Town of Shutesbury

Community Resilience Building Workshop

Summary of Findings

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FUSS & O'NEILL

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Overview

Extreme weather and natural and climate-related hazards are an increasing concern for the communities of Massachusetts, and there is a clear need to involve municipalities, corporations, organizations, and the State in increasing resilience at all levels. Recent storm events affecting the region have highlighted many of the vulnerabilities that towns and cities face. Hurricane Irene and Superstorm Sandy brought intense flooding to many municipalities and threatened (or destroyed) infrastructure across the state. Extreme temperatures at both ends of the spectrum have pushed the limits of communities' preparedness to protect both infrastructure and people. In coastal communities, the impacts of sea level rise are felt daily and further exacerbate the impacts of other extreme events. Current climate modeling indicates that all of these hazards are expected to increase in frequency and scale over the coming decades. The Municipal Vulnerability Preparedness (MVP) program provides support and a prescribed process for cities and towns in Massachusetts to plan proactively for resiliency and implement key climate change adaptation actions.

In 2020, the Town of Shutesbury was awarded a $27,000 MVP grant to fund the planning stage of this process and to update the Town's Hazard Mitigation Plan. The Town partnered with Fuss & O'Neill, a state certified MVP Provider, to complete a comprehensive, baseline climate change and natural hazard vulnerability assessment and develop a list of priority actions for the Town. This process involved the development of an MVP Core Team, which met on April 16, 2020 to determine initial concerns and worked to identify stakeholders within the municipality and set goals for the process. Those stakeholders were then invited to participate in a Community Resilience Building (CRB) workshop on May 14, 2020, engaging in a tried and tested process developed by The Nature Conservancy; the process was modified to suit a virtual platform during the Commonwealth's COVID-19 stay-at-home order. Stakeholders viewed a pre-recorded introduction, then individual stakeholder groups met via Zoom meetings to discuss strengths, vulnerabilities, and priorities in a small group setting. This information was compiled and circulated back to the larger workshop group. The CRB methodology is an "anywhere at any scale" format that draws on stakeholders' wealth of information and experience to foster dialogue about the strengths and vulnerabilities within the Town. Workshop participants interacted at both large and small group levels, using an iterative process to gather input, synthesize ideas across groups, and ultimately develop a set of priority resilience and adaptation actions.

The CRB workshop's central objectives were to:

- Define top local natural and climate-related hazards of concern;
- Identify existing and future strengths and vulnerabilities;
- Develop prioritized actions for Shutesbury;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Top Hazards and Vulnerable Areas

During the MVP Core Team Meeting, participants were asked to identify the top four natural hazards of concern for the Town of Shutesbury. Heavy precipitation and associated localized ponding/minor flooding was identified as a top hazard. Drought and fire risk was identified as a second hazard. Extreme temperatures, both very cold temperatures and extreme heat, were seen as a third major hazard. Extreme storm events were identified as a fourth hazard. These four hazards have already had demonstrated impacts on the Town, and as climate change progresses, these hazards are expected to have ever greater consequences for infrastructure and environment, as well as for various societal elements. Specific areas of concern are identified below.

Top Hazards

- Heavy Precipitation (Flooding)
- Drought and Fire Risk
- Extreme Temperatures
- Extreme Storm Events

Areas of Concern

While many impacts are expected to be felt Town-wide, certain elements, locations, or community groups present particular concerns.

Neighborhoods/Communities
Senior population, school-aged population

Facilities
Fire Department, Town Hall/Police Department, Public Library, Elementary School, Regional Schools

Ecosystems
Lake Wyola

Dams
Lake Wyola Dam, Atkins Reservoir Dam

Infrastructure
Roads (specifically gravel roads), Baker Road, Wendell Road, Montague Road, Dudleyville Road, Locks Pond Road, Locks Pond Road culvert, Cooleyville Road culvert

Current Concerns and Challenges Presented by Hazards

Major storm events have been a recurring threat to Shutesbury throughout its history, from storms bringing wind, intense precipitation, and localized flooding, to winter storms delivering ice and snow. More recently, the Town has been experiencing an increasing regularity of storms, with the so-called 100 year storm occurring every few years. More intense storms delivering higher volumes of precipitation in a single event are expected to put significant pressure on dams, culverts, and other drainage infrastructure that were designed to handle smaller storms with more consistent distributions of precipitation. Workshop participants stressed that the intensity of rain storms has been increasing in recent years—the amount of precipitation the Town would receive over multiple days has condensed into hours. This problem is also exacerbated by the extensive amount of gravel roads in Town. Heavy precipitation on these roads causes runoff and erosion that negatively impacts private property, gardens, tree health, and private wells. Changing temperatures resulting from climate change have also shifted the freeze/thaw cycles in Town, creating increased prevalence of dangerous road conditions, especially on gravel roads, and increased the burden on Town staff and resources to keep these roads safe. Conversely, the Town has also experienced issues relating to drought, which has adversely impacted the private wells in Town, as well as water supplies used for firefighting purposes.

Furthermore, changes in temperature and precipitation patterns have increased problems associated with pests and disease control. Like many communities in Massachusetts in 2019, Shutesbury faced the threat of Eastern Equine Encephalitis (EEE). Residents have also observed an increase in mosquito and tick populations and an uptick in vector-borne diseases such as Lyme disease. Increasing temperatures have also had numerous social impacts in Shutesbury; historically, air conditioning was not needed in Town, in either private residences or Town facilities. However, in 2019, extreme temperatures caused the Town to establish a cooling center for the first time—the Town purchased generators and opened a portion of the Town Hall for resident cooling.

Storm events have also negatively impacted the Town, most notably during 2008 and 2016, when residents were left without power for days. This problem is exacerbated by the reported "microclimate" produced by the Town's elevation, as well as its relative isolation from surrounding communities. In addition to power outages, storm events can down trees and impact roadway access to and from Town, which is especially problematic because residents rely on out-of-Town resources for supplies such as food, fuel, and medicine.

Furthermore, Shutesbury is home to a large senior population, which may not have the financial or physical resources to adapt to the impacts of climate change. These residents may be especially vulnerable due to a lack of adaptation measures such as air conditioning, or lack of access to private transportation needed to obtain critical resources such as food, medicine, and fuel.

Specific Categories of Concerns and Challenges

Infrastructural

Fire Fighting Water Supply
There are no hydrants in Shutesbury and the Town has no public water supply. As a result, the Fire Department sources its firefighting water solely from various surface water sources, including streams and ponds across Town. The Town's largest source of water for firefighting is Lake Wyola—participants expressed concern over the lack of accessibility for the fire truck at the Lake, as there are only 3 to 4 points where the truck can access water due to development over the years. Workshop participants stated that changing precipitation patterns have already impacted the Town's water supply for firefighting, and expressed concern that this impact is expected to continue or worsen as a result of increased frequency and intensity of droughts. Workshop participants observed that shifting precipitation patterns impact certain water supplies more than others; for example, some water supplies are so drastically affected by a lack of rain in the summer they become unusable. Excessive weed growth in the summer has also impacted the supply of water for fire suppression.

Roads
Half of the roadways in Town (approximately 16 miles) are gravel. Workshop participants expressed concern over how gravel roads are more susceptible to the effects of climate change, specifically increased intensity and frequency of heavy precipitation events. For example, heavy precipitation events can cause extensive erosion on the roadways, causing gravel to migrate with runoff to enter culverts and water to pool on nearby properties. Workshop participants stated that while the Town used to get two inches of rain over two to three days, it now happens over the span of a few hours, which is "devastating to infrastructure" and causes high levels of roadway runoff. Additionally, heavy precipitation has also caused roadway flooding in Town. Although this is an issue Town-wide, Baker Road was noted by workshop participants as being especially prone to flooding issues. As climate change brings increased frequency and intensity of storms, as well as overall increases in annual precipitation, these flooding and runoff-related problems may be exacerbated in the future. Paving these roads, while it may address some of the runoff issues experienced across Town, would place a large financial burden on the Town, and would impact the Hilltown character of Shutesbury.

Snow and ice also negatively impact gravel roadways—when rain hits the gravel roads in cold temperatures, it freezes and sanding is required. Shifting weather patterns due to climate change are increasing the difficulty of maintaining these roadways, especially given the increase in freeze/thaw cycles seen throughout the season. Tim Hunting, Highway Department Superintendent, noted that, in recent years, icy roads are the worst the Town has experienced in 20 years. He also noted that the Town sanded more in 2019 than in previous years because of the extensive ice on roadways. Tim Hunting estimates that up to 75% of the sand purchased by the Town is used on gravel roads. This increased roadway maintenance, especially of gravel roads, not only stresses staffing for the Highway Department but places an increased economic burden on the Town. Additionally, roadway impacts due to hazard events also compromise the Town's ability to provide emergency services and to respond to and treat roadway conditions. Sand Hill Road, particularly the section running from Route 106 to Pratt Corner Road, was brought up as a particularly problematic road in the winter; the road is shut down occasionally in the winter due to dangerous conditions. Montague Road and Wendell Road were also brought up as problematic roads in the winter. The concern over the runoff and winter conditions relating to gravel

roads also extended to unpaved private driveways and private roads, notably those owned by the Lake Wyola Association.

Lastly, repeated freeze/thaw cycles and heavy precipitation has historically caused extensive mudding of roads in the spring, especially near Dudleyville Road.

Culverts and Bridges
In Shutesbury, like in many communities across the Commonwealth, existing culverts and bridges were designed to accommodate historic patterns of precipitation and runoff. As precipitation events become more intense and less predictable, undersized culverts are expected to pose a greater threat of failure and flooding. The DPW makes an effort to track and monitor culverts in Town. The Highway Department noted that the Town makes efforts to replace culverts as needed, upsizing them in accordance with MassDEP guidelines. The Locks Pond Road culvert located approximately 100 feet below the Lake Wyola Dam was identified as a primary culvert of concern. The culvert is in poor condition, and, if it fails, the road would wash out and potentially cause flooding of surrounding residences and infrastructure.

Electrical Infrastructure
Power lines can be knocked out by snow and ice, in addition to wind events, causing extensive impacts to the Town. Wind causing downed trees leading to power outages is of special concern throughout Town. During the 2008 ice storm, some residents were without power for eight days. During the October 2011 snowstorm, residents of low-lying areas near the Amherst border and near Lake Wyola also lost power. The Town is serviced mostly by National Grid, with a small portion of Town serviced by Eversource. The main power corridor in Town runs from Pratt Corner Road to the Elementary School. Workshop participants highlighted the importance of the ongoing aggressive tree trimming conducted by National Grid, as well as the company's efforts to replace hazard poles.

Broadband Internet
The Town recently installed community-owned and operated broadband internet, which has rapidly become an important resource for residents and a vital tool for critical municipal communications, both for everyday and emergency communications. (As an aside, it was acknowledged during each of the small group sessions that the remote workshops conducted for this planning process would not have been possible in Shutesbury six-months earlier.) The broadband internet is run through the Town's Municipal Light Plant. An estimated 75% of residents now rely on broadband for their phone service. Workshop participants highlighted that robust, resilient, and redundant broadband service is becoming increasingly important for the Town, especially as more residents work and learn from home.

Septic Systems
The entire Town relies on septic systems, a number of which are mounded septic systems. Septic systems in Shutesbury are a concern due to increasing flooding and the potential for high groundwater to lead to septic failures and discharges of sanitary waste to the environment, posing a threat to both human health and the environment. This is of particular concern in the Lake Wyola area, where an increase in year-round residents and potential new development may stress septic systems in the area. Workshop participants also expressed concern over the economic burden of septic system repair or replacement on residents.

Drinking Water Supply
There is no public water supply in Shutesbury—all residents and municipal facilities rely on private wells. For the past six years, the Town's Water Resource Committee has operated four wells to monitor the quantity/depth of groundwater along the ridge of Shutesbury. April Stein noted that the Committee has not noticed problems relating to water quantity at these wells so far, but that continued monitoring is vital

for identifying potential problems in the future. Water is supplied by a bedrock aquifer located on a recharge area. As a result, the Town currently has "some of the best water" in the area, although climate change may threaten the future quality and quantity of the Town's water supply.

The many private wells in Town are also vulnerable to impacts of drought and heavy precipitation. Across Town, runoff from gravel roads has led to issues with sedimentation of wells. Wells have also run dry during droughts— there has been an increase in well problems during dry summers, with an uptick in well drilling during these times. The Board of Health noted that wells in Town have had to be re-drilled, or deeper wells drilled in place of shallow wells. Furthermore, during heavy precipitation, if the seal on well caps degrades, bacteria can enter the well—the Board of Health has observed an increase in wells requiring disinfecting in the past two years. These problems may be exacerbated in the future as both droughts and heavy precipitation events become more frequent and intense. Similar to septic system repair and replacement, workshop participants expressed concern over the economic impact of well repairs/re-drilling on residents.

