Town of South Hadley

Community Resilience Building Workshop

Summary of Findings

December, 2019

FUSS & O'NEILL

Project No. 20170390.V10

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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 2019, the Town of South Hadley was awarded a $25,000 MVP grant to fund the planning stage of this process. 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 August 15, 2019 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 September 19, 2019, engaging in a day-long, tried and tested process developed by The Nature Conservancy. 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 South Hadley;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Top Hazards and Vulnerable Areas

During the Community Resilience Building workshop, participants were asked to identify the top four natural hazards of concern for the Town of South Hadley. Discussion of the top hazards built on earlier conversations that took place at the MVP Core Team Meeting. Flooding was identified as a top hazard. Extreme weather events, including Nor'easters, hurricanes, and other severe storms, was a second hazard. Drought and extreme precipitation were identified as a third hazard. The collective impacts of ice and snow were seen as a fourth major 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

- Flooding
- Ice and Snow
- Drought and Extreme Precipitation
- Extreme Weather 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
The Falls, Cove Island, East Street, Hadley Street, Westbrook Road, Bridge Street, Lower River Road, student populations, senior populations

Facilities
Mosier Elementary School, Michael E. Smith Middle School, South Hadley High School, South Hadley Electric Light Department (SHELD), Town Hall, Municipal recreation fields

Ecosystems
Titus Pond, Black Stevens Pond, Newton Smith Brook, Titus Pond and Black Stevens Pond watershed to Buttery Brook

Dams
Queensville Dam, Holyoke Dam, Stony Brook Dam, Upper Pond Dam, Lower Pond Dam

Infrastructure
SHELD power lines, water infrastructure, wastewater treatment plant, pump stations

Current Concerns and Challenges Presented by Hazards

Major storm events have been a recurring threat to South Hadley throughout its history, from hurricanes bringing wind, intense precipitation, and localized flooding, to winter storms delivering ice and snow. Notable historic events include impacts from the Flood of 1936, the flood stage of which is memorialized with a sign on Route 47 in neighboring Hadley, along with water levels from floods in 1927, 1938, and 1984. More recently, the Town has been experiencing an increasing regularity of storms, with the so-called 100 year storm now happening several times a year. Workshop participants also recalled an extreme weather event 15 years ago that dropped over 9 inches of rain in 24 hours. Although these flooding and heavy precipitation events have impacts Town-wide, they are known to cause recurring issues at specific locations in South Hadley—Cove Island, located in the flood zone of the Connecticut River, is especially prone to flooding that leads to issues with septic systems.

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. This problem manifests at points across the Town and is acute where the local drainage systems concentrate and discharge, especially near areas such as Easy Street and Hildreth Avenue.

The Town is also noticing a shift in the type and timing of storms. Many storm events now encompass a mixture of rain, ice, and snow, making it more difficult to maintain safe, accessible roadways. The major snow storm that hit in October 2011 is also still fresh in residents' memories. Due to the unusual timing of wet, heavy snow when leaves were still on the trees, the storm caused extensive damage to electrical infrastructure, leading to extended power outages.

Extreme temperatures are also leading the Town to make greater use of cooling shelters. The South Hadley Council on Aging and the Public Library are both designated heating and cooling shelters. Municipal leaders are eager to get the word out and increase transportation options to shelters so that more people, especially vulnerable populations like the elderly, are able to access these vital resources more often.

Specific Categories of Concerns and Challenges

Infrastructural

Culverts and Bridges

Culverts and bridges are a concern Town-wide, particularly as South Hadley's developed areas are in such close proximity to the Connecticut River and several brooks and wetlands. Existing culverts and bridges were designed to accommodate historic patterns of precipitation and runoff, but are rapidly becoming inadequate as a result of climate change. While design standards have changed, the Town's infrastructure largely predates such changes, and thus has not kept up with new standards. As precipitation events become more intense and less predictable, undersized culverts are expected to pose a greater threat of failure and flooding. Although culverts and bridges are a concern Town-wide, participants focused on several in particular. The River Lodge Road culvert appears to be silting and is possibly in disrepair, although it is privately owned. The Amherst Road bridge was noted as being in disrepair, and workshop participants also expressed concern about the wooden bridge at The Ledges golf course, which is over 20 years old. The bridge crosses wetlands and electrical service to adjacent holes runs underneath it. The condition of the culvert on Route 116/Newton Smith Brook was also discussed, although is likely being repaired/replaced as a part of a Transportation Improvement Program (TIP) project in 2021. The Town is also concerned about the culverts on River Road, Pearle Street, and New Ludlow Road.

Stormwater Basins and Conveyances

Detention basins and other stormwater infrastructure are recognized as a potential concern Town-wide. Similarly to culverts conveying natural streams, there is a general recognition that much of the stormwater drainage system was designed to accommodate historic patterns of precipitation and runoff, and may be undersized as climate and weather patterns continue to shift. The Town's aging stormwater infrastructure and lack of maintenance funds exacerbates flooding potential during heavy rains, although the Town makes efforts to stay ahead of flooding by annually cleaning catch basins. The Town Health Department does not allow detention basins that take more than 72 hours to drain, although the basins sometimes exceed this threshold. Participants also voiced concern over the lack of stormwater drainage on East Street, which has led to flooding of the road and nearby houses in the past. Workshop participants also discussed how a number of neighborhood roads without adequate stormwater drainage systems belong to homeowner's associations, making it more difficult for the Town to address the issue. Neva Tolopko from the Conservation Commission also discussed concerns over sedimentation related to issues with stormwater infrastructure.

Roads

Roads in South Hadley are vulnerable to flooding, as well as the impacts of snow and ice. In general, shifting weather patterns due to climate change are increasing the difficulty of maintaining those roadways. Potholes and sinkholes are becoming more problematic due to new patterns of freezing and thawing that occur repeatedly throughout the winter season. Roadway impacts due to hazard events, may, in turn, compromise the Town's ability to provide emergency services, although workshop participants do not recall this being problematic in recent years. Roads vulnerable to flooding were identified in multiple locations across the Town, including Cove Island Road, Ludlow Road, Easy Street, Hildreth Avenue, and Lower River Road, the latter of which is known to flood every spring. In the 1990s, the bridge on Route 116 at Stony Brook was raised, although there are still concerns about flooding in the area during heavy rains.

Public Water Supply

The Town's current public water supply is supported by two independent water districts. District #1 serves 2/3 of residents that are reliant on public water supply and receives its water from the Quabbin (through 9 interconnections). The water is stored in two 1.5 million gallon water tanks, one on Industrial Drive and one on Alvord Street. District #2 serves the northern portion of Town and the remaining 1/3 of residents (150 homes) on public water supply. The District receives water from the Dry Brook Hill well on Sullivan Lane. There are tie-ins between the two districts, allowing them to support each other in emergency situations. Both districts expressed that critical infrastructure, equipment, and water mains may be susceptible to hazards, especially flooding and extreme temperatures. Upgrades to the drinking water infrastructure are necessary and ongoing—the water line on Route 116, built in the 1920s, was recently replaced. The departments have also instituted shut-off valves on both sides of bridge structures, a practice that was initiated after a storm 15 years ago dropped nine inches of rain in 24 hours. The valves allow water to be shut down from either side of the structure in the event of bridge flooding/failure or other emergency. Workshop participants were also concerned about the impact of a rising water table on water supplies.

Wastewater Infrastructure

A majority of residents (90%) are tied into the Town's sewer system. Concerns about sewer interceptors in low-lying areas were noted during the workshop. Inflow and infiltration (I/I) is also a concern, particularly as South Hadley's already high water table has been rising, according to DPW Superintendent Jim Reidy, which threatens to inundate existing sewer infrastructure. The treatment plant is rated to process 2.4 million gallons a day—it normally processes 1.8 to 2 million, although during heavy rains it can receive up to 15 million gallons a day due to the influx of stormwater runoff. The treatment plant recently flooded, although Viv Price, DPW Operations Manager, was unsure if this was related to stormwater drainage.

Septic Systems

Septic systems in South Hadley 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. Approximately 10% of the Town (400 of 6,200 households) is on septic systems, mainly along the mountain and the river. Workshop participants expressed concern over septic systems on Cove Island as that area is particularly prone to flooding. However, these septic systems are designed as tight tanks to prevent failure due to flooding.

Electrical and Communications Infrastructure

Communications and power lines can be knocked out by snow and ice, in addition to wind events, causing extensive impacts to the Town. Extreme heat also stresses the electrical system, as increasing use of air conditioning leads to a risk of brown outs and outages, particularly if heat impacts are region-wide. South Hadley's electric distribution infrastructure is owned and operated by South Hadley Electric Light Department (SHELD). Mark Gilmore, Senior Engineer at SHELD, noted that although the system has not experienced major issues recently due to heat, he worries about the impact that a 3+ day heat wave could have on the system, as it could lead to extended power outages. Mark also discussed proactive actions the department is taking to increase resiliency of the Town's electrical infrastructure, including surveying poles for rot and increasing the height and circumference of poles. The Department currently trims 8-feet to the side and 10-feet above high voltage lines, and closely monitors the health of trees in and near the lines in the "fall-zone." Similarly, in the past year, Eversource Energy has also increased its removal of trees within its outer right-of-way, in response to extended power outages in recent years from downed trees.

Buildings and Facilities

Extreme temperatures in municipal buildings are impacting the ability to effectively heat or cool buildings. For example, buildings with brick and masonry facades absorb excessive heat from the urban environment and retain it during extremely hot days. Cooling capacity is an issue at locations Town-wide, but was noted in particular for the Town Hall and schools. Plains Elementary and the Town Library are the only two municipal buildings with central air conditioning, although other facilities may have window units. Additionally, participant Anne Capra noted that the new parking lot at Town Hall causes a "heat island" effect. Furthermore, the need to buffer and protect structures in flood zones and establish backup power for critical infrastructure and facilities across the Town is recognized as a major concern affecting large portions of the community. The Town Hall falls within the flood zone and has a history of basement flooding caused by blocked roof drains—a sewer backup caused the basement to flood in 2008, resulting in the loss of a considerable amount of records. The basement was flooded again, this time with water, in 2018, caused by tree roots obstructing foundation drains. Both the Town Hall and Mosier Elementary are aging and in need of upgrades—the roof at the school is prone to leaks. The Town also recently conducted facility audits for municipal properties, with a goal of power reduction and capital projects aimed at reducing the Town's carbon footprint and moving towards becoming a "green community."

Dams

Dams in South Hadley were identified as a priority for resiliency improvements. Although dams are a concern Town-wide, the Holyoke Dam, Queensville Dam, Stony Brook Dam, and the Upper Pond and Lower Pond dams at Mount Holyoke College were brought up specifically as dams of concern during the workshop. Rich Murray, Compliance Engineer for Holyoke Gas and Electric, noted that he has seen changes in flows to the Holyoke Dam over the past 17 years—summers are getting drier and there is a lack of winter snow melts, leading to lower water levels in spring. Rich added that HGE is proactive about moving water through the dam when there are high water levels. Fish passage facilities were also recently rebuilt at the dam, although sturgeon counts have declined in the past year and juvenile counts are "way down" compared to the past few years. On a near annual basis, flows recede enough, typically by June, so that HGE closes all of the dam's rubber bladders—the dam reaches its maximum capacity at approximately 55,000 cubic feet/second, at which point HGE will initiate flood protections for the City of Holyoke.

