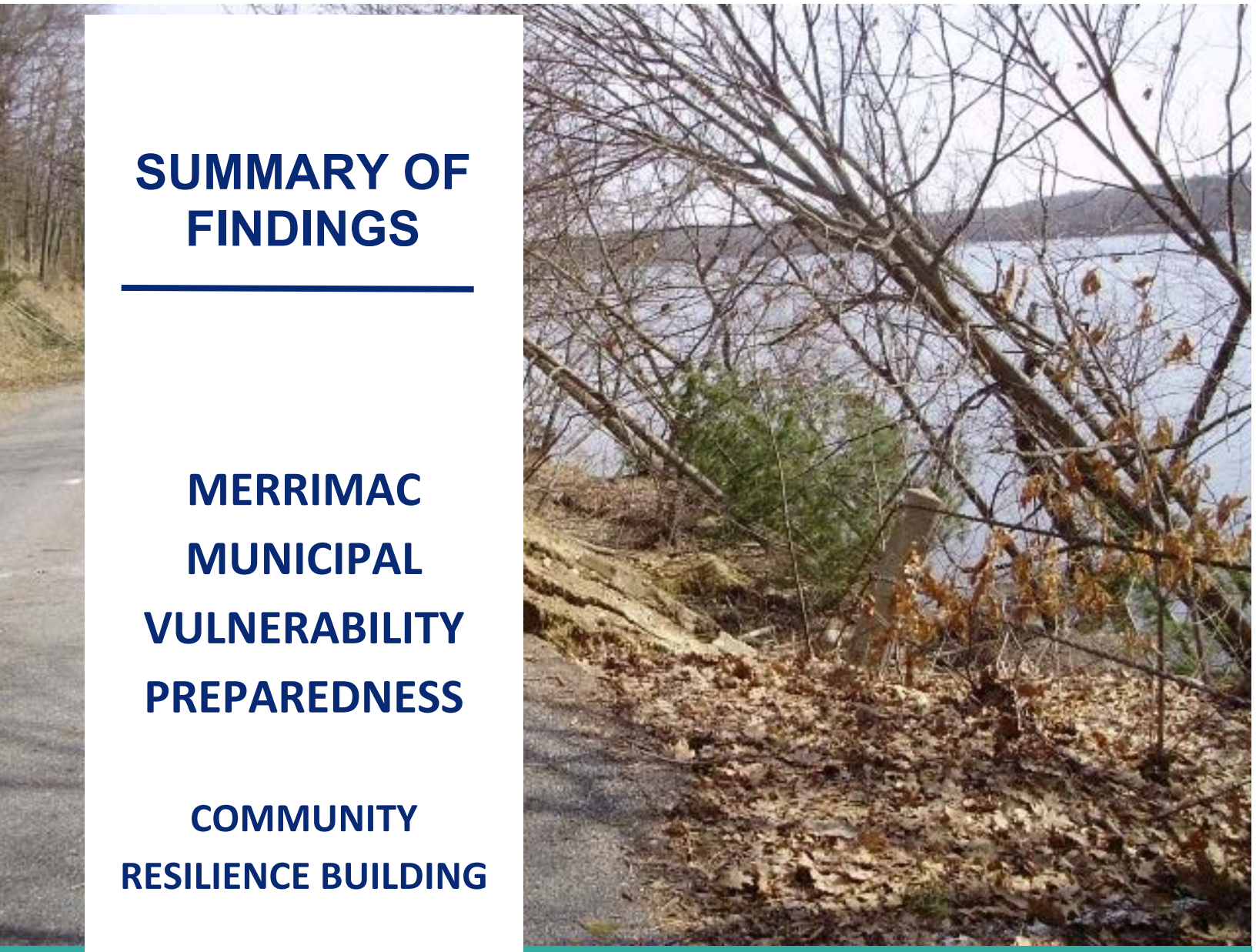
SUMMARY OF FINDINGS



MERRIMAC MUNICIPAL VULNERABILITY PREPAREDNESS

COMMUNITY RESILIENCE BUILDING

APRIL 2020

TOWN OF MERRIMAC

With assistance from

Merrimack Valley Planning Commission

Table of Contents

Overview

Executive Order 569 and the Massachusetts Municipal Vulnerability Preparedness Program

Governor Baker in September 2016 issued Executive Order 569 directing the Secretary of Energy and Environmental Affairs and the Secretary of Public Safety to coordinate efforts across the Commonwealth to strengthen the resilience of communities, prepare for the impacts of climate change and mitigate damage from extreme weather events. The state agencies were charged with establishing a framework that each Town and City could use to assess local vulnerabilities to climate change and to develop appropriate action-oriented response strategies.

The Commonwealth's response to Governor Baker's directive was the creation of the Municipal Vulnerability Preparedness Grant Program (MVP) which provides Massachusetts communities with support to plan for resilience and implement key adaptation actions. The MVP framework, developed by The Nature Conservancy, employs a workshop-based model designed to help local stakeholders in:

- Characterizing climate-related and extreme weather hazards of highest concern to the community;
- Understanding the science of climate change and adaptation. EOEEA has established a website www.resilientma.org as a data clearinghouse for science and state-specific geographic data on climate change;
- Identifying existing and future vulnerabilities and asset strengths in areas of infrastructure and critical facilities, socio-economic characteristics and environmental resources;
- Developing and prioritizing actions for community resilience based on identified opportunities for risk reduction and resilience building;
- Implementing key actions through community partnerships.

With completion of the resilience building planning process, a city/town can become a formally designated MVP community, eligible for MVP action grants to undertake technical plans as well as design and construct priority resilience projects.

During 2019, the Town of Merrimac applied for and received an MVP Planning Grant and initiated the process for MVP designated communities. This funding provided the

Town the resources to organize a series of community resilience building planning workshops. The workshops took place on January 28 and February 11, 2020.

Working groups focused on identifying Merrimac's strengths and vulnerabilities at the January 28th workshop held at Merrimac Town Hall (MVPC Photo)

Invitations were distributed to approximately 40 stakeholders with excellent participation of approximately 20 people per workshop. Workshop participants included a broad representation of community groups, board and commission members, and staff from public works, building, planning, conservation, the Council on Aging, library and other community departments. The workshops were facilitated by MVPC and were held at Sargents Hall at Merrimac Town Hall. The first workshop focused on characterizing the Town's top hazards followed by small table group discussions to identify community features most vulnerable to natural hazards exacerbated by climate change and define community assets that contribute to mitigating risk and aiding recovery. The second workshop centered on discussion of actions in the realms of infrastructure, society and environment the Town can undertake to build a more resilient Merrimac and better prepare for future emergencies.

Planning Project Vision Statement

Merrimac Core Team members developed the following vision for the Town's Municipal Vulnerability Preparedness planning project:

Through a series of Community Resilience-Building workshops, Merrimac seeks to develop an action plan to substantially and sustainably improve its resilience to and preparedness for local climate-related hazards. Merrimac seeks to achieve this by:

1) defining local climate-related hazards;
2) identifying the town's strengths and vulnerabilities regarding each of these hazards, now and in the future; and
3) developing a prioritized action plan to improve the town's resilience to and preparedness for these hazards.

In developing this action plan, the following factors should be considered:

- Maintaining and improving quality of life in Merrimac
- Maintaining fiscal balance and stability despite large and unforeseeable municipal expenses during and after events
- Maintaining communication pathways, and information technology systems, during events (including power outages)
- Maintaining water quality and protecting our natural resources through changing conditions
- Maintaining and replacing aging infrastructure to withstand current and future hazards
- Protecting transportation systems against hazards, including: 1) pothole maintenance from multiple freeze-thaw periods and 2) public transportation reliability
- Avoiding and mitigating damage to private and public property during events
- Providing emergency shelter options to vulnerable populations during events
- Culling at-risk trees and removing fallen trees during storms in a timely manner
- Avoiding poor air quality as temperatures rise, especially during heat waves
- Accommodating increasing energy use and the resulting strain on the electrical grid during heat waves
- Managing insects, pests, wildlife and invasive plant species with changes in precipitation patterns and increasing temperatures

The Workshop Planning and Project Prioritization Process

Agendas for the January 28 and February 11, 2020 workshops are attached as appendices. The ArcGIS Storymap, used as a presentation tool, can be found at the following link:

https://mvpc.maps.arcgis.com/apps/MapJournal/index.html?appid=89747a76fd554be58f4de62b510f303f

As noted above, the first workshop included an opening presentation with summaries of the MVP Program and planning framework, climate change data and projections and Merrimac's history of hazard events all incorporated into the Storymap. Following the presentation, in small table discussions, participants identified and categorized as strengths and/or vulnerabilities critical community infrastructure, societal and environmental features. Individuals then voted on the most vulnerable infrastructure, societal and environmental features in the community. This information was recorded on a matrix for each category and is attached to this summary.