Buildings and Facilities

Workshop participants stated that there is roof damage at almost every public building in Town. The roof of the old Town Hall, where Town records and archives are stored, has caved in. The Fire Department has also experienced leaks, mostly recently in April 2020. The Town Hall also experienced a slow leak that caused extensive mold buildup in the Town Administrator's Office and Police Department. Furthermore, workshop participants identified the need for a separate police station, as the Police Department is currently in the same building as the Town Hall and provides no privacy for residents. Workshop participant Dan Fernandes, Chief of Police, stressed the importance of having a separate facility that would serve as a shelter/safe space for residents.

The elementary school's gymnasium, which serves as the Town's main meeting space, has issues with puddling resulting from heavy rains. The roof of the school is flat and has repeatedly leaked and been patched. Runoff from the roof has also caused buckling on the nearby sidewalks. For the past two years, the Town has submitted Massachusetts School Building Authority (MSBA) applications which seek to address these deficiencies, but the Town has been waitlisted.

Cooling capacity in Town buildings is limited. The Town Hall recently had a mini-split heating/AC system installed. The Fire and Highway Departments also have mini-splits installed, but other areas of the Town Hall are not cooled. The library is also air conditioned, although workshop participants stated that cooling and heating the building, which was constructed in 1902, is difficult. Additionally, the Town Hall, elementary school, and Fire Department buildings are equipped with generators.

Dams

The Lake Wyola Dam is a primary dam of concern in Town. The dam is classified as "high hazard" and is maintained by the Town, which employs a dam keeper. Failure of the dam would cause extensive damage to surrounding infrastructure and residences. It would also negatively impact the main transportation route from Town to Leverett and Montague. Workshop participants also identified the Atkin's Reservoir Dam, managed by the Town of Amherst, as a potential dam of concern.

Solar Fields

There is one solar farm in Town, located on Pratt Corner Road. The facility has also been authorized to install battery storage. Town also operates small solar groupings scattered throughout Town, including behind Town Hall and on the roof of the elementary school. There is also potential for the Town to construct a solar network on "Lot 032," a currently vacant municipal lot across from the Highway Department. Workshop participants expressed interest in the viability of using new and existing solar

power in Town to create an off-the-grid system to support key municipal functions. Furthermore, workshop participants noted concern over the land clearing and deforestation related to the construction of solar fields, as this may become a more prevalent issue given the increasing popularity of renewable energy.

Stormwater Runoff
The pooling resulting from stormwater runoff on gravel roads has caused tree loss from flooded root systems. Standing water from roadway runoff may also encourage insect population growth, specifically mosquitos. Additionally, roadway runoff from heavy precipitation events has caused basement flooding in residences across Town, leading to issues with mold. In addition to property damage and health impacts, remediation of this damage can lead to financial burden on residents. Runoff is also causing increased sedimentation in wells and has negatively impacted gardens on private property.

Environmental

Agriculture and Gardens
There are a number of agricultural establishments across Town, including five active farms and an additional handful of growers that participate in the local farmer's market. There are a considerable number of maple sugar operations, although sugaring has declined in recent years. Private gardens are also prevalent in Town. Climate impacts such as drought, excessive rain, and changing temperatures may affect agriculture and livestock for both commercial and residential agricultural practices. Across New England, for instance, maple sugaring may no longer be economically viable at some point in the future, and some agricultural producers may be forced to consider alternate crops or altogether different sources of income. The impacts of climate change, ranging from increased frequency and intensity of drought, to heavy precipitation, and changes in seasonal and average temperatures may adversely impact these farms and private gardens.

Trees and Forests
Forests provide critical ecosystem services that help buffer the effects of climate change, from storing and sequestering carbon, to increasing groundwater recharge, to modulating local temperature. However, trees and forests are also threatened by climate change. Wind and storms cause blowdowns, drought can contribute to die-off, new invasive pests (e.g., Emerald Ash Borer and Hemlock Wooly Adelgid) are eliminating certain tree species, and others are in decline due to shifting temperature and precipitation regimes that favor more southerly species. The Town's emergency services also recognize that hazard events can convert trees from assets to threats. Tree loss from road runoff pooling near root systems was brought up as a concern by workshop participants. Walter Tibbetts, Fire Chief/EMS Director, also discussed how drought can worsen brushfire conditions and increase the risk of wildfires in Town. In addition to creating safety hazards, failing tree health can also have adverse economic impacts—Evan Jones from Cowls Building Supply noted that tree health can be negatively impacted by storms and other impacts of climate change, leading to standing and fallen dead timber that the company must address on their lands.

Brushfires and Wildfires
There is concern over the impact of wildfire and brushfires in Town. Increases in temperature and frequency and intensity of drought can dry out trees and vegetation. In combination with standing dead wood and fallen timber as noted above, this creates an excess of fuel in the system, leading to increased risk of wildfires and brushfires in Town. As workshop participant Walter Tibbetts, Fire Chief, noted, fire risk from drought is a "double-edged sword," as drought simultaneously depletes water supplies available for firefighting. Chief Tibbetts also expressed concern that other types of fires in Town, such as structure fires, can spread and turn into brushfires.

Lake Wyola

In addition to serving as the Town's primary water source for firefighting, Lake Wyola is as an important recreational resource. There are two beaches on the Lake and a number of lake-front properties. Currently, there are approximately 100 houses on the Lake, approximately 20 of which are occupied year-round. Workshop participants noted that the number of year-round residences increases by one or two homes per year. Workshop participants also stated that water quality at the Lake is "generally good," although there are concerns over the potential impact of septic system failure on water quality. The impacts of road runoff were also a concern—as workshop participants Evan Jones noted, stormwater runoff during heavy storms can cause silt deposits in the Lake, which is of concern "when we have that 100-year storm that we seem to be getting a lot more often." Evan noted that the Lake Wyola Association acknowledges that paving these roads is likely not a possibility, and that having unpaved roads does not cause issues a majority of the time. Furthermore, workshop participants noted that increased development and associated impervious cover around the Lake as residents upsize the original cottages may exacerbate these issues.

Invasive Species and Stress on Native Species

Invasive plants and animals are a source of concern in Shutesbury, as they are throughout the Commonwealth. Forest and upland ecosystems are threatened by a variety of invasive plants, including plants such as oriental bittersweet, multiflora rose, two types of swallowwort, and several non-native honeysuckles. Riparian and aquatic habitats are severely threatened by species such as common reed, Japanese knotweed, and invasive water chestnut. These and other species pose a significant challenge and have serious consequences for ecosystem health and resilience, and these impacts are likely to increase in response to climate change. Warming temperatures will also bring new invasives to the area, and these will have an easier time gaining a foothold if the Town's natural ecosystems are simultaneously weakened due to changes in climatic conditions. The Town has had particular issues with Japanese knotweed, focused mainly on the Pelham Hill Road area. The Town sprayed the area in the past, although ceased spraying due to impacts on nearby residents.

Wetlands

Wetlands serve a number of important ecological functions, including flood storage and water quality improvements. Workshop participant Linda Avis Scott, Conservation Commission member, noted that wetland boundaries in Town may be shifting as a result of changing temperatures and precipitation patterns. Subsequently, changing wetland boundaries may also increase the stress on native species and lead to increased prevalence of invasives.

Chemical Use

Workshop participants expressed concern over the environmental and human health impacts of chemical use related to pesticides and herbicides used both by private residents and the Town. This is of special concern as invasives become increasingly common as a result of climate change. In the past, the Town sprayed herbicides to control Japanese knotweed growth on Pelham Hill Road. The Town received calls about the spraying negatively impacting residents nearby. As a result, the spraying stopped. Workshop participants also expressed interest in increasing education and awareness of herbicides and pesticides used on private property, and how the Town can encourage residents to use pollinator-friendly methods of controlling pests.

Wildlife and Habitat Loss and Connectivity

As climate change brings changes in seasonal and annual temperatures, wildlife habitats are shifting in Shutesbury and across the Commonwealth. Workshop participants noted an "explosion" of residents observing bear activity this spring—however, as the COVID-19 stay-at-home order has many residents confined to their homes, workshop participants were unsure if this observed increase in bear sightings is

due to increased opportunity to observe the bears or actual shifts in hibernation patterns causing an increase in bear activity earlier in the season.

Societal

Schools
Shutesbury Elementary School (pre-K through 6th grade) is the only school in Town. Beyond the 6th grade, Shutesbury's children attend Amherst-Pelham Regional Public Schools for middle and high school. The Town is responsible for busing the children to Amherst to attend the regional schools. There are concerns over the impact of winter conditions on bus routes and the subsequent difficulty in transporting the children down the hill. For example, in 2019, there were multiple instances of school buses getting stuck on icy gravel roads. As a result of difficult transportation during inclement weather, some children are forced to miss school even when it is not cancelled. Furthermore, there is no air conditioning at the elementary school or the regional schools. There have been days at the start and end of the school year that have been "unbearably hot" at the schools and, as workshop participant Mary Anne Antonellis noted, "we're having days where it's really too hot for students to be comfortable at school," and these conditions have a negative impact on learning. The regional schools have also had problems with excess ambient humidity on the floors causing slips and falls—on at least one occasion, there was so much condensation in the building that the school had to be closed to dry out the floors. There are issues with puddling in the elementary school, which also serves as the main gathering space for the Town. The Town been unsuccessful in its past years in its applications for MSBA grants for funding to fix the roof.

Library
The Town is attempting to build a new Public Library, as the current library has no running water and is only 900 square feet. The Town would like to include green energy features and additional amenities for residents in the new building. As it is the only public building with building-wide air conditioning, the current library serves as an unofficial cooling center for residents. It also serves as a resource during power outages, where residents have come to charge their phones. The library also provides internet access to residents. The library also plays an important role in community outreach, education, and engagement—for example, the library runs climate change awareness programs and related book clubs. All of these efforts could be expanded and enhanced through a larger, purpose-built library and community center.

Town Communication
The Town currently operates a newsletter that reaches a majority of residents. Broadly, the Town is interested in pursuing effective means of communication with residents, including alternatives to email, that allow the Town to provide emergency alerts, Town-wide updates, and raise awareness of the impacts of climate change and adaptation and mitigation actions residents can take.

Climate Migration and Future Development
As sea levels in the Commonwealth rise, populations may begin shifting inwards towards communities like Shutesbury. Workshop participants acknowledged that future climate migration may present development-related challenges in the community. Given the small size of the community, even "100 new families would have a huge impact" on the Town and its available resources.

Parks and Open Space
Open space provides ecosystem services that help buffer the effects of climate change, from sequestering carbon, to increasing groundwater recharge, to modulating local temperature. Open space is also critical in floodplains for providing a buffer and increased flood storage, near public water supplies to maintain high water quality and promote recharge, and to maintain overall habitat connectivity that will be vital to

allowing ecosystems and individual species to adapt to a changing climate. From a social perspective, open space and parks also provide opportunities for recreation and stress-relief, as well as relief from extreme heat events. Workshop participants questioned how the effects of climate change on the Town's open space resources, forests, and parks (increased risk of wildfire, increased insect populations, etc.) may impact the quality of life of Shutesbury residents.

Cooling Centers

The library operates as an unofficial cooling shelter during extreme heat events, when it has historically extended normal service hours to accommodate residents. In 2019, the Town purchased generators and used a portion of the Town Hall as a cooling center. Workshop participants have also noticed that increasing temperatures in recent years has necessitated the installation of air conditioning in private homes, whereas it was never needed previously. There are currently, however, no dedicated spaces with centralized air conditioning that serve as official cooling centers in Town.

Emergency Sheltering

The elementary school currently serves as the Town's main emergency shelter. Workshop participants expressed concern over the potential impact of using the shelter while school is in session and the subsequent safety implications for children. There is interest in exploring alternative sheltering options to address this concern.

Pests and Disease Control

The Town recognizes that climate change is affecting pests and disease vectors both through changing precipitation conditions and changing temperature conditions. Warmer, wetter conditions lead to increased mosquito populations, while the absence of sufficient periods of cold means that pest populations that would historically have been killed off or reduced are able to survive the winter and emerge in greater numbers the following season. Further, as the Massachusetts climate begins to look more like the climate of the mid-Atlantic and southern states, we are seeing new types of diseases show up in existing pests (e.g. mosquitoes carrying West Nile Virus, Eastern Equine Encephalitis, or Zika and ticks carrying Rocky Mountain Spotted Fever). These changes present a major public and animal health challenge in terms of education, prevention, and treatment. 2018 marked the Commonwealth's highest ever incidence of West Nile Virus diagnosis, and 2019 marked the highest number of EEE cases in recent history in Massachusetts.

