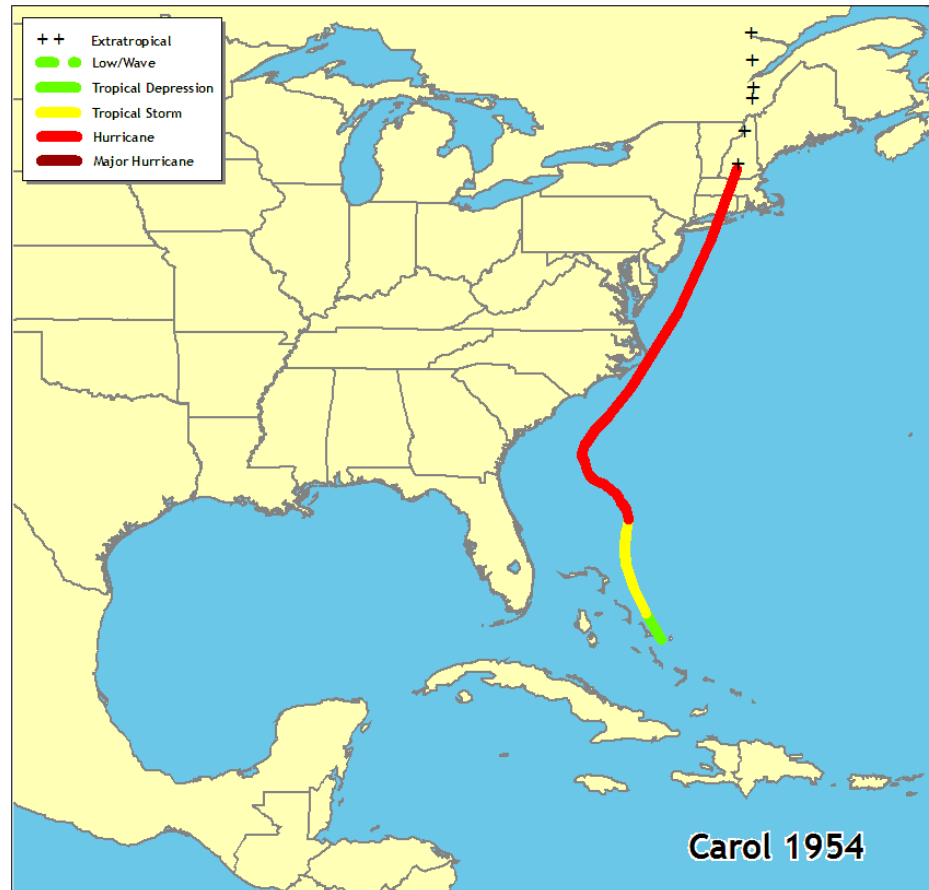
29 HAZUS-MH: Hurricane Event Report, run 11/27/2017.

HAZUS Qualitative Damage Description
<p>No Damage or Very Minor Damage</p> <p>Little or no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very limited water penetration.</p>
<p>Minor Damage</p> <p>Maximum of one broken window, door or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.</p>
<p>Moderate Damage</p> <p>Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water</p>
<p>Severe Damage</p> <p>Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.</p>
<p>Destruction</p> <p>Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.</p>

Table 21 HAZUS-MH Scenarios for Woonsocket, RI

1954 Hurricane Carol Scenario	
DAMAGE	AMOUNT
Debris generated	9,527 tons (77% is brick/wood)
Buildings destroyed	0
Buildings at least moderately damaged	118
Displaced households	11
Essential Facility Damage (fire, police, schools)	hospital
Residential Property (capital stock)	\$37 million
Business interruptions	\$4.2 million

Figure 2 Hurricane Carol Path



Using the 2014 Tax Assessor's Database, the Rhode Island GIS e911 structure file, and the City's GIS, it was determined that of the 10,413 parcels in Woonsocket, 39 have insurable buildings in the SFHA. Non-insurable buildings include detached garages and outbuildings.

Table 22 displays potential damage estimates of property values of structures which are located wholly or partially within the City's Special Flood Hazard Area (SFHA, or regulatory floodplain). The parcel information, using the best available data, provides the number of parcels in the SFHA, and values of the buildings on each property. Land value was not considered for this exercise. According to Table 22, the city wide total potential building damages for these floodplain areas are about \$63,059,600.

The most expensive residential building in the SFHA is located in the Peters River-Blackstone River sub-watershed. This residential complex is at the confluence of the Mill River, Peters River, and Blackstone River and has estimated building value of just less than \$8 million. Fortunately the building is protected from the Blackstone River by an earthen flood control berm.

Approximately 35% of Woonsocket's revenue is generated from property tax.³⁰ Should any of the properties forming the tax base be destroyed by a hazardous event, a causal effect would be those property owners whose parcels remain intact would carry an increased financial burden with regards to property taxes. It is an important course of action for the City to protect both lives and property from natural disasters.

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³⁰ City of Woonsocket, Rhode Island Annual Financial Report, Year Ended June 30, 2017.

Using data from the RI Geographic Information System (RIGIS) and 2017 information from the Woonsocket Tax Assessor, the following table summarizes the value of the properties that are located within the Special Flood Hazard Areas.

Table 22 Property Vulnerability from Flooding³¹

Watershed	# Parcels in SFHA w insurable buildings	Residential	Commercial/ Industrial	Public	Utility	TOTAL
Mill River	9	\$ 4,788,400	\$ 1,301,700	\$ 708,700	\$ -	\$ 6,798,800
Emerson Brook-Blackstone River	4	*	\$ 1,712,000	\$ -	\$ 571,500	\$ 2,283,500
Peters River-Blackstone River	26	\$ 8,752,000	\$ 5,820,500	\$ 39,404,800	\$ -	\$ 53,977,300
TOTAL	39	\$ 13,540,400	\$ 8,834,200	\$ 40,113,500	\$ 571,500	\$ 63,059,600

* note that building values for the River Island Condos on 148 Bernon Street were not available.

Built Environment

About 71% of the City of Woonsocket is developed.³² According to 2010 statistics developed by the RI Housing and the State of Rhode Island, approximately 16% of the housing units in Woonsocket are classified as “affordable” to low-moderate income households. Of all the 17,324 housing units, 62% are renter-occupied, and 72% are made up of two or more units.³³ This means that there may be large concentrations of people in a small area that will be affected by a localized event. Also, renters are less likely to have flood insurance, especially if they are not located in the ground flood where the risk is greater. The City has concerns about the structural integrity of some of these public structures and is interested in conducting a city-wide building assessment to help better protect residents.

According to HAZUS-MH, Woonsocket has an estimated 9,000 buildings with a total replacement value (excluding contents) of \$4.6 billion. Approximately 70% of which are associated with residential housing buildings.³⁴

The WG has identified critical infrastructure listed in the Community Asset Matrix (Table 23). The list includes: flood prone drainage systems, Fresh Water Resources, Electrical Facilities, Dams, Special Populations, Businesses, and Recreational Facilities. All of these important community resources have the potential to be affected by a natural or manmade hazard. The magnitude of the losses would be dependent upon the type, location, and extent of each unique hazard.

The city’s zoning laws help dictate future development while maintaining Woonsocket’s unique character. Continued enforcement of Rhode Island State

³¹ City of Woonsocket GIS parcel data

³² This data was derived using the 2011 Land Use layer available on RIGIS. The following areas were excluded from the total: wetlands, pasture, brushland, forests, water, urban open space, and vacant land.

³³ U.S. Census Bureau. American Fact Finder, 2011-2015 American Community Survey 5-year Estimate

³⁴ HAZUS modeling conducted by VHB on 11/27/2017 using HAZUS-MH 2.2.

building codes and new regulations as required will lessen potential damage caused by a natural hazard event. The codes adopted by the City of Woonsocket range from building codes and design standards, to zoning regulations.

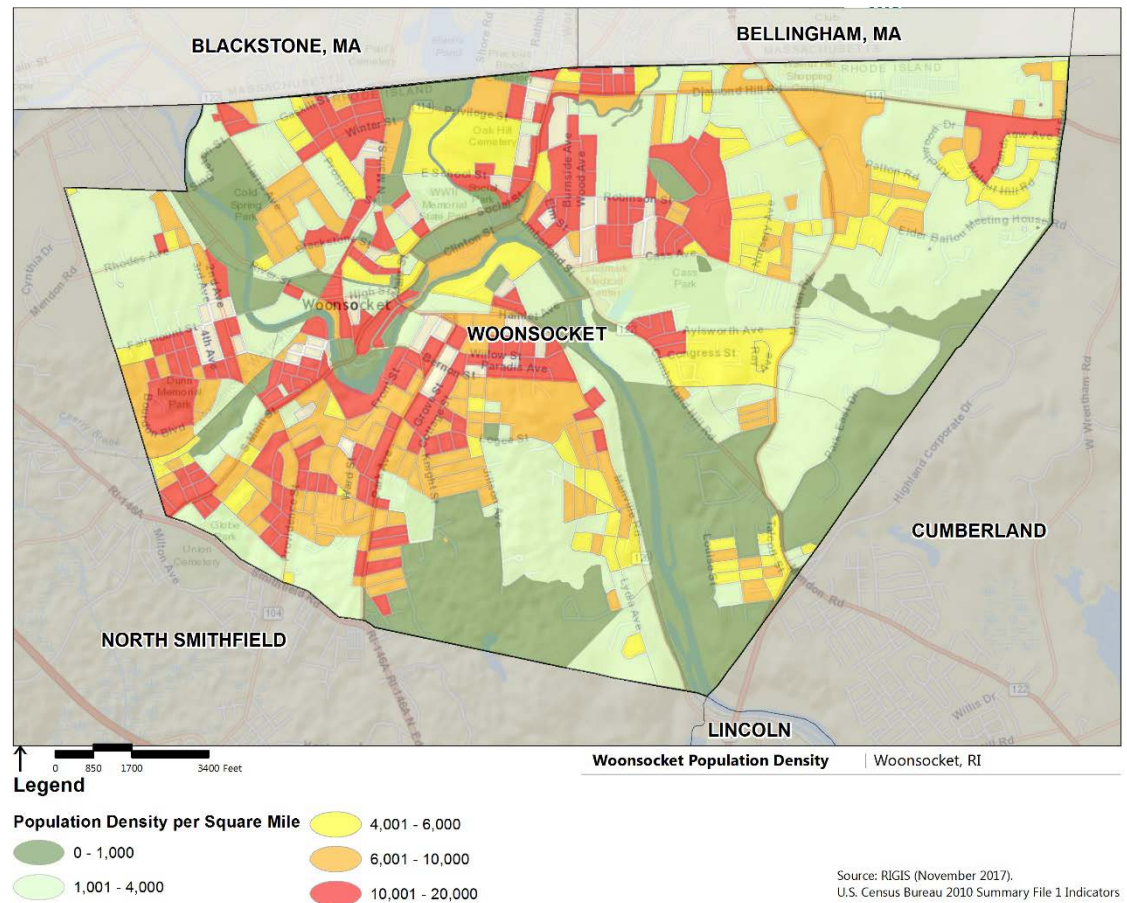
Some of the developed parts of Woonsocket are particularly susceptible to flooding. The base flood is an event that has a 1% chance of occurring annually and is the storm event used to identify the flood zones which impact zoning and building requirements throughout the City. Kennedy Manor (a residential facility) and Villa Nova Middle School are both protected from rising floodwaters by well-maintained flood control berms.

While temporary street flooding is generally a nuisance, the WG is most concerned about natural hazards which will knock out power and cripple the city. Wind and snow vulnerability to structures can be controlled in part by building and construction standards. Wind and heavy snow can also bring down trees, power, and communication lines, reducing access to the transportation network and leaving residents without power. Heavy rain is more of an issue to the transportation network than the buildings. In a built-out city by the river, the water from runoff and rising rivers will spread fast through the paved areas.

Population Impact Analysis

Of primary concern during a hazard event is protecting the health and safety of Woonsocket residents. In addition to knowing the total population, it's also important to estimate how many people would be impacted by loss of service or the need to evacuate. According to the 2010 US Census, there are 14,850 housing units in Woonsocket supporting a population estimate of 35,041. The population is not spread evenly throughout the city.

Map 3 Population Density



Although the overall population has been declining since the 1950s, there are fewer people per household, which has increased the demand for housing. In Woonsocket, a disproportionately high percentage of elderly residents are more likely to live alone than younger adults.