Workshop participants were not aware of any specific damage or flooding to nearby property from the dam on Stony Brook. The Queensville Dam, at the outlet of Titus Pond, was discussed as the dam is considered a "significant hazard risk." The Town is currently exploring options for how best to approach necessary improvements at the Queensville Dam. There are several dams on the Mount Holyoke College campus that the college monitors closely, specifically the Lower Pond Dam—Kevin McCaffrey, Director of Government and Community Relations at the College, recalled an assessment conducted for the dams that modeled failure impacts and noted that no properties would be significantly impacted if they were to fail. Other privately-owned dams were not discussed in detail at the workshop, although their failure could also potentially have severe impacts.

Newton Street acts as a dam, creating the impoundment at Black Stevens Pond. Due to significant sedimentation in the pond, the outlet of the Pond often backs up during larger storm events, flooding the street and parts of the adjacent parking lot to the High School. MassDOT is currently working on a redesign of the Pond outlet as part of the Newton Street/Route 116 reconstruction. However, stormwater flows upstream to the Pond from Newton Smith Brook need further assessment to determine a more comprehensive approach to restoring the Pond and managing stormwater during peak flows.

South Hadley Electric Light Department (SHELD)
Safety and reliability of electricity supply is important to South Hadley's resiliency. One main concern discussed at the workshop was the location of the South Hadley Electric Light Department (SHELD) main office, which is in a flood zone. The location impacts the Department's ability to respond to power outages and downed lines during emergency situations, and makes accessing equipment during hazard conditions difficult or impossible. The Department is currently in the process of considering sites for relocation.

Backup Power Supply
A need for back-up power supply was discussed for sites Town-wide. In addition to acquiring generators, workshop participants discussed the possibility of developing a microgrid. A microgrid would allow buildings to continue receiving electricity even if the main power grid experienced an outage and would reduce the Town's reliance on greenhouse gas producing fuel sources.

Environmental

Beavers
Whereas the Town generally has some record of and control over man-made stream crossings or impoundments, beaver activity is often known only anecdotally, if at all, and can cause unpredictable problems during heavy precipitation, when flooding occurs in unexpected locations. While beavers are not considered a problem Town-wide, beaver impoundments are known to cause flooding issues in specific neighborhoods, including Cedar Ridge, along Stony Brook, and in scattered areas throughout South Hadley. There is currently no beaver management plan or policy to uniformly address the issue across Town. The DPW constructed its first "beaver deceiver" at a culvert at Cedar Ridge in July 2019 to manage repeated road and property flooding.

Water Quality
Anne Capra, Conservation Administrator/Planner, discussed concern over the increase of harmful algal blooms (HABs) in the area in recent years. In addition to algal blooms, workshop participants were also concerned about the impact of climate change on drinking water. Mark Aiken from the South Hadley Water District #2, noted uncertainty regarding water quality and quantity in the future, although he has not observed any issues yet in his district. Additionally, there are concerns over the water quality impairments at portions of Buttery Brook, Bachelor Brook, and Stony Brook. Historically, Buttery Brook and Stony Brook were impacted by combined sewer overflows (CSOs), leading to issues with *E. coli*. These issues may have been compounded by beaver lodges and culverts.

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. Street trees are likewise critical for infiltration of rainwater and provision of shade. 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. Mark Gilmore, Senior Engineer at the South Hadley Electric Light Department, also noted that there is a lack of budget for maintaining Town-owned trees. This may become increasingly problematic as these trees threaten electrical infrastructure during extreme weather events. Furthermore, Mark expressed concern over how warming winter temperatures affect tree health, as insect populations are not being killed off—this leads to additional dying and dead trees, which multiple participants noted having observed in Town. Tree removal on private property can be a considerable burden on residents,

and may be cost-prohibitive. Lastly, most of the open space and conservation areas in Town are forested, although the Town has no forest management plan in place.

Invasive Species

Invasive plants and animals are a source of concern in South Hadley, 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 common reed, Japanese knotweed, invasive water chestnut, hydrilla, purple loosestrife, Eurasian milfoil, and zebra mussels. In addition to their habitat impacts, the latter can potentially cause flooding by clogging drain pipes. Critical invasive insect pests already in the area include the Gypsy Moth, Hemlock Wooly Adelgid, and Emerald Ash Borer, all of which have the potential to do serious damage (both environmental and economic) to Massachusetts' forests and trees. These and other species already 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.

Titus Pond and Black Stevens Pond

Water quality issues are of special concern at Titus Pond and Black Stevens Pond, both of which experience significant problems with erosion and sediment and nutrient loading. According to workshop participants, Titus Pond suffers from severe eutrophication—at the time of the workshop, it was "pea green." The pond also releases sulfur odors, which have been so severe that surrounding residents called the Fire Department multiple times in fall of 2018. Workshop participants voiced concern about the ability of the pond to retain additional stormwater runoff that results from severe weather events. On the other hand, Black Stevens Pond has considerable historic value in the community—as workshop participant Anne Capra noted, the pond is "fondly remembered in Town," as it powered a mill, was used as an ice pond, and served recreational purposes in the past. Black Stevens was historically two separate ponds until an earthen separator gave way. Participants described past efforts to get the pond dredged, which were unsuccessful. Additionally, continued growth in the watershed along Routes 202 and 33 has led to concerns regarding the effect of increased impervious surface and its impact on the pond. Both ponds are within the watershed to Buttery Brook, the most urbanized watershed in South Hadley, and a tributary to the Connecticut River.

Local Agriculture

Unpredictable climate and weather conditions are taking a toll on agriculture locally and across the region. Workshop participants noted concern in particular for McCray's Farm and Olesiuk Farm, local farms that serve the area. Climate change is expected to result in a longer growing season for New England, which can be beneficial for some crops but may lead to issues with others, for instance, by allowing additional time for blight or other crop diseases to develop. Early melt of snow pack, drought, excessive rain, and changing temperatures may all affect agriculture and livestock at varying scales.

Flood Mapping

South Hadley's flood mapping is approximately 40 years old and does not reflect contemporary data or modeling that accounts for climate change. FEMA does have plans to update the Town's flood maps as part of the middle-Connecticut updates, but will not likely be released for several years. Flood maps were recently updated for neighboring Holyoke and showed one- to two-foot changes in the flood zone along the Connecticut River near the Holyoke Dam. The updated flood mapping will play an important role in the Town's economic revitalization plans for the Falls, which is in close proximity to the river.

Vulnerable Neighborhoods

Certain neighborhoods within South Hadley are especially prone to flooding and have been experiencing problematic events for decades, including localized areas with high groundwater issues that rise seasonally and during storm events. This includes houses on Westbrook Road to East Street, where basements are known to flood during heavy rainfall. The Town is also concerned about neighborhoods within the flood zone, including Cove Island and the Falls. Cove Island was last evacuated during Hurricane Irene in 2011. The South Hadley Falls, which has dense, small lot residential development, area experiences water seeping out of the hillside and draining toward the Connecticut River. Homeowners closest to the toe of the slope report wet basements and poor drainage. The residential neighborhood west of Newton Street/Route 116 and east of Buttery Brook also experiences problems due to a culvert at an intermittent stream which is the outlet of Titus Pond. Homeowners along Mountain Avenue, Joffre Avenue, and Haig Avenue report wet basements and drainage problems. This neighborhood was likely developed by filling wetlands in years prior to the Wetlands Protection Act. The Conservation Commission has also reached out to vulnerable neighborhoods in the past, including a mailing to residents in the flood area of the Connecticut River, to educate them on the requirements and regulations surrounding development and the Wetlands Protection Act. Participants were concerned about impacts related to potential future developments in the flood plain in the Falls, which is an area targeted for economic revitalization.

Vulnerable Populations

Certain populations, such as seniors, are known to be at higher risk during hazard events and may require support beyond emergency notifications. Workshop participants expressed concerns about vulnerable citizens' ability to obtain food and medical supplies during hazard events, and to access heating and cooling centers on their own due to lack of transportation. South Hadley's Public Library and the Council on Aging are informally providing respite for vulnerable populations during the day, including as warming and cooling centers during extreme temperatures. The Council has a van capable of transporting 8 to 10 people, although they would require additional transportation options during hazard events. The Council on Aging runs a senior preparedness program that encourages go-bags and preparedness for emergency situations.

Communications Systems

The Town operates an alert system, CivicReady, to send mass messages to all registered users during emergency situations, including flooding, road closures, power outages, and other situations relevant to the community. The system is opt-in, and residents can choose to receive alerts by text, email, or phone (landline or cellphone). Registration is available through the Town's website. Additionally, the Town has an Emergency Operations Center (EOC) that operates out of Town Hall; workshop participants expressed concern that this is in the flood zone of the Connecticut River. Participants also recalled that in 2011, during the snow storm, the cell towers in Town went down, impeding communication.

Shelters

There are four shelters in Town that are certified by the American Red Cross, with an agreement in place with Walgreens to ensure residents have access to medication. Scott Brady, Fire Chief for South Hadley Fire District #2, noted, however, that there is a lack of shelters that are carbon monoxide (CO) compliant. In 2011, the middle school and Mount Holyoke College were both used as shelters, although they were not CO compliant—this was the last time the Town opened the shelters. Participants described the current staffing shortages and the subsequent expectation of difficulties related to the lack of trained personnel to open the Town's shelters. St. Theresa's Parish was also identified as a potential shelter for future operations as the Town has a working relationship with the organization. Workshop participants also

noted that there are no emergency shelters in District #2. Understanding the different needs of the Town's residents and the strengths and limitations of its sheltering resources was a major concern for South Hadley's emergency preparedness in the face of a hazard event.

Schools

South Hadley's schools and student population are affected by a variety of hazard types. As days above 90 degrees increase, heat stroke is a concern for the student population in general, as the schools are not air conditioned (with the exception of Plains Elementary, pre-K through grade 1). Angela Wang, School Business Administrator, noted that classes at Mosier Elementary School (grades 2 through 4) have been delayed due to extreme heat. Heat related health conditions are particularly a concern for special needs students and student athletes, but extreme heat conditions also make for a poor learning environment in general. Workshop participants also voiced concern about the increasing utility costs of running the schools during extreme temperatures, and the need to replace AC units due to stress from continued use at the High School during heat waves, raising maintenance costs. The Town is exploring options for the replacement/renovation of Mosier Elementary School.

Mount Holyoke College

The College has an agreement with the Town to make its facilities available to provide meals and shelter to South Hadley residents during emergencies. The College also has its own backup power supply. The campus has numerous means of entrance/egress, with primary access to the College from West Street. Participants expressed concern that this main entrance is susceptible to flooding in two places: near the west exit parking lot and where the street crosses Stony Brook. In both locations, the flooding is thought to be due to undersized culverts. The College is also making efforts to reduce its carbon footprint, with a goal of being carbon neutral by 2037.