Workshop participants noted an increase in the number of ticks and mosquitos in recent years. The Town is not currently part of a mosquito control district, although the Board of Health noted that the Town is pursuing membership in the Pioneer Valley Mosquito Control District (the Board was not aware of the existence of the mosquito control district until early 2020). The Town plans to put it on a Town Meeting Warrant this year, although it will likely not be in time to spray for the 2020 season.

Public Transportation

Shutesbury is currently not a "walkable Town"—it is a community without public transportation that relies on private vehicles for commuting. Workshop participants expressed concern that this negatively impacts seniors and other vulnerable populations that may not have access to private transportation, which is needed for access to grocery stores, Town buildings, medical facilities, and other vital resources. The Town has been unsuccessful in past efforts to request expanded service routes through the Franklin Reginal Transport Authority (FRTA) to and from Shutesbury. Additionally, workshop participants noted that increases in inclement weather conditions have made four-wheel drive increasingly necessary for private and municipal vehicles.

Provisions, Medicine, Fuel

Maintaining access to essential supplies like groceries, medicines, and fuel (for vehicles, heating, and generators), as well as critical medical care and drug treatment during emergencies is important during hazard events. It was acknowledged that power outages or road closures, like those seen in the 2008 ice storm, which affect access to these services could have extensive impacts on residents throughout Town. These issues are exacerbated for vulnerable populations without personal transportation, as these resources are all located outside of Town—there are no retail establishments in Town that provide fuel, medicine, or food and other provisions. The Highway Department, Fire Department, and Police Department, however, have access to an in-Town fueling station at the Highway Department.

Vulnerable Populations

Shutesbury is home to a large senior population: out of a population of approximately 1,800, 700 are 60 years old or older. There is a general concern for isolated populations, as Shutesbury is a community that depends on personal transportation—seniors or members of other vulnerable populations may not have access to this transportation. The Council on Aging operates a MedRide Program to transport seniors to medical appointments. The Village Neighbors Group, a community organization comprised of four small eastern Hill Towns and 100 volunteers, also provides support for seniors to age in place. The organization provides complementary services not covered by the Council on Aging, such as transportation for seniors to grocery stores and social destinations. The organization expressed interest in acquiring a van to increase its transportation capacity. The Village Neighbors also offer a number of non-transportation related services, including yard clean-up, IT support, check-ins, etc., for seniors. Workshop participants also expressed concern over the ability to reach seniors during hazard events when there may be washouts or other events that lead to roads being impassible. Seniors may also be isolated during power outages. Additionally, a number of seniors may be vulnerable to increasing temperatures as they may lack air conditioning in their homes. Many seniors also live on a fixed-income and may have a limited ability to adapt to the impacts of climate change.

While the Town recently installed broadband, workshop participants also expressed concern over populations that may not have access to the internet and therefore may be unaware of Town information regarding community resources or emergency alerts that are disseminated online.

Food Insecurity

Food insecurity affects approximately one in every eight or nine people in Shutesbury, close to the State average. However, the COVID-19 pandemic caused a sharp increase in this number—due to job loss and other related factors, 20-30% of residents in Town are currently food insecure. Workshop participant Laura Sylvester expressed concern over how widespread hazard events, similar in scale to the COVID-19 pandemic, may affect future food security for vulnerable populations in Town.

Stress on Emergency Services

Shutesbury's Fire, Police, and Public Works departments bear much of the burden of responding to the increased human threats that result from climate-induced hazards. An ever larger percentage of the departments' time and resources must be devoted to handling things like traffic accidents resulting from ice or other dangerous conditions and activities to maintain traffic flows or protect property during storm events, and Public Works is relied upon to clear roads and maintain access throughout the Town. As Walter Tibbetts, Fire Chief, said regarding the discussion on impacts of climate change "every aspect comes back to the Fire Department or Emergency Management." As severe storms and "erratic weather patterns" become increasingly common, this places an even greater burden on these departments. Furthermore, Chief Tibbetts noted that warmer temperatures can negatively impact worker health and increase the risk of heat stroke and heat exhaustion. Town staffing is also an issue, as the Chief noted that, "demands for our job are constantly increasing but the people we have, the resources we have, are

decreasing, and that alone is a concern." The Highway Department recently lost a staff member and is interested in filling the position.

Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well.

- The Town is **updating its Open Space and Recreation Plan** this year.
- The Council on Aging operates a **MedRide Program** for seniors.
- There are **thousands of acres of forest and open** space across Town.
- The Town is in the planning stages of a **new public library facility**.
- The Town has **four water monitoring wells** to track water quantity.
- The Town runs a **Septic Betterment loan program**.
- **The Town runs a Farmer's Market** to provide local produce and supports local farmers.
- The **Village Neighbors program** provides transportation, food delivery, and a wide-variety of services for seniors.
- The Town and National Grid conduct **aggressive tree trimming and removal** to protect power lines.
- The Town has set up **temporary cooling centers** for residents in the past.
- Shutesbury runs a **Town announcement program** to inform residents on important events and Town news.
- The Town plans to join the **Pioneer Valley Mosquito Control District**.
- Shutesbury recently installed **community-owned broadband internet**.

Top Recommendations to Improve Resilience in Shutesbury

Participants at the CRB workshop identified a number of recommendations to address vulnerabilities and increase resiliency in three main topic areas: infrastructure, environment, and society. The impacts of extreme precipitation and related issues of runoff and flooding were a primary concern that emerged, encompassing a wide variety of infrastructural concerns both private and public. Providing sufficient protections and planning for vulnerable populations in Town (such as seniors and food insecure populations) and improving effective communication between the Town and residents was a second major theme.

Highest Priority

- **Conduct a field inventory of culverts and bridges** to rank and prioritize projects for increased flooding resiliency and storm-hardening, followed by design and implementation of priority re-sizing or replacement projects. Build on previous work in the Town's Hazard Mitigation Plan that identified top-priority culverts. Green infrastructure, Low-Impact Design, and other nature-based solutions will be integrated with hard-infrastructure improvements to establish approaches that will be robust in the face of natural hazards and climate-change scenarios.

- **Assess options for repairing or replacing the culvert downstream of the Lake Wyola Dam** to increase resilience of the dam and reduce the risk of flooding during heavy precipitation events. Explore funding options for implementation.

- **Coordinate with the Town of Amherst on inspections for the Atkins Reservoir Dam**. Consider climate change impacts, such as increased intensity and frequency of heavy precipitation events, when assessing the dam.

- **Enact the Town's plan to join the Pioneer Valley Mosquito Control District**. Membership includes periodic testing of mosquito and tick populations to help monitor vector-borne diseases.

- **Research municipally-owned solar installations** that would provide energy directly to Town buildings and possibly residents through the existing Municipal Light Plant (MLP) structure and would establish off-grid reliability. Conduct a microgrid feasibility assessment to assess the viability of providing continuous, green power to a subset of municipal buildings and ensure that key personnel and vulnerable populations have access to Town services, including communications, sheltering, cooling centers, etc.

- **Create a Climate Mitigation/Adaptation Fund** to enable capital or operating budget support for climate interventions for municipal projects.

- **Update the Town's Master Plan** to address a full range of zoning-related climate change mitigation/adaptation issues, such as limiting development in high-hazard areas, incorporating green infrastructure in new development plans, and encouraging low-impact development practices.

- **Explore options for enhanced and effective communication with residents.** Utilize the Town's recently installed broadband internet, and increase transparency and awareness in Town.

Make communications with residents more interactive. Pursue 100% enrollment in the Town announcement program (approximately 150 people are not enrolled). Assess communications alternatives that are not reliant on electricity the way that phone (VOIP) and internet systems in the community currently are.

- **Establish a regulatory review process for future developments** to address impervious cover and manage stormwater runoff. Review and update applicable Town regulations and bylaws to improve stormwater management and mitigate flooding risk.

- **Assess green infrastructure opportunities for stormwater management** to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Review Town regulations and update as necessary to support green infrastructure and low-impact development and encourage green infrastructure to be incorporated into all roadway projects. Focus on known problem areas for stormwater runoff, including Locks Pond Road and the Lake Wyola area. Assess opportunities to reduce runoff from private driveway to roadways, such as encouraging Green Infrastructure practices at private residences. Encourage stormwater harvesting and reuse practices on private and Town-owned properties.

- **Develop transportation planning for vulnerable populations during hazard events** to ensure that vulnerable groups, notably seniors, will be able to get to shelters, obtain food and medications, or receive emergency services. Focus should be on identifying vulnerable populations and providing aid during all types of climate-induced risks, such as extreme temperatures, increasingly intense storms which may make travel difficult, or flooding and storm events that may leave residents unprepared, stranded, or cut off from supplies.

- **Identify vulnerable populations and foster a communications network** in advance of a hazard event to facilitate communication efforts and outreach to those most in need of information and assistance. Focus should be on populations that may be more vulnerable to climate-induced risks, such as extreme temperatures, may lack appropriate shelter during increasingly intense storms, or that may be unprepared if stranded or cut off from supplies due to flooding or storm events. Evaluate communication or emergency alert methods that may not require internet access, as vulnerable populations, notably seniors, may not be connected to broadband service.

- **Hire one additional Highway Department staff** to increase the capacity of the department to respond to and mitigate hazardous conditions.

- **Establish a designated cooling center in Town** and ensure that it has adequate capacity and power requirements. Assess the feasibility of establishing the new library facility as a cooling center and identify related needs during the planning stages of development. Future plans for a separate police department facility may also provide an opportunity to establish it as a designated cooling center.

- **Work with the Planning Board and Select Board to ensure that commercial development** remains appropriate to Town (e.g., grocery stores and food establishments) and does not lead to forest degradation. Designate payments in lieu of taxes (PILOT) to fund a Climate Mitigation Fund.

Moderate Priority

- **Conduct strategic planning to support the agricultural community** in the face of climate change. All of the identified hazards (heavy precipitation, drought, extreme temperatures, and extreme storm events) have the potential to significantly impact agricultural production, with corresponding threats to livelihoods. Planning should include education on adapting agricultural practices to impacts of climate change, such as longer growing seasons, extended periods of drought, and changes in overall precipitation patterns. Educate farmers and gardeners on adaptation measures, including drought resistant crops.

- **Educate owners of private gardens** on stormwater management practices that can help reduce runoff to private gardens and encourage pollinator-friendly planting and pesticide alternatives for landowners.

- **Assess additional mosquito/pest control options,** including establishment of buffers between developed and undeveloped areas, determination of future risks due to increase in type and quantity of pests/disease vectors due to climate change, and development of an education and outreach program. Evaluate alternative methods for pest management, such as biological controls, that do not involve chemical application. Coordinate with the Board of Health to increase educational opportunities/awareness relating to pests and disease control. Conduct research on the impacts of pest management options on the environment to inform Town bylaws.

- **Install central air conditioning** in the Town's elementary school and regional schools to protect children from the impacts of increasing heat as seasonal weather patterns become more unpredictable and average temperatures and days over 90 degrees F increase.

- **Develop comprehensive invasive species management** from inventory stage through management planning and implementation to address existing invasive populations that threaten features such as open space or forests, both of which contribute to resiliency, as well as anticipate new invasives that are likely to move into the area as climates shift. Continue to manage the invasive plants in Town and explore alternative spraying options for Japanese knotweed. Assess biological control options for pests, including gypsy moths, and alternatives to spraying for invasives.

- **Assess wells providing water for key municipal facilities**, including the Town Hall, elementary school, and Fire Department, to ensure reliability of water supplies.

- **Conduct a detailed vulnerability and risk assessment of surface water supplies used for firefighting** by the Fire Department or Emergency Management. Individual source ponds already identified as potential water sources should be inspected, physical problems noted, and possible solutions identified. Conduct a wildfire risk assessment to identify vulnerable areas and develop an action plan for the Fire Department..

- **Disincentivize land clearing for building solar installations.** Evaluate zoning bylaws as they relate to solar in the Town and amend accordingly. Research zoning regulations for residential battery use for solar installations.

- **Conduct a Select Board review of anticipated emergency services needs** independent of current personnel. Include planning for future financing.

- **Explore partnerships with neighboring towns or nonprofits** to create repositories for provisions, medicine, fuel, and other essential goods that residents or town officials can access during emergency situations.

- **Establish annual Select Board updates** on climate adaptation and mitigation activities at annual Town Meetings as part of department updates. Include these updates at regular Town meetings.

- **Establish the elementary school as an emergency shelter.** Acquire necessary equipment and conduct policy review to plan for how best to safely shelter adults if school is still in session to identify potential safety issues regarding schoolchildren. Assess funding for AC and equipment.