These residents rely on city sewer and water connections in their homes. The failure of these services could present health risks to the entire population. Woonsocket's water supply system consists of three reservoirs: Reservoir #1, Reservoir #3, and Harris Pond. Harris Pond was developed as a supplementary water supply for the City during the 1960's. Contaminated or otherwise unavailable drinking water can quickly have wide-spread impacts to residents and employees who rely on it for drinking, bathing, and fire-fighting.

Being an urban environment, Woonsocket residents may also be disproportionately affected by heat waves. Climate change may bring more intense heat waves, intensifying the urban heat island effect. Residents without air conditioning will be seeking cooling shelters.

Natural Environment

Woonsocket possesses an extensive network of surface water resources comprised of rivers, lakes, ponds, brooks and streams, accounting for over 128 acres. These bodies of water are basic elements to the City's character, provide wildlife habitat, afford recreational opportunities and are component parts of a broader regional ecological system.

Woonsocket's wetlands are a vital component in the community's ecological system. Wetlands hold waters from rain and melting snow and aid in flood protection. Wetlands also aid in recharging groundwater supplies leading to cleaner surface water and public water supplies. Wetlands also provide habitat for many kinds of wildlife and may also serve as valuable open space for recreation and conservation. The local wetlands are evenly distributed throughout the city following drainage patterns, along streams, brooks, and surface water bodies. As with other natural resources, a regional approach to wetland protection is necessary in the greater Woonsocket area. Functioning wetlands in neighboring communities offer the benefits of cleaner surface water and groundwater throughout the region.

Of particular concern to the City is the protection and expanded use of its dominant geographical feature, the Blackstone River. Woonsocket sees the Blackstone River Valley National Heritage Corridor and the building of related parks, bicycle paths and developments, as a great opportunity to create a resource that will improve the quality of life of its residents. The City has an opportunity to capture its river frontage and create a continuous parkway, which can be incorporated into the Heritage Corridor system.³⁵

The City of Woonsocket has 25 separate parks, playgrounds, and playing field areas, as well as 4 conservation areas, 3 publicly-owned open space areas, and several riverfront open space parcels.

Vulnerability of Future Structures

Since the 2011 Hazard Mitigation Plan, Woonsocket has experienced slow growth.

According to the 2012 Comprehensive Plan, the City seeks to promote and enhance the quality of life for present and future residents of the City, by making Woonsocket an attractive and sustainable place to live, work, recreate, and do business."

In general, Woonsocket is considered to be quite "land poor." Some undeveloped residential land does exist, however, and should be developed with respect for its natural constraints, and compatibility with surrounding neighborhoods. Out of approximately 2,800 acres of residential land in the City, approximately 250 acres (9%) are undeveloped. Of the undeveloped residential land, approximately 90 acres are "developable" based on having frontage on an accepted public street.

³⁵ Woonsocket Comprehensive Plan (2012 Update).

There may not be enough land available to meet Woonsocket's near-future development needs for both residential and non-residential structures.

Woonsocket's vulnerability to natural hazards is not expected to change dramatically over the next five years due to increased development. Enforcement of current building codes will ensure that development will be stronger and more resilient than some of the older structures in Woonsocket.

Community Assets Matrix

(next page)

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Table 23 Critical Infrastructure/Community Assets Matrix

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
Flood Prone Drainage Systems/Streets	<p>Bernon St. Blakley St. by mill Cumberland Hill Rd. near Sylvester's Pond (2nd egress to hospital) East Woonsocket Holding Area Edmond St. (middle) Elder Ballou Meeting House Road (State owned) Front St. Greene St. Knight St. Area Logee/St. Barnabe Streets Mason St. Mendon Rd. Saint Simon St. Theresa Brook Truman Drive</p>	Flooding	<p>Dredging Cutting vegetation back to grassy swales</p>	<p>1. Improve locally owned roads (carry over from 2011)</p> <ul style="list-style-type: none"> • Victory Boulevard • Cass Ave. • Colony • Cumberland Hill Rd. <p>2. Public education on not driving through temporarily flooded roads</p>
Bridges Spanning Rivers	<p>Blackstone River (6):</p> <ul style="list-style-type: none"> • Fairmount St. #95701, River St. #95601, Sayles St. #68901, Singleton St. #95501, Bernon St. #95201, Court St. #95901, Hamlet Ave. #50001 (State), Kendrick Ave. #96001, South Main Street Bridge #95801 <p>Peters River (4)</p> <ul style="list-style-type: none"> • Diamond Hill Rd. #95401, Wood Ave., #95301, Mill St. #68801, Elm St. #99801 <p>Mill River</p> <ul style="list-style-type: none"> • Privilege St. #96301, East School St. #96201, Social St. #96101 	All hazards as it relates to access the bridges provide.	<p>Kendrick Ave. (pedestrian bridge with water main)- out to bid Privilege St/Mill River #96301- working on bid package.</p> <p>Sandblasting and paint needed. \$3m per bridge. (regular maintenance)</p>	none

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
Wastewater	Woonsocket Regional Wastewater Facility (11 Cumberland Rd) Sewer collection system- throughout City	Flooding, loss of power from other hazards. Connects to the nearby towns of Blackstone, North Smithfield, and Bellingham	Recent significant upgrades to Wastewater Facility. \$40 million for operations, design-built upgrades, and long-term operations contract.	3. Emergency Action Plan
Water Supply Systems	Woonsocket Water Treatment Plant (1500 Manville Rd)	Infrastructure failure	In the process of an \$60M upgrade. Land development project in the works- subdivision plan by March 2018.	none
Flood Control Project-U.S. ACOE	Singleton District Pumping Station Hamlet District Pumping Station Social District Pump Station Lower Flood Control Project Upper Flood Control Project	Flood Power outage		none
Utilities	National Grid utility substation at the end of Florence Drive Verizon utilities on Clinton St.	In flood zones (Zone A)		4. Flood mitigation plans
Communication Towers	Communication equipment on water towers throughout the City. Additional towers at the Police and Fire Stations.	High winds	Not a problem, relatively new. DHS backup for police and fire. Line conversion to fiber optic would be too expensive citywide.	none
Dams	Harris Pond Dam (High Hazard) Holley Lane Pond Dam (High Hazard) Woonsocket Falls/Thundermist (Significant Hazard) Cass Park Middle (Low Hazard)	Flooding Dam failure	Reservoir 1 rebuilt 2 years ago. Harris in good shape	none

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	Jenckesville Pond Upper and Lower (Low Hazard) Social Park Pond Lower (Low Hazard) Social Park Pond Secondary (Low Hazard) Sylvester Pond (Low) Priscilla Road Pond (Low Hazard) Cass Park Upper and Lower (Low Hazard)		Holley- private, EAP being written Woonsocket Falls/Thundermist owned by U.S. ACOE- not City	
Critical Facilities	Woonsocket Fire Department, Station 1 (169 Providence Street) Woonsocket Fire Department, Station 2/EMS/EOC (5 Cumberland Hill Road) Woonsocket Fire Department, Station 3/EMS (241 North Main Road) Woonsocket Fire Department, Station 4 (806 Mendon Road) Station 5 closed since 1984 Woonsocket Fire Department, Station 6 (504 Fairmount Street)- closed but houses equipment and is used as a training facility. Woonsocket Police Station and dispatch (242 Clinton Street) City Hall (169 Main Street) DPW Garage (River Street)	Infrastructure failure Structural fire Communication failure	Generator being upgraded at EOC at fire department headquarters. Generator being upgraded at Police Station	5. Spatial needs assessment for public safety
Populations	All residents <u>Nursing Homes</u> The Friendly Homes Oakland Grove Health Care Center Woonsocket Health Centre Trinity Health and Rehabilitation Center Ballou Home for the Aged <u>Assisted Living</u>	Infrastructure failure	Education for all on hazards. Evacuate people without vehicles Educate vulnerable populations. City is in contact with them. Generator testing, National grid has them on feeds.	6- Create policy to have City minimum housing inspectors check shelters, public housing, and assisted living to make sure buildings are up to code.

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	<p>Evergreen Assisted Living Center St. Germain Manor Assisted Living Wyndemere Woods</p> <p><u>Public Housing</u> Morin Heights Veterans Memorial Crepeau Court Kennedy Manor (in SFHA) Park View Manor St. Germain Manor</p> <p><u>Shelters</u> Men's Veterans Shelter Woonsocket Women's Shelter (Sojourn House) Woonsocket Family Shelter/ Community Care Alliance Haven of Grace (Women's Transitional Housing) Burnside (Transitional Housing) Harvest Community Church Senior Center is a Red Cross approved emergency shelter Woonsocket High is used as an emergency shelter</p> <p>Homeless Encampments</p> <p>Thundermist Health Center Landmark Medical</p>		<p>Educate on situational awareness. Safety info. Flashlights, batteries,</p> <p>Generators installed at schools and Senior center.</p> <p>Kennedy Manor is protected by a flood control berm.</p>	
Businesses	24 commercial buildings located in the SFHA	Flooding	City can pump out basements.	8- Distribute educational material to business owners

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
				to reduce injuries and damages during an event.
Schools	Woonsocket High (777 Cass Ave.) Beacon Charter (320 Main St.) Hillside Alternative (115 Richard St.) Viola Berard School (181 Cumberland Dive) Action Based Enterprises (55 Main St.) Woonsocket ACTC (400 Aylsworth Ave.) Bernon Elemenary (657 Logee Street) Savoie Elementary (980 Mendon Road) Pothier Elementary (420 Robinson St.) Citizens Elementary (250 Winthrop Street) Coleman Elementary (96 2 nd Ave.) Globe Elementary (192 Avenue A) Good Shepard (1210 Mendon Rd) Harris Elementary (60 High School Street) Monsignor Gadoury Primary (1371 Park Ave.) Mount St. Charles Academy (800 Logee Street) McFee Administration Building (108 High Street) Hamlett Middle School (60 Florence Drive) in the SFHA Villa Nova Middle School (240 Florence Drive) in the SFHA	Snow loads on flat roofs	Snow removal in house Snow plowing in house Villa Nova Middle School protected by a flood berm	None
Recreation Facilities	City Parks Blackstone River World War II Veteran's Memorial Park Rivers Edge Recreation Complex	Lightning	Little Leagues rely on phones for weather warnings	None
Historic Resources	North End Historic District Cato Hill Historic District Main Street Historic District Allen Street Historic District The Woonsocket Company/Bernonn Mills L'Englise du Precieux Sang	Fire Post-disaster recovery	Fire prevention program in place Carriage House demolition removed hazard Carbarn demolition.	10- Develop a plan to safely contain any known hazardous chemicals on site and demolish Dorado Processing Company at 719 River Street.

At Risk	Location	Hazard/Problem	Ongoing Actions	Mitigation Actions
	Island Place Historic District Blackstone Canal		City does have a plan to remove blight	

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5

Programmatic Capabilities

Purpose

This capability assessment examines the existing studies, plans, programs, and policies that have incorporated hazard mitigation and other pro-active tools into the City system. The purpose of the capability assessment is to highlight successes, identify shortcomings, and to lay the groundwork for possible improvement.

Woonsocket recognizes that the inclusion of mitigation initiatives not only benefits the community by reducing human suffering, damages and the costs of recovery, but also helps build and maintain the sustainability and economic health of the City. Section 5.2 details the City's existing relevant plans, programs, and policies that were reviewed during the drafting of this plan.

Primary Plans, Regulations, and Departments

Woonsocket Comprehensive Plan

The Woonsocket 2012 Comprehensive Plan was adopted on June 22, 2010, revised in and most recently adopted in April 4, 2012. The Woonsocket Comprehensive Plan discusses current community conditions, expected future trends, and new initiatives, challenges, and opportunities. It provides a vision for future community development by identifying updated goals, policies, and implementation actions. The current plan includes a natural and cultural resources element that focuses on the natural environment. However, it is expected that new revisions will include

elements of hazard mitigation and climate change, using this document as a reference.

Zoning Ordinance

Among other things, the Zoning Ordinance of the City of Woonsocket (January 4, 2017) aims to provide guidance for orderly growth and development which recognizes natural characteristics of the land including its suitability to surface or groundwater pollution, the values of ponds and wetlands, the values of unique or valuable natural resources and features, the availability and capacity of existing and planned public and/or private services and facilities, the need to shape an balance residential and commercial development, and the use of innovative development regulations an techniques.³⁶ The Zoning ordinance promotes safety from fire, flood, and other natural or man-made disasters. Section 12.4 of the Code of Ordinances describes zoning standards for the special flood hazard overlay district. The Zoning Ordinance also restricts the amount of impervious surface on a property.