Pests and Disease Control

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). 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. The Town, at the time of the workshop, was recently downgraded from "high" to "moderate"—the Town cancelled several events due to the EEE risk, including movie nights, athletics, outdoor dining, golf, hiking, etc. Public Health Director Sharon Hart also noted the increase in reports of Lyme disease and the overall prevalence of ticks in recent years. These changes present a major public and animal health challenge in terms of education, prevention, and treatment. Workshop participants noted that unmaintained stormwater detention basins collect standing water, which encourages mosquito populations. South Hadley is currently part of a mosquito control district and participates in spraying programs. Richard Harris, Planning Director, also voiced concern over warmer temperatures extending the black fly season.

Provisions, Medicine, and 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, was a concern for workshop participants. It was acknowledged that power outages or road closures which affect access to these services could have extensive impacts on residents throughout the Town. These issues are exacerbated for vulnerable populations, and for particular neighborhoods where there is limited access to grocery stores. There are pharmacies, gas stations, and grocery stores in Town, and three community

hospitals, Bay State Medical Center, Holyoke Medical Center, and Mercy Medical Center, in neighboring communities. Workshop participants were not concerned about access to these medical facilities during emergency or hazard events. The Town also has an agreement with Walgreens to receive medication during emergency events.

Economic Revitalization

The Town is examining options for economic revitalization of the Falls area. A revitalized downtown core could potentially increase the Town's resiliency, both from an economic perspective, and in terms of the ability to access resources during a hazard event. However, any new development in the Falls would also fall within the current flood zone, which was discussed as a major concern by workshop participants as South Hadley pushes to increase resiliency Town-wide.

Stress on Emergency Services

South Hadley'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 are being devoted to handling things like traffic accidents and injuries that result from ice or other dangerous conditions and activities to protect property and maintain traffic flows during storm events, and Public Works is relied upon to clear roads and maintain access throughout the Town. Scott Brady, Fire Chief of Fire District #2, noted that half of his firefighters are call firefighters with other jobs, and that climate change-related hazards will place increasing stress on emergency services amid existing understaffing. South Hadley is part of a state-wide mutual aid agreement for Fire and EMS, and both Fire Department #1 and #2 have regional mutual aid agreements. However, many climate hazards are expected to have regional effects, in which case resources from neighboring communities may not be available.

Parks and Open Space

Open space provides ecosystem services that help buffer the effects of climate change, from sequestering and storing 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. The Town is in the process of updating its Open Space and Recreation Plan and is aware of a need to preserve open space, particularly agricultural lands, which may become available to the Town through Chapter 61 as the Town's farming families age into retirement and look to sell their land. Workshop participants noted that open space preservation is aided somewhat by the fact that the northern portion of the Town has always been development-limited by the lack of sewer service in that area. Management of existing open spaces in the face of climate hazards presents its own challenges. Several of South Hadley's fields and recreational facilities are not irrigated and have been affected by drought and the freeze/thaw cycle that runs longer in recent years. The Town has had to adjust the activities schedules for these fields, and Andy Roger, Recreation Department Director, noted that he has had to cancel outdoor events at various points over the past four years due to drought or excessive rain that rendered fields unplayable. Protecting the undeveloped flood plains along Bachelor Brook, Stony Brook, and Buttery Brook will be critical nature based strategy for managing flood waters.

Neighborhood Conflicts

Due to the prevalence of flooded basements in the Westbrook Road/East Street area, participants noted that there have been conflicts between neighbors related to sump pump discharges, which have resulted in ongoing litigation. The Town expressed an interest in taking actions to prevent similar situations from occurring in the future.

Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well. South Hadley has a number of systems in place to facilitate emergency communications and information transfer. The Town has also established memorandums of understanding and mutual aid agreements that will support resiliency during hazards.

- The Town's **Plains Elementary School** is new (constructed in 2015) and equipped with air conditioning.
- South Hadley has an existing **Town Facebook page** that serves as an information hub for residents.
- The Town operates a **CivicReady system** that can be used to share information relevant to short-term hazards or expected long-term hazards.
- The Town has **two water and fire districts** that serve residents and have mutual aid agreements in place.
- South Hadley's **Emergency Operations Center** operates out of the Town Hall.
- The Conservation Commission has **a 2:1 tree replacement/removal policy** to encourage new plantings (two trees planted for every one removed within Wetland Protection Act jurisdiction).
- The Town is in the process of updating its **Master Plan**.
- There are **17 conservation areas** in Town, most of which are forested.
- The Town is in the process of updating its **Open Space and Recreation Plan**.
- The Town is investing in **emergency evacuation route signage**.
- The Town contracted a consultant to explore ways to **improve energy efficiency in municipal buildings.**
- SHELD engages in **proactive tree trimming and removal** to protect power lines.
- The Town is offering a **senior storm preparedness program**.
- The Conservation Commission is developing a **Forest Management Plan.**
- Mount Holyoke College has a goal of being a **carbon neutral campus by 2037.**
- The DPW conducts proactive **maintenance and cleaning of catch basins** each year.

- There are several **emergency shelters** in place and additional options available at local institutions.
- The Town has short-term **heating and cooling centers**.
- The Town is part of a regional **mosquito control district**.
- The Town is conducting an ongoing **corridor study** assessing land use along Route 33.
- The Town has mechanisms in place for **wetland protection**.
- The Town has **multiple access routes to medical centers** during emergencies.

Top Recommendations to Improve Resilience in South Hadley

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 flooding, specifically for developments in the flood plain, were a primary concern that emerged in both the small and large group discussions, encompassing a wide variety of infrastructural concerns. Providing sufficient protections and planning for vulnerable populations, such as seniors and students, in the Town 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. 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.

- **Replace the Route 116/Newton Smith Brook culvert** in coordination with MassDOT through TIP funding.

- **Conduct dam assessments, identify privately-owned dams, and study feasibility of dam removals** where other aging, public or privately-owned dams may pose a threat of failure and flooding, or where removal may have significant positive impacts on stream habitat and aquatic organism passage or for increasing flood storage and flood control possibilities. Identify owners of private dams throughout Town.

- **Evaluate options for Queensville Dam**, including repair, improvement, or having it reclassified as non-jurisdictional.

- **Coordinate across departments and organizations to develop an emergency plan** that includes both fire districts and water districts, the Town, Mount Holyoke College, and any other relevant parties. Share information regarding available resources, such as vehicles or sheltering options, including those offered by the Council on Aging. Organize information on evacuation routes and emergency communications equipment so that local organizations are well-informed and can help keep residents out of hazard areas.

- **Establish a comprehensive emergency awareness plan for residents**, incorporating a robust education and outreach strategy to build awareness of town resources and make Town residents aware of evacuation routes, shelters, and general emergency preparedness (e.g., 72-hour kits). Ensure that all residents know how to access these resources when they are needed—consider disseminating information on the Town's television station, Channel 15.

- **Develop a Citizen Response Team** of trained volunteers to staff shelters during hazard events and emergencies to relieve the burden on emergency personnel.

- **Develop a comprehensive strategy for sheltering** that evaluates strengths and vulnerabilities of existing shelters and recommends tangible steps for improvements. Include a plan for communication to residents about shelter locations, amenities, and availability. Train additional personnel to open the Town's shelters and enact a Community Sheltering Plan. Ensure that all shelters are carbon monoxide compliant.

- **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. Transportation should not depend on emergency services personnel, as is currently the case.

- **Conduct a feasibility study for relocation of the Emergency Operations Center** outside of the flood zone, potentially to another municipal facility.

- **Assess cost-effective green infrastructure opportunities for stormwater management** to develop a list of specific priority projects where reduction of stormwater runoff could mitigate flooding risk without the need to conduct expensive culvert replacement and resizing projects. 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 approaches. Identify potential funding sources.

- **Continue education and outreach to residents living in flood-prone areas** to ensure that all individuals and families residing in these areas are aware of the potential risks, as well as mechanisms, such as flood insurance, to reduce their risk exposure. Ensure that outreach targets renters as well as property owners.

- **Develop educational resources, building/code recommendations, and support programs for residents interested in storm-hardening and increasing flood resiliency** of their homes. Focus on economically vulnerable populations. Consider utilizing the Town's television station, Channel 15, to disseminate information. Pursue funding opportunities to make resiliency improvements feasible for low-income residents

- **Conduct robust education and outreach to build awareness of Town resources** and make Town residents aware of the many planning efforts, sources of emergency information, mutual aid agreements, shelters, evacuation routes, etc. which are focused on making the Town more resilient to climate change impacts. Ensure that all residents have transportation options and know how to access these resources when they are needed.

- **Evaluate opportunities to provide improvements at critical facilities, especially emergency backup power**, including feasibility of green power and battery storage. Town-wide, there are a number of buildings and facilities (including pump stations, schools, senior housing properties, etc.) in need of backup power systems to protect public buildings and infrastructure from freezing and improve services for residents who may lose power during emergencies or hazard events.

- **Incorporate resiliency into economic development planning in the Falls** to support local businesses and make the business community more resilient. Identify business development

opportunities where impacts from climate hazards can be easily avoided or mitigated (e.g., by encouraging resilient building or areas of known drainage-related flooding). Pursue concept designs for development visioning to promote implementation of the urban renewal plan.

- **Increase public awareness programs related to vector-borne diseases,** such as EEE, West Nile, and Lyme Disease, to educate residents on the risks and warning signs of these diseases. This should include programs targeted at residents to increase awareness of new diseases and encourage early testing. Develop local funding and resources to make it easier for residents to have ticks tested when a biting tick is found.

- **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).

- **Seek to establish resilient natural infrastructure** to mitigate the effects of climate change, particularly through the ongoing preservation, maintenance and planting of trees, and, through forest stewardship.

- **Explore the possibility of expanding the Tree Warden position,** including reenvisioning the position to incorporate assessment of Town forest health and implementation of a comprehensive tree and forests management plan**.**

- **Accelerate upgrades of the Town's sewer and water infrastructure**. Prioritize ongoing efforts to replace piping at the wastewater plant.

- **Perform a risk assessment of the wastewater treatment plant and pump stations** and establish priority actions for reducing potential flooding impacts, including consideration of nature-based solutions or green infrastructure approaches. Explore options to increase flooding resiliency of the wastewater treatment plant. Establish emergency back-up plans for the plant and pump stations.

- **Continue exploring relocation options for SHELD** to move it out of the flood zone.

- **Engage the community in exploration of stormwater management approaches for Titus Pond and Black Stevens Pond**, focusing on upstream green infrastructure and stormwater reduction. Identify approaches to stormwater management consider the Town's future land use plans.

- **Explore upstream stormwater retention options to improve conditions at Black Stevens Pond**, including assessing feasibility of subsurface retention under the ballfield at Plains Elementary School to reduce stormwater runoff to Newton Smith Brook and ultimately reduce flooding downstream at Buttery Brook. Develop an overall watershed restoration plan that begins with Black Stevens and proceeds downstream along the Buttery Brook corridor to the Connecticut River.

- **Formalize or increase recognition of the collaboration between departments**, including the Town's Water and Fire Districts, Police Department, and SHELD during day-to-day operations and hazard events.

- **Address flooding on Route 47/Pearl Street near Bachelor Brook.** Consider options for culvert repair or replacement. Green infrastructure, Low-Impact Design, and other nature-based solutions should be explored to establish approaches that will be robust in the face of natural hazards and climate-change scenarios.