- **Develop a comprehensive tree and forests management plan** to identify, remove, and replace problem trees, preserve intact forests, provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures), and develop guidelines to manage conversion of forest land (e.g. solar guidelines). Update the Town's Master Plan, zoning bylaws, and Planning Board policies accordingly.

- **Conduct a study of potential impacts of climate migration on the Town.** Develop recommendations for consideration of these impacts in zoning regulations and actions by the Town's Planning Board.

- **Begin discussions between Board of Health, Lake Wyola Association, Water Committee and State** regarding the impact of climate change on lake water quality and usage, and impacts on both recreational uses of the lake and surrounding septic systems.

- **Establish a community education program on the risks of wildfire and** prevention measures that can be taken by residents.

- **Explore alternative measures for addressing extreme heat conditions at the elementary school**. Assess the feasibility of planning for school closures and remote learning on extreme temperature days.

- **Enhance "walkability" in Town through the creation of walking paths to popular destinations**, such as the school and public library, to reduce reliance on private vehicles and provide transportation options for populations that may not have access to private vehicles.

- **Educate owners of private septic systems** about the importance of having systems pumped out and keeping them in good working condition in order to prevent risks to public health and the environment from systems that become overwhelmed during periods of heavy precipitation. Evaluate the possibility of developing a comprehensive Town-wide septic plan to uniformly address these concerns.

- **Assess additional options for stand pipes or underground storage tanks** for water supply for firefighting to reduce the Fire Department's reliance on surface water, which is vulnerable to the impacts of drought. Coordinate permitting efforts with other Town projects.

- **In the planning stages for the new Town library,** include provisions to have the facility serve as a community cooling shelter and explore options for incorporating a community meeting room. Assess the feasibility of including green energy features or an off-grid power supply to increase resilience of the facility.

- **Acquire a Town van and designate a paid driver to assist in the transportation of seniors** to medical appointments, grocery stores, and other key destinations.

- **Increase access to food for individuals who cannot leave their homes** and assess options for the Town to assist in distributing food, including alternatives to accessing food through means other than private vehicles.

- **Conduct a Town-wide survey to identify existing skills in the community** that can be assets during an emergency, such as child care. Build upon previous Board of Health efforts surrounding this purpose.

- **Develop a comprehensive tree and forests management program** to identify, remove, and replace problem trees, preserve intact forests and street tree cover, provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures), and develop guidelines to manage conversion of forest land (e.g. solar guidelines).

- **Continue efforts related to the Town's well monitoring program** to observe available water quantity for private wells across Town.

- **Revisit the Green Infrastructure assessment for the Lake Wyola area**. Identify and implement high-priority practices to reduce runoff and sedimentation of the Lake. Explore potential funding sources for top projects. Explore funding options for private road maintenance for the Lake Wyola area.

- **Evaluate the impacts of road treatments on private drinking water wells** and educate residents on these impacts and any mitigation measures that can be taken to protect private wells. Assess potential funding sources for residents to pursue private well repair and replacement**,** similar to the Town's Septic Betterment program.

- **Pursue public facilities upgrades that would increase resiliency**, including repairs to the roofs of the Town Hall, Fire Department, and elementary school. Continue to pursue an MSBA grant for replacement of the roof at the elementary school.

- **Conduct a feasibility assessment for dispersed municipal water supply** that would rely on multiple supply sources to provide public water and relieve some of the burden from residents' need to rely on and maintain private wells at every residence.

Lower Priority

- **Establish a formal drought plan** to detail appropriate actions to be taken during times of extended drought, with particular attention to developing alternate water supply sources for farmers.

- **Facilitate discussions between leadership and staff at the elementary school and the Town** on childcare options, especially during hazard events.

- **Continue to post signage at the Town's trailheads warning of ticks and other pests.**

- **Educate the public on shifting wildlife populations and proper safety protocol for encountering wildlife.**

- **Assess the feasibility of implementing a "stump fee" in Town** to discourage tree removal.

- **Explore options for Town-owned co-op, general store, or formalized community exchange programs** to increase in-Town access to food and supplies, especially during hazard events.

- **Conduct education and outreach on the impacts of impervious cover on wetlands** and changes in microclimates. Continue with Conservation Commission efforts to revise applicable bylaws and wetland protections.

- **Assess feasibility of a municipal wastewater treatment plant** to reduce the reliance on private septic systems across Town, especially in areas of high concern such as Lake Wyola.

- **Support incentives that allow for individual homeowners to have self-sufficiency** (off-the-grid) for solar and explore potential regulatory barriers. Incentivize battery storage.

- **Assess feasibility of construction a separate police department facility** outside of the Town Hall**.** The facility would serve as a "safe space" for residents and allow for privacy that is not currently afforded in the department's current location in Town Hall.

CRB Workshop Participants

All workshop invitees are listed below; attendees are indicated with an asterisk.

Name	Position/Organization
Deacon Bonnar*	Farm & Forestry Committee
Walter Tibbetts*	Fire Department/Emergency Management Department
Megan Rhodes*	Senior Transportation and Lane Use Planner, Franklin Regional Council of Governments
Linda Avis Scott*	Co-Chair, Shutesbury Council on Aging; Land Use Clerk
Rita Farrrell*	Co-Chair, Finance Committee; Co-Chair/Housing Authority Representative, Community Preservation Committee
Elaine Puelo*	Member, Shutesbury Select Board
Allison Gage*	Shutesbury Resident
Laura Paquin Thomas*	Chair, Shutesbury School Committee
Laura Sylvester*	Legislative and Community Partnership Coordinator, Food Bank of Western Massachusetts
Susan Millinger*	Citizen Climate Group; Shutesbury Council on Aging
Nancy Matthews*	Shutesbury Athletic Club
Gayle Huntress*	Manager, Municipal Lighting Plant Board; Chair, Broadband Committee
April Stein*	Member, Shutesbury Select Board
Eric Stocker*	Co-Chair, Finance Committee
Ezzell Floranina*	Shutesbury Resident
Evan Jones*	President, Cowls Building Supply, Inc.
Penelope Kim*	Amherst Survival Center
Dan Fernandes*	Chief, Shutesbury Police Department
Ellen McKay*	Town Collector, Town of Shutesbury
Alan Werner*	Professor of Geology, Mount Holyoke College
Miriam DeFant*	Board of Directors, Village Neighbors
Ajay Khashu*	Member, Shutesbury Finance Committee
Scott Farrar*	Customer & Community Manager, National Grid
Kate Cell*	Trustee, Shutesbury Public Library
Pamela Hill*	Senior Program Manager, Community & Customer Management, National Grid
Rebecca Torres*	Town Administrator, Town of Shutesbury
Melissa Makepeace O'Neill*	Member, Shutesbury Select Board; Council on Aging
Michael DeChiara*	Planning Board, Town of Shutesbury
Andrew Smith*	MVP Coordinator, Greater Connecticut River Valley, Massachusetts EEA
Tim Hunting*	Superintendent, Highway Department
Mark Rivers*	Member, Lake Wyola Association
Dan Wakoluk*	Tree Warden, Town of Shutesbury
Veronica Richter*	Church Representative
Grace Bannasch*	Assistant Town Clerk, Town of Shutesbury

Mary Anne Antonellis*	Director, Shutesbury Public Library
Catherine Hilton*	Board of Health
Jessica Belanger*	School Administrator, Shutesbury Elementary School
Kimberly McPhee	Franklin Council of Regional Government
Chuck DiMare	Zoning Board of Appeals
Dennis Clark	Clark Excavating
B-Z Reilly	Recreation Committee
Dina Stander	Shutesbury Resident
Howie Kinder	Dam Keeper
Robert Sulenski	Shutesbury Resident
Bob Groves	Building Committee
William Levine	Farmer, Town of Shutesbury
Steve Hubbard	DCR, Lake Wyola State Park
Allison Brau	High School Student

CRB Workshop Project Team

Name	Organization	Role
Becky Torres	Shutesbury Town Administrator	Project Coordinator/ Core Team Member
Rita Farrell	Co-Chair, Finance Committee; Community Preservation Committee,	Core Team Member
April Stein	Select Board; Lake Wyola Advisory Committee; Water Resources Committee	Core Team Member
Michael DeChiara	Planning Board	Core Team Member
Melissa Makepeace O'Neil	Member, Shutesbury Select Board	Core Team Member
Catherine Hilton	Clerk, Board of Health	Core Team Member
Eric Stocker	Co-Chair, Finance Committee	Core Team Member
Walter Tibbetts	Fire Chief/EMS Director, Shutesbury Fire Department	Core Team Member
Tim Hunting	Highway Department	Core Team Member
Dan	Police Chief, Shutesbury Police Department	Core Team Member
Elaine Puelo	Member, Shutesbury Select Board	Core Team Member
Mary Anne Antonellis	Director, Shutesbury Public Library	Core Team Member
Julianne Busa	Fuss & O'Neill	MVP Lead Facilitator
Sarah Hayden	Fuss & O'Neill	Scribe

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Cover image credit: John Phelan.