Subdivision Regulations

These regulations, last revised December 6, 2011, protect existing natural and built environments and mitigate the significant negative impacts of proposed development on those environments. Updated subdivision regulations were approved in September 2017. The regulations promote design of land developments and subdivisions which are well-integrated with the surrounding neighborhoods with regard to natural and manmade features, and which concentrate development in areas which can best support intensive use by reason of natural characteristics and existing infrastructure.

Further, the regulations do not allow for development in wetlands or floodplains without appropriate permitting procedures.

These Regulations support hazard mitigation efforts by managing development in areas that absorb floodwaters and promote sustainable buildout practices.

Stormwater Management Plan

The City of Woonsocket has a Stormwater Municipal Separate Storm Sewer System (MS4) permit issued by the Rhode Island Department of Pollution Discharge and Elimination Systems (RIPDES) program., As an MS4 permit holder, all development and redevelopment in the City of Woonsocket requires the development and submittal of a Stormwater Management Plan with any kind of development plan.

This requirement supports hazard mitigation by encouraging reducing and disconnecting impervious surface area, and identifying activities that may adversely impact ground or surface waters.

³⁶ Woonsocket Zoning Ordinance, January 4, 2017

National Flood Insurance Program (NFIP)

The City of Woonsocket is an active and compliant member of the National Flood Insurance Program since 1980. As such, Woonsocket residents are able to purchase flood insurance to protect their property against flood losses. The City of Woonsocket has adopted the most recent (October 2015) Flood Insurance Rate Maps (FIRM) and Flood Insurance Study (FIS). The City has designated the Building Official as the NFIP Coordinator to manage the program.

DEPARTMENTS

Planning & Development Department

The Department serves many functions related to the physical development of the community. The department is responsible for City zoning, building inspection, construction development, as well as the Planning Board and the City's Director of Planning and Development. The Department actively works to improve Woonsocket's economy by encouraging appropriate economic development. Additionally, the department oversees the administration of various State and Federal Grants including the Community Development Block Grant (CDBG) and HOME Investment Partnership Programs.

Emergency Management

The primary mission of the Woonsocket Emergency Management Agency (EMA) is to protect life and property in the event of a disaster or crisis situation through a program of mitigation, preparedness, response and recovery. The Woonsocket Emergency Management department is currently staffed by two people. The Director acts as the day-to-day liaison between the City Council and the City's emergency service providers and acts as an advisor on all emergency related affairs in Woonsocket. The Emergency Management Director is responsible for all emergency planning. This department, manages the Emergency Operations Center (EOC), works with the RI Department of Health, and promotes the RI Special Needs Emergency Registry. The Department promotes the CodeRed Emergency Notification System. The CodeRed system is used by the City to deliver automated emergency information by phone, emails, and text to citizens.

The City has exercised and is able to deploy medical points of distribution (MedPODs) in case of an emergency. This effort is managed by the Woonsocket Emergency Management Director and the State.

Engineering

The Woonsocket Engineering Division helps the City improve resiliency and reduce damages and cost from hazards by reviewing every site that is proposed for new

development and/or redevelopment to ensure the sewer, water and stormwater regulations are followed during the design, the construction and the final acceptance of the site. The division also works alongside the Army Corps of Engineers for the Woonsocket Flood Risk Management Program. The Project includes the Woonsocket Falls Dam, a concrete overflow dam, channel improvements, stone slope protection, earth dikes, concrete floodwalls, and pressure conduit and pump stations.³⁷ The Engineering Division is responsible for inspecting all (private and public) detention basins annually and sends out reports to the property owners.

Public Safety

The Public Safety Director is the liaison between the Police and Fire Chiefs and the Mayor. Employees of this department deal with all public safety issues and planning.

Public Works

The Public Works facility is located at 1117 River Street. This property houses all of the City's public works maintenance equipment, vehicle repair facilities, sand and salt storage, and fueling facilities.

Public Works maintains the following ongoing mitigation strategies: snow plowing, ice management, storm drain and culvert maintenance, City vehicle repair, road repairs, street sweeping, and tree trimming (in partnership with the utility companies).

In the winter of 2017/2018, Woonsocket will be implementing a new road pre-treatment system. The City will be manufacturing a brine mixture and spraying it on streets to prevent icy and snow build up. The City previously pre-treated roads with dry salt which was not as efficient.

School Department

The Woonsocket School Department's Director of Facilities, Security, and Transportation is responsible for organizing the maintenance and security of the City's schools. The School Department has the resources in house to keep entrances, roofs, and sidewalks free of snow and ice. Additional equipment and labor from the City may be available during a particularly heavy storm.

In addition to being able to utilize the City's CodeRed system, the School Department has an internal communication network for emergencies. They coordinate their storm response efforts through Woonsocket EMA.

³⁷ More project details located here: <http://www.nae.usace.army.mil/Missions/Projects-Topics/Woonsocket-Flood-Risk-Management-Program/>

Zoning Department

The City Zoning official is responsible for issuing all building permits, permit inspections and code enforcement. This department is also responsible for enforcing the floodplain ordinance and land development and subdivision regulations.

Police Department

The Woonsocket Police Department consists of 101 sworn police personnel including a Chief, and three Captains. The Department operates twenty-four hours a day and responds to all criminal complaints and City-wide emergencies. The Department is located on 242 Clinton Street.

Fire Departments

Woonsocket businesses and residents are protected from fires and other emergencies by 107 staff. The Department is led by the Fire Chief, and four Deputy Fire Chiefs. The 4 fire stations are equipped with 4 engines, 2 ladders, 3 rescues, and a bucket truck. All personnel (including fire alarm division, fire marshal and education personnel) are trained to respond to all emergencies. The fire chief led this recent hazard mitigation plan update process. It is likely that they will retain that role in the future. These volunteer departments provide quality protection to residents and businesses.

The Fire Department has 80 EMTs and 3 rescues throughout the four departments.

StormReady Community

Woonsocket is a StormReady Community (designated by the National Weather Service) having demonstrated necessary communication and safety procedures needed to save lives and property before and during a storm event. There is an existing notification network, and weather radios and lightning detection devices are distributed throughout the City. The City has adopted Standard Operating Procedures to provide guidance in preparing for and dealing with the effects of hazardous weather conditions. If the Woonsocket EMA Director is unable to be reached, responders are encouraged to monitor weather activity through WebEOC, National Weather Service Alerts, and Code Red. The Rhode Island State Police provide National Weather Service Alerts.

Regional Hazardous Response Team

Woonsocket is home to one of 6 Regional Hazardous Material Response Teams located in the State. The teams are used to assess and manage the consequences of a hazardous materials/weapons of mass destruction release such as white powder incidents, fuel spills, industrial chemicals, carbon monoxide leaks, gas leaks, and unknown odors. Nineteen members of the response teams are from Woonsocket.

There is also a Regional Foam Task Force trailer in Woonsocket deployable for highway incidents.

There is no Woonsocket Civilian Emergency Response Team (CERT). However, CVS's CERT is trained by the City and able to assist with disasters throughout Woonsocket.

City Council and City Mayor

The City Council is made up of seven elected members committed to providing an effective and efficient government for residents and businesses. Among other duties, the City Council approves local hazard mitigation plans and zoning ordinances.

The Mayor is the chief executive and administrative officer of the City.

Planning Board

The Planning Board consists of the City Engineer and four members appointed by the Mayor to serve for four years. This Board is responsible for adopting the Comprehensive Plan and regulating subdivisions.

STATE PROGRAMS

Rhode Island State Building Code

All municipalities within the State of Rhode Island share a single building code (RIGL 23-27.3-100 et. al.). The Code itself (which incorporates the International Building Code) was last amended in 2012 and provides comprehensive construction requirements designed to mitigate the impacts from natural hazards, such as high wind events. The Code is enforced by the Woonsocket Building Department and provides an additional layer of regulatory control to those discussed above.

Rhode Island State Fire Code Regulations

Woonsocket has adopted the RI Fire Safety Codes to safeguard life and property from the hazards of fire and explosives in accordance with safe practice. The Code is enforced by the Woonsocket Fire Departments and provides reasonable minimum requirements for fire prevention and protection.

Rhode Island State Dam Safety Program

The City of Woonsocket participates in the State Dam Safety Program because of the two high hazard and one significant hazard dams in the City. The State Dam Safety Program was created to facilitate the enforcement of the primary dam inspection law (RIGL 46-19, Inspection of Dams and Reservoirs). RIGL 46-19 states that dam

owners are responsible for the safe operation, maintenance, repair, and rehabilitation of a dam, which are the essential elements in preventing dam failure; furthermore, dam owners are liable for the consequences of accidents or failures of their dams. According to the State of Rhode Island 2015 Dam Safety Program Report, the following have been identified as program limitations: unclear ownership of numerous high hazard dams, construction of buildings within inundation areas below dams, lack of funding to repair or remove privately owned dams, inadequate spillway capacities and engineering analyses, lack of Emergency Action Plans across the state, inadequate staffing, increase in rainstorm intensities. Of the two high and one significant hazard dams in Woonsocket, all of them have Emergency Action Plans on file. The City is currently creating the dam EAPs and encouraging local dam owners to write them.

Rhode Island DEM Wetland Regulations

The Rhode Island Department of Environmental Management is responsible for regulating alterations of the freshwater wetlands throughout the State. Since many floodplains are also wetlands, appropriately managing these resources help maintain proper floodplain function. These regulations ensure that actions in this plan which will alter the physical landscape will not do so at the expense of wetlands.

Rhode Island Emergency Management Agency

The Rhode Island Emergency Management Agency (RIEMA) is the State agency assigned to reduce the loss of life and property for the whole community while ensuring that as a state we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all natural, human-caused, and technological hazards. RIEMA is also the pass-through agency for FEMA mitigation funding.

Rhode Island Department of Health

The Rhode Island Department of Health (RIDOH), not only strives to prevent disease and increase health and safety, but they also promote the Special Needs Emergency Registry. By voluntarily enrolling in this list, local police, fire, and other local first responders can better prepare for and respond to an individual's needs during a disaster.

FEDERAL PROGRAMS

US Army Corps of Engineers (USACE)

The Woonsocket Falls Dam, as well as channel improvements, stone slope protection, earth dikes, concrete floodwalls, pressure conduit, and pump stations are managed by the USACE as part of the Woonsocket Flood Risk Management

Program. The project protects the city from flooding due to large rain storms. When conditions warrant, USACE will operate the dam gates to reduce flooding upstream thereby protecting residential and commercial properties, and infrastructure within the city of Woonsocket during storms.

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6

Mitigation Actions

Mission Statement

Preserve and enhance the quality of life, property, and resources by identifying areas at risk from natural hazards and implementing priority hazard mitigation strategies to protect the City's infrastructure, population, and historical, cultural, and natural resources.

Mitigation Goals

Goal 1: Implement actions which protect the lives and property of Woonsocket's residents

- Provide timely notification and direction to the public of imminent and potential hazards
- Continue to manage the development in hazard-prone areas

Goal 2: Implement actions which protect Woonsocket's critical facilities and infrastructure

- Protect critical facilities and infrastructure to minimize loss of critical services following a hazard event
- Continue to manage the development in hazard-prone areas
- Protect existing property to the extent possible
- Create incentives for the public to mitigate hazards on their own property

- Continue to reduce flood losses through compliance with National Flood Insurance Program requirements

Goal 3: Implement actions which protect Woonsocket's cultural, historical, natural and economic resources

- Continue to manage the development in natural environments
- Implement mitigation measures to preserve cultural and historical areas
- Continue to manage the development in hazard-prone areas to reduce economic loss

Table 24 Status of 2011 Actions- listed by order in which they appeared in the plan.

