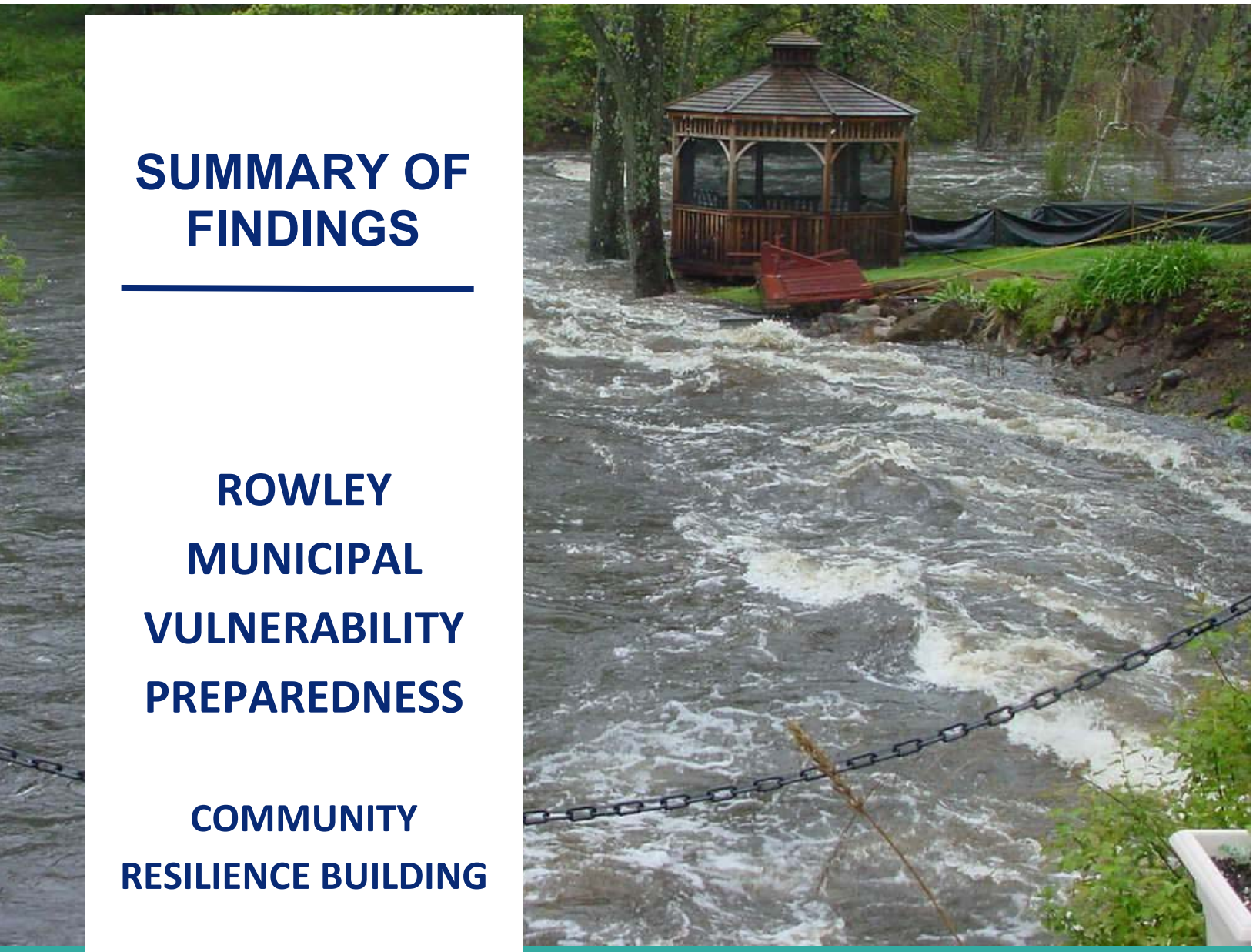
SUMMARY OF FINDINGS



ROWLEY MUNICIPAL VULNERABILITY PREPAREDNESS

COMMUNITY RESILIENCE BUILDING

OCTOBER 2020

TOWN OF ROWLEY

With assistance from

Merrimack Valley Planning Commission

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Cover image: Mother's Day Flood, Rowley 2006 (MVPC Photo)

Overview

Executive Order 569 and the Massachusetts Municipal Vulnerability Preparedness Program

Governor Baker in September 2016 issued Executive Order 569, directing the Secretary of the 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 City and Town could use to assess local vulnerabilities to climate change and to develop appropriate action-oriented response strategies.

The Commonwealth's agency response is 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; and
- Implementing key actions through community partnerships.

With completion of the resilience building planning process, a city or 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.

The Town of Rowley in 2020, seeking to become an MVP-designated community, applied for and received an MVP Planning Grant to organize a series of community resilience building planning workshops. To lead the process, Rowley engaged the

Merrimack Valley Planning Commission (MVPC) as its certified MVP provider. The Town Administrator's Office, including Debbie Eagan (Town Administrator) and Natalie Lovett and Amy Lydon (Assistant Town Administrators), served as the lead for the MVP planning process. An initial meeting was held on March 10th to plan the in-person Core Team meeting and stakeholder workshops.

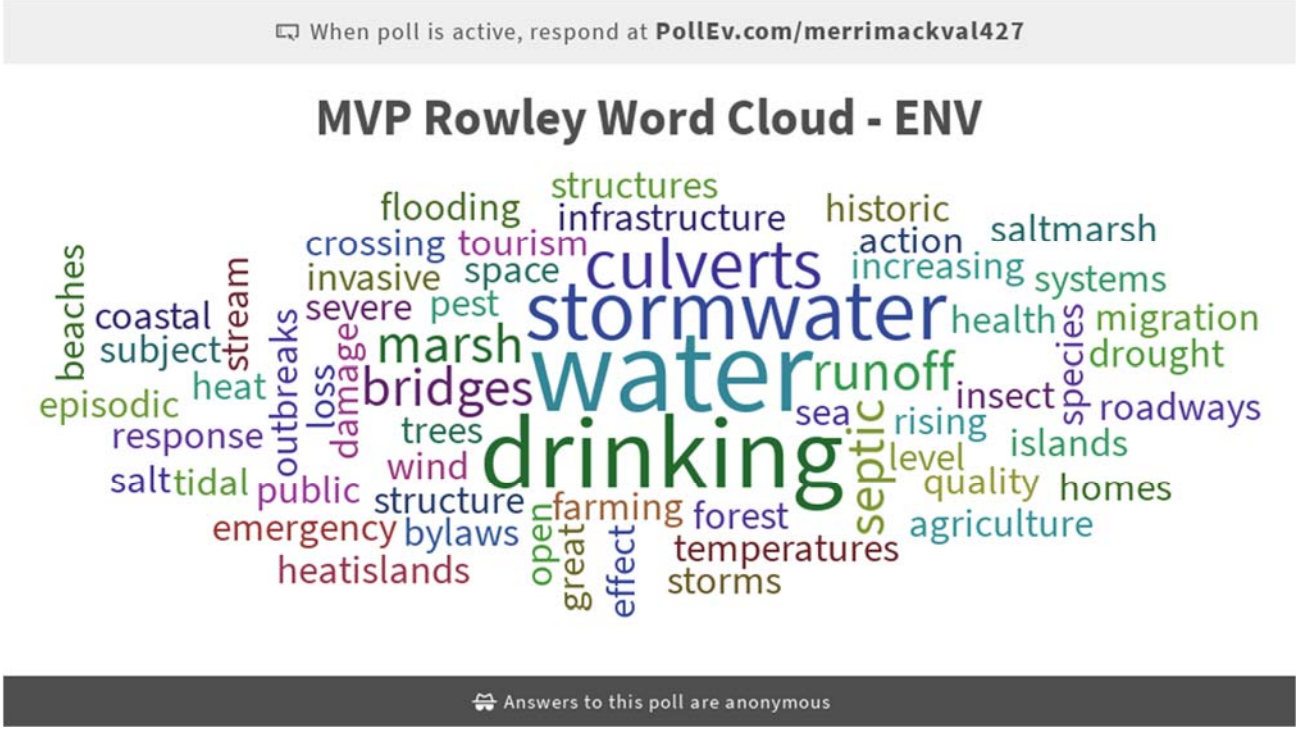
The meeting and workshops were originally slated to take place during March and April of 2020. However, that winter, the spread of the COVID-19 virus resulted in the declaration of a global pandemic and on March 24, 2020, Governor Baker issued the Massachusetts Non-Essential Business Order and Stay-at Home Advisory. Due to the crisis, the Core Team meeting and subsequent workshop schedule were postponed until a remote format could be implemented. Town officials and residents were forced to develop immediate response actions to this public health emergency that vividly highlighted some of the community's vulnerabilities and resiliency strengths.

Outdoor dining during the COVID-19 Pandemic, July 2020. Photo credit: Kirk Baker, Town of Rowley

Schools, town hall and many businesses were closed for nearly 3 months to slow the spread of the virus. Remote participation via online meeting platforms became the new

normal for conducting business. The pandemic reinforced the importance for community engagement and planning on how to effectively respond and mobilize resources to protect and inform the public. The ongoing pandemic thereafter provided the backdrop for the Town of Rowley's MVP resilience building workshops.

The Core Team meeting, originally scheduled for March 17th, was held virtually on April 22, 2020 using the GoToMeeting platform. Over 15 Core Team members attended including Town leadership, local emergency management personnel (police, fire), planning, health, highway and conservation department staff, and the senior center director. This team would lay the groundwork for an effective and collaborative workshop process following the Community Resilience Building (CRB) procedures established by the MVP Program.



Word Cloud generated by Environmental Workshop participants in response to the question "Where is your community vulnerable?" during the May 28th workshop held on the GoToMeeting Platform (MVPC Image). Word Cloud created on "PollEverywhere.com".

Planning Project Vision Statement

Rowley core team members developed the following vision for the Town's Municipal Vulnerability Preparedness planning project:

Through a series of Community Resilience-Building workshops, Rowley seeks to develop an action plan to substantially and sustainably improve its resilience to and preparedness for local climate-related hazards. Rowley seeks to achieve this by:
(1) defining local climate-related hazards;
(2) identifying Rowley's strengths and vulnerabilities regarding each of these hazards, now and in the future; and
(3) developing a prioritized action plan to improve Rowley's resilience to and preparedness for these hazards.