Appendix A

Final Risk Matrix

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

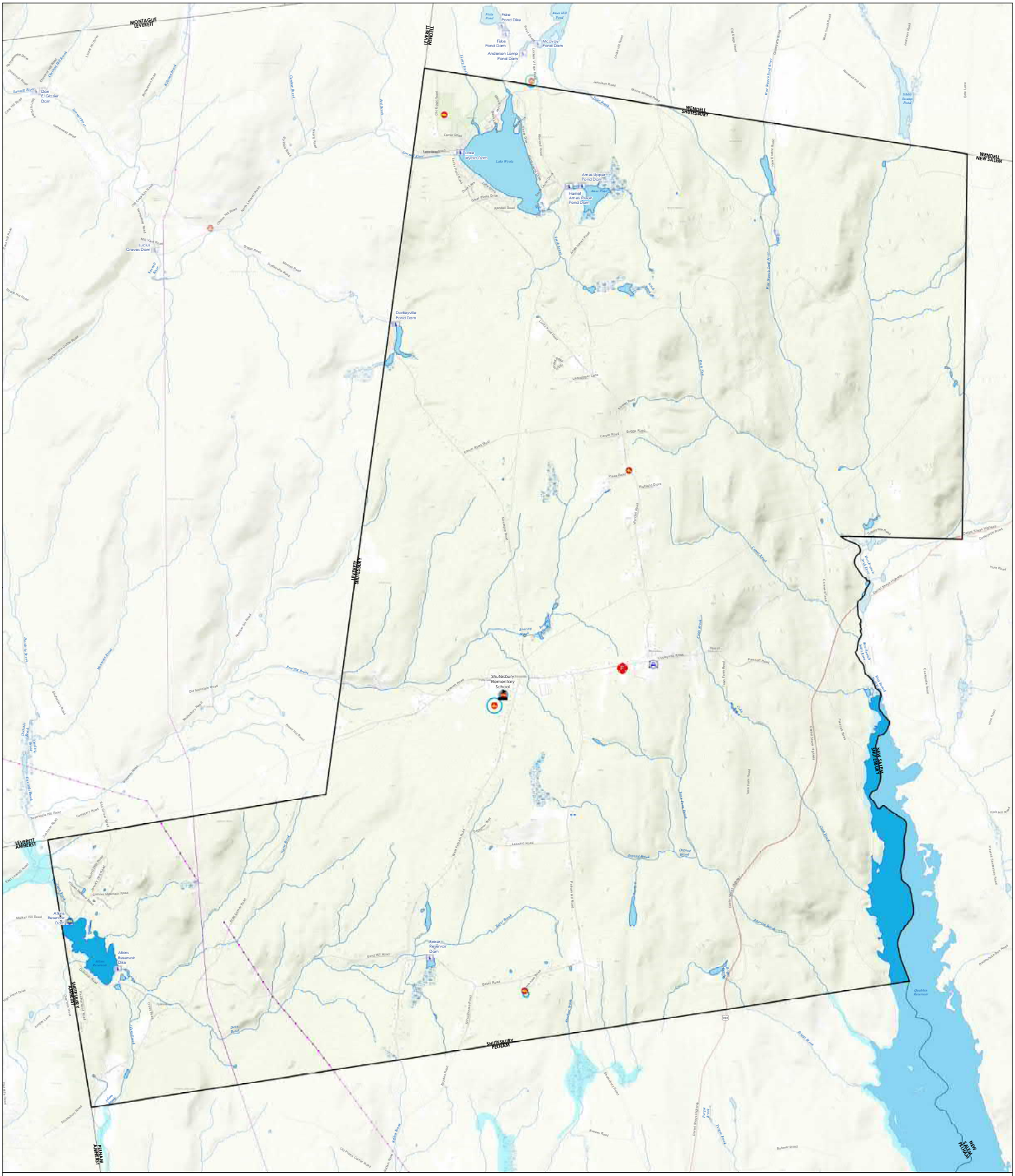
Features	Location	Ownership	V or S	Heavy Precipitation (Including Flooding)	Drought (Including Fire Risk)	Extreme Temperatures	Extreme Storm Events (Including Wind)	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Fire Fighting Water Supply	Town-Wide	Town	V	Conduct a detailed vulnerability and risk assessment of surface water supplies used for firefighting by the Fire Department or Emergency Management. Conduct a wildfire risk assessment to identify vulnerable areas and develop an action plan for the Fire Department.				M	S
				Assess additional options for stand pipes or underground storage tanks for water supply for firefighting to reduce the Fire Department's reliance on surface water. Coordinate permitting efforts with other Town projects.				M	L
Roads	Town-Wide, Baker Road, Wendell Road, Montague Road, Dudleyville Road, Locks Pond Road	Town, Private	V	Review Town regulations and update as necessary to support green infrastructure and low-impact development and encourage green infrastructure to be incorporated into all roadway projects. Assess opportunities to reduce runoff from private driveway to roadways, such as encouraging green infrastructure practices at private residences.				H	S
Culverts and Bridges	Town-Wide, Locks Pond Road Culvert, Cooleyville Road Culvert	Town, Private	V	Conduct a field inventory of culverts and bridges to rank and prioritize projects for increased flooding resiliency and storm-hardening, followed by design and implementation of priority re-sizing or replacement projects. Build on previous work in the Town's Hazard Mitigation Plan that identified top-priority culverts. Green infrastructure, Low-Impact Design, and other nature-based solutions will be integrated with hard-infrastructure improvements.				H	S
				Assess options for repairing or replacing the Locks Pond Road culvert (near Lake Wyola) to increase resilience of the dam and reduce the risk of flooding during heavy precipitation events. Explore funding options for implementation.				H	S
Electrical Infrastructure	Town-Wide	Private	S	The Town and National Grid conduct aggressive tree trimming and removal to protect power lines.				N/A	O
Internet (Broadband)	Town-Wide	Town	S	Shutesbury recently installed community-owned broadband internet.				NA	O
Septic Systems	Town-Wide	Town, Private	S	The Town runs a Septic Betterment loan program.				N/A	O
			V	Educate owners of private septic systems about the importance of having systems pumped out and keeping them in good working condition in order to prevent risks to public health and the environment from systems that become overwhelmed during periods of heavy precipitation. Evaluate the possibility of developing a comprehensive Town-wide septic plan to uniformly address these concerns.				M	L
				Assess feasibility of a municipal wastewater treatment plant to reduce the reliance on private septic systems across Town, especially in areas of high concern such as Lake Wyola.				L	L
Drinking Water Supply	Town-Wide	Town, Private	S	The Town has four water monitoring wells to track water quantity.				N/A	O
			V	Assess wells providing water for key municipal facilities, including the Town Hall, elementary school, and Fire Department, to ensure reliability of water supplies.				M	S
				Continue efforts related to the Town's well monitoring program to observe available water quantity for private wells across Town.				M	O
				Evaluate the impacts of road treatments on private drinking water wells and educate residents on these impacts and any mitigation measures that can be taken to protect private wells. Assess potential funding sources for residents to pursue private well repair and replacement, similar to the Town's Septic Betterment program.				M	L
				Conduct a feasibility assessment for dispersed municipal water supply that would rely on multiple supply sources to provide public water and relieve some of the burden from residents' need to rely on and maintain private wells at every residence.				M	L
Buildings and Facilities	Town Hall (and Police), Highway Department, School, Old Town Hall, Library, Fire Station	Town	V	Pursue public facilities upgrades that would increase resiliency, including repairs to the roofs of the Town Hall, Fire Department, and elementary school. Continue to pursue an MSBA grant for replacement of the roof at the elementary school.				M	L
				Create a Climate Mitigation/Adaptation Fund to enable capital or operating budget support for climate interventions for municipal projects.				H	L
				Assess feasibility of construction of a separate police department facility outside of the Town Hall.				L	L
Dams	Town-Wide, Lake Wyola, Atkins Reservoir Dam	Town, Town of Amherst, Private	V	Coordinate with the Town of Amherst on inspections for the Atkins Reservoir Dam. Consider climate change impacts, such as increased intensity and frequency of heavy precipitation events, when assessing the dam.				H	L
Solar Fields/Groups	Town-Wide, Pratt Corner Road	Town, Private	V	Research municipally-owned solar installations that would provide energy directly to Town buildings, and possibly residents, through the existing Municipal Light Plant (MLP) structure and would establish off-grid reliability. Conduct a microgrid feasibility assessment to assess the viability of providing continuous, green power to a subset of municipal buildings and ensure that key personnel and vulnerable populations have access to Town services, including communications, sheltering, cooling centers, etc.				H	L
				Disincentivize land clearing for building solar installations. Evaluate zoning bylaws as they relate to solar in the Town and amend accordingly. Research zoning regulations for residential battery use for solar installations and support incentives that allow for individual homeowners to have self-sufficiency (off-the-grid) for solar and explore potential regulatory barriers. Incentivize battery storage.				M	L
Stormwater Runoff	Town-Wide	Town, Private	V	Establish a regulatory review process for future developments to address impervious cover and manage stormwater runoff. Review and update applicable Town regulations and bylaws to improve stormwater management and mitigate flooding risk.				H	S
				Assess green infrastructure opportunities for stormwater management to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Focus on known problem areas for stormwater runoff, including Locks Pond Road and the Lake Wyola area. Encourage stormwater harvesting and reuse practices on private and Town-owned properties.				H	S
				Update the Town's Master Plan to address a full range of zoning-related climate change mitigation/ adaptation issues, such as limiting development in high-hazard areas, incorporating green infrastructure in new development plans, and encouraging low-impact development practices.				H	S

Societal									
Schools	Elementary School, Regional Schools	Town, Regional	V	Install central air conditioning in the Town's elementary school and regional schools to protect children from the impacts of increasing temperatures.				M	L
				Explore alternative measures for addressing extreme heat conditions at the elementary school. Assess the feasibility of planning for school closures and remote learning on extreme temperature days.				M	L
				Facilitate discussions between leadership and staff at the elementary school and the Town on childcare options, especially during hazard events.				L	S
Public Library	Public Library	Town	S	The Town is in the planning stages of a new public library facility.				N/A	O
			V	Assess feasability of having new library serve as a community cooling shelter and explore options for incorporating a community meeting room. Assess the feasibility of including green energy features or an off-grid power supply to increase resilience of the facility.				M	L
Town Communication	Town-Wide	Town	S	Shutesbury runs a Town announcement program to inform residents on important events and Town news.				N/A	O
			V	Explore options for enhanced and effective communication with residents. Utilize the Town's recently installed broadband internet, and increase transparency and awareness in Town. Make communications with residents more interactive. Pursue 100% enrollment in the Town announcement program (approximately 150 people are not enrolled). Assess communications alternatives that are not reliant on electricity the way that phone (VOIP) and internet systems in the community currently are.				H	L
			V	Establish annual Select Board updates on climate adaptation and mitigation activities at annual Town Meetings as part of department updates. Include these updates at regular Town meetings.				M	L
Climate Migration and Future Development	Town-Wide	N/A	V	Conduct a study of potential impacts of climate migration on the Town. Develop recommendations for consideration of these impacts in zoning regulations and actions by the Town's Planning Board.				M	S
Parks and Open Space	Town-Wide	Town, State, Private	S	The Town is updating its Open Space and Recreation Plan this year.				N/A	O
Cooling Centers	Town Hall	Town	S			The Town has set up temporary cooling centers for residents in the past.		N/A	O
			V			Establish a designated cooling center in Town and ensure that it has adequate capacity and power requirements. Assess the feasibility of establishing the new library facility or a new police department as a cooling center and identify related needs during the planning stages of development.		H	L
Emergency Sheltering	Town-Wide	Town	V	Establish the elementary school as an emergency shelter. Acquire necessary equipment and conduct policy review to plan for how best to safely shelter adults if school is still in session to identify potential safety issues regarding schoolchildren.				M	L
Pests and Disease Control	Town-Wide	Town, Private	S	The Town plans to join the Pioneer Valley Mosquito Control District.				N/A	O
			V	Enact the Town's plan to join the Pioneer Valley Mosquito Control District. Membership includes periodic testing of mosquito and tick populations to help monitor vector-borne diseases.				H	S
			V	Assess additional mosquito/pest control options, including establishment of buffers between developed and undeveloped areas, determination of future risks due to increase in type and quantity of pests/disease vectors due to climate change, and development of an education and outreach program. Coordinate with the Board of Health to increase educational opportunities/awareness relating to pests and disease control. Conduct research on the impacts of pest management options on the environment to inform Town bylaws.				M	L
				Continue to post signage at the Town's trailheads warning of ticks and other pests.				L	O
Public Transportation	Town-Wide	Town	V	Enhance "walkability" in Town through the creation of walking paths to popular destinations, such as the school and public library, to reduce reliance on private vehicles and provide transportation options for populations that may not have access to private vehicles				M	L
Provisions, Medicine, Fuel	Town-Wide	Private	V	Explore partnerships with neighboring towns or nonprofits to create repositories for provisions, medicine, fuel, and other essential goods that residents or town officials can access during emergency situations.				M	L
				Explore options for Town-owned co-op, general store, or formalized community exchange programs to increase in-Town access to food and supplies, especially during hazard events.				L	L
Vulnerable Populations	Town-Wide	N/A	S	The Council on Aging operates a MedRide Program for seniors.				N/A	O
				The Village Neighbors program provides transportation, food delivery, and a wide-variety of services for seniors.				N/A	O
			V	Develop transportation planning for vulnerable populations during hazard events to ensure that vulnerable groups, notably seniors, will be able to get to shelters, obtain food and medications, or receive emergency services. Focus should be on identifying vulnerable populations and providing aid during all types of climate-induced risks.				H	S
				Acquire a Town van and designate a paid driver to assist in the transportation of seniors to medical appointments, grocery stores, and other key destinations.				M	L
Food Insecurity	Town-Wide	N/A	V	Increase access to food for individuals who cannot leave their homes and assess options for the Town to assist in distributing food, including alternatives to accessing food through means other than private vehicles.				M	L
Stress on Emergency Services	Town-Wide	Town	V	Hire one additional Highway Department staff to increase the capacity of the department to respond to and mitigate hazardous conditions.				H	S
				Conduct a Select Board review of anticipated emergency services needs independent of current personnel. Include planning for future financing.				M	S
				Conduct a Town-wide survey to identify existing skills in the community that can be assets during an emergency, such as child care. Build upon previous Board of Health efforts surrounding this purpose.				M	S
Environmental									
Agriculture and Gardens	Town-Wide	Private	S	The Town runs a Farmer's Market to provide local produce and supports local farmers.				N/A	O
			V	Conduct strategic planning to support the agricultural community in the face of climate change. Planning should include education on adapting agricultural practices to impacts of climate change, such as longer growing seasons, extended periods of drought, and changes in overall precipitation patterns. Educate farmers and gardeners on adaptation measures, including drought resistant crops.				M	L
				Educate owners of private gardens on stormwater management practices that can help reduce runoff to private gardens and encourage pollinator-friendly planting and pesticide alternatives for landowners.				M	S
				Establish a formal drought plan to detail appropriate actions to be taken during times of extended drought.				L	L