At the second workshop, participants focused table discussions on actions that either enhance community strengths or mitigate hazards that may be exacerbated by climate change. These actions were recorded in the matrices. Individual tables then reported out on all actions and a summary list was compiled.

In both workshops, lead facilitators from MVPC guided table discussions of 8-10 people aided by MVPC staff scribes. Each table delegated a volunteer to report out for the table in the large group discussion.

At the end of the second workshop, similar actions from each table were consolidated and participants voted for their three top recommended priority resilience projects for Merrimac in each or the designated categories (critical infrastructure, socio-economic, and environmental).

A draft Summary of Findings was posted to the Town of Merrimac website in March of 2020 and a public listening session was scheduled for March 16th. During that same month, the COVID-19 pandemic hit the country and state and local governments began working remotely. The listening session was cancelled and rescheduled to be held remotely on April 27, 2020. Over 30 people attended the remote session and additional comments were incorporated into the draft.

Planning Context

Climate Data for Merrimac and the Merrimack River Basin

Nine of the ten warmest years on record have all occurred since 2005, according to the U.S. National Oceanographic and Atmospheric Administration, with 2019 being the second-hottest year in NOAA's 140-year climate record just behind 2016. Average global temperatures have risen steadily in the last 50 years. Scientists warn that the trend will continue unless greenhouse gas emissions are significantly reduced. [1]

What does this mean for Merrimac? Here are some of the statistics:

Changing Temperatures

- From 1971 to 2000, the Merrimack River Watershed basin and the Merrimack Valley had an annual average of 7 days with temperatures above 90 degrees Fahrenheit.
- By the end of the century, Merrimac and the region are projected to have fourteen (14) to as many as seventy-two (72) more days per year with temperatures rising above 90 degrees.
- The area can expect shorter, milder winters with seven (7) to twenty-nine (29) fewer winter season days yearly with temperatures below freezing on average.
- Mean annual temperatures in Massachusetts are expected to be 3.8-10.8°F warmer than over recent decades.
- Total days requiring heat will be 15-37% lower, but days requiring cooling are projected to triple by century's end.
- The agricultural season will be longer with growing degree days expected to increase by 30 to 100%.[2]

Changing Precipitation

- Total annual precipitation at century's end is projected to increase by as much as 18% above the 1971-2000 baseline of 45", with most high precipitation events concentrated in the winter and spring months.
- Winter precipitation is expected to increase by as much as 36%. Winters are projected to get wetter with more precipitation occurring as rain or freezing rain, rather than snow because of the increase in temperatures.

- For summer and fall seasons, data projections are showing variable precipitation levels with potential for a moderate change in the number of consecutive dry days (less than 1 mm precipitation).
- From 1971 to 2000, the baseline average for annual consecutive dry days was 17. That is projected to increase by 3 days at the end of this century.[3]

More Frequent, Intense Storms

According to the Fourth National Climate Assessment issued in 2018, heavy precipitation events in most parts of the United States have increased in both intensity and frequency since 1901. There are important regional differences in trends, with the largest increases occurring in our northeastern United States.

The frequency and intensity of heavy precipitation events in Merrimac and the Merrimack Valley are projected to continue to increase throughout the 21st century. The northern United States, including New England, is projected to receive more intense precipitation events in the winter and spring, while parts of the southwestern United States are projected to receive less precipitation in those seasons. Consequences of more extreme storm events include infrastructure failures, disruptions to local economies, and increased public safety risks with more demands on local government and first responders.

March 2018 Nor'easter
Photo credit: MVPC Library

[1] https://www.noaa.gov/news/2019-was-2nd-hottest-year-on-record-for-earth-say-noaa-nasa

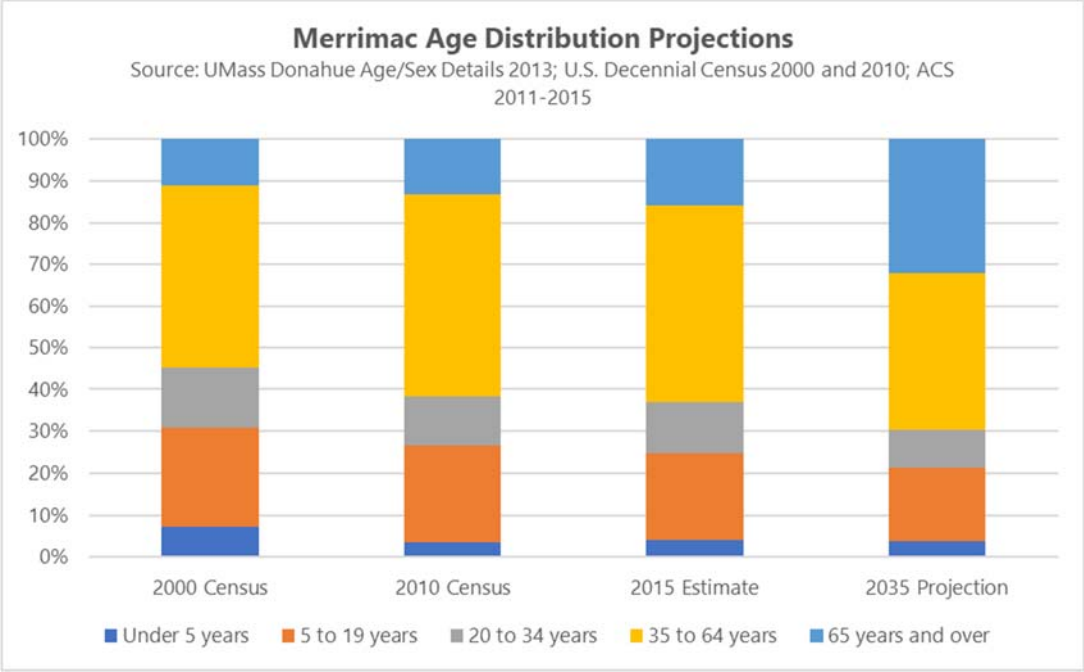
[2] http://www.resilientma.org/resources/resource::2152 National Climate Science Center at the University of Massachusetts Amherst, Massachusetts Climate Change Projections, March 2018.

[3] Ibid.

Planning Context

Merrimac Demographics

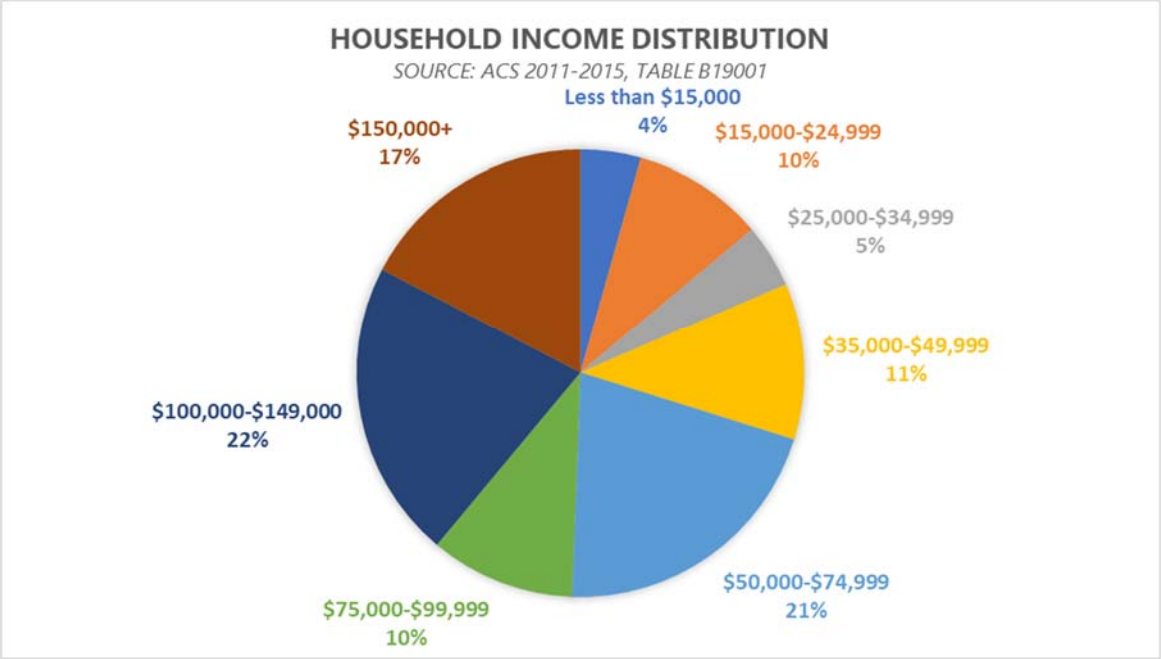
- Merrimac is growing, but at a slightly slower rate than the region overall. Projections indicate a population increase of 5 percent by 2020. From 2000 to 2015, the number of households grew by 13 percent, fourth highest in the region. Population growth combined with household growth indicate a need for more housing in the coming years.
- The composition of Merrimac's households is also changing, with less households with children and a significantly greater percentage of older adults in the coming years.
- The age composition of Merrimac's population is anticipated to change with a 160 percent increase in the number of older adults (age 65 year and over), a 39 percent decrease in the number of school age children, a 59 percent decrease in the number of adults age 20 to 34 years, and a 40 percent decrease in the number of adults age 35 to 64.