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

- Maintaining and improving quality of life in Rowley
- 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 natural resources through changing conditions
- Maintaining and replacing aging infrastructure to withstand current and future hazards
- Protecting transportation systems against hazards, including: 1) inundation due to coastal and inland flooding 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, and wildlife with changes in precipitation patterns and increasing temperatures
- Responding to changes in forest composition, invasive species migration and agriculture as a result of increasing temperatures

The Core Team and Planning Process. As noted above, the Core Team met virtually on April 22nd, with the purpose of introducing the Team to the MVP workshop process. The session began with an ArcGIS StoryMap presentation by MVPC that introduced Executive Order 569 and the evolution of the MVP Program.

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=fe59c8ec0ba44e0599aa4a13c7f2743a

Other agenda items included a review of a draft stakeholder survey to identify natural hazards of greatest concern, identification of key community stakeholders to participate in the workshop process, and confirmation of a workshop schedule. Members of the Core Team were also integral in updating existing hazard area and critical facility inventories to update plans and maps used during the workshop process. The Core Team will also serve as the future implementation team.

Stakeholders and Community Resiliency Building Workshops. The Core Team coordinated with MVPC to develop a list of stakeholders including a broad representation of community groups, board and commission members, and town staff with subject matter expertise from public works, utilities, highway, planning, conservation, the Council on Aging (COA), library and other community departments. The stakeholder list also included local elected officials as well as representatives from the business community, and nonprofit and environmental organizations. This broad representation of local and regional entities ensured the MVP plan aligned with the policies, planning and resiliency strategies at different levels of government. The list of Core Team members and other stakeholders can be found in the Appendices.

Similar to the Core Team meeting, the in-person CRB workshops were reorganized to meet virtually on the GoToMeeting platform. The first workshop, focused on characterizing the Town's top hazards, was organized into three virtual small group meetings. During these sessions, participants were asked to identify community features most vulnerable to natural hazards, many of which have been exacerbated by climate change, and to define community assets that contribute to mitigating risk and aiding recovery. Workshops were organized with participants grouped into the categories according to their professional expertise: environment, infrastructure/emergency management and health/society. Each group identified vulnerabilities and strengths using three lenses: infrastructure, society and environment. Groups then voted virtually using Polleverywhere.com to identify their top choices.

The second part of the CRB process centered on identifying community actions to address the top voted strengths and vulnerabilities in the categories of Infrastructure, Society and Environment. This work was also done remotely with stakeholders who completed a partially filled in matrix by identifying action items in their field of expertise. MVPC staff then followed up with the Core Team members to prioritize the actions in the categories of infrastructure, society and environment.

All meetings were held on the GoToMeeting virtual meeting platform which enables audio, video and screen sharing capabilities. Meeting agendas are provided in the Appendices. Workshop sessions were also recorded with attendee permission.

Planning Context

Community Profile

The Town of Rowley is located approximately 32 miles north of Boston on Massachusetts' historic "North Shore". The Town encompasses 19 square miles and is characterized by gently rolling uplands and expansive salt marsh. It is bordered to the north by the Town of Newbury, to the west by Georgetown, to the southwest by Boxford, to the south by Ipswich, and to the east by Plum Island Sound and the Atlantic Ocean. According to the 2019 ACS Data, the year-round resident population is 6,400.

The predominant land uses in Rowley are: *forest* – 5,401 acres (42.25%); *salt marsh/wetlands* – 2,515 acres (19.7%); *residential development* – 1,213 acres (9.5%); and *agriculture* – 700 acres (5.5%). Commercial and industrial uses combined comprise 214 acres, or less than 2% of the total area. Rowley's most conspicuous and visually stunning landscape feature is its vast salt marshes. Part of the 25,000-acre, multi-community Great Marsh ACEC (Area of Critical Environmental Concern), the Rowley salt marshes protect broad upland areas in town from the full brunt of high-energy coastal winds and waves. Interlaced with myriad tidal creeks, these ecologically rich salt wetlands are home to diverse plant and animal species, including commercially valuable soft-shell clams. They also provide outstanding recreational opportunities for bird watchers, kayakers, and other outdoor enthusiasts.[1]

Climate Data for Rowley and the Rowley/Parker River Basins

Nineteen of the 20 warmest years all have occurred since 2001, according to the NASA's climate change website.[2] Average global temperatures have risen steadily in the last 50

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

[2] https://climate.nasa.gov/vital-signs/global-temperature/

years. Scientists warn that the trend will continue unless greenhouse gas emissions are significantly reduced. [3]

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

Sea Level Rise

- Rising temperatures have contributed to thermal expansion of the ocean and an influx in fresh water from melting glaciers, resulting in greater than 8 inches of increase in global sea level rise since 1950.
- According to the Northeast Climate Adaptation Science Center (NECASC), sea levels are expected to rise at least 3 feet by the end of the century.[4]

Changing Temperatures

- From 1971 to 2000, the Merrimack Valley annually had an average of 7 days with temperatures above 90 degrees Fahrenheit.
- By the end of the century, Rowley and the region are projected to have fourteen (14) to as many as fifty-six (56) 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 heating degree days will be 15-37% lower, but cooling degree days 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%.[5]

Changing Precipitation

- Increased frequency of high-intensity events, with the Northeast already experiencing a 71% increase in precipitation during storms between 1958 and 2012.

[3] https://www.noaa.gov/news/2018-was-4th-hottest-year-on-record-for-globe

[4] https://www.umass.edu/necsc/northeast-climate

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

- Total annual precipitation at century's end is projected to increase by as much as 18% above the 1971-2000 baseline of 45 inches, 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).
- The 1971 to 2000 baseline is 17 on average annual consecutive dry days and that is projected to increase by 3 days by the end of this century.[6]

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.

March 2018 Nor'easter at Rowley Town Landing & Perley's Marina (MVPC Library)

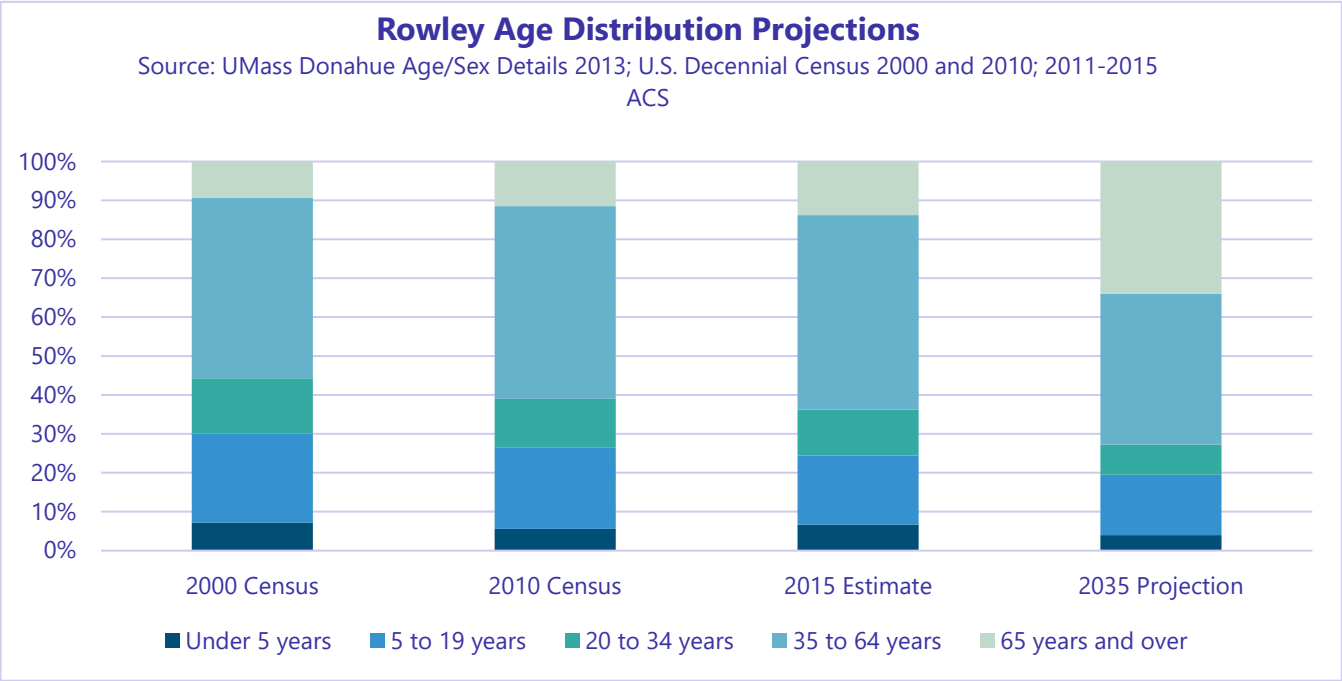
The frequency and intensity of heavy precipitation events in Rowley and the Merrimack Valley are projected to continue to increase throughout the 21st century. The northern United States, including New England, is projected to receive more intense precipitation events in the winter and spring, while 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 responder capacity.

[6] Ibid.

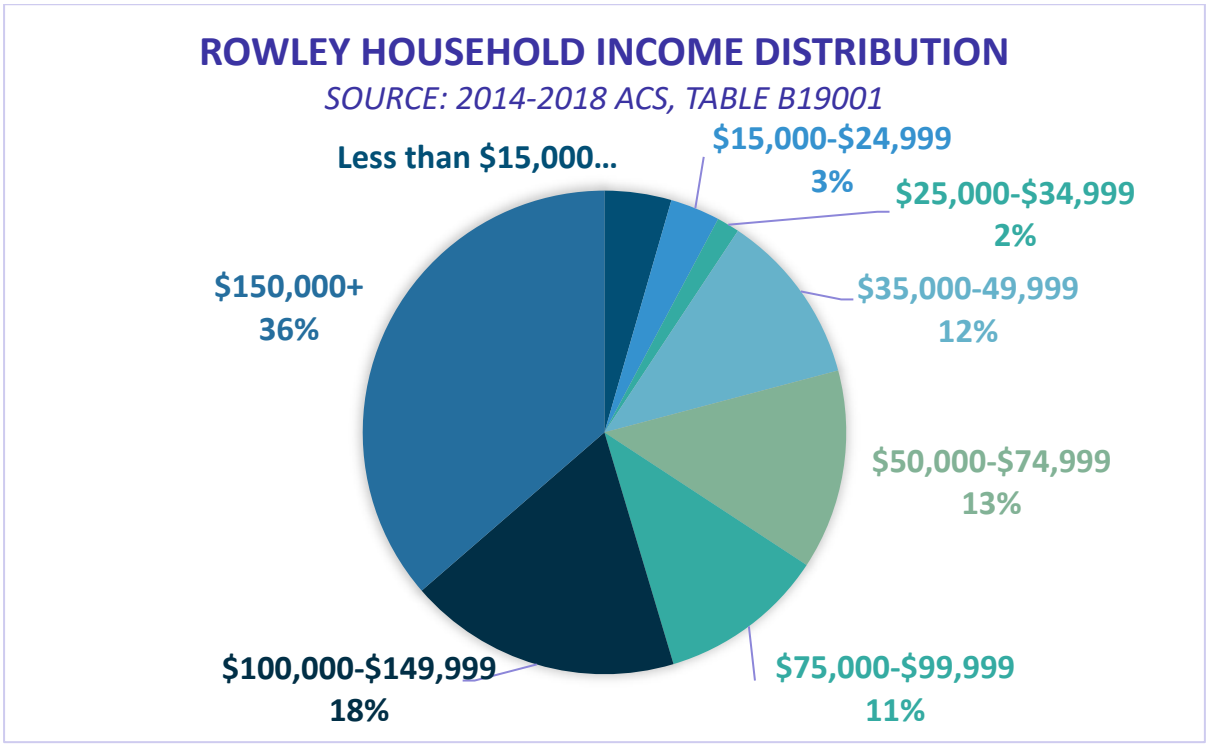
Rowley Demographics[7]