Action	Status	Reason why it is not complete (shift in focus, funding, etc.)	Other comments
Repair and improvement of existing flood walls, flood proofing and berms at Woonsocket Regional Wastewater Facility	Ongoing effort	✓	Upgrades have been done.
Replace sewer manways with solid covers	Ongoing effort	✓	The City is doing this on retrofit projects.
Identify and complete repairs and retrofits to sewer collection system to minimize storm flooding and groundwater infiltration			Ongoing.
Victory Boulevard Culvert - land acquisition for flood control improvements, flood walls, and berms	Not completed	funding	Culvert has been cleaned but it has not been rebuilt and no land has been acquired. The problem still exists.
Cass Avenue Culvert - land acquisition for flood control improvements, flood walls, and berms.	Not completed	funding	The problem still exists.
Colony Avenue Culvert - land acquisition for flood control improvements, flood walls, and berms.	Not completed	funding	The problem still exists.
Elder Ballou Meeting House Road Culvert - land acquisition for flood control improvements, flood walls, berms.	Not completed	funding	The problem still exists.

Action	Status	Reason why it is not complete (shift in focus, funding, etc.)	Other comments
Mendon Road Culvert - land acquisition for flood control improvements, flood walls, and berms. Enlarge holding pond and install culvert from Holly Spring holding pond to Mendon Road culvert.	Not completed	funding	State road. The problem still exists.
Cumberland Hill Road Culvert - land acquisition for flood control improvements, flood walls, and berms.	Not completed	Project location seems to be incorrect as per review in 2017.	The problem still exists.
Blackstone River Bridges (6) – Inspect, repair, replace, and retrofit deteriorated bridge components.	Partially complete	✓	Kendrick Street bridge (Ped)- had structural deficiencies. Going out to bid. Repaired decks on River St, Sayles, Fairmount bridge, cement work on some walks. Hamlet has had work done on expansion joints, old thrust bearings replaced.
South Main Street Bridge No. 958 – Repairs and retrofit of the granite footings for the stone arches.	Currently being completed	✓	10/17 replacing curbing on both sides of the sidewalk, repointing some blocks on the bridge.
Woonsocket Flood Control Project	Completed	✓	Owned by U.S. Army Corps of Engineers
Inspect, repair, replace, and retrofit deteriorated pump station components to prevent damage from earthquakes and severe weather.	Ongoing	✓	Owned by U.S. Army Corps of Engineers
Woonsocket Falls Dam- Paint the four tainter gates and deck areas to prevent corrosion	Completed	✓	Owned by U.S. Army Corps of Engineers
Truman Drive- Flood control improvements that include flood walls, berms, and new construction	Not completed	Lack of funding and interest	
Theresa Street Brook- Land acquisition for flood control improvements, flood walls, and berms.	Not completed	Lack of funding	The problem still exists.

Mitigation Actions

The Woonsocket Hazard Mitigation Plan Working Group decided to propose actions that addressed certain vulnerabilities that were identified earlier in the planning process. See Chapter 4.

The text following the table below summarizes the specific problem and proposed possible solution(s), details the primary tasks to be undertaken, identifies an appropriate lead and anticipates financing options. Each action was given a priority ranking of low, medium, or high as determined by the WG. The WG understands that implementation of many of these proposed actions require the City to secure external funding.

There are necessary planning elements that need to be completed before additional mitigation actions can be considered. The WG has identified a revised range of actions below, some of which are planning. However, there is a mitigation action identified for each vulnerable area where applicable.

Priority Level

- › High: Reduces the greatest risks, is important to accomplish first
- › Medium: May need other actions to be completed first
- › Low: Less of an impact on safety and property

Time Frame (from date of plan adoption)

- › Short Term: within 1-3 years
- › Medium Term: within 3-5 years
- › Long Term: greater than 5 years

VULNERABLE AREA: Flood Prone Drainage Systems/Streets

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
1. Improve locally owned roads to reduce flooding. Consider dredging, green infrastructure*, and cutting back vegetation. <ul style="list-style-type: none"> • Victory Boulevard • Cass Avenue • Cumberland Hill Road 	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			Active

RATIONALE- WHY IS THIS IMPORTANT?

Flooding during heavy rain events creates a public safety issue and impacts road infrastructure.

BENEFITS	OBSTACLES
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Safer driving conditions.

LEAD/CHAMPION	SUPPORT
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Engineering Department

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
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City Capital Bonds

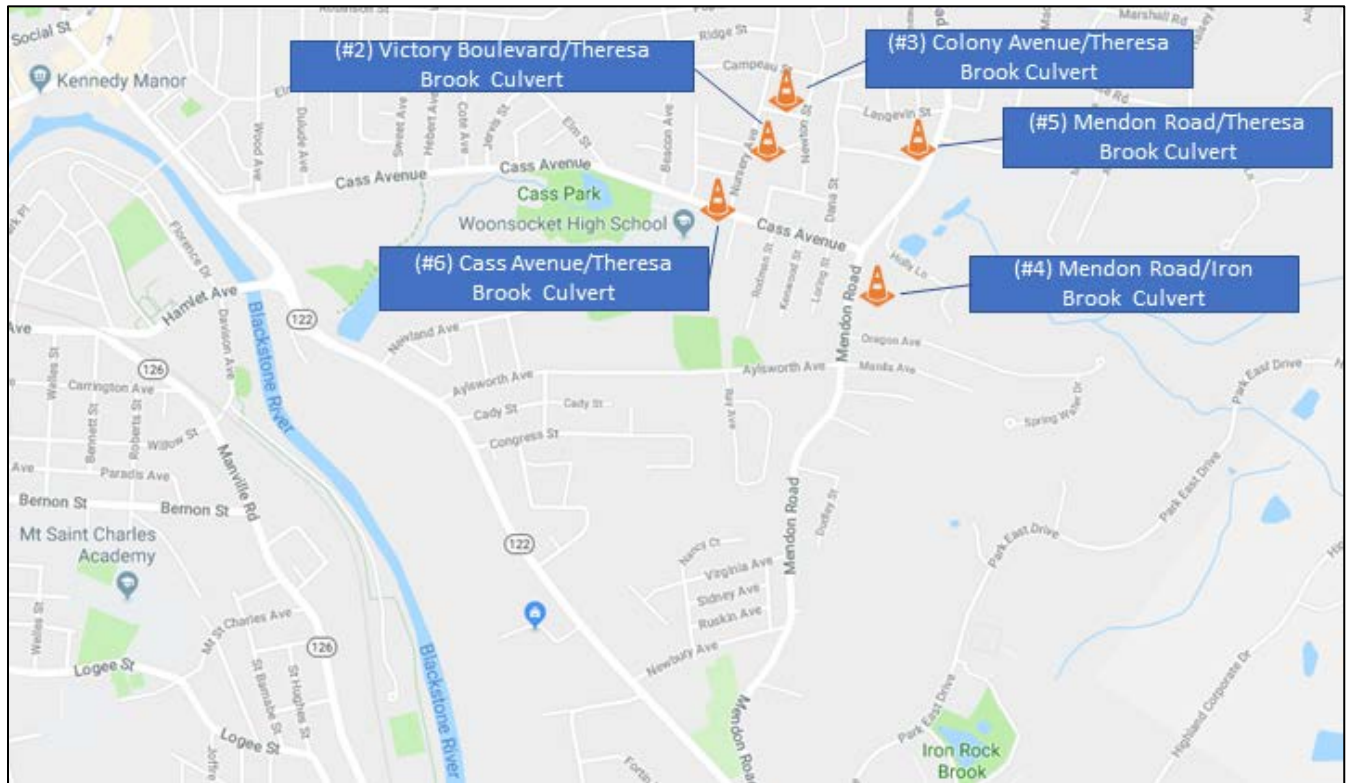
Depends on technique deployed.

☒ Short Term (0-3 years)
☐ Medium Term (3-5 years)
☐ Long Term (more than 5 years)

OTHER NOTES

*Green infrastructure is a style of water management using natural elements combined with porous hard-scaping materials to absorb and filter rain water. Examples include bio-swales, rain gardens, tree wells, and green-scaping using local native plants that can be combined with porous asphalt, porous concrete, porous pavers and underground trenches that allow for natural filtration of rain water. Well-designed green infrastructure projects can be more efficient in their management of storm water and more cost effective in construction and long-term maintenance than traditional grey infrastructure.

Map 4 Stormwater Projects



The map above provides reference for the next 5 mitigation actions which aim to improve stormwater flow near Theresa Brook and Iron Brook.

VULNERABLE AREA: Flood Prone Drainage Systems/Streets

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
2. Improve stormwater drainage to reduce flooding on Victory Boulevard . Consider land acquisition and green infrastructure for flood control improvements, flood walls and berms.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			Active
RATIONALE- WHY IS THIS IMPORTANT?			
Residents along Theresa Brook and in the area of the culvert (Colony Ave. and Victory Boulevard) are at risk of flooding due to storm water.			
BENEFITS		OBSTACLES	
By acquiring land (easements) the City will be able to establish a defined path for storm water making local residents less vulnerable.			
LEAD/CHAMPION		SUPPORT	
Woonsocket Department of Public Works, Engineering Division		RI Department of Environmental Management,	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
City Capital Bonds	\$125,000	<input type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input checked="" type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			

VULNERABLE AREA: Flood Prone Drainage Systems/Streets

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
3. Improve stormwater drainage to reduce flooding on Colony Avenue . Consider land acquisition and green infrastructure for flood control improvements, flood walls and berms.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			Active

RATIONALE- WHY IS THIS IMPORTANT?

Residents along Theresa Brook and in the area of the culvert (Colony Ave. and Victory Boulevard) are at risk of flooding due to storm water.

BENEFITS

By acquiring land (easements) the City will be able to establish a defined path for storm water making local residents less vulnerable.

OBSTACLES

LEAD/CHAMPION

Woonsocket Department of Public Works, Engineering Division

SUPPORT

RI Department of Environmental Management

POTENTIAL FUNDING SOURCES

City Capital Bonds

ESTIMATED COST

\$125,000

TIMELINE

- ☐ Short Term (0-3 years)
☐ Medium Term (3-5 years)
☒ Long Term (more than 5 years)

OTHER NOTES

VULNERABLE AREA: Flood Prone Drainage Systems/Streets

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
4. Improve stormwater drainage to reduce flooding on Mendon Road at Iron Rock Brook . Consider land acquisition and green infrastructure for flood control improvements, flood walls and berms.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			Active
RATIONALE- WHY IS THIS IMPORTANT?			
Residents along Iron Rock Brook and in the area of the Holley Springs are at risk of flooding due to storm water.			
BENEFITS		OBSTACLES	
By acquiring land (easements) the City will be able to establish a defined path for storm water making local residents less vulnerable.			
LEAD/CHAMPION		SUPPORT	
Woonsocket Department of Public Works, Engineering Division		RI Department of Environmental Management, RI Department of Transportation	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
City Capital Bonds	\$150,000	<input type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input checked="" type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			

VULNERABLE AREA: Flood Prone Drainage Systems/Streets

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
5. Improve stormwater drainage to reduce flooding on Mendon Road at Theresa Brook. Consider land acquisition and green infrastructure for flood control improvements, flood walls and berms.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			Active
RATIONALE- WHY IS THIS IMPORTANT?			
Residents along Theresa Brook (near Mendon Road and Cass Avenue) and in the area of the East Woonsocket are at risk of flooding due to storm water.			
BENEFITS		OBSTACLES	
By acquiring land (easements) the City will be able to establish a defined path for storm water making local residents less vulnerable.			
LEAD/CHAMPION		SUPPORT	
Woonsocket Department of Public Works, Engineering Division		RI Department of Environmental Management	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
City Capital Bonds	\$100,000	<input type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input checked="" type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			

VULNERABLE AREA: Flood Prone Drainage Systems/Streets

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
6. Improve stormwater drainage to reduce flooding on Cass Avenue at Theresa Brook . Consider land acquisition and green infrastructure for flood control improvements, flood walls and berms	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			Active
RATIONALE- WHY IS THIS IMPORTANT?			
Residents along Theresa Brook (near Mendon Road and Cass Avenue) and in the area of the East Woonsocket are at risk of flooding due to storm water.			
BENEFITS		OBSTACLES	
By acquiring land (easements) the City will be able to establish a defined path for storm water making local residents less vulnerable.			
LEAD/CHAMPION		SUPPORT	
Woonsocket Department of Public Works, Engineering Division		RI Department of Environmental Management	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
City Capital Bonds	\$150,000	<input type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input checked="" type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			

VULNERABLE AREA: Flood Prone Drainage Systems/Streets

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
7. Public education for drivers who drive through Truman Drive and Theresa Street Brook when they are flooded.	<input type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input checked="" type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			New

RATIONALE- WHY IS THIS IMPORTANT?