- The region is becoming more racially and ethnically diverse, however, Merrimac's population continues to racially identify primarily as white alone,

with an estimated 99 percent (2015 ACS), a slight increase from 2000 when 98 percent of the population identified as white alone.

- Merrimac's population has slightly lower disability rates than the region, and while it is more common for older adults to have disabilities in general, Merrimac has a slightly lower proportion of its older population reporting disabilities than in the region. However, there is still an estimated 30 percent (about 317 of older adults age 65 years and over) of residents with disabilities.
- Merrimac's households have slightly lower median income than households in the region, however, householders between the ages of 25-44 have a substantially higher income than other age brackets. Only one other community in the region is similar in this regard. Poverty rates in Merrimac are lower than the region, with an estimated 6 percent of the population living in households below the federal poverty thresholds.



- About 85 percent of Merrimac's households own and 15 percent rent their home, which is a much higher estimated percentage of owner households than in the region overall (63 percent).[4]

[4] Town of Merrimac Housing Production Plan 2018-2022 prepared by Merrimack Valley Planning Commission with JM Goldson community preservation & planning

Other Demographic Information:

EMPLOYMENT

- Roughly 45 percent of Merrimac's total labor force is employed in the industries of management, business, science and arts. About 25 percent is employed in sales or office occupations, and about 15 percent is employed in the service industry. The remaining employed population works in the fields of natural resources, construction, and maintenance and production, transportation, and material moving.
- The 2016 estimated unemployment rate for Merrimac was 3.6 percent, which is lower than the county rate of 3.8 percent. The state was estimated to have a 3.7 percent unemployment rate in 2017.
- Per the 2015 estimates, about 50 percent of Merrimac households have less than 30-minute travel time to work. This is lower than the estimated population in the region (57 percent), county (57 percent), and state (56 percent) that have less than 30-minute travel time to work. About 21 percent of Merrimac households commute over an hour, which is greater than in the region, county, and state.

EDUCATION

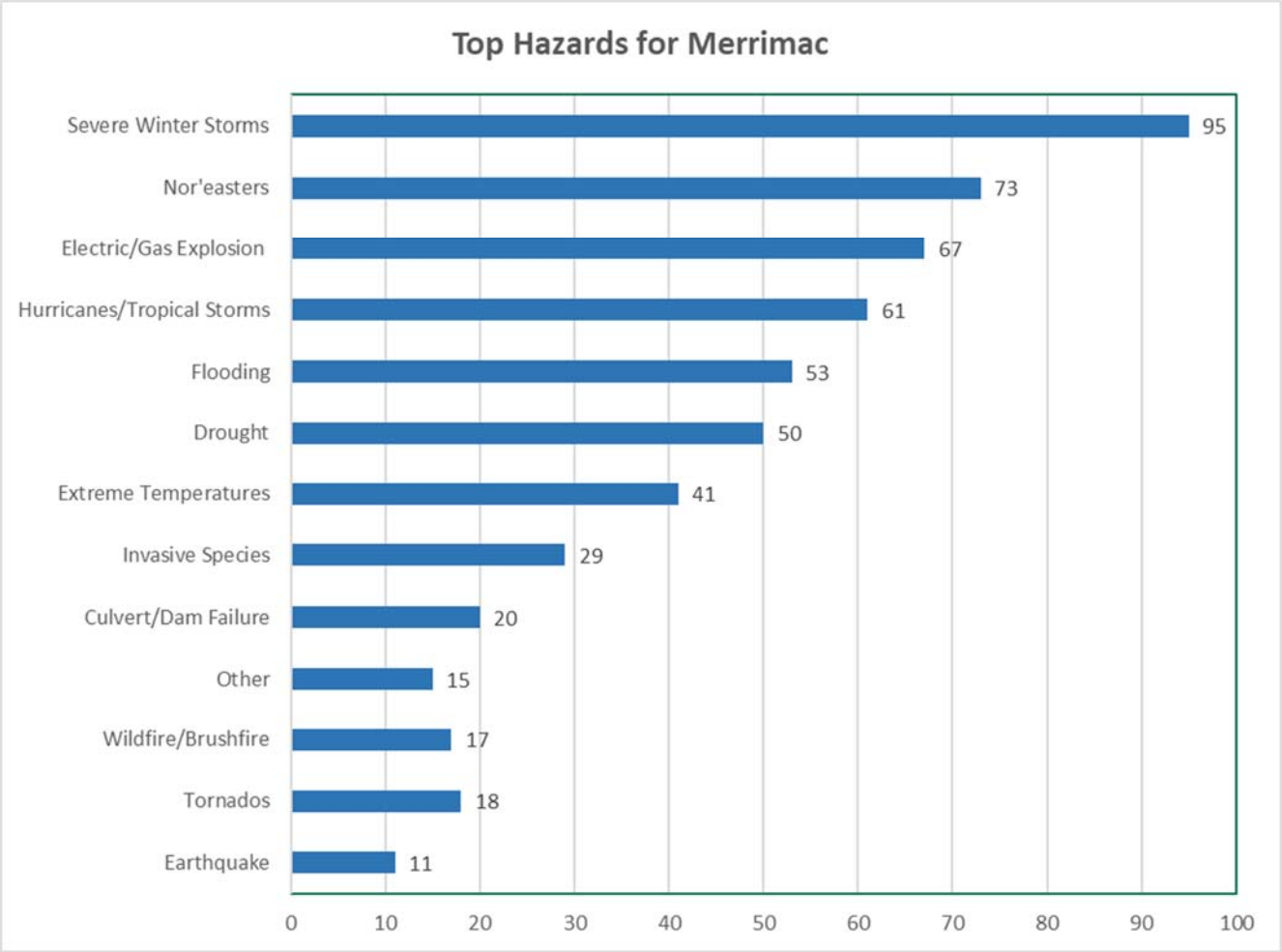
- Per the 2015 ACS, about 97 percent of Merrimac's population age 25 years and over are high school graduates or have higher education – this is higher than the county (89 percent) and state (89.8). About 26 percent of the population have a bachelor's degree and not a graduate or professional degree – this is higher than the region (22 percent), county (22 percent) and state (23 percent). About 19 percent of Merrimac's population has a graduate or professional degree – this is higher than the region (16 percent), county (15 percent), and state (18 percent).

RESIDENTIAL PROPERTY VALUES

- There are 2,582 housing units in Merrimac.
- In FY17, the total assessed value of all residential parcels in Merrimac was $700,971,527, and the average value of a single-family home was $348,594. Merrimac's average single-family tax bill is $5,696, which is about $331 lower than the median of the regional community's average single-family tax bills ($6,027).

Top Hazards for Merrimac

In preparation for the community resilience workshops, the project team sent out a community survey asking stakeholders to identify the top four potential hazard events of most concern. Over 200 people responded to the survey question which generated the following response levels.



Informed by the survey, the Core Team characterized the top Merrimac hazard concerns (additional survey results in Appendix).

Town of Merrimac Primary Hazard Concerns Identified

Nor'easters/Severe Winter Storms

Storms of heavy winds and rain along with severe winter storms are the most frequent naturally occurring hazard in Massachusetts. And with climate change, the intensity and frequency of these storms will rise. Nor'easters have caused major tree damage and infrastructure disruption to many Merrimack Valley Communities, memorably in March 2018 and Oct. 2017 when storms precipitated road closures and extended power outages.