- The number of households in Rowley grew over 13 percent from 2000 to 2015, which is higher than population growth due to the decrease in average household size. Projections indicate a continued growth in the coming years and a potential need for increased housing units overall.
- The composition of Rowley's households has changed. The number of households with children decreased slightly while the number of single-person households increased substantially. This includes a growing number of older adults in the community.
- Rowley's population overall has comparable disability rates to the region. However, Rowley has a higher proportion of its older population reporting disabilities than in other communities in the region. Persons with disabilities, whether physical, mental, or emotional, can be especially vulnerable during natural hazard emergencies.
- About 80 percent of Rowley households own and 20 percent rent their homes. The homeownership rate in Town is significantly higher than in the Merrimack Valley region overall (63 percent).
- The age composition of Rowley's population is anticipated to change with a 221 percent increase in the number of older adults (age 65 year and over) – growing from about 12 percent of the total population in 2015 to almost 34 percent of the population in 2035. See the table on the following page.

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



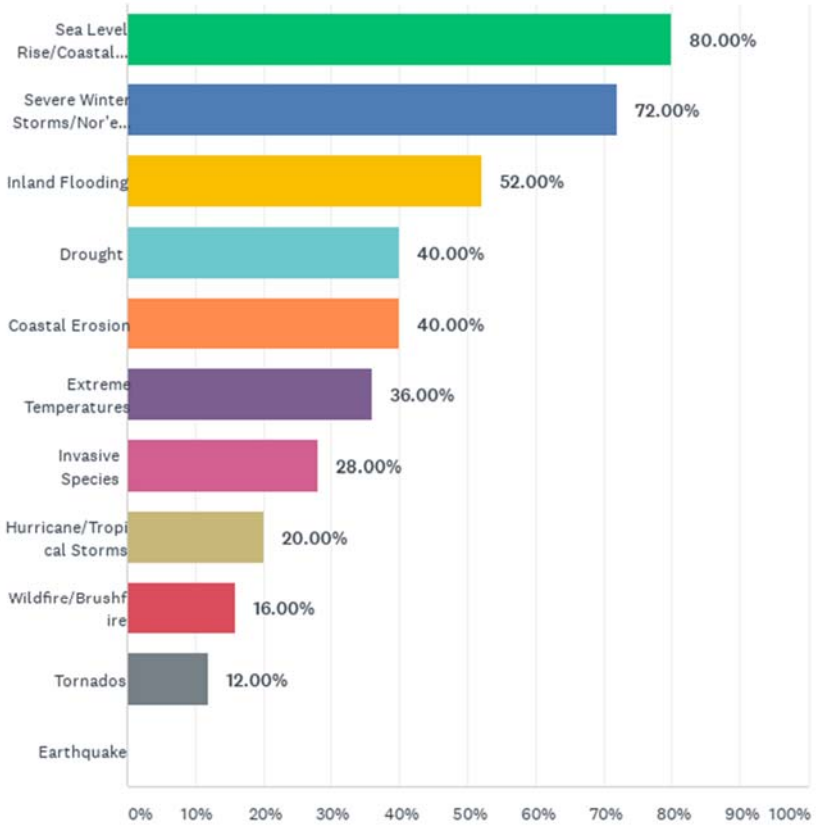
- Rowley's households have higher median income than households in the region, with renters having lower income than owners, but higher than in the region. Rowley owners have slightly lower median incomes than in the region. Older adults (i.e. age 65 and over) tend to have lower incomes in Rowley than in the region.



Top Hazards for Rowley

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. Twenty-five people responded to the survey question which generated the following response levels:

Q1 What are the top four potential hazard events that are of most concern to you as a Town of Rowley stakeholder? Choose 4 from below.



Informed by the survey, the Core Team characterized the top Rowley hazard concerns as noted on the following page.

Town of Rowley Primary Hazard Concerns Identified

Sea Level Rise/Coastal Flooding

Approximately 20% of Rowley's land area currently lies within the coastal hazard zone. By 2070 this is expected to increase to 25%.[8] According to the Great Marsh Coastal Adaptation Plan, only 3% of Rowley's developed land is vulnerable to coastal inundation in a worst-case storm scenario. However, approximately 20% of the town is within the Great Marsh, one of the most important ecosystems in the Northeast. Sea level rise and future storms are likely to inundate the marsh that currently helps reduce storm surge, prevent erosion, and provide important habitat to rare and threatened species.[9]

Nor'easters

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, flooding and infrastructure disruption to Rowley, memorably in March 2018 and October 2017 when storms precipitated road closures and extended power outages throughout the region.

Flooding

Approximately 40% of Rowley's land area lies within either the designated flood zone areas with either a 1% (100-Year) or 0.2% (500-year) chance of occurrence. Much of this land is undeveloped and a large percent is marsh. 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, the 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. [10] Significant flood events occurred in Rowley most recently in Spring 2010 and the Mother's Day Flood of 2006.

[8] Abdollahian, N. et al., Community exposure to potential climate-driven changes to coastal-inundation hazards for six communities in Essex County, Massachusetts, U.S. Geological Survey open-file report (Reston, VA: USGS, 2016), 37

[9] Schottland, Taj, Melissa G. Merriam, Christopher Hilke, Kristen Grubbs, and Wayne Castonguay. 2017. Great Marsh Coastal Adaptation Plan. National Wildlife Federation Northeast Regional Office, Montpelier, VT.

[10] 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.

	According to FEMA, 98 non-critical residential and commercial buildings are located in the floodplain and 3 critical structures including the Rowley Town Well #3.
	**Extreme Temperatures & Drought** Average Summer & Fall temperatures in the Parker River Basin could increase 12.4° F by century's end. The annual number of extreme heat days of greater than 90°F is expected to increase by as much as 32 more days in 2050. [11] Extended heat waves could significantly impact public health as well as infrastructure, economic systems including agriculture and ecosystems of forests and wetlands. As higher temperatures lead to greater evaporation and earlier snowmelt, the frequency and intensity of droughts is predicted to increase in summer and fall in the Northeast.[12]

In 2017, with funding from the "Hurricane Sandy Coastal Resiliency Competitive Grant Program", the Great Marsh Resiliency Partnership, including the Town of Rowley, undertook community adaptation planning to reduce community vulnerability to climate driven threats by increasing the resilience of the natural systems that Rowley and the other Great Marsh communities depend upon. The result was the Great Marsh Coastal Adaptation Plan of December 2017. MVPC reviewed this document in preparation for the workshops and referenced the Town-Specific Strategies and Recommendations where they aligned with the findings of the MVP process.

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

[12] https://www.mass.gov/files/documents/2018/09/17/SHMCAP-September2018-Chapter4.pdf

Concerns & Challenges Presented by Hazards and Climate Change

Rowley Infrastructure & Critical Facilities – Vulnerabilities Identified

Roadways, Bridges and Culverts: Rowley has 51.8 miles of roadways, 41.9 miles of which are owned and maintained by the Town. MassDOT owns and maintains 7.9 miles and 2 miles are private, unaccepted ways. [13] Bridges and undersized culverts can act as choke points restricting stream flow. Low-lying, flood-prone areas considered particularly vulnerable to flooding are Route 133 at Bachelder Brook (undersized culvert), Mill River Crossing on Haverhill Street near Boxford Road (undersized culvert), Stackyard Road and Route 1A north into Newbury (coastal flooding), and the Glen Street bridge. All of these areas were previously identified as vulnerable in the 2017 Great Marsh Coastal Adaptation Plan.

Rowley stakeholders reiterated those concerns during the virtual workshops. In addition, stakeholders expressed concern about culverts on Central Street at Church Street (Ox Pasture Brook), Route 1A near the Seaview Nursing Home, and culverts on Route 1 and Route 133 near *Off the Vine* and a new physicians building. Also identified in the Coastal Adaptation Plan, but not mentioned during the workshops, is a crossing on Daniels Road north of Haverhill Street. Both the Coastal Adaptation Plan and workshop participants identified the vulnerability of the Massachusetts Bay Transportation Authority (MBTA) Newburyport Train Line which serves hundreds of passengers per day between Newburyport and Boston. This line traverses salt marsh and tidal rivers and is thus subject to storm surge and sea level rise. The Coastal Adaptation plan indicates the MBTA is undertaking its own comprehensive analysis of asset climate vulnerability.[14]

[13] Merrimack Valley Planning Commission, Transportation Program

[14] Schottland, Taj, Melissa G. Merriam, Christopher Hilke, Kristen Grubbs, and Wayne Castonguay. 2017. Great Marsh Coastal Adaptation Plan. National Wildlife Federation Northeast Regional Office, Montpelier, VT, 82.

Dams: Rowley has several public and privately-owned dams. The privately owned Jewell Mill Dam on the Mill River between Mill Street and Glen Street is classified as a significant hazard by the Office of Dam Safety. The downstream Glen Road bridge would be at risk if the dam were to fail. Downstream flooding would also occur. The lower Ox Pasture Brook Dam was removed in 2009, the first dam removal project in Essex County.