These streets flood temporarily and are not prioritized to be improved or upsized. Instead, residents should be educated on the dangers of driving through standing flood water on the streets.

BENEFITS

Protect residents from getting stranded.

OBSTACLES

LEAD/CHAMPION

Engineering Department

SUPPORT

None.

POTENTIAL FUNDING SOURCES

Engineering Department budget

ESTIMATED COST

Staff Time

TIMELINE

- ☒ Short Term (0-3 years)
☐ Medium Term (3-5 years)
☐ Long Term (more than 5 years)

OTHER NOTES

May include use of an electronic sign at the streets and flood information on the website.

VULNERABLE AREA: Wastewater

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
8. Emergency Response Plan	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <div>ACTION STATUS</div> <div>New</div>
RATIONALE- WHY IS THIS IMPORTANT? <p>There have been recent upgrades to the wastewater facility which connects to Blackstone, North Smithfield, and Bellingham. Having a well-developed Emergency Response Plan will result in fewer and less severe injuries and structural damage during an emergency.</p>			
BENEFITS		OBSTACLES	
Proper employee training to respond to and recover from a disaster. Reduce loss and damages.			
LEAD/CHAMPION		SUPPORT	
Woonsocket EMA		CM2H Hill City Engineer Woonsocket Regional Wastewater Commission	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
FEMA's Emergency Management Performance Grant Program	\$5,000	<input checked="" type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			

VULNERABLE AREA: Utilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
9. Investigate whether National Grid and Verizon have plans which mitigate flood damage.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			New

RATIONALE- WHY IS THIS IMPORTANT?

Reduce disruption of service to customers.

BENEFITS

It may not be feasible to move the infrastructure located in the flood zone but the utilities should have a plan to protect their investment and ensure continuity of service. Especially during a severe weather event.

OBSTACLES

LEAD/CHAMPION

Woonsocket EMA

SUPPORT

National Grid and Verizon

POTENTIAL FUNDING SOURCES

ESTIMATED COST

None

TIMELINE

- ☒ Short Term (0-3 years)
☐ Medium Term (3-5 years)
☐ Long Term (more than 5 years)

OTHER NOTES

They may already have these plans but the City would like to confirm if they do and become familiar with them.

VULNERABLE AREA: Critical Facilities

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
10. Public buildings spatial needs assessment.	<input type="checkbox"/> Local Plans and Regulations <input checked="" type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			New
RATIONALE- WHY IS THIS IMPORTANT?			
Building and structural deficiencies exist throughout the City. By assessing the location, size, and condition, the City can prioritize improvements. Examples include: re-pointing masonry, update mechanical systems, Code Compliance and access issues, and future growth needs.			
BENEFITS		OBSTACLES	
Safer public structures that are more resilient to extreme weather events.			
LEAD/CHAMPION		SUPPORT	
Fire Department			
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
FEMA Fire Prevention and Safety Grants	\$35,000	<input checked="" type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			
Risk assessment may include a web-based program for organizing the data in the field.			

VULNERABLE AREA: Populations

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
11. Create policy to have City minimum housing inspectors check shelters, public housing, and assisted living to make sure buildings are up to code.	<input checked="" type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			New
RATIONALE- WHY IS THIS IMPORTANT?			
Some of the homeless, veterans and women's shelters have exposed wires and may not be up to code.			
BENEFITS		OBSTACLES	
Safety of vulnerable populations that may not have the means to move to safer housing. Meeting the service needs of the aging population will be critical for the future of the City.			
LEAD/CHAMPION		SUPPORT	
Building Inspection & Minimum Housing			
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
City Housing budget	Staff time	<input checked="" type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			

VULNERABLE AREA: Businesses

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
12. Distribute educational material to business owners to reduce injuries and damages during an event.	<input type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input type="checkbox"/> Natural Systems Protection <input checked="" type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			New
RATIONALE- WHY IS THIS IMPORTANT?			
24 commercial properties are located in the SFHA.			
BENEFITS		OBSTACLES	
Businesses that have a plan prior, during and after a disaster are better equipped to get their businesses back up and running.			
LEAD/CHAMPION		SUPPORT	
Woonsocket EMA		Planning and Development	
POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE	
City EMA budget	Staff time	<input checked="" type="checkbox"/> Short Term (0-3 years) <input type="checkbox"/> Medium Term (3-5 years) <input type="checkbox"/> Long Term (more than 5 years)	
OTHER NOTES			
Potential FEMA resources: Emergency Preparedness https://www.fema.gov/media-library/collections/357 Flood Insurance for Businesses https://www.fema.gov/media-library/assets/documents/126017			

VULNERABLE AREA: Historic and Natural Resources

MITIGATION ACTION	MITIGATION TYPE	ALIGNMENT WITH PLAN GOALS	ACTION PRIORITY
13. Develop a plan to safely contain any known hazardous chemicals on site and demolish Dorado Processing Company at 719 River Street.	<input type="checkbox"/> Local Plans and Regulations <input type="checkbox"/> Structure and Infrastructure <input checked="" type="checkbox"/> Natural Systems Protection <input type="checkbox"/> Education and Awareness	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
			ACTION STATUS
			New

RATIONALE- WHY IS THIS IMPORTANT?

BENEFITS	OBSTACLES
----------	-----------

Free up flood storage space along the Blackstone River, remove the risk of contaminated material in the water and in the ground, remove fire and public safety threat.

LEAD/CHAMPION	SUPPORT
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Woonsocket EMA

Planning and Development

POTENTIAL FUNDING SOURCES	ESTIMATED COST	TIMELINE
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City EMA budget

Staff time

☒ Short Term (0-3 years)
☐ Medium Term (3-5 years)
☐ Long Term (more than 5 years)

OTHER NOTES

Building is vacant. Last Toxic Release Inventory Program data in 2001 listed ammonia, sodium nitrate, and copper compounds as being released into the environment.

Nearby Seville Dye Mill (299 First Avenue) burned to the ground in 2011.

7

Implementation and Adoption

Prioritization of Mitigation Actions

Having identified a range of appropriate mitigation actions, the Woonsocket Hazard Mitigation Plan WG set about prioritizing them for implementation. The WG had an informed roundtable discussion on 10/17/2017 about the prioritization of each action. They ranked each as “high”, “medium”, and “low”. See Table 25 below. It is understood that these ranks may change and will be re-considered when the plan is updated.

The following were considered when ranking the actions:

- › Protecting human health and safety
- › Reducing damages
- › Economic feasibility
- › Political climate
- › Environmental impact

High Priority: Greatest beneficial impact

Medium Priority: May need other actions to be completed first

Low Priority: Less of an impact on safety and property

Table 25 Priority of Mitigation Actions

High	1. Improve street flooding at Victory Boulevard, Cass Avenue, and Cumberland Hill Road.
	4. Improve stormwater drainage to reduce flooding on Mendon Road at Iron Rock Brook.
	5. Improve stormwater drainage to reduce flooding on Mendon Road at Theresa Brook.
	6. Improve stormwater drainage to reduce flooding on Cass Avenue at Theresa Brook.
	8. Emergency Response Plan for WWTF
	11. Policy for building code enforcement in public housing, shelters, and assisted living properties
	12. Public education for business owners
Medium	13. Dorado Processing decommissioning
	3. Improve stormwater drainage to reduce flooding on Colony Avenue
	7. Public education on flooded roadways (Truman Drive)
	9. Utility mitigation plans
	10. Spatial needs assessment

Implementing the Plan

The City of Woonsocket and the Woonsocket Hazard Mitigation Plan WG realize that successful hazard mitigation is an ongoing process that requires implementation, evaluation, and updates to this plan. The City also understands the importance of integrating appropriate sections of the plan into the City's Comprehensive Plan, Emergency Operations Plan, and site plan review process. It is intended that this plan and the ongoing efforts of the WG will preserve and enhance the quality of life, property, and resources for the City of Woonsocket.

Adoption of this mitigation strategy increases Woonsocket's eligibility for federal hazard mitigation grants. These grants originate from FEMA's Pre-Disaster Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation (PDM) and post-disaster Hazard Mitigation Grant (HMGP) Programs. (Refer to Appendix B for further information.)

Monitoring

The WG, under the leadership of the City's Fire Chief, will meet annually (or more frequently if necessary), to monitor and evaluate the actions contained in the plan. At each meeting, the WG members will discuss the actions assigned to them to ensure continual progress with mitigation efforts. The status of each mitigation

action will be documented and minutes recorded for the record. The WG will also continue to re-evaluate membership to ensure effective engagement of the appropriate parties. New members may be invited to serve on the WG as priorities shift.

Evaluation

At the annual meetings, the WG will evaluate both the actions and the planning process. The WG will base its evaluation on whether the actions have met the following criteria: increased public awareness/education, reduction in hazard damage, actions being implemented in the designated time frames, and actions staying within the cost estimate. The WG will document and report its findings to the City Council. The WG will involve the public in the action evaluation process by holding an annual advertised public meeting to review the evaluation and solicit input.

During the annual evaluation process, the plan will be promoted online (City's website and social media outlets), in the local library, in the Woonsocket Call, at City Hall, and the Senior Center for public review. Comments and suggestions can be sent directly to the Fire Chief or brought up at the advertised public meeting.

Revisions

Recognizing that this is a living document, the WG will make changes to it after each annual revision or a disaster, as conditions warrant. These revisions will also reflect changes to priorities and funding strategies that may have been implemented.

A full revision of the plan will commence a year in advance of the current plan expiration date to ensure the City always has an approved plan. The update will be completed every five years and will incorporate a formalized process for prioritizing actions and weighing the cost/benefit of such actions. All updates or revisions to the plan will be submitted to the RIEMA. The City Council will involve the public in the plan revision process by holding an annual advertised public meeting to present recommended revisions and solicit input. Revised plans will also be sent to the neighboring municipalities for comment.

All future meetings will be open to the public and it is the hope of the WG that once the public education and outreach actions begin, public involvement in the Plan will increase and will be reflected in future revisions. The WG will involve the public in the annual meeting by posting it on the website, in the local library, and in the local newspaper to encourage involvement.

Adoption

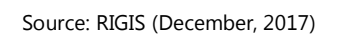
After each evaluation cycle (every 5 years), the Woonsocket hazard mitigation plan will be presented to and adopted by the City Council. The associated ordinance documentation will be kept as part of this plan.

Appendices

- A. Resources Map which will include dams
- B. List of Recreation Department Resources
- C. Public Notices
- D. Hazards Survey
- E. Resources

Appendix A

Woonsocket Resource Map



Appendix B

City Parks and Recreation Facilities

City Parks



Park List & Amenities

- Ayotte Field
- Bernon Park
- Bouley Field
- Cass Park
- Cold Spring Park
- Costa Park
- Dionne Track
- Dunn Park
- Globe Park
- Hartnett Field
- Menard Field
- Phyllis Thomas Park
- Renaud Field
- River Island Art Park
- Rivers Edge Complex
- Soucy Falls
- World War II Memorial Park

Appendix C

Public Notices

SOCIAL MEDIA

Public Notice for Review

DRAFT

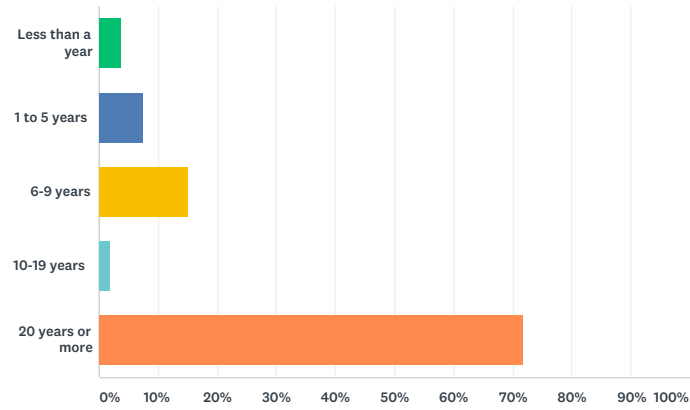
Appendix D

Public Survey

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q1 How long have you lived in Woonsocket, Rhode Island?