Trees and Forests	Town-Wide, Forested Area between Wendell Road/Montague Road	Town, State, Private	S	There are thousands of acres of forest and open space across Town.	N/A	O
			V	Work with the Planning Board and Select Board to ensure that commercial development remains appropriate to Town (e.g., grocery stores and food establishments) and does not lead to forest degradation. Designate payments in lieu of taxes (PILOT) to fund a Climate Mitigation Fund.	H	L
				Develop a comprehensive tree and forests management plan to identify, remove, and replace problem trees, preserve intact forests, provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures), and develop guidelines to manage conversion of forest land (e.g. solar guidelines). Update the Town's Master Plan, zoning bylaws, and Planning Board policies accordingly.	M	L
				Assess the feasibility of implementing a "stump fee" in Town to discourage tree removal	L	L
Brush and Wild Fires	Town-Wide	Town, State, Private	V	Establish a community education program on the risks of wildlife and prevention measures that can be taken by residents.	M	S
Lake Wyola	Lake Wyola	Town, Private	V	Begin discussions between Board of Health, Lake Wyola Association, Water Committee and State regarding the impact of climate change on lake water quality and usage, and impacts on both recreational uses of the lake and surrounding septic systems.	M	L
				Revisit the Green Infrastructure assessment for the Lake Wyola area. Identify and implement high-priority practices to reduce runoff and sedimentation of the Lake. Explore potential funding sources for top projects. Explore funding options for private road maintenance for the Lake Wyola area.	M	S
Invasive Species and Stress on Native Species	Town-Wide	Town, State, Private	V	Develop comprehensive invasive species management from inventory stage through management planning and implementation to address existing invasive populations that threaten features such as open space or forests, both of which contribute to resiliency, as well as anticipate new invasives that are likely to move into the area as climates shift. Continue to manage the invasive plants in Town and explore alternative spraying options for Japanese knotweed. Assess biological control options for pests, including gypsy moths, and alternatives to spraying for invasives.	M	L
Wetlands	Town-Wide	Town, Private	V	Conduct education and outreach on the impacts of impervious cover on wetlands and changes in microclimates. Continue with Conservation Commission efforts to revise applicable bylaws and wetland protections.	L	S/O
Chemical Use	Town-Wide	Town, Private	V	Evaluate alternative methods for pest management, such as biological controls, that do not involve chemical application.	M	L
Wildlife and Habitat Loss and Connectivity	Town-Wide	Town, State, Private	V	Educate the public on shifting wildlife populations and proper safety protocol for encountering wildlife.	L	S

Appendix B

CRB Workshop Base Map



SHUTESBURY, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

- Dams
- Town Hall
- Police Station
- Fire Station
- School
- Powerline
- Surface Water Intake
- Non-Community Groundwater Source
- Wellhead Protection Zone I

N
W E
S

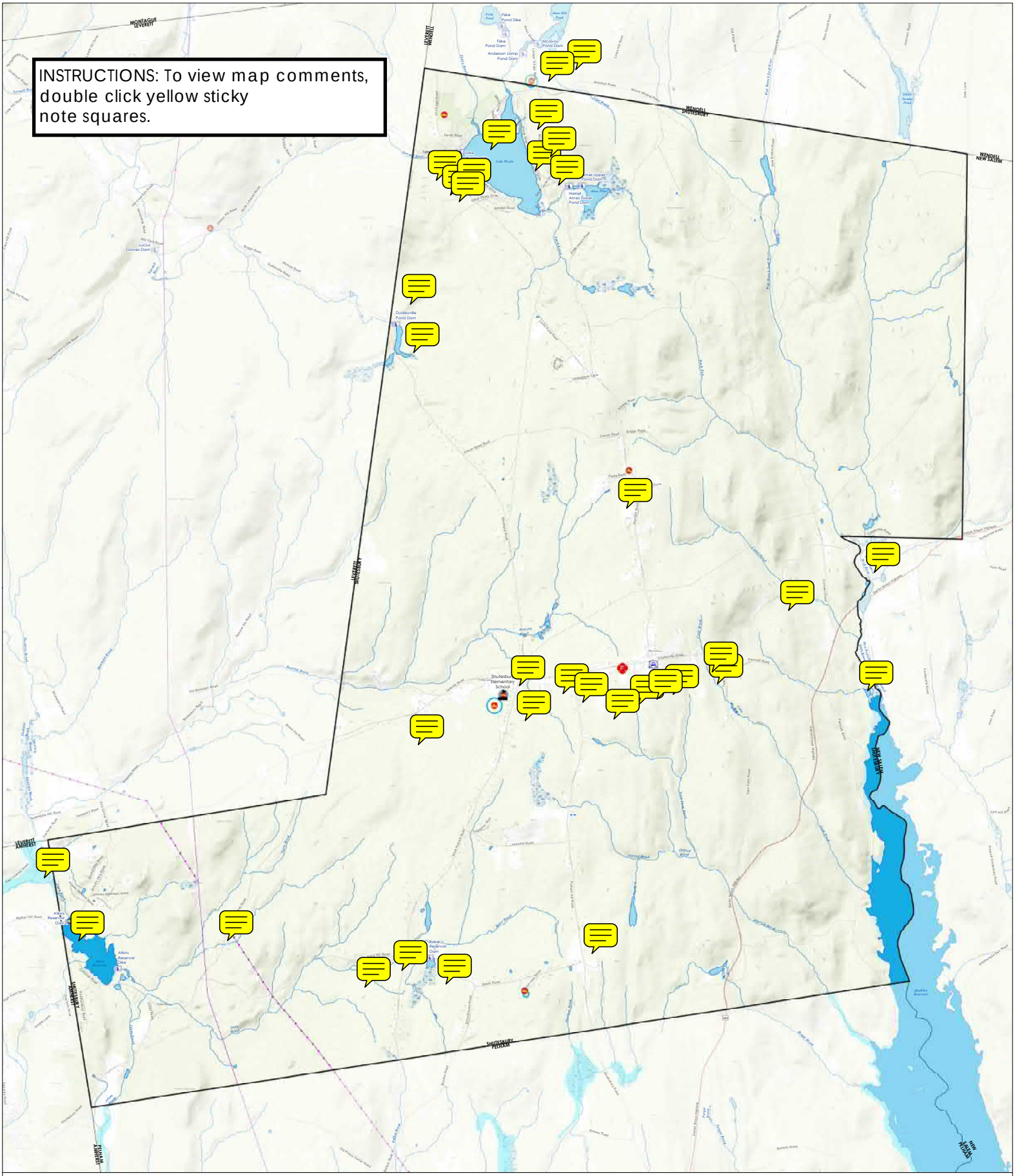
0 0.25 0.5
Miles

FUSS & O'NEILL

Data sources:
MassGIS - Infrastructure, Hydrology, and Administrative Data
ESRI - World Topographic Map - Base Map

Appendix C

CRB Workshop Outputs:
Participatory Mapping Exercise & Risk Matrices



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0 0.25 0.5

Miles

FUSS & O'NEILL

Data sources:
MassGIS - Infrastructure, Hydrology, and Administrative Data
ESRI - World Topographic Map - Base Map

SESSION 1 RISK MATRIX

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Heavy Precipitation (Including Flooding)	Drought (Including Fire Risk)	Extreme Temperatures	Extreme Storm Events (Including Wind)	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Roads (Especially Dirt/Gravel)	Town-Wide, Sand Hill Road	Private, Town	V	Increase road maintenance, consider paving, upsize culverts (including those identified in Hazard Mitigation Plan). Hire additional Highway Department staff.					
Electrical Infrastructure	Pratt Corner Road, Wendell Depot (substations)	Private, Town, National Grid/Eversource	S				National Grid conducts aggressive tree trimming.	N/A	O
			V				Continue hazard tree trimming/removal, review zoning for underground connection to private residences, explore microgrid options to maintain power to key facilities during outages.		
Drinking Water Supply (Private Wells)	Town-Wide	Town-Wide	V	Explore options for: dispersed municipal water supply options, funding assistance for individual/private well upgrades (similar to septic betterment program), increasing education/awareness on well maintenance and impacts resulting from climate change, and steps that can be taken to protect these wells.					
			S	The Town operates monitoring wells to monitor water quantity.				N/A	O
Septic Systems	Town-Wide	Private	V	Increase education/awareness of: maintenance of septic systems, the impacts of climate change on septic systems, understanding why zoning systems are set up they way they are, and steps that can be taken to protect systems.					
			S	The Town runs a Septic Betterment Program.				N/A	O
Culverts	Town-Wide, Lake Wyola, Camel Brook, Roaring Brook Culvert	Town, Private	S	There is an upcoming culvert study in Town.					
			V	Upsize culverts identified in the Town's Hazard Mitigation Plan.					
Water Supply for Fire Fighting	Town-Wide, Lake Wyola	Town	V	Explore additional options for stand pipes or underground storage tanks, coordinate permitting with other Town projects.					
Internet (Broadband)	Town-Wide	Town	S					N/A	O
Buildings and Facilities	Town Hall, Highway Department, School, Old Town Hall	Town	V	Construct new library facility, study feasibility of new police department facility.					
Societal									
Agriculture and Gardens	Town-Wide	Private	V	Increase education/awareness on adapting to climate change (expansion of growing season, drought resistant crops, water mitigation). Explore resources for stormwater management and drainage that are acceptable to residents. Encourage pollinator-friendly policies, pollinator-friendly planting, and pesticide alternatives for homeowners/pollinator-friendly lawn practices.					
			S	The Town has the Shutesbury Farmers Market.				N/A	O
Senior Population/Vulnerable Population	Town-Wide	N/A	V	Acquire Village Neighbors or Town van. Explore options for adequate cooling centers (Fire station has AC in part of building, Town Hall lower level w/ portable AC--both used in past). Increase access to food for individuals who can't leave their homes. Explore how Town can accept donations (can't buy food outright for donations). Explore partnership between EMS and Village Neighbors (similar to neighborhood watch program).					
			S	Village Neighbors delivers food for seniors.				N/A	O
Transportation	Town-Wide	Town, Private	V	No priority action items were discussed.					
Schools	Elementary School, Regional School	Towns	V			Assess feasibility of air conditioning in schools.			
Pests and Disease Control	Town-Wide	N/A	V	Explore natural pest management options.					
Public Library	Public Library	Town	V	No priority action items were discussed.					
Stress on Emergency Services	Town-Wide	Town	V	No priority action items were discussed.					

Access to Provisions, Medicines, and Fuel	Town-Wide	Private	V	No priority action items were discussed.					
Food Insecurity	Town-Wide	Private	V		Assess alternatives to access to food through means other than private vehicle.				
Environmental									
Lake Wyola	Lake Wyola	Town, Private	V	No priority action items were discussed.					
Brush Fires	Town-Wide	Town, Private	V	No priority action items were discussed.					
Invasive Species/Pests	Town-Wide	Town, Private	V	Develop a comprehensive management plan for invasive species. Increase education/awareness on invasive species management.					
Solar Fields	Pratt Corner Road	Private	V	No priority action items were discussed					
Stormwater Runoff	Town-Wide	Town, Private	V	Evaluate road treatment impacts/alternatives. Educate landowners about what to do about stormwater runoff on private property. Address issue of salt in runoff impacting wells.					
Impervious Cover	Town-Wide	Town, Private	V	No priority action items were discussed.					
Septic Systems	Town-Wide	Private	V	See "Infrastructure" section.					
Trees and Forests	Town-Wide	Town, State, Private	V	Develop a comprehensive tree and forest management plan					
Stress on Native Species	Town-Wide	Town, State, Private	V	Increase education/awareness, tie into invasive species management efforts.					
Wetlands Boundaries	Town-Wide	Town, Private	V	Education/outreach on runoff and impervious cover impacts on wetlands/changes in microclimates.					
			S	Conservation Commissions is currently exploring revisions to applicable bylaw				N/A	0

SESSION 2 RISK MATRIX

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Heavy Precipitation (Including Flooding)	Drought (Including Fire Risk)	Extreme Temperatures	Extreme Storm Events (Including Wind)	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Roads (Especially Dirt/Gravel)	Town-Wide	Private, Town	V	Explore surfacing or paving options for gravel roads.					
Electrical Infrastructure	Pratt Corner Road, Wendell Depot (substations)	Private, Town, National Grid/Eversource	S				National Grid conducts aggressive tree trimming.	N/A	O
			V				Continue tree trimming and hazard tree removal.		
Drinking Water Supply (Private Wells)	Town-Wide	Town-Wide	V	Continue well monitoring efforts. Educate residents on/facilitate private well monitoring and explore funding sources for well testing. Assess options for rainwater/grey water reuse.					
Septic Systems	Town-Wide	Private	V	No priority action items were discussed.					
Culverts and Bridges	Town-Wide, Lake Wyola, Cooley Road Bridge	Town, Private	V	No priority action items were discussed.					
Water Supply for Fire Fighting	Town-Wide, Lake Wyola	Town	V		Explore options for water reuse.				
Internet (Broadband)	Town-Wide	Town	S					N/A	O
Buildings and Facilities	Town Hall, Highway Department, School, Old Town Hall, Library	Town	V	Assess feasibility for separate police department facility.					
Solar Fields/Groups	Town-Wide, Pratt Corner Road	Town, Private, Regional	V				Continued assessment of feasibility of options for linking the system linked to grid or installing a battery system.		
Societal									
Agriculture and Gardens	Town-Wide	Private	V	Explore rainwater harvesting and reuse options.					
Senior Population/Vulnerable Populations	Town-Wide	Private	V			Assess feasibility of installing air conditioning at all Town buildings to be used as cooling centers (including school). Explore transportation options for seniors and low-income residents.			
			V	Identify vulnerable populations/locations in Town, coordinate w/ Village Neighbors for these efforts. Continue safe space efforts.					
Transportation	Town-Wide	Private	V	Acquire small municipal fleet (especially for seniors and vulnerable populations). Continue efforts for regional scale for transportation options.					
Schools	Elementary School	Towns	V	Formalize assistance programs.		Install air conditioning at the schools.			
Pests and Disease Control	Town-Wide	Town, Private	V	Consideration of policies regarding different pest control mechanisms.					
Public Library	Public Library	Town	V	No priority action items were discussed.					
Stress on Emergency Services	Town-Wide	Town	V	Assess options for a separate police department facility. Acquire/continue to acquire SUV/vehicles better suited for road conditions for emergency responders.					
Access to Provisions, Medicines, and Fuel	Town-Wide	Private	V	Explore options for Town-owned food co-op/general store and community exchange programs.					
Food Insecurity	Town-Wide	Private	V	No priority actions were discussed.					
Childcare	Town-Wide	Private	V	Conduct a Town-wide survey to identify existing skills in the community that can be shared or a space where these skills can be shared in an emergency, building on previous Board of Health efforts (see the status, wasn't just focused on childcare, focused on general emergencies).					
Community Engagement	Town-Wide	Town	V	Explore alternative options for community engagement, outreach, etc.--utilize broadband, increase transparency/awareness, make communication more interactive (not just one-way). Increase enrollment to the 150 people not currently in "Town Announce" newsletter.					
			S	Shutesbury runs a "Town Announce" newsletter program.				N/A	O