Utilities: The Rowley Municipal Light Plant (RMLP) is the electricity distributor for Rowley and maintains a network that includes a substation, limited underground conduit and extensive overhead wires considered vulnerable to intense storms and associated winds as well as extreme heat. The RMLP expressed concern for poles located in areas subject to coastal inundation but has the equipment to access them in an emergency. Most of the existing above ground lines utilize a spacer-cable system which improves resistance to high winds and fallen trees.

Water & Stormwater Infrastructure: Rowley's water and drainage infrastructure is vulnerable because of age and condition in some areas but is also a strength in mitigating hazards and protecting public health in others. There is no sewer system in Rowley. MVP Workshop participants raised concerns about water supply and the ability to serve the Town's growth demands given the changing conditions projected with climate change. Rowley is looking for a new well site to accommodate growth and ensure supply into the future. In Rowley, water use restrictions are triggered by Parker River Streamflow falling below 6cfs for three (3) consecutive days.

The drinking water for the Town of Rowley comes from three groundwater wells located on Town-owned parcels of land within the Parker River Basin.[15] In addition to water supply concerns, Rowley stakeholders identified vulnerabilities in the area of wellhead protection. Concerns included relocating Haley Field outside of the Zone 1 (primary protection area). In addition, a former gas station in the same wellhead protection district was identified as a possible concern.

Stakeholders also indicated Rowley Town Well #3 is located in the 100-year floodplain (1% annual chance of flooding). According to the Great Marsh Coastal Adaptation Plan, water from the well is pumped through a 10-inch transmission water main to the town's filtration plant where it is treated and then released into the town's distribution

[15] Rowley Water Department, Consumer Confidence Report, 2019

lines. Flooding has the potential to make the well's pumping equipment vulnerable and possibly interrupt the drinking water supply. The pump station building, and access are additional vulnerabilities.

Rowley does not have any sewer infrastructure. All homes and businesses are serviced by private septic systems. New systems and upgrades are regulated by the Rowley Board of Health. Sampling done by the Parker River Clean Water Association (PRCWA) shows high levels of nitrates and bacteria in Ox Pasture Brook. The failure of private septic systems is one possible cause of this water quality issue.

Rowley maintains a variety of stormwater structures including 496 catch basins and approximately 60 outfalls. 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 portions of Rowley, 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. This increased maintenance and oversight could be a strength as the community works to improve the quality of its waterways.

Municipal Facilities & Resources: Rowley is part of the Triton Regional School District but owns and maintains the Pine Grove Elementary School. The school was updated in 2018/19 and now has a backup generator and is available as a day use shelter (bathrooms are designed for small children limiting its use as an overnight/long-term shelter). In 2018 Rowley also updated its public safety complex including renovations to the Police Station and a new Fire Station. The two facilities share a backup generator and the Fire Station is available as a cooling/heating center. The Senior Center, while considered a town strength, lacks a backup generator and currently relies on window air conditioners. A lack of overnight/long-term sheltering was identified as a vulnerability by workshop participants. A regional sheltering plan is needed.

Workshop participants also identified the Highway Department location as vulnerable. The site is located adjacent to Ox Pasture Brook and while not within a FEMA flood hazard area, is considered vulnerable to flooding.

Private Property: Rowley stakeholders identified several neighborhoods as vulnerable to sea level rise and coastal flooding during large storm events. These neighborhoods

include The Cottages, Patmos Road, Railroad Avenue, Stackyard Road and Ocean Avenue. In addition to homes, Perley's Marina, including a fueling station, and the Rowley boat launch are within the area subject to coastal flooding.

Rowley Societal Features – Vulnerabilities Identified

Seniors, People with Disabilities and other Vulnerable Populations: Rowley is among the wealthier communities in the region. Despite its high average median household income, the Town has a number of residents considered vulnerable to hazard events and climate change including an increasing senior population as well as community members with disabilities. The Plantation Drive Community was also identified as a vulnerable population.

Communication and Transportation: The Rowley Council on Aging (COA) currently provides transportation to seniors in need utilizing a town owned van and through collaboration with Northern Essex Elderly Transport (NEET), a volunteer staffed transportation provider. Rowley lacks regional transportation services and has very little sidewalk infrastructure to facilitate walking. Rowley does have an MBTA commuter rail station, but it too is outside of the downtown and not easily accessible without a car. Rowley does not have access to services available to other Merrimack Valley communities such as regional bus service or access to ride sharing services (Uber/Lift). In emergency situations, seniors and other vulnerable populations can be left with limited access to vital services including medical care and food.

Rowley Fire Department Staff (MVPC Photo)

Rowley communicates with its senior population through several services offered by the Rowley COA and the police department including Ring me Rowley, Wake Up with Rowley and a reverse 911 system which is also used town wide. These services are fairly well used but Rowley stakeholders acknowledged there are still vulnerable seniors and others in the community who may be hesitant to sign up for services.

Vulnerable Neighborhoods: Approximately 40% of the land in Rowley falls within the designated FEMA flood zones, either the 100-year floodplain (area with a 1% chance of

flooding in any year) or within the 500-year floodplain (area with a .2% chance of flooding). However, there is limited residential and commercial development within these areas. According to the Great Marsh Coastal Adaptation Plan, 98 non-critical residential and commercial buildings are located in the floodplain, valued at approximately $11.5 million.[16] According to FEMA records, there are fourteen (14) FEMA Flood Insurance policies in place in Rowley insuring $4,932,000 in property. As previously mentioned, residents of the The Cottages, Patmos and Stackyard Roads and Railroad and Ocean Avenues are most affected by storm surge and coastal flooding.

Other Societal Vulnerabilities:
Rowley workshop participants also identified the town's animals/pets, including many horses, as vulnerable. The town has several animal hospitals who should be included in preparedness for emergency situations.

Parker River, Rowley (photo credit MVPC)

[16] Schottland, Taj, Melissa G. Merriam, Christopher Hilke, Kristen Grubbs, and Wayne Castonguay. 2017. Great Marsh Coastal Adaptation Plan. National Wildlife Federation Northeast Regional Office, Montpelier, VT, 75.

Rowley Environmental Features – Vulnerabilities Identified

Water Resources: Rowley boasts a wealth of water resources and protected conservation lands. The Town's land area is split between the Ipswich and Parker River Watersheds. The Town's water resources include rivers, tidal creeks, and estuarine wetlands. Approximately 20% of Rowley lies within the Great Marsh, the largest salt marsh in New England and a state designated Area of Critical Environmental Concern (ACEC).

Rowley stakeholders identified sea level rise as the hazard of greatest concern. Much of the developed land in Rowley is buffered by Plum Island and an expansive marsh ecosystem during storms. With expected sea level rise and larger more intense storm events, workshop participants identified coastal resources like saltmarsh as extremely vulnerable. Stakeholders recognized the need for ongoing participation in collaborative efforts with regional, state and federal partners to restore saltmarsh and prevent loss of high marsh and associated wildlife habitat.

Workshop participants also raised concerns about the need to protect Rowley's groundwater resources threatened by changing climate conditions. With hotter, drier summers predicted, stakeholders considered Rowley's drinking water, supplied by three town owned wells, to be vulnerable. This concern also extended to the wellhead protection areas surrounding each well to protect water quality.

Forests: Participants also identified threats to Rowley's many forests and trees including damage by invasive pests such as gypsy moths and winter moths as well as clear cutting for development. Approximately forty percent of land in Rowley is forested. Forests provide many ecosystem services including carbon storage, stormwater uptake, and cooling. Threats from invasive species (both insect and plant) coupled with damage from severe storm events can dramatically affect forest ecosystem health.

Community Strengths & Assets

Rowley Town Hall (MVPC photo)

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

Infrastructure Investments: Heavy rains and flooding associated with the 2006 Mother's Day storm destroyed several Rowley bridges. Subsequent construction of new bridges on Dodge Road and Wethersfield Street have resulted in more resilient structures over the Mill River and Bachelder Brook. Rowley stakeholders also identified the newly renovated Pine Grove School as a strength for its daytime sheltering capacity. The School renovation included installation of a backup generator.

Senior Services: Rowley has a vibrant Council on Aging (COA) and Senior Center. Many workshop participants commended the staff and programs offered by the Senior Center. The Police and Fire Departments were also acknowledged for their work in providing services and support to Rowley seniors. Programs include Ring me Rowley, Wake-up with Rowley and COA use of the My Senior Center application through which staff maintain a phone tree with a reverse 911 type calling system. Other strengths included the senior transportation services offered by the COA including the partnership with Northern Essex Elder Transport (NEET), a non-profit volunteer driver program. The COA has two vehicles, including one van, to assist with transportation.

Open Space Residential Bylaw: Rowley stakeholders acknowledged the strength of the existing Open Space Residential Development (OSRD) Bylaw which promotes use of green infrastructure, groundwater recharge and flood mitigation. This bylaw also requires new developments to connect to town water rather than private wells which are not subject to water use restriction during drought.

Wetlands Protection: Workshop participants praised Rowley's Conservation Department and local Wetlands Protection Bylaw which provides protection to wetland resource areas above and beyond the Massachusetts Wetlands Protection Act. Stakeholders also acknowledge the eco-system services provided by wetlands such as the Fenno Drive Swamp, noting that groundwater and surface waters are "cleansed" by wetland resources areas like this. Wetlands were also noted as a strength for their ability to provide habitat for wildlife and fish.

Town of Rowley Website Photo

Top Recommendations for a More Resilient Rowley

Following the online workshop, Rowley stakeholders identified actions focusing on infrastructural, societal and environmental features and issues of greatest concern. Each stakeholder identified their priority actions on a matrix containing the previously discussed vulnerabilities and strengths. The Core Team assisted in ranking the priority actions. Highest priority actions selected by these stakeholders were:

High Priority Actions Infrastructure:

- Implement recommendations of town wide bridges and culverts study including maintenance. Identify funding sources.
- Clearly identify and then prioritize most vulnerable dams. Develop a long-term capital improvement plan to address these vulnerable areas. Work with MassDOT and private property owners where relevant. Develop plan to address each hazardous dam.
- Identify roads and homes most vulnerable to storm surge and coastal flooding including areas projected to be inundated as sea levels rise. Develop a long-term plan (for each), including possible solutions and funding. For homes, consider options to prevent/discourage building/rebuilding in areas affected by sea level rise.

Highest Priority Actions Socio-Economic:

- Provide emergency assistance for Seniors including:
    - Develop a coordinated effort with COA and first responders (Police and Fire) to deliver meals to seniors during emergency situations. Coordinate with Elder Services of Merrimack Valley (ESMV).

- New/updated/larger senior center could provide more services and accommodate more emergency services and sheltering needs of seniors during long-term emergency events/power outages.