- **Develop a resiliency audit program,** modeled off of existing energy audit programs to assess individual properties for potential impacts of changing temperature and precipitation patterns that will result from climate change and how this will impact storm readiness and overall resiliency of homes. The program should offer recommendations for resiliency improvements and link property owners with necessary resources for implementation. Consider working with utility providers and insurance companies to develop incentives for resiliency improvements.

Moderate Priority

- **Assess options to address excessively hot days in schools.** This may include implementing plans to install air conditioning in schools, including necessary upgrades to the electrical infrastructure to allow for the additional capacity required to run air conditioning systems. Explore nature-based solutions such as pavement removal or tree-plantings.

- **Continue exploring options for funding the rebuild/retrofit of Mosier Elementary School**, including the Massachusetts School Building Authority (MSBA) grant.

- **Pursue opportunities to fund open space acquisition** that will mitigate the effects of increased storm events. Focus on areas that will create flood resiliency through increasing storage capacity in floodplains and/or infiltration capacity in uplands, including the Stony Brook area. Priority should also be given to larger parcels that can provide connectivity between existing conserved parcels to maintain habitat corridors.

- **Develop a beaver management plan** to mitigate against unpredictable flooding/impoundment impacts. Establish creative engineering solutions, identify suitable areas for beaver relocation or where beaver activity may be creating flood storage that contributes to resiliency, and consider the development of special legislation to give the Town authority to address problematic beaver dams on private property.

- **Continue exploring options for regional dispatch** with Granby or neighboring communities.

- **Assess shelters and other critical facilities in Town's for storm resiliency** (e.g., hurricane resistance). Review building codes as needed. If necessary, pursue funding sources for upgrades to increase resiliency.

- **Conduct feasibility studies for the redesign or rebuild of outdated municipal buildings,** especially those within the flood plain, such as the Town Hall (home to the Emergency Operations Center).

- **Pursue public facilities upgrades that would increase resiliency,** including actions to make facilities more resilient to power outages, water supply problems, floods, etc.

- **Pursue funding to update the floodplain mapping for the Town** using data that incorporates projections for changing precipitation patterns as a result of climate change. Consider partnering

with neighboring communities for a regional approach. Develop a duplicate effective model and request official map revision from FEMA.

- **Develop long-term solutions for floodplain management and flood resiliency**, focusing in particular on River Road and neighborhoods within the floodplain in the Falls**.** Consider both in situ protections, and eventual redevelopment strategies that may include retreat from the floodplain. Educate residents on ecosystem services provided by the floodplain. Evaluate Town regulations and strengthen restrictions on new development in the floodplain, as necessary.

- **Develop concept designs for flood-resilient development visioning** to promote implementation of the urban renewal plan for South Hadley Falls, while simultaneously incorporating cutting edge strategies for climate resiliency.

- **Develop partnerships with local businesses** to distribute information and help facilitate outreach efforts, particularly to vulnerable populations such as senior residents.

- **Implement the findings of the Route 33 corridor study** assessing land use.

- **Acquire five electronic road signs** for communications use during climate change-related hazard events.

- **Develop an Alternate Emergency Staffing Plan** to ensure that essential roles are covered during an emergency, and reduce dependency on volunteers. Provide training so that Town employees in non-essential roles could be redirected to provide support during emergencies.

- **Develop educational resources and how-to guides for residents interested in implementing Green Infrastructure at their homes.** Review Town regulations as necessary to facilitate implementing Green Infrastructure practices at residences.

Lower Priority

- **Evaluate opportunities for improved watershed protections** to preserve or improve water quality in the Town's reservoirs and waterways, including those on the Mount Holyoke College campus.

- **Communicate with St. Theresa's Parish** on the possibility of using their facility as an emergency shelter.

- **Conduct strategic planning to support regional agriculture** in the face of climate change. All of the identified hazards (flooding, ice and snow, drought and extreme precipitation, and extreme weather events) have the potential to significantly impact agricultural production, with corresponding threats to livelihoods and food availability. Planning should address hazard resiliency and approaches to connect growers with local buyers to shorten supply chains.

- **Assess feasibility of using pervious paving** in new road or parking lot construction.

- **Promote bio-blitzes and citizen science** through continued efforts of the Conservation Commission and other initiatives with the goal of increasing resiliency throughout Town.

- **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.

- **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.

- **Develop a neighbor-to-neighbor program** to facilitate identification of and support for vulnerable populations and promote assistance between neighbors.

- **Distribute an emergency kit list** to all citizens to encourage self-preparedness for hazard events.

- **Assess old industrial and automobile sites,** specifically in the Gaylord Street and Bridge Street areas and areas near the Connecticut River, for flooding risk and potential contaminants. Remediation is anticipated to be necessary at some of these sites; explore funding options for required cleanup.

- **Provide more resilient storage facilities for vital information**, including birth, death, and marriage records, voter registration data, and associated equipment. Coordinate with the Town Clerk, Treasurer, Assessor, and Planning Board to assess all vulnerable records information and ensure that the Town protects critical data.

- **Assess the feasibility of developing a regional or Town-specific clearinghouse** that tracks and educates residents on town, state, and federal programs and incentives to ensure that residents have up-to-date information on all available resources, particularly funding/subsidy programs, including appropriate information on deadlines, applications, etc.

CRB Workshop Participants

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

Name	Position/Organization
Anne Capra*	Conservation Administrator/Planner, Town of South Hadley
Mike Sullivan	Town Administrator, Town of South Hadley
Neva Tolopko*	Conservation Commission, Town of South Hadley
Bill DeLuca	Conservation Committee, Town of South Hadley
Jim Reidy	Superintendent, Department of Public Works, Town of South Hadley
Viv Price*	Operations Manager, Department of Public Works, Town of South Hadley
Bill Simard	Parks Supervisor, Department of Public Works, Town of South Hadley
Andy Rogers*	Director, Recreation Department, Town of South Hadley
Sharon Hart*	Public Health/Emergency Management Director, Town of South Hadley
Dr. Diane Dietzen	Vice Chair, Board of Health, Town of South Hadley
Richard Harris*	Director, Planning and Conservation Department, Town of South Hadley
Jennifer Gundersen	Chief, Police Department, Town of South Hadley
Melissa O'Brien*	Vice Chair, Planning Board, Town of South Hadley
Matt Cowie*	Facilities Manager, Department of Health and Safety, Town of South Hadley
Mark Cavanaugh	Vice Chair, Planning Board, Town of South Hadley
Andrea Miles	Selectboard, Town of South Hadley
Leslie Hennessy	Director, Senior Center, Town of South Hadley
Nick Young	Superintendent, South Hadley Public Schools
Angela Wang*	School Business Administrator, South Hadley School Department
Mark Gilmore*	Senior Engineer, South Hadley Electric Light Department
Robert Authier	Chief, South Hadley Fire District #1
Scott Brady*	Chief, South Hadley Fire District #2
Jason Houle*	Lieutenant/Fire Prevention office, South Hadley Fire Department #1
Jeff Cyr	Superintendent, South Hadley Water District #1
Mark Aiken*	Superintendent, South Hadley Water District #2
Patty Gambarini*	Pioneer Valley Planning Commission
Michelle Theroux	President, South Hadley & Granby Chamber of Commerce
Kevin McCliffe*	Government Relations, Mount Holyoke College
Paul Breen*	Director of Facilities Management, Mount Holyoke College
Rich Murray*	Compliance Engineer, Holyoke Gas and Electric
Paul Ducheney	Superintendent, Holyoke Gas and Electric
Simon Hildt	Eversource Energy
Luke Brunelle	Brunelle's Marina
Dan Carey	Massachusetts State Representative, 2nd Hampshire District
Jo Comerford	Massachusetts State Senator, Hampshire, Franklin, and Worcester Districts
Jeff Labrecque	Chief Operating Office, The Village Commons
Wayne Ashcroft	E Ink
Marc Kenen	Executive Director, Pioneer Valley Performing Arts

Citation

Fuss & O'Neill (2019). Community Resilience Building Workshop Summary of Findings. Town of South Hadley, Fuss & O'Neill, Inc. Springfield, Massachusetts.

CRB Workshop Project Team

Name	Organization	Role
Anne Capra	Conservation Administrator/Planner, Town of South Hadley	Project Coordinator/ Core Team Member
Jim Reidy	Superintendent, Department of Public Works, Town of South Hadley	Core Team Member
Viv Price	Operations Manager, Department of Public Works, Town of South Hadley	Core Team Member
Bill Simard	Parks Supervisor, Department of Public Works, Town of South Hadley	Core Team Member
Richard Harris	Director, Planning and Conservation Department, Town of South Hadley	Core Team Member
Andy Rogers	Director, Department of Recreation, Town of South Hadley	Core Team Member
Sharon Hart	Emergency Management/Public Health Director, Town of South Hadley	Core Team Member
Julianne Busa	Fuss & O'Neill	MVP Lead Facilitator
Arnold Robinson	Fuss & O'Neill	MVP Facilitator/Scribe
Sarah Hayden	Fuss & O'Neill	MVP Facilitator/Scribe

Acknowledgements

Many thanks to the MVP Core Team members, CRB workshop participants, and to Anne Capra who acted as the local Project Coordinator. Thanks to the Town of South Hadley for providing a meeting space for the Core Team Meeting and CRB Workshop.

Funding for the CRB Workshop was provided through a Massachusetts MVP grant.

Appendix A

Final 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.)