Flooding

Approximately 11% of Merrimac's land area lies within either the designated flood zone areas with either a 1% (100-Year) or .2% (500-year) chance of occurrence. Risk of flooding events are heightened by the effects of climate change which portends higher precipitation levels in Winter/Spring seasons and more frequent, intense storms. In fact, parameters of the so-called 100-year storm are changing. In the 1960's, a 24-hour event that produced 6.5 inches of rain was categorized as a 100-year storm. By 2015, threshold for the 100-year storm (i.e. storm with 1% occurrence odds in any year) was 8.4 inches of rain over 24 hours. [5] Significant flood events occurred in Merrimac most recently in Spring 2010 and the Mother's Day Flood of 2006.

Hurricanes/Tropical Storms

A 2017 U.S. Climate Science Special Report noted that there has been an upward trend in North Atlantic hurricane activity since 1970. The report forecasts that future hurricanes formed in the North Atlantic will drop more rain and may have higher wind speeds. This is because a warmer atmosphere will hold more water, and hurricanes are efficient at wringing water out of the atmosphere and dumping it on land. [6] Extreme tropical storms travel over inland areas and may release large quantities of precipitation causing rivers to overtop their banks flooding roads and damaging infrastructure.

Aging Infrastructure

The Sept. 2018 Gas Explosions underline heightened concern with infrastructure conditions in the Merrimack Valley. Bridges, culverts, dams, sewer, water and storm drain lines, power and communication networks, many installed in the first half of the 20th century or earlier are all vulnerable to extreme storm events.

[5] https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html National Oceanic and Atmospheric Administration, Atlas 14 Precipitation Frequency Atlas of the United States & Technical Paper # 40, U.S. Dept. of Commerce.

[6] http://www.resilientma.org/resources/resource::2152 National Climate Science Center at the University of Massachusetts Amherst, Massachusetts Climate Change Projections, March 2018.

Concerns & Challenges Presented by Hazards and Climate Change

Merrimac Infrastructure & Critical Facilities – Vulnerabilities & Actions Identified

Culverts: Locally, several major arterial, collector and local roadways comprise Merrimac's transportation network. Sidewalks for pedestrian access are located principally in the downtown area. Several local trails are used by pedestrians, cyclists, horses, cross country skiers and snowmobilers. Many of Merrimac's roads are winding, rural and lined with mature trees. Major highways located within Merrimac include State Route 110 and Interstate 495. These roads also serve as evacuation routes in an emergency. All of Merrimac is located in the Merrimack River Watershed, which covers approximately 5,000 square miles in Massachusetts and New Hampshire. Lake Attitash, located along Merrimac's eastern boundary, doubles as a recreational and scenic resource for the region and a source of drinking water for neighboring Amesbury. The Town is crossed by many major and minor streams, such as Cobbler's Brook, which runs through the center of town to the Merrimack River and the Back River that drains into Lake Attitash.

Undersized culverts can act as choke points restricting stream flow causing flooding of local roadways preventing access to these major routes. Extreme storm events with higher precipitation amounts will exacerbate this flooding. Significant parts of the Town of Merrimac lie within the floodplains of the Merrimack River, Cobbler's Brook and Lake Attitash. A GIS analysis of the town's FIRM flood hazard areas by MVPC has determined that a total of 513.6 acres (0.8 sq. mi.) of land area in Merrimac is located within the 100-Year floodplain and thus is vulnerable to flooding. An additional 124.8 acres (0.2 sq. mi.) lies within the 500-Year floodplain. Together, these two flood zones constitute 11.2% of the total area of the community which is a large proportion of land in town located in a flood hazard area. The 100-year floodplain extends the distance of the Merrimack River riparian corridor and includes the shoreline of Lake Attitash. The City of Amesbury controls the height of the surface water in Lake Attitash in accordance with the public water supply management plan. Other large flood hazard areas in Merrimac include the Cobbler Brook riparian corridor and the associated wetlands located to the east of the corridor.

Workshop participants identified several culverts of concern including those on Bear Hill Road, Mill Street, Church Street and Harriman Road. Culverts on Bear Hill Road and Mill Street have been evaluated and need funding for final design, permitting and construction. Other culverts were identified for study and prioritization.

In addition, workshop participants recognized that addressing flooding in the Lake Attitash area will require a regional response as the City of Amesbury controls the height of the Lake. Workshop participants identified regional planning for Lake Attitash Management as an important action item.

Emergency Shelters: Merrimac stakeholders were concerned about the lack of shelter locations in the community. Currently Merrimac does not have any identified shelter locations, only Emergency Operation Centers (Merrimac HMP 2016). Identifying shelter locations and properly equipping these locations was another high priority. Regional collaboration for sheltering was also identified as was the need to have backup power. Merrimac acknowledged that a clean energy source with storage capacity would be the ideal solution and an action the town should pursue.

Water, Sewer & Stormwater Infrastructure: Merrimac's water, sewer and drainage infrastructure are vulnerable because of age and condition in some areas but is also serves as a strength in mitigating hazards and protecting public health in others.

Water supply remains a significant challenge to Merrimac's future development and is likely to be exacerbated by the increasing number of days without precipitation. According to the Water Master Plan completed in November 2009, Merrimac obtains water from two well fields, the East Main Street well field and the Sargent Pit well field. The Town is registered to withdraw a total of 0.36 Million Gallons per Day (MGD) from these supply sources and is permitted to withdraw an additional 0.1 MGD for a total Water Management Act Authorized withdrawal of 0.46 MGD, or 167.9 MG/year. The system provides municipal water to approximately 5,390 persons, or 80% of the town's total population and the average water use per person is 64 gallons per day. The Town anticipates that water demand will increase from current average daily flows of 0.396 Mgal/day to 0.422 Mgal/day in 2020, and 0.450 Mgal/day in 2030. Merrimac's efforts in promoting water conservation and aggressively correcting leaks when detected are very effective in managing a limited supply with few options for expansion. Workshop participants identified a need to undertake a study to identify

additional drinking water sources which could include looking regionally. A need for greater water storage facilities was also identified.

Except for a few small isolated rural sections, most of Merrimac is part of the public wastewater system. The Merrimac Wastewater Treatment Facility (WWTF) was upgraded in 2005. It has a discharge license that limits its total discharge flow rate to 450,000 gallons per day calculated on a 12-month running average. This flow rate was exceeded from May to September 2006 due to severe storms that exposed the vulnerability of the system to infiltration and inflow into the collection system. The town has since been aggressive in eliminating infiltration/inflow to seep into the system. These efforts have been successful in reversing the increase in the 12-month running average to its current level of approximately 326,300 gallons per day. While the town does have a meaningful reserve that can be used to support continued but controlled growth in the community, a study is needed and was identified by workshop participants as a priority. Moving critical wastewater treatment plant infrastructure (including lift stations and main lines) farther from the Merrimack River and other sources of potential flooding was also an identified action item.

Merrimac maintains many stormwater structures including catch basins and outfalls as well as a variety of basins and swales. In 2016, the U.S. EPA and MassDEP updated the permit regulating municipal management of separate storm sewer systems (MS4s). It went into effect in 2018 and requires that urbanized Massachusetts communities, including Merrimac, take proactive steps to implement tracking systems to guard against illicit discharges that could pollute waterways. The permit also prescribes maintenance of stormwater infrastructure and mandates promotion of low impact development techniques including nature-based stormwater treatment systems. Merrimac prioritized a need to inventory and prioritize maintenance of stormwater basins to be certain they will function as needed in larger more frequent storm events.

Merrimac identified a need to review its traditional and open space subdivision bylaws and regulations to improve maintenance access to stormwater infrastructure. This increased maintenance and oversight could be a strength as the community works to improve the quality of its waterways. However, it has led Merrimac to identify the need to review its stormwater bylaws and regulations to be sure they are addressing future climate related concerns including increased rainfall and more frequent severe storm events.

Municipal Facilities & Resources: Workshop participants identified the DPW Facility located on East Main Street as a top concern. The facility is located on Cobbler's Brook and is subject to flooding. Cobbler's Brook is a 3.7-mile perennial stream that originates between Highlands Hill and Red Oak Hill. It runs north-south through central Merrimac, passing just east of the town square before emptying into the Merrimack River. Much of the shoreline has been disturbed and extensively developed with residential uses, light manufacturing, agricultural uses, road crossings and culverts, and the former municipal landfill all of which have increased flooding events. The riparian corridor of this brook is not an ideal location for the DPW facility and the many operations that it supports. Finding a new location for the DPW complex was a priority for workshop participants to increase the resiliency of the community.