- Improve transportation for seniors and other vulnerable populations:
  - Develop/enhance emergency action plan for different types of emergencies – determine resources available for transportation such as taxis, Uber and/or MBTA, MVRTA, Police, Fire, and COA.
  - COA has MVRTA sponsored van (well used). Additional vehicles are needed for medical visits and appointments. Plan for more modern/efficient vehicles for senior transport (2 vehicles with more seating capacity). Need alternatives to NEET including funding.
  - Identify and pursue more transportation options for Rowley (Dial-a-Ride is one option)
  - Utilize AARP Walkability Toolkit (Grant Program), Age Friendly (Dementia Friendly), sidewalk and crosswalk improvements, more benches (resting stations) and water fountains. Increase walkability and age friendly score town-wide not just downtown. Have plan ready for application.
- Improve contact lists with vulnerable populations including seniors and disabled:
  - Enhance/restructure Rowley Good Morning program to encourage participation.
  - Provide more staff time for Senior Center Outreach Coordinator.
  - Continue Community Service liaison in Police Department (good for seniors and schools) – increase liaison contact with COA and other town services.

Highest Priority Actions Environmental:

- Increase and protect public drinking water supply through a variety of efforts including:
  - Prioritize protection of Zone I and II wellhead protection areas in Open Space and other planning. Work with land trusts and town departments.
  - Conduct training seminars and public outreach to help residents understand how water conservation and limiting use helps preserve water quality.
  - Expand participation in/optimize use of the Greenscapes North Shore Coalition, the Parker-Ipswich-Essex Rivers Partnership (PIE-Rivers) water conservation task force to increase municipal capacity to manage water neutral growth programs and initiatives.
  - Work with Park and Recreation to find alternate location for playing fields (currently located in Zone I).

- Protect groundwater infiltration of petro-chemicals and additives, especially in vulnerable recharge areas.
- Consider more protective zoning changes in well head protection areas.
- Encourage use of phosphorous free and low nitrogen fertilizer on lawns and creating incentives for drought resistant Greenscapes that require little to no water use.

- Make stormwater improvements to address effects of climate change including:
  - Require (unless infeasible) green infrastructure (bio-retention and infiltration, rain gardens, swales) in all new developments, and retrofit in flood-prone areas to improve retention and drainage.
  - Investigate innovative stormwater treatment systems near Ox Pasture Brook and other resource areas (ex. small park near Town Hall Annex).
- Continue and improve protection of valuable wetland resource areas including the Great Marsh by:
  - Continuing involvement with Eight Towns and the Great Marsh, invasive species management work, US Fish & Wildlife projects in the Great Marsh and other programs to enhance the natural resiliency of Rowley's coast.
  - Preparing and distributing brochures/flyers for new residents about the importance of wetland protection on both public and private lands.
  - Continuing support for the local Wetlands and Open Space Residential Design Bylaws and associated regulations.

Other High Priority community resilience projects identified by workshop stakeholders and MVP core team, in addition to the Top Workshop Outcome Recommendations, were:

- Identify alternative/additional funding for Glen Street bridge replacement.
- Prioritize land purchase and protect areas for future well siting. Work with Open Space Committee, Conservation Commission, Water Department, and other partners (land trusts) to find suitable locations and explore opportunities for funding.
- Review and protect locations for saltmarsh migration. Work with land trust partners and others who have identified parcels that will increase resiliency (Essex County Greenbelt, Trustees for Reservations, MassAudubon).
- In partnership with Greenscapes North Shore, establish a water conservation incentives program, including incentives for people to convert impermeable surfaces such as driveways to permeable surfaces and minimize runoff and promote groundwater infiltration.
- Work with Town of Newbury to identify options to increase resiliency of portions of Route 1A subject to coastal flooding/storm surge and seek State assistance (state road).
- Provide stormwater improvements to Highway Department site which is in a low-lying area adjacent to Ox Pasture Brook.
- Increase cooling and heating capacity for seniors during extreme temps and address fiscal constraints for seniors to pay for heating/cooling. Possibly develop a privately funded donation account to be utilized for those with demonstrated need (like Smith Fund -COA controlled). Encourage/promote use of energy efficiency programs. Plan for improvements to Senior Center including backup power. Identify additional areas in town that might be used for heating/cooling emergencies including possibly the Pine Grove School.
- To address drought, review the Mass Sustainable / Safe Yield Estimator for the Parker River to create more accurate data. Currently MassDEP's "safe yield" exceeds the amount of water available to be allocated.
- Conduct a thorough audit of the local zoning and land use regulations utilizing Mass Audubon's Bylaw Review Tool to benefit from Green Infrastructure and Low Impact Development (LID).
- Work with Parker River Watershed Association and PIE Rivers to address water quality issues in Ox Pasture Brook. Work with other communities throughout the PIE-Rivers Region to improve watershed-wide conservation of Riparian/Wetland buffers, which naturally help filter nutrient runoff, and educate landowners about the importance of increasing these areas.

- To address widespread damage to native trees by invasive pests, encourage replanting with diverse tree species (investigate resilient species). Consider an adopt a tree program model.
- Continue protection of freshwater ecosystems for groundwater and surface water cleansing and wildlife habitat value.
- Evaluate the status and contribution of personal septic systems to the high E. coli and nitrates in Ox Pasture Brook.

Appendices

- Workshop Participants & Resource Staff
- Reference Sources
- Citations & Acknowledgements
- Additional Comments Received (listening session)
- Additional Survey Results
- Word Cloud Images
- Risk Matrices
- Workshop Agendas
- GIS Maps

Rowley Core Team, Stakeholders & Resource Staff

First	Last	Dept	Focus Category
		CORE TEAM	
Natalie	Lovett	Assistant Town Administrator	Environment
Brent	Baeslack	Conservation	Environment
Brienne	Walsh	Council on Aging	Environment
Amy	Lydon	Assistant Town Administrator	Health/Safety
James	Broderick	Fire	Health/Safety
Scott	Dumas	Police	Health/Safety
Frank	Marchegiani	Board of Health	Health/Safety
Debbie	Eagan	Town Administrator	Infrastructure
Patrick	Snow	Highway	Infrastructure
Kirk	Baker	Planning	Infrastructure
		STAKEHOLDERS	
Bob	Snow	Selectman	Environment
Christine	Berry	Dept. of Cons. & Rec. (DCR)	Environment
Vanessa	Johnson-Hall	Essex County Greenbelt	Environment
David	Moon	Mass Audubon	Environment
Ann	Witzig	Parker River Watershed Assoc.	Environment
George	Comiskey	Parker River Watershed Assoc.	Environment
Patrick	Lynch	Ipswich River Watershed Assoc.	Environment
Cindy	Quinn	Rotary Club	Environment
Margaret	Duffy	Greenscapes	Environment
Travis	Kneeland	Shellfish Constable	Environment
Michelle	Rowden	EEA	Environment
Joy	Duperault	State National Flood Ins. Prog. Coord.	Environment
Bill	DiMento	Harbormaster	Health/Safety
Patricia	Huckery	Fish and Wildlife	Health/Safety
Cliff	Pierce	Chair, BOS	Health/Safety
George	Gallant	COA Chair	Health/Safety
Deb	Ketchen	Health Department	Health/Safety
Bruce	Tarr	State Senator	Health/Safety
Pam	Jacobson	Library Director	Health/Safety
Karen	Tyler	Veterans Agent	Health/Safety
Maryellen	Mighill	Public Health Nurse	Health/Safety
Roy	Melnick	North Mosquito Control	Health/Safety
Sara	Bourque	Historical Commission	Health/Safety
Christopher	Thornton	Planning Board Chairman	Infrastructure

David	Jaquith	Planning Board Vice Chairman	Infrastructure
Larry	White	Finance Committee Chairman	Infrastructure
Brad	Hill	State Representative	Infrastructure
Joseph	Costanzo	MVRTA	Infrastructure
Matt	Brown	Rowley Municipal Light General Manager	Infrastructure
Robert	Gray	Water Superintendent	Infrastructure
Cindy	Dunn	Housing Authority	Infrastructure
Brian	Forget	Regional School District Superintendent	Infrastructure
Larry	Kendell	Parks & Recreation Committee Chair	Infrastructure
Curt	Annen	Community Preservation	Infrastructure
Christopher	Bevilaqua	YMCA	Infrastructure
Maureen	Lynch	Whittier Superintendent	Infrastructure
Heidi	Riccio	Essex Technical Vocational High School	Infrastructure
		MVPC RESOURCE STAFF	
Theresa	Park	Executive Director	
Jerrard	Whitten	GIS and IT Manager	
Anthony	Komornick	Transportation Program Manager	
Peter	Phippen	Coastal Resources Coordinator	
Mikayla	Minor	GIS Analyst	
Jennifer	Hughes	Environmental Program Manager	

Reference Sources

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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.

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

Great Marsh Coastal Adaptation Plan, prepared by National Wildlife Federation Northeast Regional Office, Montpelier, VT, 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 Rowley, 2020. Prepared by Merrimack Valley Planning Commission.

This Town of Rowley 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.