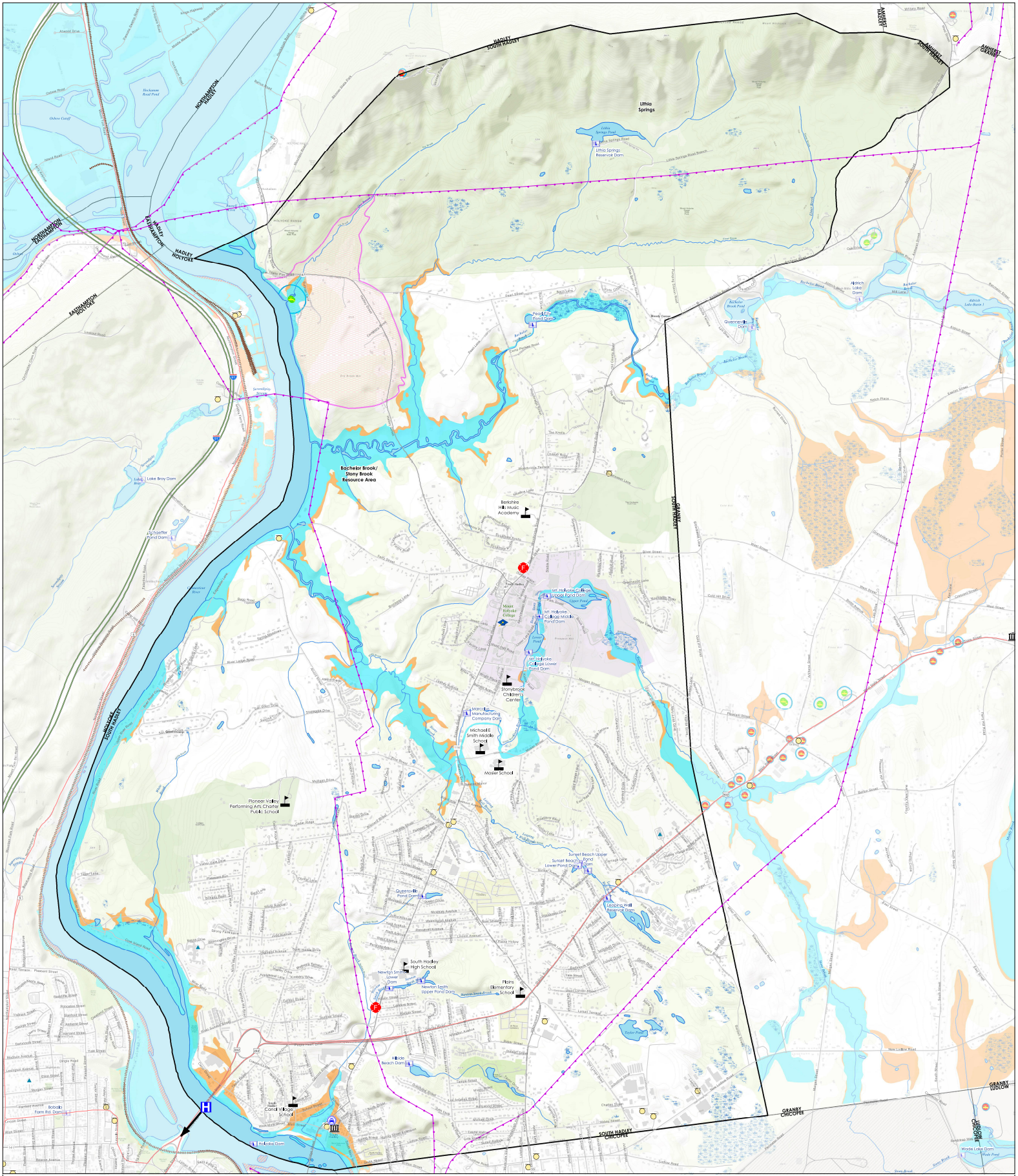
H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Features	Location	Ownership	V or S	Flooding	Ice and Snow	Drought and Extreme Precipitation	Extreme Weather Events	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Culverts and Bridges	Town-Wide, River Road, Pearle Street, New Ludlow Road, Route 116/Newton Smith Brook, River Lodge Road, Amherst Road bridge	Town, State, Private	V	Conduct a Town-wide field inventory of bridges and culverts for increased flooding resiliency and storm-hardening, including design of priority re-sizing or replacement projects. Green infrastructure, Low-Impact Design, and other nature-based solutions should be integrated with hard-infrastructure improvements.				H	S
			V	Replace the Route 116/Newton Smith Brook culvert in coordination with MassDOT through TIP funding.				H	S
Stormwater Basins and Conveyances	Town-Wide	Town	S	The DPW conducts proactive maintenance and cleaning of catch basins each year.				N/A	O
			V	Assess cost-effective Green Infrastructure opportunities for stormwater management to develop a list of specific priority projects where reduction of stormwater runoff could mitigate flooding risk without the need to conduct expensive culvert replacement and resizing projects. 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 approaches. Identify potential funding.				H	S
Roads	Town-Wide, Cove Island Road, Ludlow Road, Easy Street, Hildreth Avenue, Lower River Road	Town	S	The Town is conducting an ongoing corridor study assessing land use along Route 33.				N/A	O
			V	Implement the findings of the corridor study assessing land use along Route 33.				M	L
			V	Address flooding on Route 47/Pearl Street near Bachelor Brook. Consider options for culvert repair or replacement. Green Infrastructure, Low-Impact Design, and other nature-based solutions should be explored to establish approaches that will be robust in the face of natural hazards and climate-change scenarios.				H	S
			V	Assess feasibility of using pervious paving in new road or parking lot construction.				L	S
Public Water Supply	Town-Wide	Town	V	No specific priority action identified.				N/A	N/A
Wastewater Infrastructure	Town-Wide	Town	V	Accelerate upgrades of the Town's sewer and water infrastructure. Prioritize ongoing efforts to replace piping at the wastewater treatment plant.				H	O
			V	Perform a risk assessment of the wastewater treatment plant and pump stations and establish priority actions for reducing flooding impacts, including consideration of nature-based solutions or Green Infrastructure approaches. Explore options to increase flooding resiliency of the wastewater treatment plant. Establish emergency back-up plans for the plant and pump stations.				H	S
Septic Systems	Town-Wide, Cove Island	Private	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.				L	L
Electrical and Communications Infrastructure	Town-Wide	Town	S	SHELD engages in proactive tree trimming and removal to protect power lines.				N/A	O
Buildings and Facilities	Town-Wide	Town	S	The Town contracted a consultant to explore ways to improve energy efficiency in municipal buildings.				N/A	O
			V	Conduct feasibility studies for the redesign or rebuild of outdated municipal buildings, especially those within the floodplain, such as the Town Hall (home to the Emergency Operations Center).				M	L
			V	Pursue public facilities upgrades that would increase resiliency, including actions to make facilities more resilient to power outages, water supply problems, floods, etc.				M	L
			V	Assess shelters and other critical facilities in Town for storm resiliency (e.g., hurricane resistance). Review building codes as needed. If necessary, pursue funding sources for upgrades.				M	S
			V	Provide more resilient storage facilities for vital information, including birth, death, and marriage records, voter registration data, and associated equipment. Coordinate with the Town Clerk, Treasurer, Assessor, and Planning Board to assess all vulnerable records information and ensure that the Town protects critical data.				L	S
Dams	Town-Wide, Queensville Dam	Town, Private	V	Conduct dam assessments, identify privately-owned dams, and study feasibility of dam removals where other aging, public or privately-owned dams may pose a threat of failure and flooding, or where removal may have significant positive impacts on stream habitat and aquatic organism passage or for increasing flood storage and flood control possibilities. Identify owners of private dams throughout Town.				H	L
			V	Evaluate options for Queensville Dam, including repair, improvement, or having it reclassified as non-jurisdictional.				H	S
South Hadley Electric Light Department (SHELD)	SHELD	Town	V	Continue exploring relocation options for SHELD to move it out of the flood zone.				H	O
Backup Power Supply	Town-Wide	Town	V	Evaluate opportunities to provide improvements at critical facilities, especially emergency backup power, including feasibility of green power and battery storage, to protect public buildings and infrastructure from freezing and improve services for residents who may lose power during emergencies or hazard events.				H	L
Societal									
Vulnerable Neighborhoods	Town-Wide, Cove Island, The Falls	Private	V	Continue education and outreach to residents living in flood-prone areas to ensure that all individuals and families residing in these areas are aware of the potential risks, as well as mechanisms, such as flood insurance, to reduce their risk exposure. Ensure that outreach targets renters as well as property owners.				H	L
			V	Develop long-term solutions for floodplain management and flood resiliency, focusing in particular on River Road and neighborhoods within the floodplain in the Falls. Consider both in situ protections, and eventual redevelopment strategies that may include retreat from the floodplain. Educate residents on ecosystem services provided by the floodplain. Evaluate Town regulations and strengthen restrictions on new development in the floodplain, as necessary.				M	L
			V	Develop educational resources, building/code recommendations, and support programs for residents interested in storm-hardening and increasing flood resiliency of their homes. Focus on economically vulnerable populations and pursue funding opportunities to make resiliency improvements feasible for low-income residents.				H	S
			V	Develop a resiliency audit program, modeled off of existing energy audit programs to assess individual properties for potential impacts of changing temperature and precipitation patterns that will result from climate change and how this will impact storm readiness and overall resiliency of homes				H	S
			V	Develop educational resources and how-to guides for residents interested in implementing Green Infrastructure at their homes.				M	S
			V	Assess the feasibility of developing a regional or Town-specific clearinghouse that tracks and educates residents on town, state, and federal programs and incentives to ensure that residents have up-to-date information on all available resources, particularly funding/subsidy programs, including appropriate information on deadlines, applications, etc.				L	L
			V	Develop a neighbor-to-neighbor program to facilitate identification of and support for vulnerable populations and promote assistance between neighbors.				L	S
Vulnerable Populations	Town-Wide	N/A	S	The Town offers a senior storm preparedness program.				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. Transportation should not depend on emergency services personnel, as is currently the case.				H	S
			V	Develop partnerships with local businesses to distribute information and help facilitate outreach efforts, particularly to vulnerable populations such as senior residents.				M	S
			V	Develop a neighbor-to-neighbor program to facilitate identification of and support for vulnerable populations and promote assistance between neighbors.				L	S
Communications Systems	Town-Wide	Town	S	The Town operates a CivicReady system that can be used to share information relevant to short-term hazards or expected long-term hazards. The Town also operates an Emergency Operations Center out of Town Hall.				N/A	O
			S	The Town has two water and fire districts that serve residents and have mutual aid agreements in place.				N/A	O
			V	Conduct a feasibility study for relocation of the Emergency Operations Center outside of the flood zone, potentially to another municipal facility.				H	S