Emergency Sheltering	Town-Wide	Town		Identify sheltering location and resources.				
Environmental								
Lake Wyola	Lake Wyola	Town	V	No priority action items were discussed.				
Brush and Woodland Fires	Town-Wide	State, Town, Private	V	No priority action items were discussed.				
Invasive Species/Pests	Town-Wide	State, Town, Private	V	Educate residents: what is used for management/what are its impacts (on human health, pollinator species/environment, etc.). Explore policy relating to/regulation of chemical use.				
Solar Fields	Pratt Corner Road	Private	V	Evaluate how to incentivize solar on already cleared land (instead of clearing forest). Conduct a multi-level impact study of solar fields.				
Stormwater Runoff	Town-Wide	Town, Private	V	Address runoff from driveways to road, see where is problem (like W. Pelham), green infrastructure approaches, regulator mechanisms, , implement findings of green infrastructure for infiltration near Lake Wyola (Lake Wyola Association currently working on exploring funding)				
Impervious Cover	Town-Wide	Town, Private	V	Conduct a regulatory review of existing bylaws for regulating impervious cover.				
Septic Systems	Town-Wide	Private	V	Explore options for municipal treatment plant.				
Trees and Forests	Town-Wide	State, Town, Private	V	No priority action items were discussed.				
Stress on Native Species	Town-Wide	State, Town, Private	V	No priority action items were discussed.				
Wetlands Boundaries	Town-Wide	Town, Private	V	No priority action items were discussed.				
Chemical Use	Town-Wide	Town, Private	V	No priority action items were discussed.				
Habitat Loss and Connectivity	Town-Wide	State, Town, Private	V	No priority action items were discussed.				

SESSION 3 RISK MATRIX

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Heavy Precipitation (Including Flooding)	Drought (Including Fire Risk)	Extreme Temperatures	Extreme Storm Events (Including Wind)	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Roads (Especially Dirt/Gravel)	Town-Wide	Private, Town	V	Assess road materials to preserve dirt/road gravel. Assess actions for paved roads to make them more resilient to temperature changes and runoff.					
Electrical Infrastructure	Pratt Corner Road, Wendell Depot (substations)	Private, Town, National Grid/Eversource	V	No priority action items were discussed.					
			S				National Grid identifies and removes hazard trees (private and public). Town/National Grid conduct tree trimming. National Grid conducts pole replacement when necessary.	N/A	O
Drinking Water Supply (Private Wells)	Town-Wide	Town-Wide	V	Explore liability implications.	Continue well monitoring program.				
Septic Systems	Town-Wide	Private	V	Explore liability implications.					
Culverts and Bridges	Town-Wide, Lake Wyola, Cooley Road	Town, Private	V	Conduct a Town-wide culvert assessment.					
Water Supply for Fire Fighting	Town-Wide, Lake Wyola	Town	V	No priority action items were discussed.					
Internet (Broadband)	Town-Wide	Town	S					N/A	O
Buildings and Facilities	Town Hall, Highway Department, School, Old Town Hall, Library	Town	V	No priority action items were discussed.					
Solar Fields/Groups	Town-Wide, Pratt Corner Road	Town, Private, Regional	V	Support incentives that allow individual homeowners to have self-sufficiency (off the system), explore potential regulatory barriers, explore options for stronger battery incentive program.					
Dams	Town-Wide, Lake Wyola, Atkins Reservoir Dam	Town, Private, Amherst	V	Coordinate with the Town of Amherst on dam inspections for Atkins Reservoir Dam. Conduct dam assessments taking climate change into account.					
Microgrid/Town-generated electricity/battery storage	Town-Wide	Town	V	Conduct microgrid feasibility study. Study for potential for battery storage across Town.					
Societal									
Agriculture and Gardens	Town-Wide	Private	V		Establish drought management plan in support of agriculture				
			S	There is the Shutesbury Market at the Town center.				N/A	O
Senior Population/Vulnerable Populations	Town-Wide	Private	V			Establish cooling/heating centers and transportation to/from them.			
			S	Village Neighbors provides support to seniors.				N/A	O
Transportation (Through and Within Town)	Town-Wide	Private	V	Assess options for group transportation options to grocery stores, etc. Create walking paths (schools, library, etc.) and safe walkability/emergency access to shelters, cooling centers, and other key venues.					
Schools	Elementary School	Public	V			Implement air conditioning in the elementary school and regional schools.			
Pests and Disease Control	Town-Wide	Town, Private	V	No priority action items were discussed.					
Public Library	Public Library	Town	V	Establish/continue community programs at library for education/awareness. Assess feasibility for building community center area in new library.					
						Establish new library as community cooling center.			
Stress on Emergency Services	Town-Wide	Town	V	No priority action items were discussed.					

Access to Provisions, Medicines, and Fuel	Town-Wide	Private	V	No priority action items were discussed.					
Food Insecurity	Town-Wide	Private	V	Expand on Pelham brown bag program, reinstate food programs for seniors, foster partnerships with food suppliers (grocery stores, farms).					
Childcare	Town-Wide	Private	V	No priority action items were discussed.					
Community Engagement	Town-Wide	Town	V	No priority action items were discussed.					
Emergency Sheltering	Town-Wide	Town	V	No priority action items were discussed.					
Climate Migration	Town-Wide	N/A	V	Revisit regulations and model financing to consider how schooling, water/septic, etc. would be impacted by climate migration.					
Town Budget and Personnel Restrictions	Town-Wide	Town	V	No priority action items were discussed.					
Master Plan	Town-Wide	Town	V	No priority action items were discussed.					
Future Development	Town-Wide	Town, Private	V	No priority action items were discussed.					
Communications	Town-Wide	Town	V	Explore alternative options for emergency/Town communication (in addition to email).					
Environmental									
Lake Wyola	Lake Wyola	Town	V	No priority action items were discussed.					
Brush and Woodland Fires	Town-Wide	State, Town, Private	V	No priority action items were discussed.					
Invasive Species/Pests	Town-Wide	State, Town, Private	V	Conduct periodic testing of mosquito and tick populations to monitor vector-borne diseases.		Conduct periodic testing of mosquito and tick populations to monitor vector-borne diseases.			
			S	Financial Committee approved Board of Health request to join PV mosquito control district (currently about 15 towns enlisted)--would include mosquito population monitoring and feedback and pest management advice from experts.		Financial Committee approved Board of Health request to join PV mosquito control district (currently about 15 towns enlisted)--would include mosquito population monitoring and feedback and pest management advice from experts.		N/A	O
Solar Fields	Pratt Corner Road	Private	V	No priority action items were discussed.					
Stormwater Runoff	Town-Wide	Town, Private	V	Establish regulatory review process for potential future development.					
Impervious Cover	Town-Wide	Town, Private	V	Establish regulatory review process for potential future development.					
Septic Systems	Town-Wide	Private	V	See "Infrastructure" section.					
Trees and Forests	Town-Wide	State, Town, Private	V	Conduct a regulatory review Evaluate which trees will be suitable in the face of climate change and optimal location for these trees.					
Stress on Native Species	Town-Wide	State, Town, Private	V	No priority action items were discussed.					
Wetlands Boundaries	Town-Wide	Town, Private	V	No priority action items were discussed.					
Chemical Use	Town-Wide	Town, Private	V	No priority action items were discussed.					
Habitat Loss and Connectivity	Town-Wide	Town, Private	V	No priority action items were discussed.					
Wildlife	Town-Wide	N/A	V	Conduct education/communication with residents on shifting wildlife species--new realities, appropriate behavior (e.g., when you see a bear, what to do).					

SESSION 4 RISK MATRIX

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Features	Location	Ownership	V or S	Heavy Precipitation (Including Flooding)	Drought (Including Fire Risk)	Extreme Temperatures	Extreme Storm Events (Including Wind)	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Roads (Especially Dirt/Gravel)	Town-Wide	Private, Town	V	Explore options and funding opportunities to address maintenance/runoff on private roads (focus near Lake Wyola), build retention basins near Lake Wyola (build on/update findings of previous study ~20 yrs ago) and explore funding sources; establish runoff management of Locks Pond Road/paved part of Wendell Road near Carver.					
Electrical Infrastructure	Pratt Corner Road, Wendell Depot (substations)	Private, Town, National Grid/Eversource	V				Identify long-term maintenance needs for electrical corridor (Pratt Corner Rd to Elementary School).		
			S				National Grid conducts aggressive trimming and hazard tree removal, Highway Department conducts trimming.		
Drinking Water Supply (Private Wells)	Town-Wide	Town-Wide		No priority action items were discussed.					
Septic Systems	Town-Wide	Private	V	Develop Town-wide septic system maintenance plan; assess feasibility of a community wastewater treatment-pump from existing septic systems to facility.					
			S	Septic Betterment Loan Program (still have funds), septic pumping advertised in "Nextdoor Shutesbury".				N/A	O
Culverts and Bridges	Town-Wide, Lake Wyola, Cooley Road	Town, Private	V	No priority action items were discussed.					
Water Supply for Fire Fighting	Town-Wide, Lake Wyola (see list from WT)	Town	V	No priority action items were discussed.					
Internet (Broadband)	Town-Wide	Town	V	No priority action items were discussed.					
Buildings and Facilities	Town Hall (and Police), Highway Department, School, Old Town Hall, Library, Fire Station	Town	V	Roof options for elementary school, assess structure for water damage in repair damage (water under walk in cooler and hardwood gym floor has water issues).					
Solar Fields/Groups	Town-Wide, Pratt Corner Road	Town, Private, Regional	V	No priority action items were discussed.					
Dams	Town-Wide, Lake Wyola, Atkins Reservoir Dam	Town, Private, Amherst	V	No priority action items were discussed.					
Microgrid/Battery Storage	Town-Wide	Town	V	No priority action items were discussed.					
Societal									
Agriculture and Gardens	Town-Wide	Private	V	No priority action items were discussed.					
Senior Population/Vulnerable Populations	Town-Wide	N/A	V	No priority action items were discussed.					
			S	Village Neighbors runs a transportation program. Council on Aging runs the MedRide Program.				N/A	O
Transportation (Within Town and Commuting Through)	Town-Wide	Private	V	No priority action items were discussed.					
Schools	Elementary School, Regional Schools	Public	V			Install climate control/AC in schools (especially important if elementary school used as emergency shelter).			
				Address home needs--e.g., National School Lunch Program					
Pests and Disease Control	Town-Wide	N/A	V	Join PV Mosquito Control District. Coordinate w/ owner of Gage trail to maintain a walkable trail to reduce possibility of ticks. Develop integrated pest management options/larvicide in standing water; explore partnership with UMass School of Public Health/formalize relationship.		Join PV Mosquito Control District. Coordinate w/ owner of Gage trail to maintain a walkable trail to reduce possibility of ticks. Develop integrated pest management options/larvicide in standing water; explore partnership with UMass School of Public Health/formalize relationship.			
			S	Install/continue to post signage at trailheads across Town.		Install/continue to post signage at trailheads across Town.		N/A	O