Merrimac Societal Features – Vulnerabilities & Actions Identified

Merrimack River Mother's Day 2006 (MVPC Photo)

Emergency Planning: The age composition of Merrimac's population is changing with a substantially greater number of older adults (over 65) with approximately 30 percent of which identified themselves as having a disability.[7] Workshop participants stressed the need for outreach and education to vulnerable populations on emergency planning and recommended coordination with faith-based, community and veterans groups. Other actions included establishing an emergency plan including communication to vulnerable populations. A contact list was suggested. Emergency planning for flood-prone areas was also stressed as residents in these areas are often cut off from emergency services during storm events the frequency and intensity of which is already increasing. Residents of the Lake Attitash area were mentioned specifically. Stakeholders also raised the concern that some vulnerable populations are not identified in the community including those living in illegal apartments and those with mobility issues.

Other populations identified as vulnerable in Merrimac and to be considered in emergency planning included residents of one of the town's two mobile home parks and residents of the public housing complex Merri Village.

Participants agreed that there is a need for the community to enhance its current efforts to educate and communicate about climate-related hazards including ways to prepare and plan for these hazards, both now and in the future.

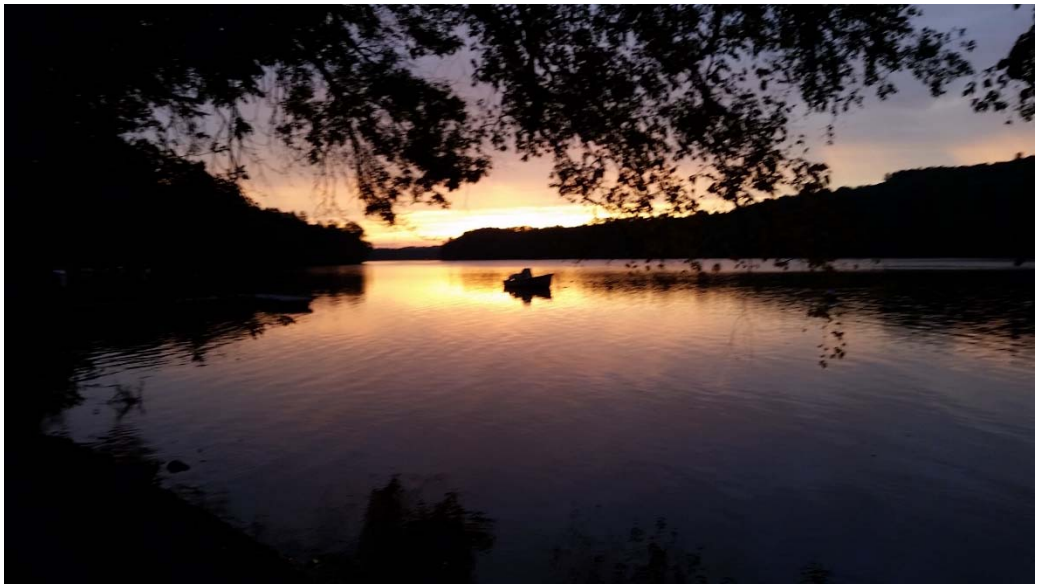
[7] Town of Merrimac Housing Production Plan 2018-2022 prepared by Merrimack Valley Planning Commission with JM Goldson community preservation & planning

Shelter Planning: Workshop attendees again identified the lack of shelters and shelter planning as a vulnerability requiring action. The need for backup energy at shelters was also raised. Green solutions for backup power were prioritized.

Access Issues: Merrimac stakeholders recognized that in emergency and in everyday situations that town sidewalks and other facilities are not accessible for those with mobility issues. Of the estimated disabilities in Merrimac, the most reported was ambulatory (36 percent of reported disabilities)[7]. Funding and implementation of the Town's transition plan was a recommended action to be certain all populations can access emergency services especially in hazard situations.

Other: Workshop attendees also identified developing youth-based education programs around stewardship, responsible land use, and eco-services as a way to address vulnerabilities related to climate change. Other suggested actions included education and outreach on resilient tree species and development of maintenance plans for stormwater infrastructure.

Merrimac Environmental Features – Vulnerabilities & Actions Identified



Lake Attitash (MVPC Photo)

Water Supply: Water supply was again a top concern of Merrimac stakeholders in the area of environmental vulnerabilities. The frequency and intensity of drought are projected to increase during summer and fall in the Northeast as higher temperatures lead to greater evaporation and earlier winter and spring snowmelt, and precipitation patterns become more variable and extreme. This may only exacerbate Merrimac's vulnerability. Workshop attendees cited the need for a comprehensive water study including storage options.

Another lower priority action was to encourage land preservation for infiltration in wellfield areas and consider an expansion of the Merrimac's water supply overlay district.

Tree/Forest Health: Merrimac stakeholders identified tree and forest health as a vulnerability. Participants selected forest management planning and implementation as the action to address this issue. Wild/brushfires as well as downed trees due to severe storm events elevated concerns among workshop participants.

Invasive species were another concern of Merrimac stakeholders and finding alternative management techniques was an action item. Street tree planting was a lower priority action suggested to improve resiliency to higher temperatures and improve infiltration of larger storm events. Participants emphasized the need to consider resilient tree species as the local climate changes. Workshop participants suggested a review of the subdivision regulations to add street trees requirements.

Planning: Many participants identified a need to continue resiliency planning beyond the workshop process. Possible actions included creating a position for a resiliency planner/sustainability coordinator to keep the process and discussion moving forward and to implement the action items. The possibility of a volunteer position/committee was also suggested.

Updating subdivision regulations for better stormwater management including ensuring better access to structures for operation and maintenance (O&M) was an action identified to improve Merrimac's resiliency to larger storm events and flooding. A specific need to review the traditional and open space subdivision regulations was cited by several participants.

Watersheds: The Cobbler's Brook watershed was specifically identified by stakeholders as vulnerable to the pressures of increased precipitation and severe storm events. A watershed study of this area including the mini watersheds that contribute to flooding in Merrimac was a high priority.

Education: Outreach to the community was suggested as an action that would improve Merrimac's resiliency. Stakeholders identified an educational speaker series on resiliency topics (possibly including presentations of before and after examples of resiliency projects) to address the effects of a changing climate.

Bank Erosion: Prior storm events have eroded banks and closed roads in Merrimac. Workshop participants recommended a bank restoration and management plan to address failing river and stream banks for resiliency to future and potentially larger storms. An educational flyer on bank erosion was another outreach example discussed in the second workshop. Areas of bank erosion include Lake Attitash, the Merrimack River and Cobbler's Brook. The Historic Commission was mentioned as a source of old photos to compare historic and existing conditions.

Flood Prone Areas: Merrimac stakeholders identified several farms and other areas potentially subject to developed that should be preserved for their flood storage capacity. Land preservation was also encouraged by several workshop participants for its ability to sequester carbon and provide increased infiltration.

Community Strengths & Assets

Identify Vulnerabilities and Strengths in Merrimac (MVPC Photo)

MVP workshop participants in taking stock of Merrimac resources not only took account of vulnerable community features, but also identified community assets and strengths that contribute to Merrimac's resilience in responding to and recovering from hazard events. Infrastructural, Societal and Environmental assets highlighted in the workshop groups include:

Requirement for Infiltration: Workshop participants stressed the need to maintain and improve upon the town's bylaws that require infiltration on new development projects.

Green Energy Program: Merrimac is a designated Green Community and recognizes that continuing in this program will make the community more resilient to climate impacts. Stakeholders identified needs to fund backup power for emergency situations using green energy solutions including solar with backup energy storage.

Senior Center: Merrimac is proactive in organizing a broad range of services and activities promoting wellness, education, creativity and advocacy for seniors. The

Senior Center was identified as an organization capable of assisting with future shelter and emergency planning in Merrimac. A backup green energy system is also needed at the senior center.

Other Regulations: Workshop participants cited the Open Space Subdivision Regulations with increasing Merrimac's resiliency. They also acknowledged that these regulations should be reviewed and updated as that has not been done in many years.

Municipal Light Plant: Merrimac acknowledged the strength of having local operation of its Light Plant. However, a need to explore backup energy solutions for emergency preparedness was noted.