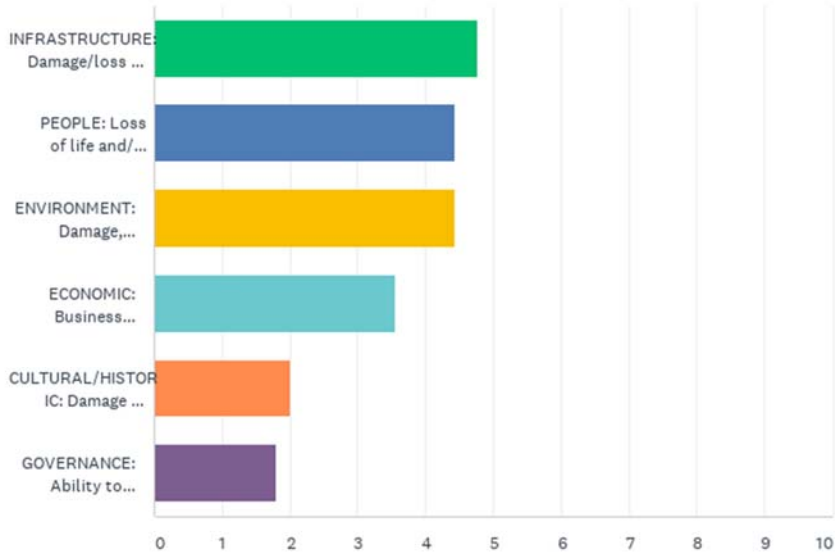
Additional Comments Received

(Listening Session – September 28, 2020)

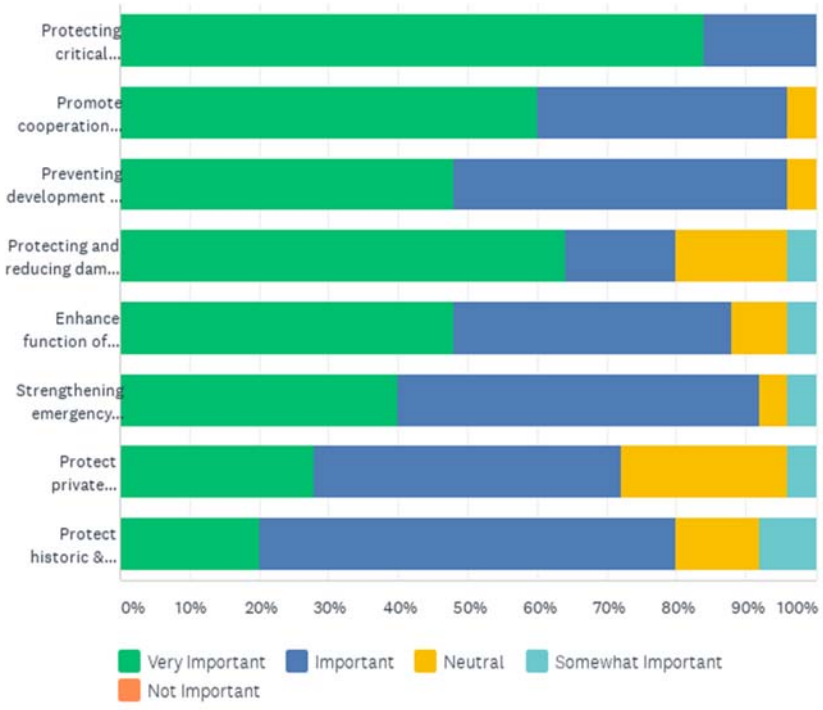
- 17 people attended the virtual session held on the Town's GoToMeeting platform
- A StoryMap Presentation was given by MVPC staff
- Comments from the session:
    - Confirmation that Rowley's electrical infrastructure is vulnerable to severe storm events and that it is important to have the ability to clear roads following these events.
    - Focus of action grants should be on those actions that will benefit the greatest number of people.
    - The Town should have a plan for the Action Grant application in advance.
    - Rowley should look to partner with organizations that have experience in these types of applications and should continue to work with regional partners like the Ipswich River Watershed Association.
- Following the Listening Session, the Town left the comment period open for one week. No additional comments were received.

Additional Survey Results

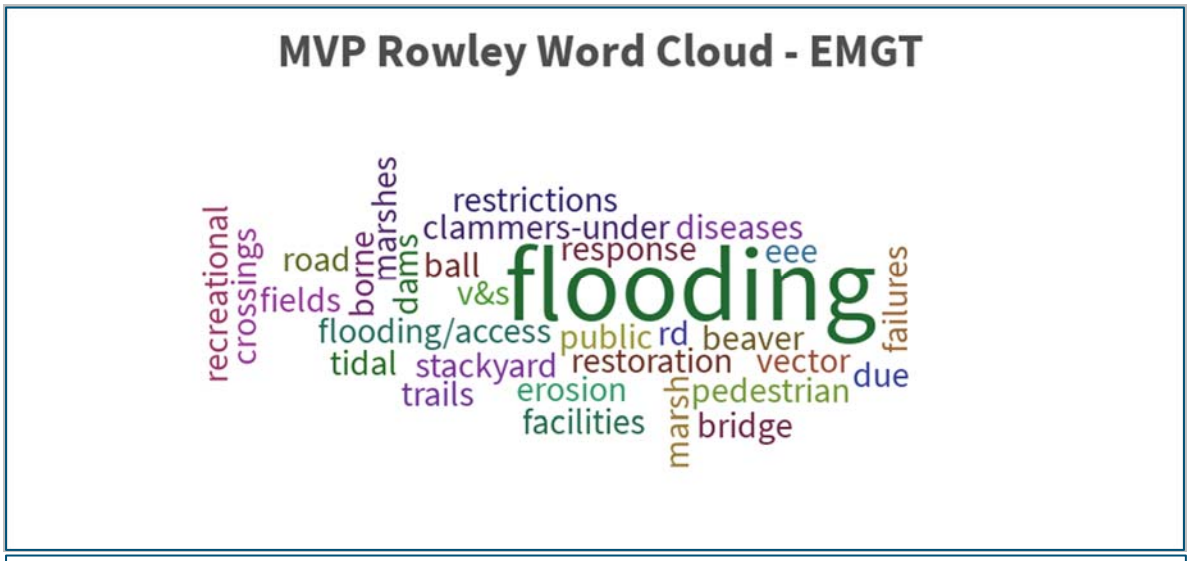
Q3 Which of the following are most vulnerable to impacts of natural hazards? (Please rank in order of vulnerability concern, 1 being most vulnerable and 6 being least vulnerable.)

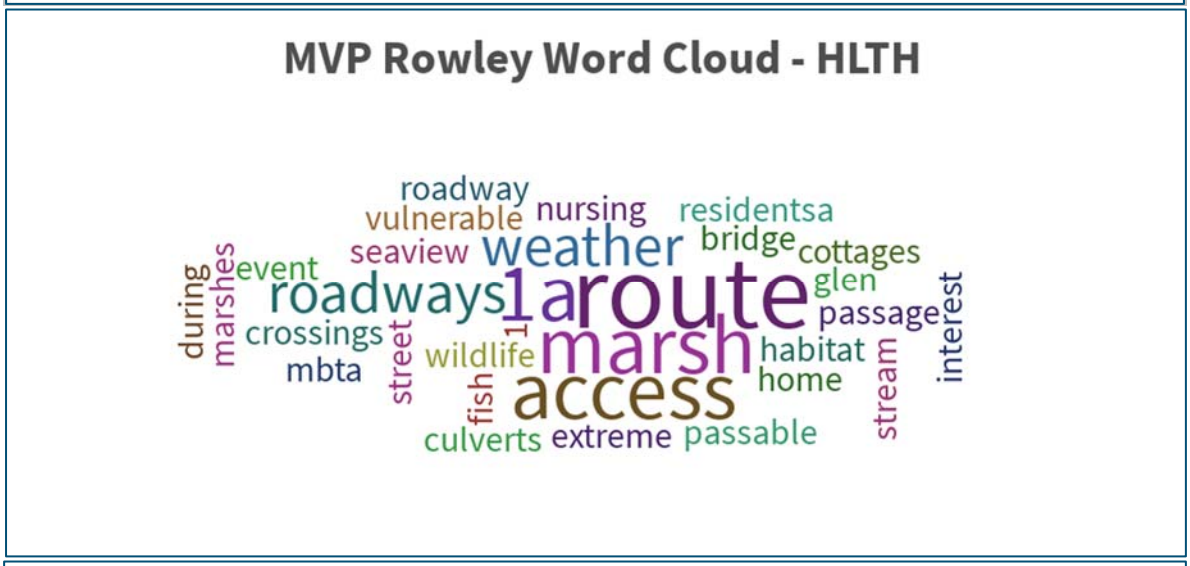


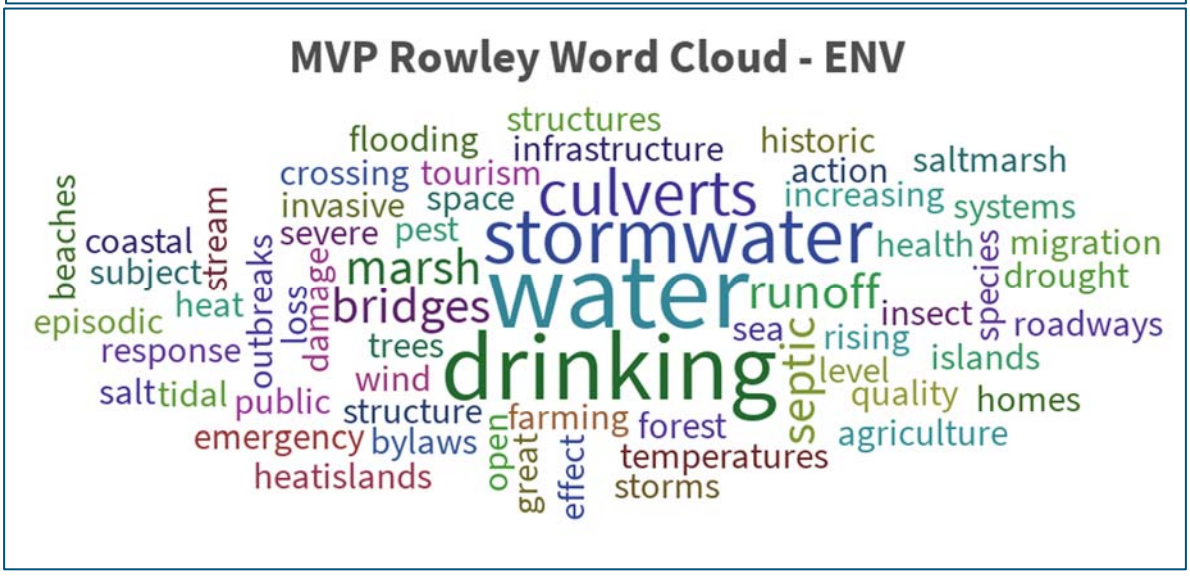
Q4 How would you make Rowley more resilient? Please tell us how important each community element is to you by checking the appropriate column box.