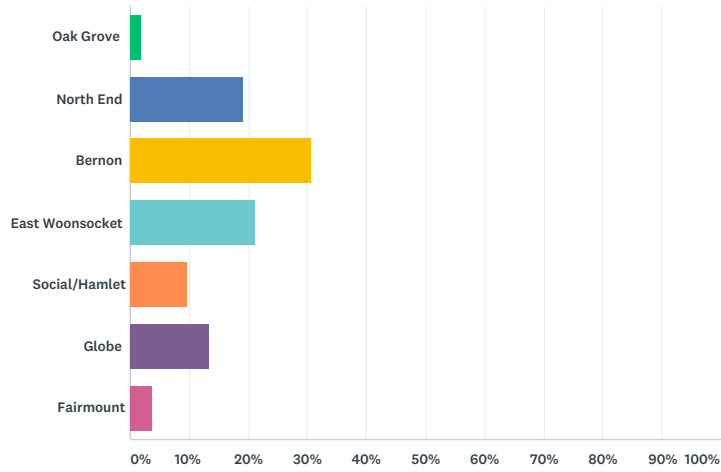
Answered: 53 Skipped: 2



ANSWER CHOICES	RESPONSES	
Less than a year	3.77%	2
1 to 5 years	7.55%	4
6-9 years	15.09%	8
10-19 years	1.89%	1
20 years or more	71.70%	38
TOTAL		53

Q2 What neighborhood do you live in?

Answered: 52 Skipped: 3

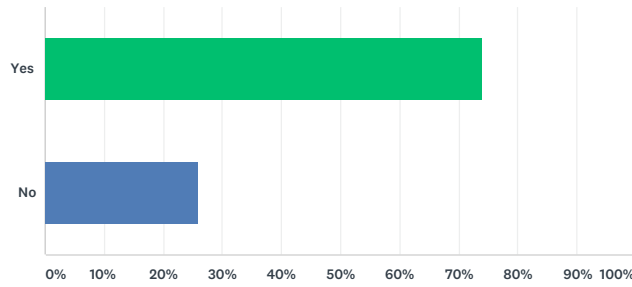


ANSWER CHOICES	RESPONSES	
Oak Grove	1.92%	1
North End	19.23%	10
Bernon	30.77%	16
East Woonsocket	21.15%	11
Social/Hamlet	9.62%	5
Globe	13.46%	7
Fairmount	3.85%	2
TOTAL		52

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q3 Have you ever experienced or been impacted by a natural disaster/event in Woonsocket?

Answered: 54 Skipped: 1

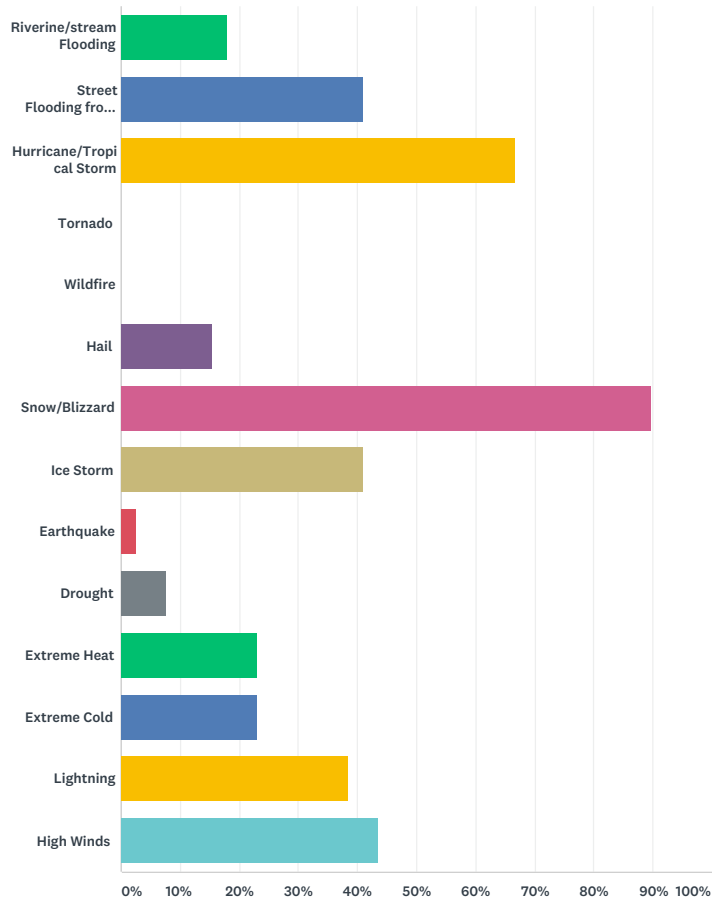


ANSWER CHOICES	RESPONSES	
Yes	74.07%	40
No	25.93%	14
TOTAL		54

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q4 If yes, what types of disasters? Check all that apply.

Answered: 39 Skipped: 16



ANSWER CHOICES	RESPONSES	
Riverine/stream Flooding	17.95%	7
Street Flooding from Heavy Rain	41.03%	16
Hurricane/Tropical Storm	66.67%	26
Tornado	0.00%	0
Wildfire	0.00%	0
Hail	15.38%	6
Snow/Blizzard	89.74%	35
Ice Storm	41.03%	16
Earthquake	2.56%	1
Drought	7.69%	3
Extreme Heat	23.08%	9
Extreme Cold	23.08%	9
Lightning	38.46%	15
High Winds	43.59%	17
Total Respondents: 39		

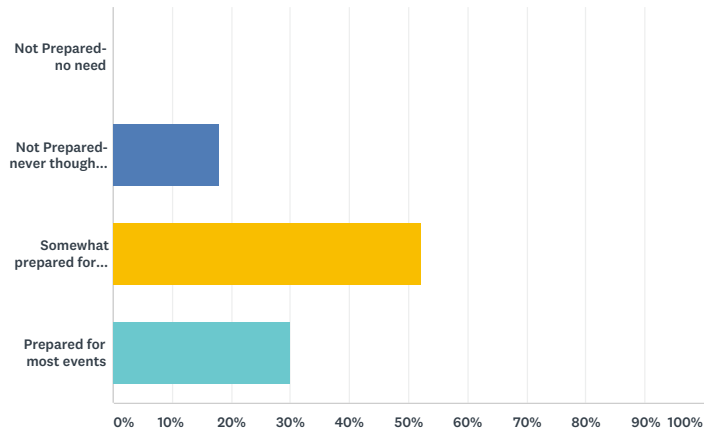
Q5 When was the last time you experienced a natural disaster in Woonsocket?

Answered: 27 Skipped: 28

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q6 How prepared do you feel that you and your household/business are for the probable impacts of natural hazards?

Answered: 50 Skipped: 5

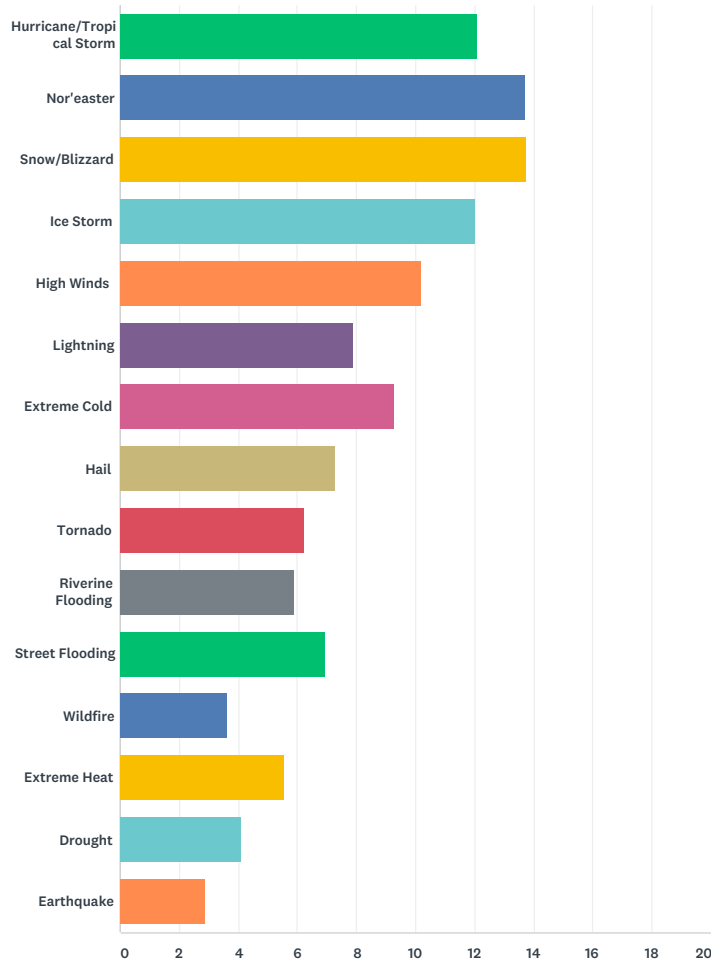


ANSWER CHOICES	RESPONSES	
Not Prepared- no need	0.00%	0
Not Prepared- never thought about it	18.00%	9
Somewhat prepared for some events	52.00%	26
Prepared for most events	30.00%	15
TOTAL		50

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q7 Please rank. Click and drag each hazard so that the one that you are most concerned about is in the #1 spot at the top.

Answered: 42 Skipped: 13



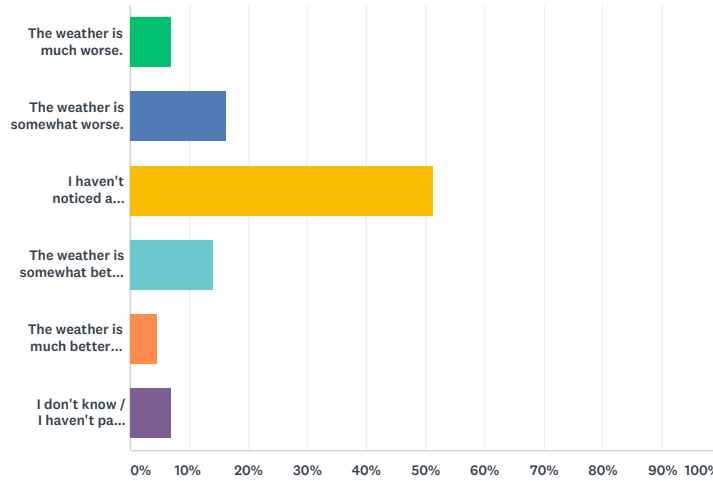
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Hurricane/Tropical Storm	35.00% 14	12.50% 5	15.00% 6	5.00% 2	7.50% 3	0.00% 0	5.00% 2	2.50% 1	5.00% 2	10.00% 4	2.50% 1	0.00% 0	0.00% 0	0.00% 0
Nor'easter	19.44% 7	55.56% 20	11.11% 4	8.33% 3	2.78% 1	2.78% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Snow/Blizzard	37.50% 15	22.50% 9	32.50% 13	2.50% 1	2.50% 1	0.00% 0	0.00% 0	0.00% 0	2.50% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Ice Storm	2.63% 1	7.89% 3	28.95% 11	28.95% 11	13.16% 5	15.79% 6	2.63% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
High Winds	0.00% 0	3.13% 1	0.00% 0	21.88% 7	34.38% 11	12.50% 4	15.63% 5	3.13% 1	3.13% 1	0.00% 0	3.13% 1	0.00% 0	0.00% 0	3.13% 1
Lightning	0.00% 0	0.00% 0	2.78% 1	2.78% 1	8.33% 3	22.22% 8	19.44% 7	13.89% 5	8.33% 3	0.00% 0	2.78% 1	2.78% 1	8.33% 3	2.78% 1
Extreme Cold	0.00% 0	0.00% 0	2.94% 1	11.76% 4	14.71% 5	17.65% 6	23.53% 8	14.71% 5	2.94% 1	5.88% 2	2.94% 1	2.94% 1	0.00% 0	0.00% 0
Hail	0.00% 0	0.00% 0	0.00% 0	3.03% 1	0.00% 0	9.09% 3	3.03% 1	33.33% 11	24.24% 8	15.15% 5	6.06% 2	3.03% 1	0.00% 0	3.03% 1
Tornado	5.56% 2	0.00% 0	0.00% 0	8.33% 3	0.00% 0	5.56% 2	0.00% 0	5.56% 2	19.44% 7	13.89% 5	8.33% 3	2.78% 1	11.11% 4	13.89% 5
Riverine Flooding	2.86% 1	0.00% 0	0.00% 0	0.00% 0	5.71% 2	0.00% 0	14.29% 5	0.00% 0	5.71% 2	22.86% 8	17.14% 6	14.29% 5	8.57% 3	0.00% 0
Street Flooding	0.00% 0	0.00% 0	0.00% 0	9.09% 3	3.03% 1	9.09% 3	12.12% 4	6.06% 2	9.09% 3	9.09% 3	27.27% 9	6.06% 2	6.06% 2	3.03% 1
Wildfire	0.00% 0	0.00% 0	0.00% 0	2.94% 1	2.94% 1	0.00% 0	0.00% 0	2.94% 1	0.00% 0	0.00% 0	11.76% 4	26.47% 9	17.65% 6	17.65% 6
Extreme Heat	0.00% 0	0.00% 0	0.00% 0	3.03% 1	6.06% 2	3.03% 1	3.03% 1	9.09% 3	12.12% 4	12.12% 4	3.03% 1	15.15% 5	24.24% 8	6.06% 2

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Drought	0.00%	2.94%	0.00%	0.00%	0.00%	0.00%	2.94%	5.88%	2.94%	8.82%	8.82%	17.65%	11.76%	32.35%
	0	1	0	0	0	0	1	2	1	3	3	6	4	11
Earthquake	0.00%	0.00%	3.03%	0.00%	3.03%	3.03%	0.00%	3.03%	0.00%	3.03%	3.03%	3.03%	9.09%	18.18%
	0	0	1	0	1	1	0	1	0	1	1	1	3	6

Q8 Looking back over the past 5 years, which statement about Woonsocket weather do you believe to be true?