Merrimac Town Hall (MVPC photo)

Other Strengths: Stakeholders also identified participation in the Mosquito Control District, Mutual Aid agreements, reverse 911 system and a strong, closely knit community as further strengths that will assist with resiliency in the face of climate change. Maintaining and strengthening these programs was a workshop priority.

Top Recommendations for a More Resilient Merrimac

Merrimac residents and staff assessing options while voting on top priority actions at the February 11th workshop at the Merrimac Town Hall (MVPC Photo)

In small table groups, workshop participants identified actions focusing on infrastructural, societal and environmental features and issues of most concern. Each table identified their priority actions. Participants came together at the end of the workshop to vote for their top three recommendations in each category. Highest priority actions selected by participants were:

High Priority Actions Infrastructure:

- Design and implement culverts where previous studies have been done. Fund a study of the remaining culverts to prioritize replacement to accommodate future stream flows. Studies should include existing and future land use development.
- Identify shelter locations and properly equip those shelters including backup green energy. Regional solutions should be considered.

- Conduct water & wastewater study including moving critical wastewater facilities out of areas that may be subject to flooding.
- Relocate DPW complex out of flood-prone area
- Continue work with Green Communities and work on green energy generation and storage

Highest Priority Actions Socio-Economic:

- Establish emergency plan including strategies for communicating with vulnerable populations.
- Outreach and education for vulnerable populations (mobility issues, group homes) in emergency situations. Coordinate this outreach with faith based, community and other groups.
- Shelter planning with backup green energy
- Improve access for emergency and everyday situations for those with mobility issues. Sidewalks were specifically mentioned.
- Emergency planning for flood-prone areas (Lake Attitash area may require regional solution)

Highest Priority Actions Environmental:

- Conduct forest management planning and implementation
- Conduct a comprehensive water study including storage (consider regional options)
- Conduct new watershed study of Cobbler's Brook including its mini watersheds
- Explore role for resiliency planner in local government. Find additional ways to continue resiliency planning including volunteers.

Other Priority community resilience projects identified by Workshop stakeholders and MVP Core Team, in addition to the Top Workshop Outcome Recommendations above were:

- Comprehensive review of bylaws for stormwater
- Conduct an educational speaker series on resiliency topics
- Study and prioritize stormwater system improvements; develop maintenance plans for stormwater basins including provisions for access
- Bank restoration and management plan; education flyer on bank erosion
- Land preservation/restrictions for infiltration, flood protection and carbon sequestration
- Public education and outreach regarding resilient tree species
- Regional planning for Lake Attitash management
- Develop youth-based education program focusing on responsible land use, stewardship and eco-services
- Add street tree planting to subdivision bylaws with requirement for resilient species and guidance on placement
- Explore collaborative and strategic development plan for former farms and other large parcels that may be subject to development
- Explore and implement alternative management strategies for invasive species

Appendices

- **Workshop Participants & Resource Staff**
- **Reference Sources**
- **Citations & Acknowledgements**
- **Additional Comments Received (Virtual Listening Session and post listening session)**
- **Virtual Listening Session Announcements**
- **Additional Survey Results**
- **Workshop Agendas**
- **Risk Matrices**
- **GIS Map**

Workshop Participants & Resource Staff

Participant Name	Title/Affiliation
Carol McLeod	Finance*
Robert Sinibaldi	DPW/ISD*
Alyssa Sexton	DPW*
Denise McClure	Consultant*
Eric Shears	Police*
Larry Fisher	Fire*
Holly Moran	Selectmen*
Kelly Unsworth	Library*
Jay Smith	Conservation*
Francisco Frias	Merrimac Light Department*
Justin Bartholomew	Pentucket School Superintendent
Eileen Stepanian	Town Nurse
Nick Fiorello	Senior Center
Laura Mailman	Senior Center
Anne Murphy	COA*
Chris Gaudet	Chair – Commission on Disabilities
Sandra Venner	Chair – OS, PB, Housing*
Veronica Wolf	Lake Attitash Association*
Greg MacLean	Retired
Hilary Snook	EPA
Lucy Abisalin	Open Space
Matt Schweisberg	Wetland Consultant
Anthony Komornick	MVPC
Theresa Park	MVPC
Jerrard Whitten	MVPC
Jennifer Hughes	MVPC
Mikayla Minor	MVPC
Nancy LaValle	MVPC
Michelle Rowden	Northeast Regional Coordinator - MVP

***Indicates MVP Core Team Member**

Reference Sources

Massachusetts State Hazard Mitigation & Climate Adaptation Plan, September 2018, Executive Office of Energy and Environmental Affairs.

Merrimack Valley Multi Hazard Mitigation Plan Update, April 2016, Merrimack Valley Planning Commission.

Massachusetts Climate Change Projections, March 2018, Northeast Climate Adaptation Science Center (NECASC) for the MA Executive Office of Energy and Environmental Affairs.

Special Report-Global Warming of 1.5 Degree Centigrade, Intergovernmental Panel on Climate Change, October 2018.

Fourth National Climate Assessment, U.S. Global Change Research Program, November 2018.

Town of Merrimac Housing Production Plan 2018-2022, prepared by Merrimack Valley Planning Commission with JM Goldson community preservation & planning, 2018.

American Community Survey, Five-year Estimates 2013-2017.

Merrimac Open Space and Recreation Plan, 2017.

Citations & Acknowledgements

For future referencing of this project and report, the following citation should be used: *Municipal Vulnerability Program Community Resilience Building Workshop Summary of Findings,* Town of Merrimac, 2020. Prepared by Merrimack Valley Planning Commission.

This Town of Merrimac planning project was funded through a Municipal Vulnerability Planning Grant awarded by the Massachusetts Executive Office of Energy and Environmental Affairs.

The Town and MVPC are appreciative of the state agency resource assistance for funding as well as technical aid provided. Special thanks to all stakeholders who participated in the planning workshops.

Additional Comments Received

Virtual Listening Session Held April 27, 2020 3:30 p.m.

Posted on Town of Merrimac Website and in the *Newburyport Daily News*

Core Team and Stakeholders were invited via email

- Listening session was held via GoToMeeting (session recorded)
- Approximately 33 people including Merrimac and MVPC staff, members of the Core Team, stakeholder group, MVP program staff and community members participated
- Comments received:
    - Lake Attitash Association member noted problems with drainage out of Lake Attitash through a culvert into Duxbury Pond (Meadow Brook). This area is in neighboring Amesbury and would require Merrimac to work collaboratively to resolve issues in this shared watershed.
    - Another resident commented in the meeting chat box that she would like to see support for residents that use renewable energy. She noted that power buyback rates in Merrimac are among the lowest in the state which is not a positive incentive for green energy production at the resident level.
- Following the Listening session, the Summary of Findings was posted to the Town Website with staff and MVPC emails listed for providing comments.
- Comments received:
    - Request to update facilities designated as Emergency Operation Centers – MVPC confirmed that currently the Fire Station serves in this capacity
    - Comment that it might be ambitious to think Merrimac could afford to create a position of resiliency planner/sustainability coordinator, but more likely to hire a professional Town Planner, with responsibilities associated with continued resiliency planning tied to that position along with affordable housing promotion and retention to meet some other unfilled planning and coordination needs.

Listening Session Announcements:

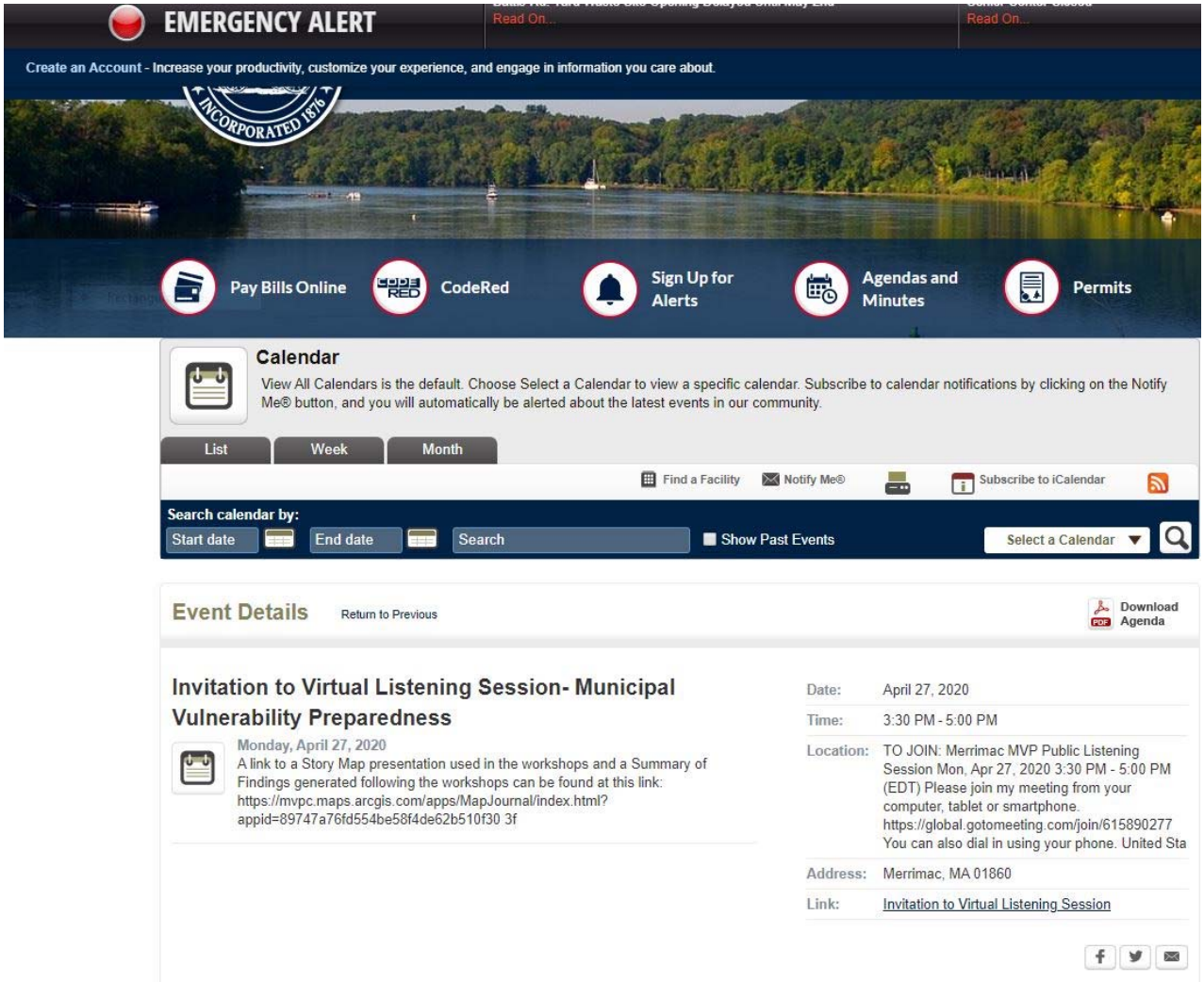
Merrimac seeks input on preparedness plan

Apr 17, 2020

MERRIMAC – Working with municipal officials and key stakeholders, the town has held two workshops to assess the town's vulnerability to climate change and develop action-oriented resilience strategies.

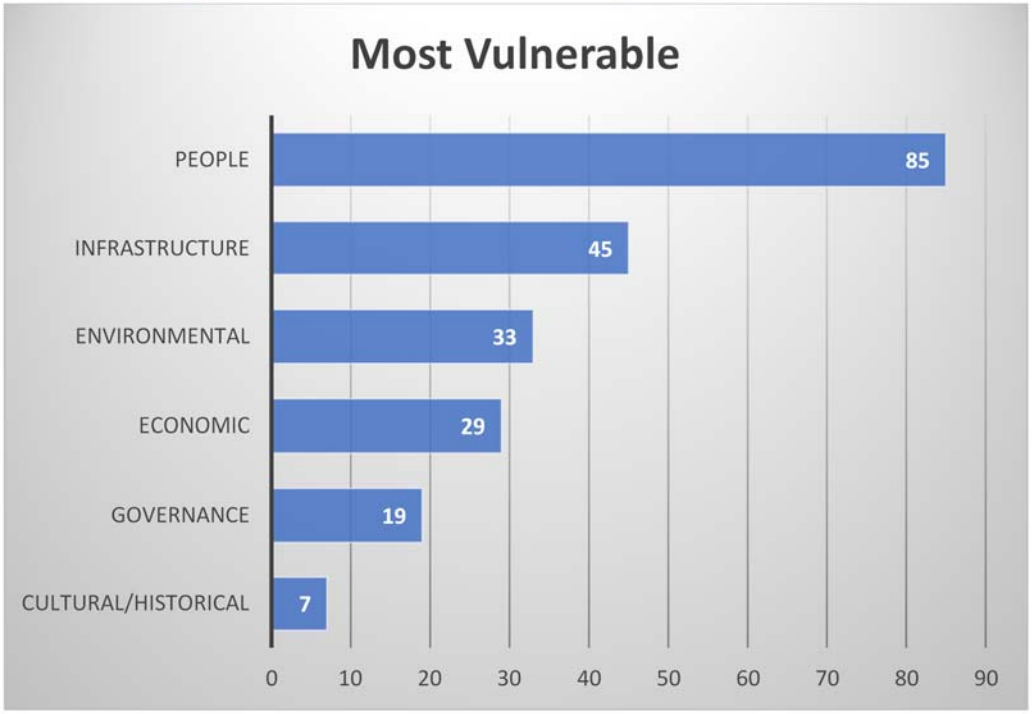
As a next step toward becoming a Municipal Vulnerability Preparedness designated community, town officials invite community members to review the summary of findings produced following these workshops and to take part in a virtual "listening session" April 27 from 3:30 to 4:30 p.m.

The summary of findings and details on how to join the workshop online or by phone can be found at www.townofmerrimac.com.

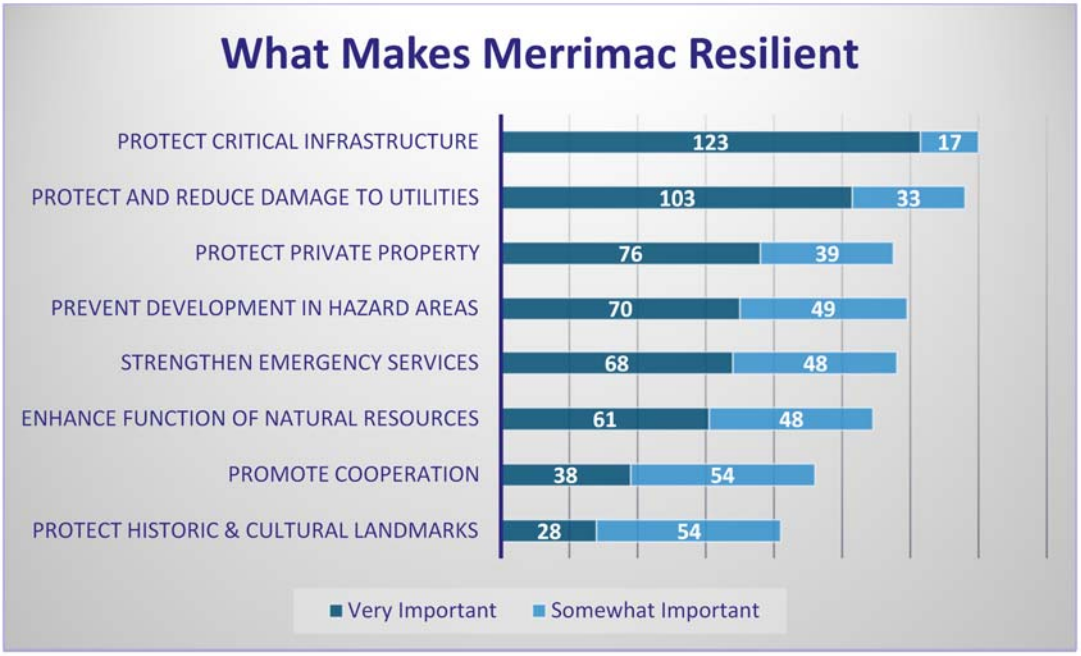


Additional Survey Results

Which of the following are most vulnerable to impacts of natural hazards?



How would you make Merrimac more resilient? Please tell us how important each community element is to you by checking the appropriate column box.



AGENDA

MERRIMAC MUNICIPAL VULNERABILITY PREPAREDNESS (MVP)
PROJECT CORE TEAM – Meeting
Tuesday, November 19, 2019 – 1 P.M.

Sargent Auditorium

1. Introductions

2. Overview of MVP Program & Project Mission Statement

3. MVP Working Sessions

    a. Late January – Characterize Hazards; Identify Strengths & Vulnerabilities
    b. Early February – Resilience Strategies & Actions (Snow dates needed)
    c. Public Meeting/Listening Session: To be scheduled.