Word Cloud Images from Workshops







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: Sea Level Rise / Severe Winter Storms/Nor'easters / Inland Flooding / Drought — Actions	Priority H-M-L	Time Short Long Ongoing
Infrastructure						
Dams in poor condition (Mother's Day Flood-Mill River)	Glen St./Dodge Rd	Private	V	Clearly identify and then prioritize those most in need. Develop a long-term capital improvement plan for these vulnerable areas. Work with DOT on those that come under their purview. Work with private owners for possible assistance Identify condition of dams and what can be done to improve safety	H	L
Culverts	Central St/Church St., Off the Vine/Physicians Bldg., Rte. 1A near Seaview	Public	V	Implement recommendations of town wide bridges and culverts study including maintenance. Identify funding sources.	H	O
Undersized Culverts	Haverhill St/Boxford Rd & Hillside St	Public	V	Implement recommendations of town wide bridges and culverts study including maintenance. Identify funding sources. Work with DOT on those that come under their purview. Identify beaver dams downstream that may be adding to problem.	H	O
Emergency Shelters (PG has generator/not for overnight sheltering)	Pine Grove School & St. Mary's Parish	Public & Private	V&S	Town has daytime sheltering options including renovated Pine Grove School (backup generator available). Work with Red Cross and others on regional shelter options.	H	L
Glen Street Bridge	Glen St.	Public	V	Town has applied for funding to implement bridge replacement. Identify alternative funding if necessary.	H/M	S
Roads subject to inundation at High Tides	Patmus & Stackyard	Public	V	Clearly identify and then prioritize roads most in need. Develop a long term capital improvement plan for these vulnerable areas. Work with DOT on those that come under their purview. Identify as to what can be done to alleviate vulnerability Raise road 1-3 feet (may still be subject to tidal washout)	H	L
Rte. 1A vulnerable to storm surge and sea level rise	Rte. 1A up to Newbury	Public	V	Work with Town of Newbury to identify options to alleviate vulnerability and seek State assistance (for state road) - Road is a major route (escape route) and should be prioritized.	M	L
Access to water and communication resources subject to washout	Prospect Hill	Public	V	Water Department recently purchased OHRV for this purpose allowing for all weather access Implement upgrades to access roads, perhaps including natural vegetation, to reduce problem with washout Roadway has been rebuilt and swales have been installed. Ensure regular maintenance is done to prevent washout.	L	S

Homes potentially vulnerable to storm surge and inundation	The Cottages, Patmos Rd, Railroad Ave, Stackyard, Ocean Ave.	Public & Private	V	Clearly identify and then prioritize homes/neighborhoods most in need. Develop a long term capital improvement plan for these vulnerable areas. Partner with state to identify what can be done to diminish the impact of storm surge Prevent/discourage rebuilding in areas affected by sea level rise - owners should rebuild at own risk and without federal/state/local aid.	H	L
Wells & Water Treatment Plan possible inundation	Boxford Rd & Pingree Farm, Well 2 (Rte. 133 & Rte. 1)	Public	V	Research and implement natural measures to protect water resources Establish goals/plan to reduce the risk of inundation of wells Establish protocol/possible shutoff if inundation occurs Ongoing beaver management required (identify dams, use deceivers where possible)	H	S/L
Town Highway Garage (Flooding potential/has generator)	Independent St.	Public	V&S	Sits in low area. Work with Civil Engineers for potential redirection of water run-off Develop plan to reduce the flooding potential to this facility	M	L
Replaced Bridges after Mother's Day Flood	Dodge Rd., Wethersfield (Mill River & Bachelder Brook)	Public	S	Continue to monitor and maintain	L	O
MBTA Line Flooding	Town wide	Public	V	Work with DOT/MBTA on long term plan Collaborate with MBTA to see what measure can be taken to mitigate flooding in area	M	L
Above Ground Power Lines	Town wide	Public	V	Continue to have a robust line clearing program in place. Require any new developments to be located underground Improve major feed lines Much of current above ground lines have cabling (spacer-cable systems) to improve resistance to winds and fallen trees. Expand cabling in near term to all lines.	L	O

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Features	Location	Ownership	V or S	Top Priority Hazards: Sea Level Rise	Severe Winter Storms/Nor'easters	Inland Flooding	Drought	Priority H-M-L	Time Short Long Ongoing
Society				**Actions**					
Seniors (lack of or hindered access to food during storms)	Town wide	Public & Private	V	Develop a coordinated effort with COA and first responders (Police and Fire) to deliver meals. Coordinate with Elder Services of Merrimack Valley (ESMV).				H	S
Seniors (large percentage of Rowley population)	Town wide	Public	V	New/more updated/larger senior center could provide more services. Accommodate more emergency services and sheltering needs of seniors. Long-term events/power outages.				H	L
Animals (many horses)/animal hospitals (preparedness for emergency situations)	Ipswich & Rowley Animal Hospitals, Muddy Creek Animal Care Center	Private	V	Develop/strengthen/ or contract with private businesses. Plan for placing animals (work with animal control and ESMV)				M	S
Plantation Population (Community Center for day use/need regional shelter)	Plantation Drive	Public/Housing Authority	V	Upgrade/enlarge community area (plan for backup power-check with Cindy Dunn). Plan for more on-site staffing to support seniors and other vulnerable populations.				M	L
People and locations vulnerable to future storm surge	Town wide	Public & Private	V	Clearly identify susceptible areas and develop plans and identify funding sources for infrastructure upgrades				H	L
Cooling and heating capacity for seniors during extreme temps (fiscal constraints for seniors to pay for heating/cooling)	Town wide	Public & Private	V	Possibly develop a privately funded donation account to be utilized for those with demonstrated need (Smith Fund -COA controlled). Encourage/promote use of energy efficiency programs. Fire Department and Senior Center have cooling/warming centers (Senior Center not as efficient). No Backup power at Senior Center - Plan for improvements to				M	L
Senior Center and fire/police staff available to assist in extreme temps	Town wide	Public	S	Identify/Develop other areas in Town that may be able to be utilized for heating and cooling centers (Pine Grove School)/upgrades to Senior Center.				M	O
Transportation for seniors and people with disabilities during emergencies Overall lack of transportation options	Town wide & Seaview	Public	V	Develop/enhance emergency action plan. Each emergency may dictate resources available/Taxi's/Uber or others/MBTA/Police/Fire/COA. COA has MRVTA sponsored van (well used). Additional vehicle for medical visits and appointments. Plan for more modern/efficient vehicles for senior transport (2 ideal) - more seating capacity). Identify and pursue more transportation options for Rowley (The RIDE, etc.)				H	L
Phone Tree Network & Reverse 911 & Updated Town Website	Town wide	Public	S	Continue advertisement for folks to sign up through website and social media. COA outreach coordinator is part time - more staff time to assist with outreach. Wake up with Rowley (Program to check in on seniors - increase use). Ring me Rowley - additional service - phone buddy when wanted. My Senior Center - software application - for staff (reverse 911 style capabilities).				M	O
Seniors living in own homes (living in older homes/may not reach out for help)	Town wide	Public & Private	V	Develop Active List of vulnerable population (currently 200-250 people). Enhance/restructure Rowley good morning program to encourage participation. More staff time for Senior Center Outreach Coordinator.				H	L
Efforts to update contacts/get in touch with seniors	Town wide	Public (COA)	S	See above. Community Service liaison in Police Department (good for seniors and schools) - increase contact with COA and other town services.				H	S

Sidewalk Accessibility/Other Mobility Issues/Lack of public transportation (taxi, Uber, mass transit)	Town wide	Public	V	AARP Walkability Toolkit (Grant Program), Age Friendly (Dementia Friendly), sidewalk and crosswalk improvements, more benches (resting stations) and water fountains. Increase walkability and age friendly score town-wide not just downtown. See other transportation actions above. Have plan ready.	H	S
Partnership with NEET	Town wide	Public/Private	S	Currently not running due to pandemic. Need alternatives and funding. Very staff dependent.	H	O
COA - two vehicles for senior transport	Town wide	Public	S	Keep vehicles current and maintained. Plan for more modern/efficient vehicles for senior transport (2 ideal - more seating capacity).	H	O

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: Sea Level Rise	Severe Winter Storms/Nor'easters	Inland Flooding	Drought	Priority H - M - L	Time Short Long Ongoing
Environment				**Actions**					
Drought Impacts on River Flows and Water Quality	Parker River	Public & Private	V	1)Establish a water conservation incentive program to pay for residential and commercial water audits, rebates for fixture upgrades, rain barrels and other measures that help capture and utilize rainwater on-site and limit runoff; Promote Greenscapes lawn alternatives to increase native groundcover, which is far better at absorbing and utilizing rainwater than traditional grass lawns where 80% of the water is evaporated; Study incentives for people to convert impermeable surfaces such as driveways to permeable surfaces and minimize runoff. 2)Work with Water Department to develop a media conservation-driven strategy. Fund water conservation in WD budget for toilet, washing machine rebates, rain barrels, etc. Collaborate with area towns on sharing leak detection equipment. 3)Consider creation of a private-well bylaw (where private wells currently exist or may be permitted in the future) based on the model recently adopted by the Town of Ipswich so that private withdrawals are subject to the same rules as the public water supply. 4)Drought - review the Mass Sustainable / Safe Yield Estimator for the Parker River to create more accurate data. Currently DEP's "safe yield" exceeds the amount of water available to be allocated.				1&2 M/H 3) L 4) M	O
Open Space Residential Subdivision Bylaw (including Green Infrastructure, recharge and flood mitigation)	Town wide	Public	S	1)Continue to support OSRD design implementation 2)Examine the Net-Zero Water Use Toolkit for a number of measures to limit risks to the Town from privately owned undeveloped land, including: a) Monitor the Town's Residential Gallons uses Per Capita Per Day (RGPCD) to ensure that it is a steady declining trajectory until it reaches and sustains a level of 42 or less; b) Consider restrictions on the installation of new underground irrigations systems and offer a generous rebate program for the decommissioning of existing underground irrigation systems. 3)Require (unless infeasible) green infrastructure (retention, rain gardens, swales) in all new developments, and retrofit in flooding areas to improve retention and drainage.				1) H 2) L 3) H	1) O 2) L 3)S
Groundwater Protection and Sensitivity	Town wide	Public & Private	V	1)Open Space Plan should prioritize Zone I & II protection. Work with town departments and local Land Trusts to prioritize these areas. 2)Conduct a thorough audit of the local zoning and land use regulations to benefit from Green Infrastructure and Low Impact Development (LID) utilizing Mass Audubon's Bylaw Review Tool; 3)Training seminars and public outreach to help residents understand how water conservation and limiting use helps preserve water quality; 4)Expand participation in/optimize use of the Greenscapes North Shore Coalition, the Parker-Ipswich-Essex Rivers Partnership (PIE-Rivers) water conservation Task Force to increase municipal capacity to manage water neutral growth programs and initiatives. 5)Optimize water supply - use the least environmentally damaging sources in the least damaging ways; don't use wells continuously. Consider regulating private wells and conserve community water use."				1) H 2) M 3) H 4) H 5)M/L	O
Collaborative Groups for Saltmarsh Restoration to prevent loss of High Marsh	Great Marsh	Public & Private	V	Continue involvement with 8Towns and the Great Marsh, Invasives Management work, and US Fish & Wildlife projects in the Great Marsh and other programs to enhance natural resiliency.				H	O