Shelters	Town-Wide	Town, Private	S	There are several emergency shelters in place and additional options available at local institutions. The Town also has short-term heating and cooling centers.	N/A	O
			V	Develop a comprehensive strategy for sheltering that evaluates strengths and vulnerabilities of existing shelters and recommends tangible steps for improvements. Include a plan for communication to residents about shelter locations, amenities, and availability. Train additional personnel to open the Town's shelters and enact a Community Sheltering Plan. Ensure that all shelters are carbon monoxide compliant.	H	S
			V	Communicate with St. Theresa's Parish on the possibility of using their facility as an emergency shelter.	L	S
Schools	Town-Wide	Town	S	The Town's Plains Elementary School is new (constructed in 2015) and equipped with air conditioning.	N/A	O
			V	Assess options to address excessively hot days in schools. This may include implementing plans to install air conditioning in schools, including necessary upgrades to the electrical infrastructure to allow for the additional capacity required to run air conditioning systems. Explore nature-based solutions such as pavement removal or tree-plantings.	M	L
			V	Continue exploring options for funding the rebuild/retrofit of Mosier Elementary School, including the Massachusetts School Building Authority (MSBA) grant.	M	L
Mount Holyoke College	Mount Holyoke College	Private	S	Mount Holyoke College has a goal of being a carbon neutral campus by 2037.	N/A	O
Pests and Disease Control	Town-Wide	Town, Private	S	The Town is part of a regional mosquito control district.	N/A	O
			V	Increase public awareness programs related to vector-borne diseases, such as EEE, West Nile, and Lyme Disease, to educate residents on the risks and warning signs of these diseases. This should include programs targeted at residents to increase awareness of new diseases and encourage early testing. Develop local funding and resources to make it easier for residents to have ticks tested when a biting tick is found.	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.	L	L
Provisions, Medicine, and Fuel	Town-Wide	Town	S	The Town has multiple access routes to medical centers during emergencies.	N/A	O
Economic Revitalization	The Falls	Private	V	Incorporate resiliency into economic development planning in the Falls to support local businesses and make the business community more resilient. Identify business development opportunities where impacts from climate hazards can be easily avoided or mitigated (e.g., by encouraging resilient building or areas of known drainage-related flooding).	H	L
			V	Develop concept designs for flood-resilient development visioning to promote implementation of the urban renewal plan for South Hadley Falls, while simultaneously incorporating cutting edge strategies for climate resiliency.	M	L
Stress on Emergency Services	Town-Wide	Town	S	South Hadley has an existing Town Facebook page that serves as an information hub for residents. The Town is also investing in emergency evacuation route signage and is in the process of updating its Master Plan.	N/A	O
			V	Coordinate across departments and organizations to develop an emergency plan that includes both fire districts and water districts, the Town, Mount Holyoke College, and any other relevant parties. Share information regarding available resources, such as vehicles or sheltering options, including those offered by the Council on Aging. Organize information on evacuation routes and emergency communications equipment so that local organizations are well-informed and can help keep residents out of hazard areas.	H	S
			V	Develop a Citizen Response Team of trained volunteers to staff shelters during hazard events and emergencies to relieve the burden on emergency personnel.	H	S
			V	Conduct robust education and outreach to build awareness of Town resources and make Town residents aware of the many planning efforts, sources of emergency information, mutual aid agreements, shelters, evacuation routes, etc. which are focused on making the Town more resilient to climate change impacts. Ensure that all residents have transportation options and know how to access these resources when they are needed.	H	S
			V	Formalize or increase recognition of the collaboration between departments, including the Town's Water and Fire Districts, Police Department, and SHELD during day-to-day operations and hazard events.	H	S
			V	Continue exploring options for regional dispatch with Granby or neighboring communities.	M	O
			V	Acquire five electronic road signs for communications use during climate change-related hazard events.	M	S
			V	Develop an Alternate Emergency Staffing Plan to ensure that essential roles are covered during an emergency, and reduce dependency on volunteers. Provide training so that Town employees in non-essential roles could be redirected to provide support during emergencies	M	S
			V	Establish a comprehensive emergency awareness plan for residents, incorporating a robust education and outreach strategy to build awareness of town resources and make Town residents aware of evacuation routes, shelters, and general emergency preparedness (e.g., 72-hour kits).	H	S
			V	Distribute an emergency kit list to all citizens to encourage self-preparedness for hazard events.	L	S
Parks and Open Space	Town-Wide	Town	S	There are 17 conservation areas in Town, most of which are forested. The Town is in the process of updating its Open Space and Recreation plan and has mechanisms in place for wetland protection.	N/A	O
			V	Pursue opportunities to fund open space acquisition that will mitigate the effects of increased storm events. Focus on areas that will create flood resiliency through increasing storage capacity in floodplains and/or infiltration capacity in uplands, including the Stony Brook area. Priority should also be given to larger parcels that can provide connectivity between existing conserved parcels to maintain habitat corridors.	M	L
Neighborhood Conflicts	Town-Wide	N/A	V	No specific priority action identified.	L	O
Environmental						
Beavers	Town-Wide	Town, Private	V	Develop a beaver management plan to mitigate against unpredictable flooding/impoundment impacts. Establish creative engineering solutions, identify suitable areas for beaver relocation or where beaver activity may be creating flood storage that contributes to resiliency, and consider the development of special legislation to give the Town authority to address problematic beaver dams on private property.	M	S
Water Quality	Town-Wide	Town, Private	V	Evaluate opportunities for improved watershed protections to preserve or improve water quality in the Town's reservoirs and waterways, including those on the Mount Holyoke College campus.	L	L
			V	Promote bio-blitzes and citizen science through continued efforts of the Conservation Commission and other initiatives with the goal of increasing resiliency throughout Town.	L	O
			V	Assess old industrial and automobile sites, specifically in the Gaylord Street and Bridge Street areas and areas near the Connecticut River, for flooding risk and potential contaminants. Remediation is anticipated to be necessary at some of these sites; explore funding options for required cleanup.	L	L
Trees and Forests	Town-Wide	Town, Private	S	The Conservation Commission has a 2:1 tree replacement/removal policy to encourage new plantings (two trees planted for every one removed within Wetland protection Act jurisdiction). The Conservation Commission is also developing a Forest Management Plan.	N/A	O
			V	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).	H	L
			V	Seek to establish resilient natural infrastructure to mitigate the effects of climate change, particularly through the ongoing preservation, maintenance and planting of trees, and, through forest stewardship.	H	L
			V	Explore the possibility of expanding the Tree Warden position, including reinvisioning the position to incorporate assessment of Town forest health and implementation of a comprehensive tree and forests management plan.	H	S
Invasive Species	Town-Wide	Town, Private	V	No specific priority action identified.	N/A	N/A
Titus Pond and Black Stevens Pond	Titus Pond, Black Stevens Pond	Town	V	Engage the community in exploration of stormwater management approaches for Titus Pond and Black Stevens Pond, focusing on upstream Green Infrastructure and stormwater reduction. Identify approaches to stormwater management consider the Town's future land use plans.	H	S
			V	Explore upstream stormwater retention options to improve conditions at Black Stevens Pond, including assessing feasibility of subsurface retention under the ballfield at Plains Elementary School to reduce stormwater runoff to Newton Smith Brook and ultimately reduce flooding downstream at Buttery Brook. Develop an overall watershed restoration plan that begins with Black Stevens and proceeds downstream along the Buttery Brook corridor to the Connecticut River.	H	S
Local Agriculture	Town-Wide	Private	V	Conduct strategic planning to support regional agriculture in the face of climate change. All of the identified hazards (flooding, ice and snow, drought and extreme precipitation, and extreme weather events) have the potential to significantly impact agricultural production, with corresponding threats to livelihoods and food availability. Planning should address hazard resiliency and approaches to connect growers with local buyers to shorten supply chains.	L	L
Flood Mapping	Town-Wide	N/A	V	Pursue funding to update the floodplain mapping for the Town using data that incorporates projections for changing precipitation patterns as a result of climate change. Consider partnering with neighboring communities for a regional approach. Develop a duplicate effective model and request official map revision from FEMA.	M	S

Appendix B

CRB Workshop Base Map



SOUTH HADLEY, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

FUSS & O'NEILL

- Town Hall
- Police Station
- Fire Station
- School
- Colleges and Universities
- Long Term Care Residences
- Dams
- Community Groundwater Source
- Non-Community Groundwater Source
- Underground Storage Tanks
- Railroads - Active Service
- Powerline
- Landing Strip/Airport
- Perennial or Intermittent Stream
- Shoreline
- Wellhead Protection Zone I
- Wellhead Protection Zone II
- Pond, Lake, Ocean
- Wetland

Flood Zone Designations

- 1% Annual Chance of Flooding
- Regulatory Floodway
- 0.2% Annual Chance of Flooding
- Area Not Included

N W E S

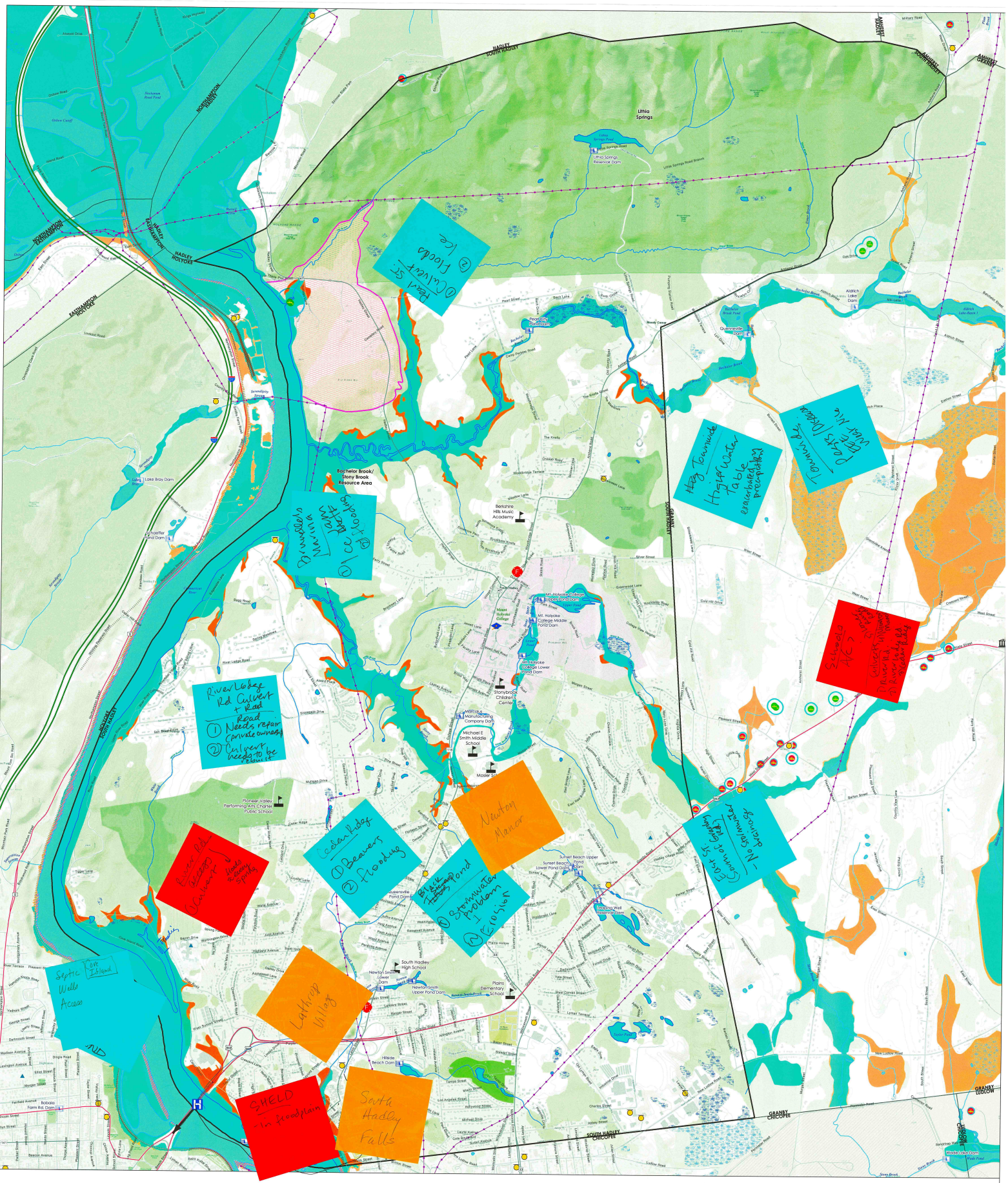
0 0.25 0.5

Miles

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

Appendix C

CRB Workshop Outputs:
Participatory Mapping Exercise & Risk Matrices



SOUTH HADLEY, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

FUSS & O'NEILL

Sewer Treatment Plant – located in Chicopee, belongs to S.H.