Public Library	Public Library	Town	V			Include cooling center plan with new library with adequate back-up power (e.g., generator or solar).			
Stress on Emergency Services	Town-Wide	N/A	V				Explore options for grapple/equipment multiplier		
Access to Provisions, Medicines, and Fuel	Town-Wide	N/A	V	No priority action items were discussed.					
Food Insecurity	Town-Wide	N/A	V	No priority action items were discussed.					
Childcare	Town-Wide	N/A	V	No priority action items were discussed.					
Community Engagement	Town-Wide	Town	V	No priority action items were discussed.					
Emergency Sheltering	Town-Wide	Town	V	Explore options for public emergency sheltering in addition to elementary school.					
Climate Migration	Town-Wide	N/A	V	Assessment of impacts of housing from climate migration/changes in population density					
Town Budget and Personnel Restrictions	Town-Wide	Town	V	Hire additional staff for Highway Department					
Master Plan	Town-Wide	Town	V	No priority action items were discussed.					
Future Development	Town-Wide	Private	V	No priority action items were discussed.					
Communications	Town-Wide	Town	V	No priority action items were discussed.					
Cooling/Heating Shelters	Town-Wide	Town	V			Establish a designated cooling shelter with adequate capacity			
Environmental									
Lake Wyola	Lake Wyola	Town	V	Install upstream sediment pond to filter out sediments and explore funding sources.					
Brush and Wild Fires	Town-Wide	State, Town, Private	V		Educate the public on fire safety				
Invasive Species/Pests	Town-Wide	N/A	V			Explore: biological control options for pests (e.g., gypsy moths); alternatives to spraying for invasives (knotweed) and long-term management strategies, advocate to state for funding programs to support invasives management; regional approaches to invasives management; reach out to state for tracking/mapping of invasives (knotweed, e.g.)			
Solar Fields	Pratt Corner Road	Private	V	Explore options for solar zoning, disincentives for clearing land for solar. Explore additional affordable, renewable energy sources.					
Stormwater Runoff	Town-Wide	Town, Private	V	No priority action items were discussed.					
Impervious Cover	Town-Wide	Town, Private	V	No priority action items were discussed.					
Septic Systems	Town-Wide	Private	V	No priority action items were discussed.					
Trees and Forests	Town-Wide, Forested Area between Wendell Road/Montague Road	Town, Private, State	V	Implement a "stump fee." Explore options for incentivizing forest preservation (beyond Ch61A). Incentivize tree plantings/reforestation--additional conversation on forest health and management and how to preserve intact forests. Evaluate biological control options for invasives (e.g., gypsy moths).					
Stress on Native Species	Town-Wide	N/A	V	No priority action items were discussed.					
Wetlands Boundaries	Town-Wide	N/A	V	No priority action items were discussed.					
Chemical Use	Town-Wide	Town, Private	V	No priority action items were discussed.					
Habitat Loss and Connectivity	Town-Wide	Town, Private	V	No priority action items were discussed.					
Wildlife	Town-Wide	N/A	V	No priority action items were discussed.					

Appendix D

CRB Workshop Presentation Materials

FUSS & O'NEILL

Boston Firefighters, January 4, 2018 (Reuters)

Lake Wyola, Shutesbury, MA (Town of Shutesbury)

Municipal Vulnerability Preparedness Program
Community Resilience Building Workshop
Town of Shutesbury

May 14, 2020 (Remote Small Group Sessions)

Community Resilience Building Workshop

Agenda

- CRB Team and participant introductions
- Introduction to Massachusetts Municipal Vulnerability Preparedness Program (MVP)
- Introduction to Climate Change and the Town of Shutesbury
- Discussion by participants on status of current planning and risks
- Introduction to CRB Workshop process

- Small work groups (Using Risk Matrix)
  - Identify Shutesbury's vulnerabilities and strengths
  - Prioritize response actions

- Discussion on next steps

- Conclusion

- Virtual follow-up
  - Report out from small groups
  - Determine overall priority actions for the Town

FUSS & O'NEILL

Fuss & O'Neill Overview

Fuss & O'Neill is a leading MVP consultant in assisting Massachusetts communities secure grant assistance, achieve designation as a Massachusetts Municipal Vulnerability Preparedness (MVP) community, and execute their MVP priority projects.

The MVP team is experienced in local government, environmental services, civil site engineering, stormwater management, and emergency management.

Fuss & O'Neill assisted new MVP communities secure more than $3.6 million in MVP Action Grants in the program's first three funding rounds.

Shutesbury's MVP Program–$27,000

- Grant Supports Climate Change Vulnerability Assessments and Resiliency Planning
- MVP Comprehensive Approach
  - Infrastructure
  - Society
  - Environment
- Hazard Mitigation Plan Update

MVP designation leads to enhanced standing in future funding opportunities

MVP Project Team

Julie Busa, PhD

Julie is a senior environmental scientist in the Water Environment and Natural Resources group of Fuss & O'Neill. She is a Certified Senior Ecologist with over 10 years of experience in the areas of global biodiversity and forest conservation, sustainability, and ecological modelling. Julie works extensively with municipalities on MS4 compliance and the MVP program.

Sarah Hayden

Sarah is an environmental scientist in the Water Environment and Natural Resources group of Fuss & O'Neill. She has a background in environmental science as well as a strong foundation in business administration and environmental economics. Sarah works with municipalities on MS4 compliance and the MVP program.

MVP Action Grant

- Grant supports priority actions identified at Community Resilience Building Workshop
- $25,000 - $2,000,000 available (up to $5,000,000 for regional projects)
- Local match of 25% - can be in-kind
- Next funding round open now

Only those communities which have completed the CRB workshop are eligible to apply

MVP Program Process

- Core Team Meeting
- Community Resilience Building Workshop
- Summary of Findings
- Listening Session
- Move Forward

Terminology

Climate Change

The Change in Usual Climate Conditions

- Rising Temperature
- Changing Precipitation/ Rainfall Amount and Intensity
- Sea Level Rise

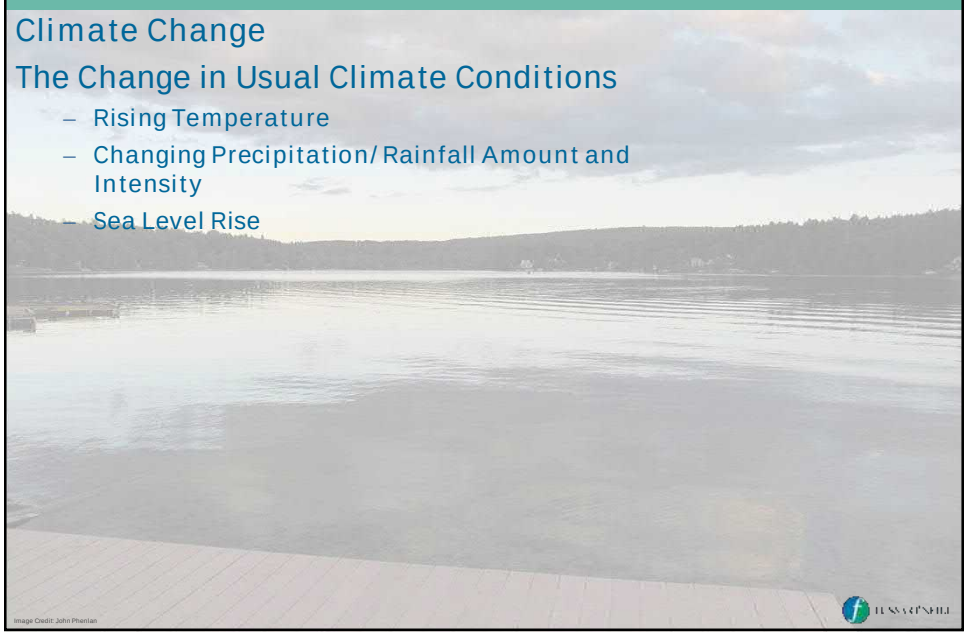


Image Credit: John Phenlan

Town of Shutesbury—Chicopee and Connecticut Basins

Rising Temperature

Chicopee Basin Connecticut Basin	Observed Baseline 1971-2000	Projected Change in 2030s	Projected Change in 2050s	Projected Change in 2070s	Projected Change in 2090s
Average Annual Temperature (°F)	46.16	2.24 to 4.48	3.03 to 6.40	3.58 to 8.97	4.01 to 10.98
	46.98	2.18 to 4.46	3.00 to 6.43	3.57 to 9.00	4.04 to 10.94
Annual Days with Maximum Temperature over 90°F (Days)	3.34	4.84 to 15.43	7.78 to 28.70	9.27 to 49.25	11.38 to 68.89
	6.41	6.36 to 19.72	9.87 to 35.35	11.98 to 57.07	14.50 to 76.01
Annual Days with Minimum Temperature below 32°F (Days)	161.76	-10.68 to -28.08	-19.27 to -37.67	-21.85 to -52.29	-23.39 to -62.50
	158.63	-10.58 to -28.13	-18.57 to -37.28	-22.18 to -50.76	-22.88 to -59.79

Town of Shutesbury—Chicopee and Connecticut Basins

Changing Precipitation

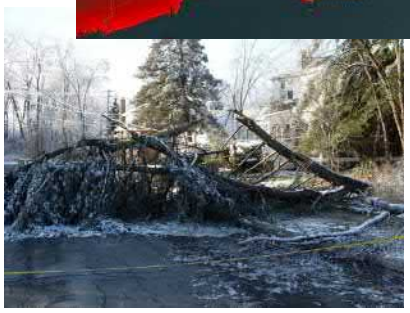
Chicopee Basin Connecticut Basin	Observed Baseline 1971-2000	Projected Change in 2030s	Projected Change in 2050s	Projected Change in 2070s	Projected Change in 2090s
Total Annual Precipitation (Inches)	46.64	-0.23 to 4.66	1.14 to 5.98	1.76 to 7.03	1.37 to 7.67
	46.39	-0.40 to 4.99	1.25 to 6.22	1.95 to 7.26	1.68 to 8.30
Annual Consecutive Dry Days (Days)	15.63	-0.56 to 1.44	-0.93 to 1.97	-1.12 to 1.97	-0.69 to 2.74
	16.41	-0.18 to 1.34	-0.42 to 1.75	-0.73 to 2.26	-0.35 to 2.44

Preparation Question

What does climate change mean to you in your role in Shutesbury?

Climate Change Impacts - Temperature

- Economic
  - Winter Recreation
  - Snow and Ice
- Agricultural
  - Longer Growing Season
- Health
  - Increased Pests
  - Heat Stroke
- Infrastructure
  - Road Buckling
  - More Potholes
  - Power Outages
- Environment
  - Change in Habitat



Climate Change Impacts - Precipitation

- Economic
  - Dangerous Floods
  - Lost Work Time
- Agricultural
  - Excessively Wet Spring
  - Drought
- Health
  - Flood/High Water-related Deaths
  - Emergency Response Delays
- Infrastructure
  - Road Washout
  - Environment
  - Sewer System Overflows
  - Compromised Bridges
- Environment
  - Changes in Habitat

Top Climate Change Hazards in Shutesbury

- Heavy Precipitation
- Drought and Fire Risk
- Extreme Temperatures
- Extreme Storm Events

Community Resilience Building Workshop

Overview – Remote CRB Workshop Process

- Pre-workshop:
  - Review recorded introductory presentation
  - All stakeholders assigned to a workshop group
- Small group workshops:
  - CRB Team and participant introductions
  - Introduction to CRB Workshop process
  - Use Risk Matrix to:
    - Identify Shutesbury's vulnerabilities and strengths
    - Prioritize response actions
- Large group response:
  - Circulate output from each small group
  - Stakeholders rate overall priority actions for the Town
- Virtual Discussion on next steps
- Compile Summary of Findings (Fuss & O'Neill)
- Stakeholders review and comment on report

Risk Matrix

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.com

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Features	Location	Ownership	V or S	Heavy Precip.	Drought/ Fire Risk	Extreme Temps.	Extreme Storms	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Societal									
Environmental									

MVP Sectors

- Infrastructure
  - Evacuation routes
  - Schools
  - Roads, bridges, dams
  - Water and wastewater
  - Septic systems
  - Hospitals
  - Commercial Buildings, churches
  - Utilities: electric, gas
  - Emergency management facilities

MVP Sectors

- Societal
  - Emergency shelters
  - Senior housing
  - Schools and campuses
  - Economically challenged populations
  - Evacuation plans
  - Animal shelters
  - Hospitals, pharmacies
  - Grocery stores
  - Utilities: electric, gas
  - Homeless
  - Other

MVP Sectors

- Environmental
  - Drinking water supply
  - Rivers and streams
  - Parklands
  - Agriculture
  - Title V systems
  - Stormwater management
  - Open spaces
  - Flood plains
  - Forest
  - Other

Community Resilience Building Workshop

Next Steps:

- Virtual Small Group Sessions (May 14)
- Identify top Priorities
- Public Listening Session
- Monitor and Update Annually
- Apply for Action Grants