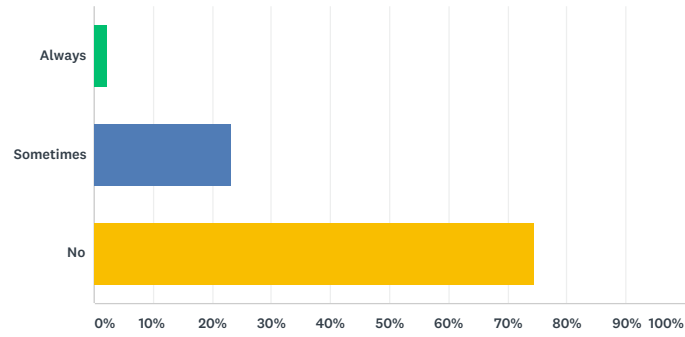
Answered: 43 Skipped: 12



ANSWER CHOICES	RESPONSES	
The weather is much worse.	6.98%	3
The weather is somewhat worse.	16.28%	7
I haven't noticed a difference.	51.16%	22
The weather is somewhat better than usual (fewer storms)	13.95%	6
The weather is much better than usual.	4.65%	2
I don't know / I haven't paid attention.	6.98%	3
TOTAL		43

Q9 Does your street flood when it rains?

Answered: 43 Skipped: 12



ANSWER CHOICES	RESPONSES	
Always	2.33%	1
Sometimes	23.26%	10
No	74.42%	32
TOTAL		43

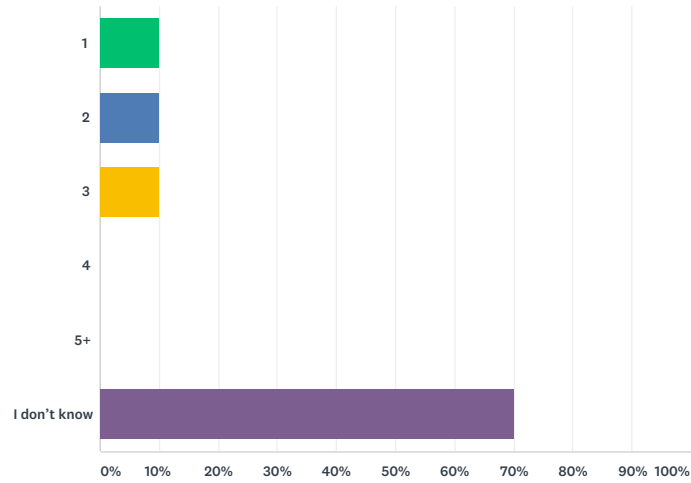
Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q10 If yes, please provide the street name and nearest cross street. Or tell us of a place you know that floods.

Answered: 7 Skipped: 48

Q11 How many times has that street flooded in the last 12 months?

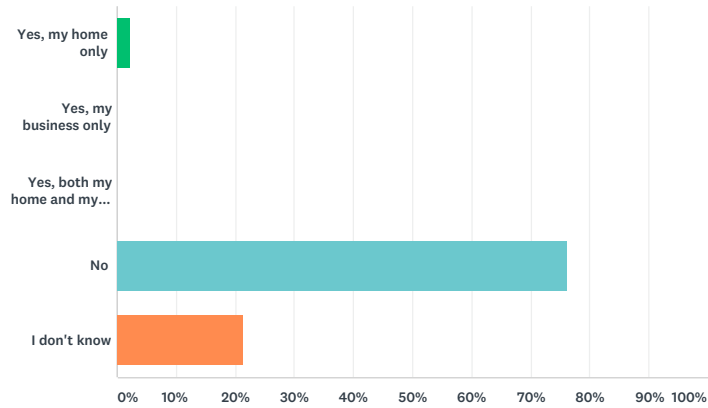
Answered: 10 Skipped: 45



ANSWER CHOICES	RESPONSES	
1	10.00%	1
2	10.00%	1
3	10.00%	1
4	0.00%	0
5+	0.00%	0
I don't know	70.00%	7
TOTAL		10

Q12 Is your home/business located in a floodplain?

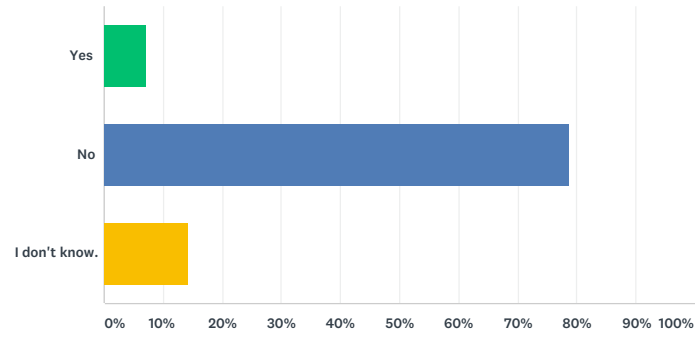
Answered: 42 Skipped: 13



ANSWER CHOICES	RESPONSES	
Yes, my home only	2.38%	1
Yes, my business only	0.00%	0
Yes, both my home and my business	0.00%	0
No	76.19%	32
I don't know	21.43%	9
TOTAL		42

Q13 Do you currently have flood insurance on your house?

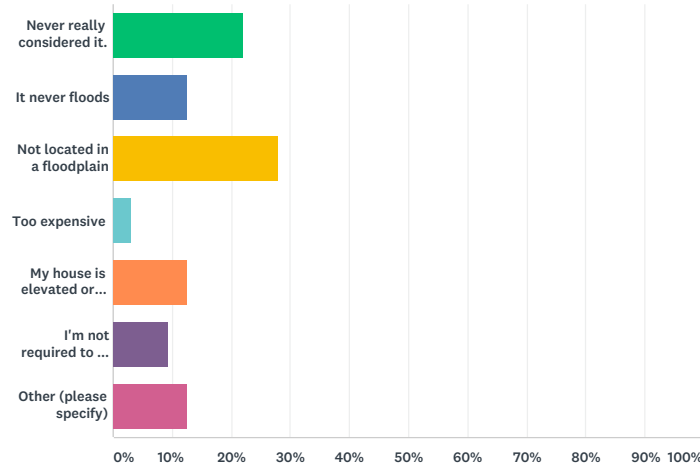
Answered: 42 Skipped: 13



ANSWER CHOICES	RESPONSES	
Yes	7.14%	3
No	78.57%	33
I don't know.	14.29%	6
TOTAL		42

Q14 If you don't have flood insurance, please indicate why.

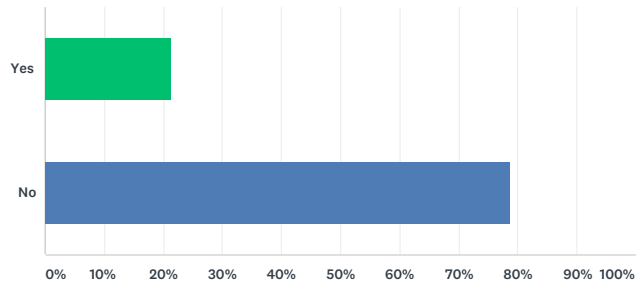
Answered: 32 Skipped: 23



ANSWER CHOICES	RESPONSES	
Never really considered it.	21.88%	7
It never floods	12.50%	4
Not located in a floodplain	28.13%	9
Too expensive	3.13%	1
My house is elevated or otherwise protected from floodwaters	12.50%	4
I'm not required to do so (I don't have a federally backed mortgage)	9.38%	3
Other (please specify)	12.50%	4
TOTAL		32

Q15 Have you taken any actions to make your home, business or neighborhood more resistant to natural hazards?

Answered: 42 Skipped: 13



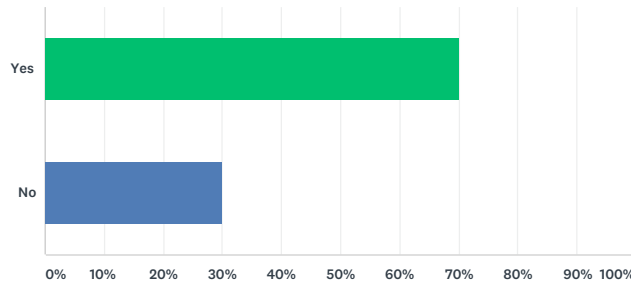
ANSWER CHOICES	RESPONSES	
Yes	21.43%	9
No	78.57%	33
TOTAL		42

Q16 If yes, please explain.

Answered: 6 Skipped: 49

Q17 Are you interested in ways to make your home, business or neighborhood more resilient?

Answered: 40 Skipped: 15

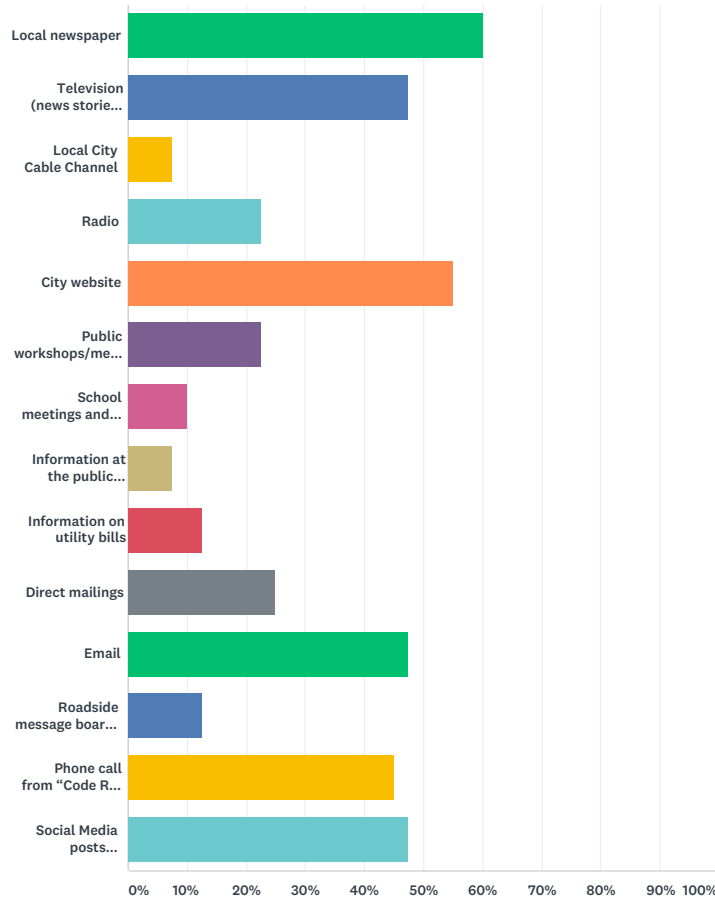


ANSWER CHOICES	RESPONSES	
Yes	70.00%	28
No	30.00%	12
TOTAL		40

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q18 How do you prefer to receive information about how to better protect your home, business, or neighborhood? Check all that apply. (Don't worry, we aren't adding you to a list.)