4. Survey – Defining Top Hazard Concerns.

5. Critical Infrastructure: Data/Plans & Mapping Overview

6. Stakeholder Outreach/Stakeholder Interviews

7. Role of Core Team

8. Questions & Answers

Municipal Vulnerability Preparedness for Merrimac

Working Session #1

Merrimac Town Hall

January 28, 2020 8:30 A.M.

AGENDA

I.	Welcome/Introductions
II.	MVP Overview, Working Session Objectives & Summary of Community Survey
III.	Hazards Overview & Resources Presentation
IV.	Instructions for Small Team Breakouts
V.	Small Team Breakouts – Community Identification and Assessment of Strengths & Vulnerabilities A. Infrastructure & Critical Facilities B. Social/Economic Features C. Environment/Natural Resources
VI.	Large Group Wrap-Up: Report Outs from Tables
VII.	Vote on Top Vulnerabilities & Strengths For reference, the Story Map presentation can be accessed at this link: http://bit.do/MerrimacMVP
Workshop #2: Prioritizing Actions for Merrimac Resiliency **Tuesday, February 11, 2020 - 8:30 A.M. at Merrimac Town Hall (Snow Date February 12)**	

Municipal Vulnerability Preparedness for Merrimac

Working Session #2

Merrimac Town Hall

February 11, 2020 8:30 A.M.

AGENDA

I.	Welcome/Introductions
II.	Recap of Workshop #1: Top Hazards, Strengths and Vulnerabilities
III.	Presentation of types of MVP Resiliency Projects and Action Grant Funding
IV.	Instructions for Small Team Breakouts
V.	Small Team Breakouts – Identify and Prioritize Actions A. Infrastructure & Critical Facilities B. Social/Economic Features C. Environment/Natural Resources
VI.	Large Group Wrap-Up: Report Outs from Tables
VII.	Vote on Highest Priority Actions For reference, the Story Map presentation can be accessed at this link: http://bit.do/MerrimacMVP
Next Meeting: Community Listening Session on Workshop Findings – Spring 2020	

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S	Top Priority Hazards: Severe Winter Storms/Nor'easters	Aging/Failing Infrastructure	Hurricanes/ Tropical Storms	Flooding	Priority H - M - L	Time Short Long Ongoing
Critical Infrastructure									
Road Culverts	Bear Hill, Mill St, Church St, Harriman Rd	Town	V	·systematic prioritization of culvert repairs w/ land use stydy for priority areas to evaluate controlls, runn-off, infiltration, etc. - study micro watersheds ·Get designs, get funding to implement design ·Update existing culvert prioritization list				H+	O
Shelters	Multiple	Town/Regional	V	·Identify potential shelter location ·Consider regional locations ·Epuip shelters ·Develop shelter plan including resources, mutual aid, database of contacts				H	O
Lake Attitash Drainage & Control Structures	Amesbury	Private, Town, City of Amesbury	V	·Regional effort to engage Amesbury in Lake Management Plan ·Explore alternative technologies to support infiltration ·Explore protection for Sargents Farm				M	O
Waste Water Treatment Plant	50 Federal Way	Town	V	·Begin wastewater study plan for upgrades to plant ·Move critical infrastructure to higher land				MH	S/O
Requirement for Infiltration (Bylaw)	Town wide	Town	S	·Conduct comprehensive reviw of bylaws/regs to update and improve				M	S/O
Fire & DPW Buildings	16 East Main Street	Town	V	·Review/update study of Cobbler's Brook ·Explore new location for DPW - currently in Floodplain/MS4 issues				MH	S/O
Green Energy Program	Town wide	Town	S	·Continue participation in Green Communities program				M	O
Redundant Power		Town	V	·Study solar/clean energy with storage				ML	O/L
Generators	Multiple	Town	V	·Identify/study needs for shelters - include consideration of above (solar/clean energy)				ML	O/L

Community Resilience Building Risk Matrix

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H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S	Top Priority Hazards: Severe Winter Storms/Nor'easters	Aging/Failing Infrastructure	Hurricanes/ Tropical Storms	Flooding	Priority H - M - L	Time Short Long Ongoing
Socio-Economic									
Mobile Home Parks	East Main Street/West Main Street	Private	V /S	·Develop tree maintenance plan ·Plan for evacuation needs of these areas ·Conduct public education and outreach around tree species and planting - plant to make areas resilient to climate hazards				H/M	O
Merri Village & All 55+ Communities	Middle Street	Housing Authority	V	·Emergency planning/evacuation in conjunction with Amesbury ·Consider this population in emergency shelter planning ·Conduct education and outreach ·Explore demographic based opportunities for funding				H/M	O
Lake Residents	Lake Attitash	Private	V	·Regional plan for Lake Management with Amesbury ·Emergency planning for when roads flood ·Mass DOT review of Route 110 Culvert ·Provide education on best mgt practices for Lake properties - need enforcement/staff				H	S/O
Emergency Management/Mutual Aid	Regional	Town	S	·Continue to maintain/improve infrastructure, networking ·Work on planning together with equal representation ·Develop database				L	O
Senior Center	East Main Street	Town	S	·Develop information/flyer for senior community of services and other information ·Shelter planning including backup energy				M	S/O
Unaccounted for Populations (elderly, unknown apartments, flood areas)	Multiple	Private	V	·Reach out to civic groups to identify populations ·Explore regional cooperation on immobile populations ·Develop central database and provide education, engage health inspectors				M	O
Mobility issues for seniors (day-to-day and emergency)	Multiple	Public and Private	V	·Implement Handicap Transition Plan - including sidewalks and complete streets				H	S
Faith Based/Civic Groups (lack of networking and communication)	Multiple	Private	V	·Improve communication to public through these institutions ·Incorporate interfaith community for emergency response and other community engagement				L	O
Group Homes	Multiple		V			·Incorporate shared living homes in emergency planning, community engagement			
Young Population			S	·Develop program to involve youth in areas of land use change, stewardship (Pentucket Regional High School)					
Disease Vulnerability	Town-wide		V			·Mass immunization plan			

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S	Top Priority Hazards: Severe Winter Storms/Nor'easters	Aging/Failing Infrastructure	Hurricanes/ Tropical Storms	Flooding	Priority H - M - L	Time Short Long Ongoing
Environmental									
Lack of Enforcement Capability for Conservation	Town-wide	Town	V	·Access to locally sourced photos ·Explore creation of education/demonstration campaign ·Need for core team, residents and grant funded sustainability coordinator ·Conduct educational speaker series					O
Tree Health/Forest Management	Town-wide/Open Space	Town	V	·Need management plan/forest management plan ·Funding to implement				H	S
Water Supply (Quantity/Withdrawal Permit)	Town-wide	Town	V	·Comprehensive water study including funding methods ·Storage needed including infrastructure ·Regional				H	O
Invasive Species	Multiple	Town	V			·Need alternative strategies to manage		H	O/L
Under designed Stormwater System (retention)	Town-wide	Town	V	·Study system/prioritize improvements				H	O
Stormwater Maintenance (Retention/Detention Basins inc. lack of access)	Multiple	Town	V	·Inventory town-owned retention/detention basins and prioritize maintenance ·Determine access and proper equipment needed ·Ensure future developments provide access rights ·Update Stormwater Bylaw				M/H	O
Bank Erosion	River	Town & Private	V	·Conduct bank restoration and management ·Enlarge culverts for future flows ·Conduct education campaign/seminar series coordinated by MVP team and historic commission (photos of prior conditions)				H	S
Flood prone Areas Subject to Development	Hoyts Farm and others	Private	V	·Plan for preservation/restriction (based on flood storage) if no longer farmed				H/M	O
Sargent Farm (subject to development)	Bear Hill Road	Private	V	·Work with Open Space Comm. to preserve for carbon sequestration and infiltration of larger storms ·Consider when updating Open Space Plan ·Explore collaborative/strategic development and acquisition				L	L
Cobblers Brook	Multiple	Town & Private	V	·Conduct watershed study (see infrastructure)				H	S
Open Space Subdivision Regs		Town	V/S	·Update Subdivision Regulations (traditional & OSRD) for better stormwater mgt. ·Add street trees to regs inc. appropriate species, placement and planting ·Regional opportunity - produce video segments				M	L
Lack of Capacity for Infiltration	Multiple	Town & Private	V	·Preserve land for infiltration ·Town has overlay district - consider expanding				H	O

Town of Merrimac

Municipal Vulnerability Preparedness Program