- Town Hall
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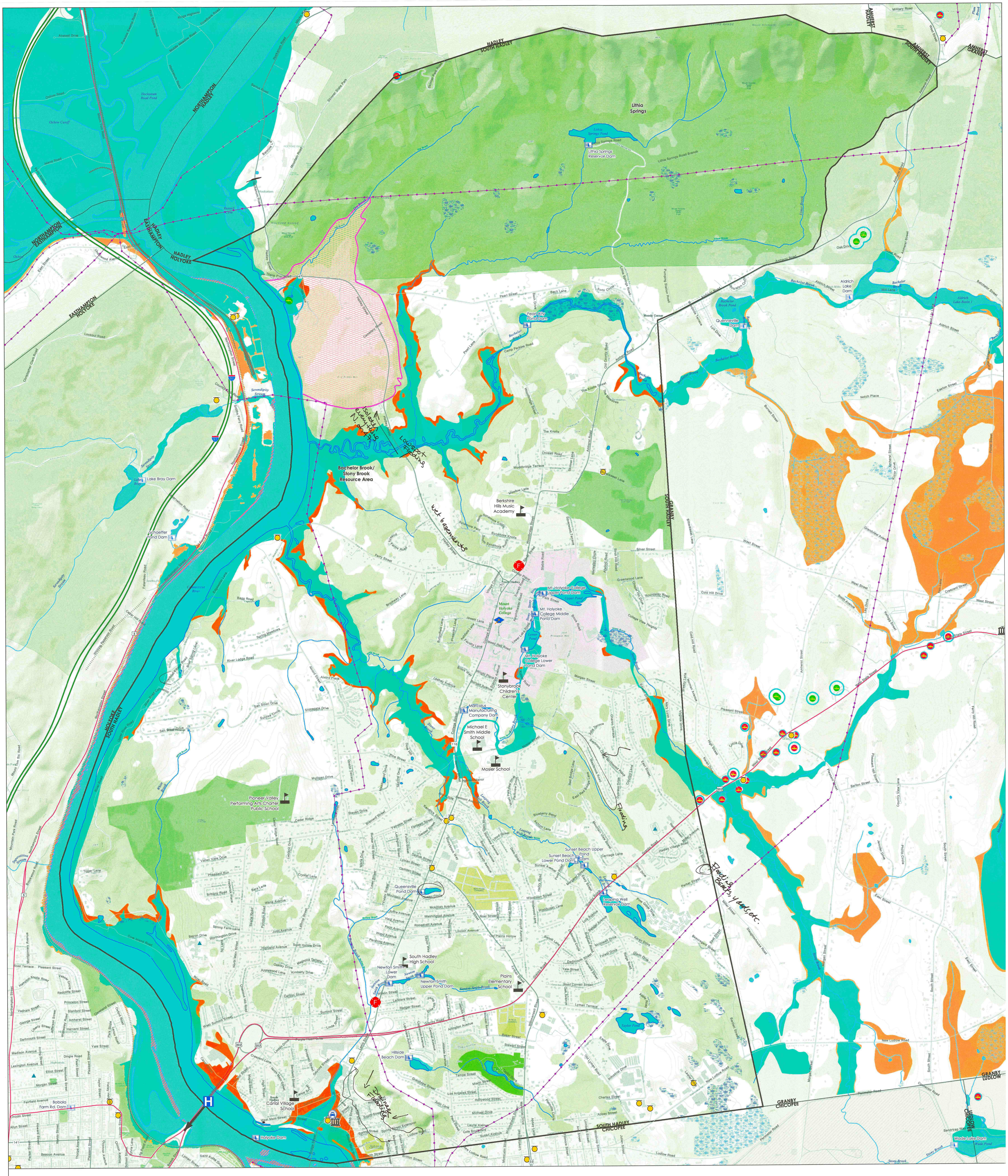

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SOUTH HADLEY, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

FUSS & O'NEILL

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N E S W

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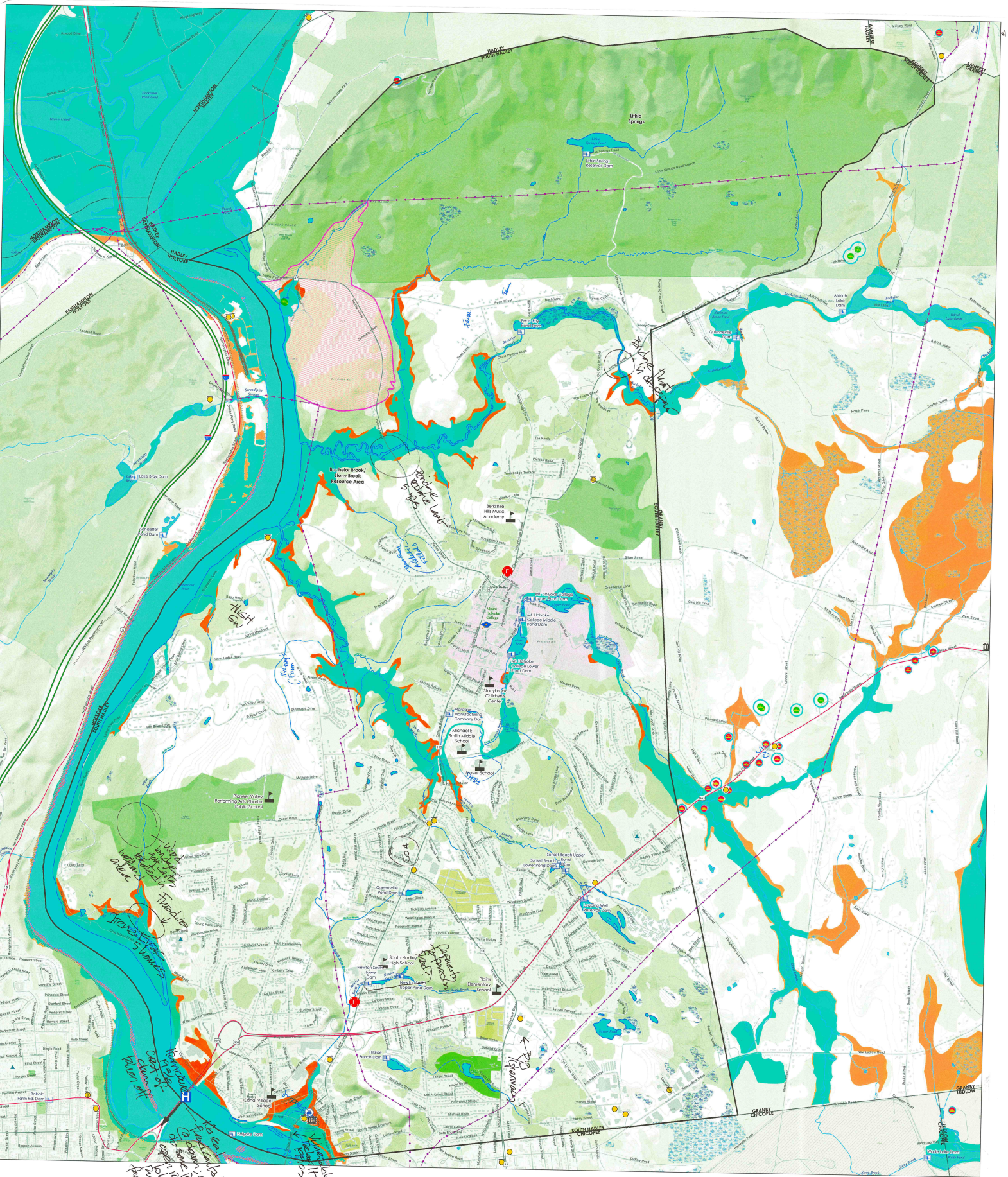

SOUTH HADLEY, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

FUSS & O'NEILL

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- Area Not Included

N W E S

0 0.25 0.5

Miles

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

* S = 1-2 years

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

H-M-L priority for action over the **S**hort or **L**ong term (and **O**ngoing)
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	Flooding	Snow/ Ice	Drought/ Extreme Precipitation	Extreme weather events	Priority H-M-L	Time Short Long Ongoing
Infrastructural Potholes – Riverside Road (private roads)									
Rte 47 + Pearl Street → Low spots / @ culverts; Culverts – Rte 47, Pearl St, Rte 116 (Stony)		Public	V	X Solutions? Feasibility study needed?				L	L
Rte 116 @ Stony Brook Bridge → immediate buildings in low elevations @ that crossing		Private + Public?	V	X "				L	L
Westbrook to East Street — Flooded basements; Mosier School		Private	V	X → Replace Mosier School / Renovation					S/L
Communications – Emerg. Radio dispatch		Public	S/V	Coordinate radio dispatch across town + regional → regional dispatch – Granby + S. Hadley; + underground utilities for all new construction				H	S
Power Lines / SHELD main office on CT River		Public	V/S	+ Relocate SHELD out of floodzone / EOC + Opps center that all; + Relocate EOC out of PD which is w/in 500-year floodzone				H; M	Ongoing; S
Old generator @ Dist. 2 Pump Station; Staff shortages / Personnel / qualified workforce		Public	V	+ Build circuit ties w/ other towns (South exists / need one in North); + Hazard Trees; + New generator for Dist. 2 pump station / Redundant parts				H; H; M	S/ongoing; ongoing; S
Societal									
Emergency access → Rte 47 @ Bachelor Brook bridge to North (all roads off Rte 47)		Public	V	Support volunteer Emergency Response team training + Recruiting				L	L/ongoing
→ Rte 116 @ Stony Bridge → Buildings in low spot Chapel de Laines, Falls Driving School		Private	V					L	L
Westbrook to East Street — Flooded basements — FD emergency pumps (Strength)		Private	V	Education on preparedness – how to help self-sufficiently				L	Ongoing
Neighborhood conflicts	East Street	Private	V	Mediation / Cooperation				L	Ongoing
CivicAlert		Public/Private	S	Opt-in for storm warnings, etc. →				H	S
Cooling Centers + Warming	Library Senior Center	Public + Private	S/V	New senior center, library, plains School? No emergency shelters in District 2 → MHC?		+ Builds awareness + ... w/ St. Therese + MHC		H	S
Environmental									
Trees	All townwide	Public + Private	S/V	Forest Management Planning — Roadsides, utility corridors + open space; ~~New Tree Roads~~				H → L	Ongoing
Floodplain		Public + Private	S/V						
Beavers		Public + Private	V	Flooding / Beaver management — site by site need				L	Ongoing
Heat Island Effect		"	V	Reduce pavement; New trees				H	Ongoing
Ticks + Other pests		"	V	Education — safety — Ecosystem Services				H/M	Ongoing

A

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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Features	Location	Ownership	V or S	Flooding	Snow / Ice	Drought / Extreme Precipitation	Extreme weather events	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Bridges - 116 & 202 have been restored - smaller bridges need evaluation	116/Ledges	State	V/S	-Ledges Bridge will need structural repair in time -CT 47 recent repair	202 should be reviewed access to Hospital			M	O
Sewer Structer	Main st.	town	V	catch BASins Identify Funding sources Make the system more resilient				H	O
Drinking Water	~~Dist~~ District 2	State / town	S: two sources	re-evaluate water supply				H	O
Critical Facilities	~~Alos~~ Schools Town Hall	Mixed	V				Heat waves Lack of Air conditionings increase the amount throughout	H	L
Dams	Town wide	Mixed	V	Investigation on Quality Any potential on removing any?		Qu'n Dam: Extream precip could ruin structure		H	S
Societal									
Senior Citizens / Facilities	Berkshire Hills	~~Private~~ Various	V/S	Confirm Evac / Event Plans	→	→	→	H	S
Falls District		Mixed	V	-Build Awareness of flood History -Confirm Evac/Events plans				M	S
Evacuation Routes	MT 47 River Road		V	Establish plans Meeting points				H	S
Athletics / Recreation	Athletic Fields Town Farm	town	V			Limited irrigation Rebuild Field's		L	L
Miskitos / Pest control		town	V			Forrested Land / tree study, Long term effect		M+	O
Mount Holyoke Coll. (strength)		Private	S	Field house - Possible meeting place Explore M.O.U. w town	Self maintain walkways / roads			M	O
Environmental									
Flood zone: FL	-S.H. Falls -River Road -College Boathouse		V	-relocation incentives -Make buildings more resilient				M	L
Fish passage - strength			S						
Wetland protection			S	Farmland to account for flood absorbtion		Look up stream systems to understand flood storage capacity		M	S/$L
Lithia Springs			S						