Answered: 40 Skipped: 15

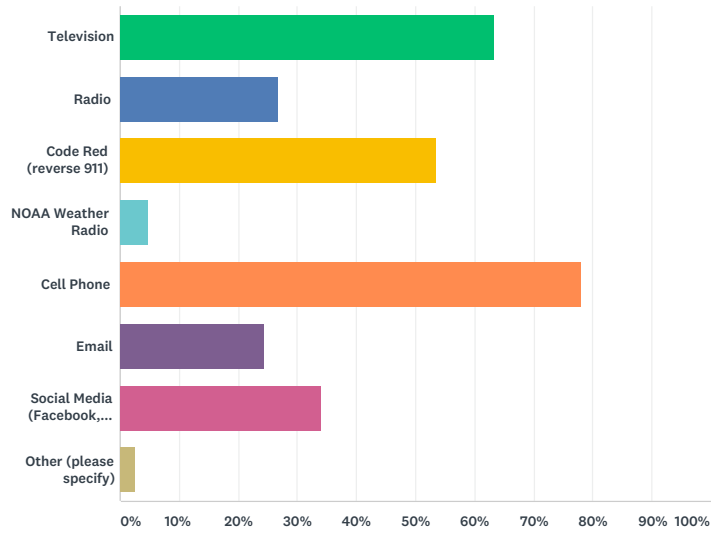


ANSWER CHOICES	RESPONSES	
Local newspaper	60.00%	24
Television (news stories, Public Service Announcements)	47.50%	19
Local City Cable Channel	7.50%	3
Radio	22.50%	9
City website	55.00%	22
Public workshops/meetings	22.50%	9
School meetings and messages	10.00%	4
Information at the public library	7.50%	3
Information on utility bills	12.50%	5
Direct mailings	25.00%	10
Email	47.50%	19
Roadside message boards or billboards	12.50%	5
Phone call from "Code Red" Systems	45.00%	18
Social Media posts (Facebook, Twitter, etc.)	47.50%	19
Total Respondents: 40		

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q19 How do you currently receive weather alerts? Check all that apply.

Answered: 41 Skipped: 14

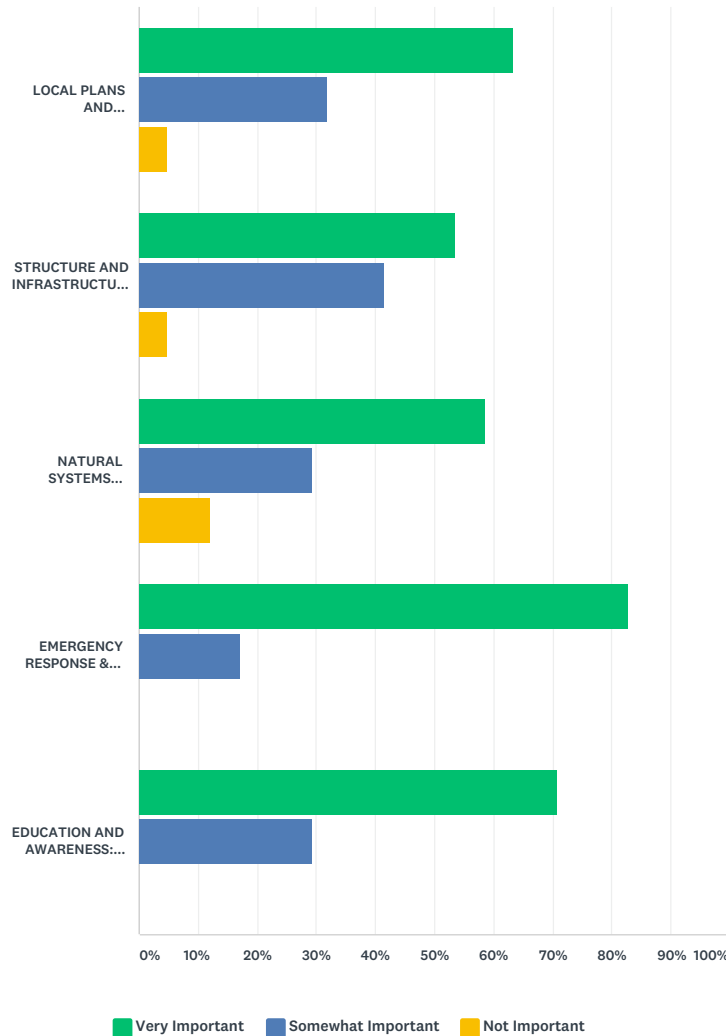


ANSWER CHOICES	RESPONSES	
Television	63.41%	26
Radio	26.83%	11
Code Red (reverse 911)	53.66%	22
NOAA Weather Radio	4.88%	2
Cell Phone	78.05%	32
Email	24.39%	10
Social Media (Facebook, Twitter, etc.)	34.15%	14
Other (please specify)	2.44%	1
Total Respondents: 41		

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q20 There are many ways Woonsocket can reduce the risk from natural hazards. Overall, these actions fall into one of the five categories. Please indicate how important each one is for your neighborhood.

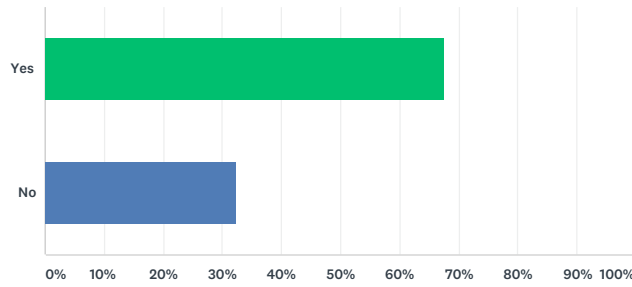
Answered: 41 Skipped: 14



	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT IMPORTANT	TOTAL
LOCAL PLANS AND REGULATIONS: Policies to reduce the impact of hazards such as zoning, planning, and building codes.	63.41% 26	31.71% 13	4.88% 2	41
STRUCTURE AND INFRASTRUCTURE PROJECTS: Modifications of existing homes and buildings to protect them from hazards, such as elevation of electrical equipment. Engineering of structures (such as levees) to reduce the impacts of hazards.	53.66% 22	41.46% 17	4.88% 2	41
NATURAL SYSTEMS PROTECTION: Actions that not only reduce the impact of hazards but also preserve and restore natural habitats. Examples include open space preservation and wetland restoration.	58.54% 24	29.27% 12	12.20% 5	41
EMERGENCY RESPONSE & SERVICES: Actions that protect people and property during or immediately after a disaster or hazardous event. Examples include Code Red emergency warning systems, and emergency response training.	82.93% 34	17.07% 7	0.00% 0	41
EDUCATION AND AWARENESS: Citizen preparedness seminars, direct mailings, public meetings, public service announcements, Q&A sessions.	70.73% 29	29.27% 12	0.00% 0	41

Q21 Are you in favor of spending tax dollars on mitigation projects for the benefit of the entire community?

Answered: 40 Skipped: 15



ANSWER CHOICES	RESPONSES	
Yes	67.50%	27
No	32.50%	13
TOTAL		40

Woonsocket, RI Public Survey for Hazard Mitigation Plan Update

Q22 Please provide additional thoughts on how Woonsocket can better prepare for and recover from the next disaster.

Answered: 9 Skipped: 46

Appendix E

Resources

Technical and Financial Assistance for Mitigation State Resources

Coastal Resources Center

University of Rhode Island
Narragansett Bay Campus
Narragansett, RI 02882
(401) 874-6224

Coastal Resources Management Council

Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879
(401) 222-2476

Department of Administration/Division of Planning

One Capitol Hill
Providence, RI 02908
(401) 222-6478

Department of Environmental Management

235 Promenade Street
Providence, RI 02908
(401) 222-6800

Rhode Island Banking Commission/Associate Director

233 Richmond Street
Providence, RI 02903
(401) 222-2405

Rhode Island Builders Association

Terry Lane
Gloucester, RI 02814
(401) 568-8006

Rhode Island Department of Business Regulations

233 Richmond Street
Providence, RI 02903
(401) 222-2246

Rhode Island Emergency Management Agency

645 New London Avenue
Cranston, RI 02920
(401) 946-9996

Public Utilities Commission

100 Orange Street
Providence, RI 02903
(401) 222-3500 Ext. 153

State Fire Marshal's Office

272 West Exchange Street
Providence, RI 02903
(401) 222-2335

State of Rhode Island Building Committee Office

Building Commissioner's Office
One Capitol Hill
Providence, RI 02903
(401) 222-3529

Technical and Financial Assistance for Mitigation
Federal Resources

Economic Development Administration

Philadelphia Regional Office
The Curtis Center
601 Walnut Street, Suite 140 South
Philadelphia, PA 19106-3323
(215) 597-8822

**Federal Emergency Management
Agency**

Mitigation Division

Mitigation Division
Region I Office
99 High Street
Boston, MA
(617) 223-9561

Small Business Administration

10 Causeway Street
Room 265
Boston, MA 02222
(617) 565-5590

**U.S. Department of Agriculture
Natural Resources Conservation Service**

451 West Street
Amherst, MA 01002
(413) 253-4362

**U.S. Department of Commerce
National Weather Service Forecast
Office**

445 Myles Standish Boulevard
Taunton, MA 02780 (508) 823-2262

**U.S. Department of Housing and Urban
Development**

Community Development Block Grants

Region I – O'Neill Federal Building
10 Causeway Street
Boston, MA 02222
(617) 565-5354

**U.S. Department of the Interior
National Park Service**

Rivers and Trails Conservation Program
Regional Office
15 State Street
Boston, MA 02109
(617) 223-5203

U.S. Environmental Protection Agency

Region I Offices
5 Post Office Square - Suite 100
Boston, MA 02109-3912
(617) 565 3400

U.S. Fish and Wildlife Service

Northeast Regional Office
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9587
(413) 253-8200

Other Resources

National/Regional Resources

The Association of State Floodplain Managers (ASFPM)

<http://www.floods.org>

A professional association with a membership of almost 1,000 state employees that assists communities with the NFIP. ASFPM has developed a series of technical and topical research papers and a series of proceedings from their annual conferences. Many mitigation "success stories" have been documented through these resources and provide a good starting point for planning.

The Rhode Island Flood Mitigation Association (RIFMA):

<http://www.riflood.org>

The goal of the organization is to form a network of associates who could bring their ideas and experiences to a forum for people to share and learn from. The result of the Association is a network of floodplain managers who can improve the effectiveness and efficiency of all aspects of floodplain management in the State of Rhode Island. RIFMA regularly provides training opportunities and an annual floodplain conference.

Natural Hazards Center at the University of Colorado, Boulder

Tel: (303) 494-6818

<http://www.colorado.edu/hazards>

The Natural Hazards Center is an international/national information center that provides information on natural hazards and human adjustments to hazards and disasters, by providing information dissemination, free library and referral services, research, and an annual workshop.

Flood Relief Funds

After a disaster, local businesses, residents, and out-of-town groups often donate money to local relief funds. They may be managed by the local government, or by one or more churches. No government disaster declaration is needed. Local officials should recommend that the funds be held until an applicant exhaust all sources of public disaster assistance. Doing so allows the funds to be used for mitigation and other projects that cannot be funded elsewhere.

Volunteer Organizations

Organizations, such as the American Red Cross, the Salvation Army, Habitat for Humanity, Interfaith, and the Mennonite Disaster Service, are often available to help after disasters. Service organizations, such as the Lions, Elks, and VFW are also available. These organizations have helped others with food shelter, clothing, money, etc. Habitat

for Humanity and the Mennonite Disaster Service provide skilled labor to help rebuild damaged buildings incorporating mitigation or flood proofing concepts. The offices of individual organizations can be contacted directly, or the FEMA Regional Office may be able to assist.

New England States Emergency Consortium (NESEC)

Lakeside Office Park

<http://www.serve.com/NESEC>

NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Brochures and videotapes are available on such topics as earthquake preparedness, mitigation, and hurricane safety tips.

Institute for Business and Home Safety (IBHS)

<http://www.ibhs.org>

An insurance industry-sponsored, nonprofit organization dedicated to reducing losses—deaths, injuries, and property damage—resulting from natural hazards. IBHS efforts are directed at five specific hazards: floods, windstorms, hail, earthquakes, and wildfires. Through its public education efforts and information center, IBHS communicates the results of its research and statistical gathering, as well as mitigation information, to a broad audience.