Water Quality Contamination (Nitrates, Bacteria)	Ox Pasture Brook	Public	V	1)Work with PRCWA and PIE rivers groups to determine source of contamination. Apply for WQ funding opportunities 2)Work with other communities throughout the PIE-Rivers Region to improve watershed-wide conservation of Riparian/Wetland buffers and limiting runoff, which naturally help filter nutrient runoff, and educate landowners about the importance of increasing these areas; 3)Encourage use of phosphorous free and low nitrogen fertilizer on lawns and creating incentives for drought-resistant Greenscapes that require little to no water use 4)Education and outreach to specific land owner groups (septic systems, lawn care, equestrian and agricultural) 5)Investigate innovative stormwater treatment systems near Ox Pasture Brook and other	2) M 3)M 4) H 5) H	3) O 4) O 5) L
Increased Prevalence of Lyme Disease & EEE	Town wide	Public & Private	V	1)For EEE: research incentives for residents/businesses to eliminate standing water sites through installation of rain gardens and other nature-based solutions to improve groundwater recharge, reduce mosquito habitat, and bring back mosquito predators (birds); 2)Consider Town Resolution opposing the State's blanket spraying authorized by H.4650, which can actually increase risk of vector-born diseases and reduces the Town's authority to utilize nature-based solutions. 3) Continue participation in Northeast Mosquito Control District	1)M 2)L 3)H	O
Clear Cutting for Development	Town wide	Public & Private	V	1)Utilize land conservation measures; consider establishing a Water Neutral Growth Bylaw or Ordinance that requires new development and re-development projects to offset their projected additional water demand to the extent feasible and offset the rest. This can greatly protect existing vegetation cover and influence developers to prefer sites without existing tree cover. 2)Require tree coverage and vegetation as part of the town green infrastructure planning. 3)Consider bylaw/regulation requiring percentage of tree cover/woody vegetation to be cleared for development	1) L 2) M/H 3) M/H	1) L 2) S 3) O
Invasive Pests (Tree damage)	Town wide	Public	V	1)Promote Greenscapes and planting of native, drought-resistant plants to restore habitat, including for pest predators like birds and bats. Nature-based solutions like habitat restoration on private properties are an attractive, cheap and safe alternative to spraying or using other chemicals that kill both invasive pests and beneficial native pests (which are protein for other insects and birds adapted to respond to plant signals and protect native flora). 2) Encourage replanting with diverse tree species (investigate resilient species). Consider adopt a tree program model.	1) M 2) M/H	1) O 2) O
Land needed for Well Site	Town wide	Public	V	1)Prioritize land purchase and protect areas for future well siting. 2)Work with Open Space Committee, Conservation Commission, **Water Department**, Land Trusts to find suitable locations and explore opportunities for funding.	M/H	S/O
Wellhead Protection needed (Zone 1)	Haley Field	Public	V	1)Prioritize land purchase and protect wellhead area; Green infrastructure only 2)Work with Park and Recreation to find alternate location for playing fields	H	S/O
Fueling Stations potential for contamination	Perley, Richdale, Knowles	Public/Private	V	1)Protect groundwater infiltration of petro-chemicals and additives, especially in vulnerable recharge areas. 2)Consider more protective zoning changes	H	O

Support for Saltmarsh Restoration Projects (protect wildlife habitat, ground/well water, infrastructure)	Town wide/Great Marsh	Public/Private	V	1)Review the 2018 Great Marsh Barriers Assessment for more information and a list ranking every culvert and stream barrier in the PIE-Rivers Region, which has become a tool for towns looking to prioritize funds and collaborate to restore critical habitat. 2)Keep our wetlands healthy and resilient with stricter guidelines in planning 3)Consider locations for saltmarsh migration	M/H	O
Town does well protecting wetlands	Town wide	Public	S	1)Consider Brochures/flyers for new residents about the importance of wetland protection on both public and private lands, to prevent backsliding of this important strength as the town develops and more residents move in. 2)Support local wetland bylaws and regulations	H	O
Fenno Drive Swamp (provides eco-system services/water quality for fisheries habitat)	Fenno Drive	Public/Private	S	Continue protection of freshwater ecosystem for groundwater and surface water cleansing created by this wetland habitat, while also evaluating the status and contribution of personal septic systems to the extreme E.coli and nitrates in Ox Pasture Brook.	M/H	O

AGENDA
ROWLEY MUNICIPAL VULNERABILITY PREPAREDNESS (MVP)
PROJECT CORE TEAM MEETING
APRIL 22, 2020 – 10-11:00 a.m.

Meeting Link: https://global.gotomeeting.com/join/770819077

United States: +1 (872) 240-3412 Access Code: 770-819-077

- One-touch: tel:+18722403412,,770819077#

1) Welcome and Introductions

2) Review Story Map:
   https://mvpc.maps.arcgis.com/apps/MapJournal/index.html?appid=fe59c8ec0ba44e0599aa4a13c7f2743a

3) Core Team Decisions
   a) Develop Schedule for Workshop(s) and Listening Sessions
   b) Determine Stakeholder List
   c) Assist with finding and updating data

4) Follow-up work for Core Team
   a) Review Summary of Findings
   b) Continue outreach and engagement – meet annually
   c) Use the plan to inform planning & project activities

5) Survey to Define Top Hazards

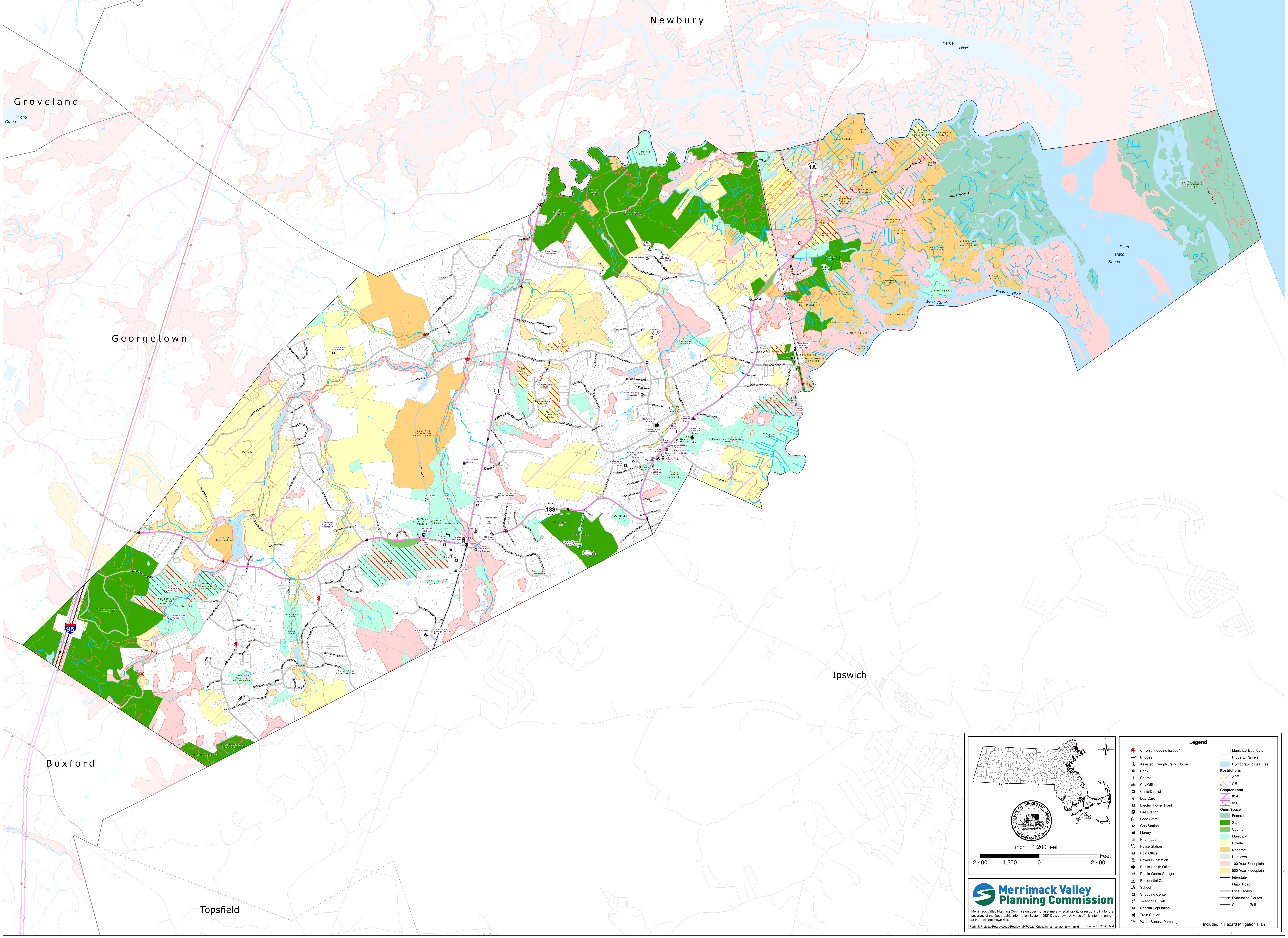
6) Action Grants ($10.5 million to 52 cities & towns in last round)

7) Questions & Answers

Town of Rowley

Municipal Vulnerability Preparedness Program

(Critical Infrastructure)



Town of Rowley

Municipal Vulnerability Preparedness Program

(Socio-Environmental)

Newbury

Groveland

Georgetown

Boxford

Topsfield

Ipswich

Parker River

Plum Island Sound

Rowley River

West Creek

Mill River

1 inch = 1,200 feet

2,400 1,200 0 2,400 Feet

Legend

- Chronic Flooding Issues*
- Activity Use Limit Sites
- Bridges
- Dams
- Subsidized Housing Locations
- Tier II Filers

Chemical Release Sites

- Oil
- Hazardous Material
- Oil & Hazardous Material
- Unknown
- Municipal Boundary
- Property Parcels
- Hydrographic Features

Restrictions

- APR
- CR

Chapter Land

- 61A
- 61B

Open Space

- Federal
- State
- County
- Municipal
- Private
- Nonprofit
- Unknown
- 100-Year Floodplain
- 500-Year Floodplain
- Interstate
- Major Road
- Local Roads
- Evacuation Routes
- Commuter Rail

*Included in Hazard Mitigation Plan

Merrimack Valley Planning Commission

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