Community Resilience Building Risk Matrix

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Features	Location	Ownership	V or S	Flooding	Snow/Ice	Drought/ Extreme Precipitation	Extreme weather events	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Schools / Municipal Buildings	town-wide	town	V/S except Plains+Library	Munic. bldgs. rebuild w/in flood zone w/parking on 1st floor or relocate within SHF (redesign)		A/C should be centralized in all facilities		M	
Sewer System + plant location in lower elev./Cinicque	most of town	town	V	Update / Replacement of system (on-going) but needs to be accelerated due to risk	→			H	
Roads / Culverts / ~~Dam~~ (Queensville)	Various locations	town + some private + State	V	Replacement of Culverts where feasible Improve emergency access				H	
Multiple Physical Plants ~~se~~. Fire Dept	2 locations	~~town~~ districts	S	2 separate regional bldgs to	address concerns				
Multiple Water Sources / System	2 locations	districts	S	~~systems able~~		systems able to be linked in drought			
Dams	Queensville ~~[illegible]~~ private	(public) town	V	Valuation of dam as resource deemed non-jurisdictional?		private dams → status?		M	
Societal Underground Fuel Tanks Replaced!	townwide	business/private	S						
Emergency Shelters in Schools + Library + COA	various	town	S	Senior ~~ctr~~. to be replaced ; better equipped for events					
SHELD Ability to Respond to Power Outage	Flood Plain	town	V/S	generally an asset b/c we own it, better response rate but located in Flood Plain. Move out to new site w/ better access? Temp parking				H	
Vulnerable Areas / Development populations	SHF, Newton Manor, Lathrop Village	various pub/private	V	transportation plans to shelters needed, →				H	
Working Farms / Remaining Farmland	Mccray's + Olesiuk + Losier	private	V	~~Olesiuk + Losier~~ STET farmland → All is vulnerable to events		APR restrictions should be sought		H	
Senior Preparedness	COA	town	S	COA programs/awareness that provides plans/options for seniors					
Environmental									
Conservation ~~+ Protected OS~~ Land as flood storage (120 acres)	Various	~~[illegible]~~ town	S	protects aquifer					
Limited Development in North – less stress on infrastructure	Northern	town-directed private	S						
Flooded Areas (Storm-related) + Townwide High Water Table	Various	town + private	V	Long term consider buying land/houses in Cove Island + Nearby riverfront houses (Taylor) to turn into green space	+ Improve Emerg. Access L	Emergency Access H		L/H	
~~A~~ Open Space still left – esp. forested	Various	town, DCR private	S						
Beavers / flooding	Cedar Ridge	source private impacts public	V	Beaver Mgmt plan needed to encourage them to areas w/out humans				M	
Pests / Disease affecting humans / tree habitat	town wide	public / private	V			Work w/ local ecologists to put together mgmt. plans		H	
Old Industrial Sites vulnerable to flooding / federal + Auto Sites	Gaylord area + Bridge St + Funeral Home [illegible]	private	V	Envir. Assessment funds needed to assess	sites →			H	

C

Appendix D

CRB Workshop Presentation Materials

FUSS & O'NEILL

Boston Firefighters, January 4, 2018 (Reuters)

Holyoke Dam between South Hadley and Holyoke, MA

Municipal Vulnerability Preparedness Program
Community Resilience Building Workshop
Town of South Hadley

September 19, 2019

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 South Hadley
- Discussion by South Hadley participants on status of current planning and risks
- Introduction to CRB Workshop process

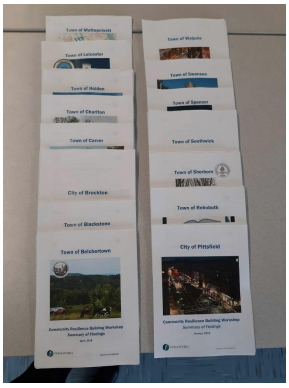
- Large group
  - Determine top four hazards

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

- Lunch

- Large group
  - Report out from small groups
  - Determine overall priority actions for the Town

- Discussion on next steps
- Conclusion



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 $3.15 million in MVP Action Grants in the program's first and second funding rounds.

FUSS & O'NEILL

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.

Arnold Robinson

Arnold, AICP is F&O's Regional Director of Planning and has been practicing in the fields of community planning, historic preservation and urban design for more than 30 years. His practice focuses on effectively engaging residents, public officials and diverse stakeholders in the planning and review process in order to maximize consensus and create achievable projects that improve communities.

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.

FUSS & O'NEILL

South Hadley's MVP Program - $25,000

- Grant Supports Climate Change Vulnerability Assessments and Resiliency Planning
- MVP Comprehensive Approach
  - Infrastructure
  - Society
  - Environment
- Expanded Scope
  - Extra listening sessions focused around stormwater management at Titus Pond and Black Stevens Pond

MVP designation leads to enhanced standing in future funding opportunities

FUSS & O'NEILL

MVP Action Grant

- Grant supports priority actions identified at Community Resilience Building Workshop
- $25,000 - $2M available (up to $5M for regional projects)
- Up to $7M available statewide
- Local match of 25% - can be in-kind
- Next funding round anticipated late September 2019

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

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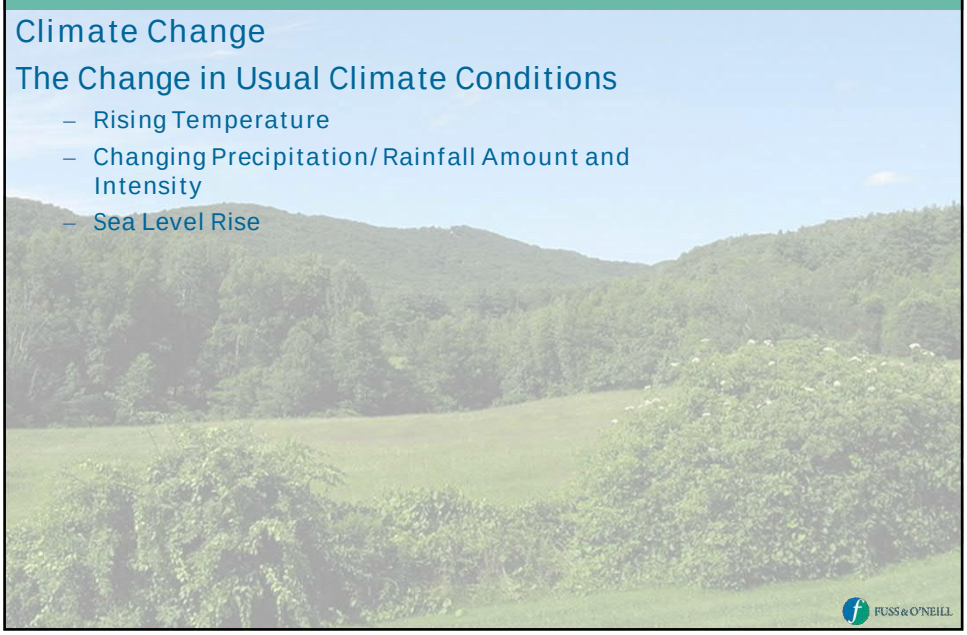
Terminology

Climate Change

The Change in Usual Climate Conditions

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



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Town of South Hadley – Connecticut Basin

Rising Temperature

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)	46.98	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)	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)	158.63	-10.58	to	-28.13	-18.57	to	-37.28	-22.18	to	-50.76	-22.88	to	-59.79

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Town of South Hadley – Connecticut Basin

Changing Precipitation

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)	46.39	-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)	16.41	-0.18 to 1.34	-0.42 to 1.75	-0.73 to 2.26	-0.35 to 2.44

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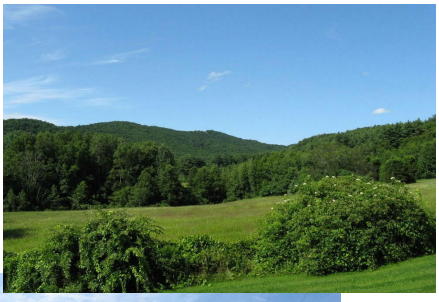
Climate Change Impacts - Temperature

- 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



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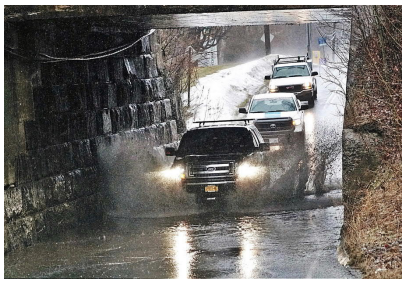
Climate Change Impacts - Precipitation

- 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



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Stakeholder Updates

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MVP Program

- Identify Top Four Hazards
  - Review MVP Sectors
  - Maps as tool
  - List infrastructure, societal, environmental feature
  - Determine whether a vulnerability or strength
  - Identify actions to reduce vulnerability or reinforce strength
  - Prioritize actions
  - Report Out
- Finalize Prioritization Plan

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Climate Change Hazards

- Flooding
- Extreme Precipitation Events
- Heat Waves
- Drought
- Snow/Ice
- Wildfire
- Tornadoes
- Hurricanes
- Nor'easters
- Other

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Risk Matrix

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.com

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					Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Societal									
Environmental									

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MVP Sectors

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

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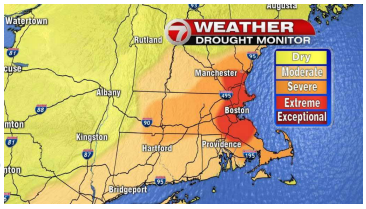
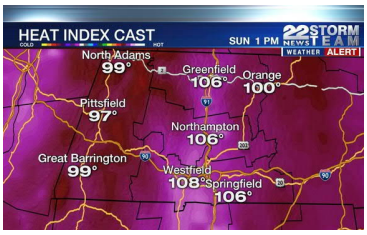
MVP Sectors

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





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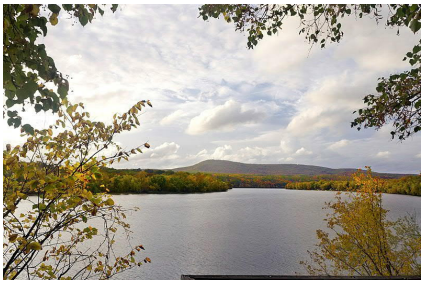
MVP Sectors

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



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Community Resilience Building Workshop

Next Steps:

- Public Review of Priorities
- Monitor and Update
- Annual Review

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Community Resilience Building Workshop

Questions?

FUSS & O'NEILL