

Town of Belchertown



Community Resilience Building Workshop *Summary of Findings*

April, 2018

Town of Belchertown

Community Resilience Building Workshop

Summary of Findings

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 2017, the Town of Belchertown was awarded a \$15,000 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 February 12, 2018 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 April 20, 2018, 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 Belchertown;
- 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 Belchertown. Discussion of the top hazards built on earlier conversations that took place at the MVP Core Team Meeting, as well as ongoing Town conversations that have formed the basis for the Town's Hazard Mitigation Plan. Flooding and intensification of precipitation events were identified as one of the Town's top hazards. Storm events and associated wind were identified as a second hazard. Impacts of extended drought, such as those seen during summer 2016 were identified as a third hazard. Finally, heat effects, particularly the increase in extremely hot days (over 90 degrees F) predicted over the next several decades, 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 and Precipitation
- Storm Events/Wind
- Drought
- Heat

Areas of Concern

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

Neighborhoods/Communities

Sportshaven and other mobile home parks; senior community; agricultural community; private well owners

Ecosystems

Batchelor Brook/Weston Brook Wetland Complex; Daigle and Jabish Well Fields and contributing aquifers

Infrastructure

Wastewater treatment plant; town wells; private wells; municipal drinking water storage tank; Quabbin Reservoir; bridges at Mill Valley Road, Daniel Shay Highway, and Allen Road; culverts town-wide; electrical infrastructure; freight railroad line



Current Concerns and Challenges Presented by Hazards

Major storm events have been a recurring threat to Belchertown throughout its history, from hurricanes bringing wind, intense precipitation, and localized flooding to the inland community, to winter storms delivering ice and snow. Notable historic events include impacts from the Great Hurricane of 1938 and a three day power-outage resulting from the impacts of Hurricane Gloria in 1985. More recently, Belchertown was impacted by Hurricane Irene in 2011 which caused flooding across the State. In a typical winter, Belchertown experiences at least one severe winter storm. Historically, some of these storm events have had significant impacts for the Town. In 1996, an ice storm impacted much of the northern section of Town, causing ice-laden trees to take down electrical infrastructure. In 2011, a late October snowstorm dumped over 12 inches of snow on the landscape while the trees were still in leaf, causing wide-spread damage that was experienced not just in Belchertown, but throughout the Connecticut River Valley. Tornadoes have not directly impacted Belchertown in the past, but there is a history of infrequent but severe tornado activity in Western Massachusetts. The Town's Hazard Mitigation Plan currently rates the probability of a tornado event in Belchertown at between a 1-10% chance in any given year. Severe thunderstorms, however have a high probability of occurrence (40-70% chance per year)¹, and are thus a more immediate threat.

There have been no dam failures recorded in Belchertown, however there is concern that climate change could exacerbate flooding to such an extent over the coming decades that dams might be adversely affected. Similarly, 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.

While excess water is an obvious problem, too little water is equally concerning. Belchertown has experienced six major droughts since the 1930s¹, most recently in 2016. In 2016, as in some other instances, the Town has experienced water supply problems. In summer 2016, at least 16 shallow, private wells dried up due to drought conditions and approximately 50 families at the Sportshaven mobile home park were under water-rationing restrictions.

Extreme temperatures at both ends of the spectrum pose occasional challenges for Belchertown. Extreme cold has been an issue for the Town several times in recent years. Warming shelters were opened during the 'polar vortex' activity of 2014 and 2015. Periods of extreme cold in 2016 and January 2018 brought frozen pipes and other impacts to the Town. At the opposite extreme, heat conditions typically trigger the opening of shelters at some point each year¹.

Meanwhile town population has increased 56% since 1980, and Belchertown continues to grow. Many of the issues identified as potential concerns or hazards will be further exacerbated by population growth. At present, Belchertown is still largely undeveloped, but conversion to residential use will impact stormwater flows and flooding. Belchertown may also see an influx of climate refugees from coastal communities as populations begin to move inland to avoid sea level rise and other coastal impacts of climate change.

¹ Belchertown Hazard Mitigation Committee, Pioneer Valley Planning Commission (2016). *Town of Belchertown Hazard Mitigation Plan Update*.

Specific Categories of Concerns and Challenges

Infrastructural

Culverts and Bridges

Culverts and bridges are recognized as a potential concern town-wide. Workshop participants noted, in particular, that bridges crossing Jabish Brook at Allen Road, and Mill Valley Road were points of concern, as the Brook is choked with debris and vegetation which threatens to cause blockages and restrict flow. Culverts are known by the Department of Public Works to be undersized in many locations, though no detailed inventory has cataloged the size and condition of culverts town-wide. Regardless of condition, culvert and bridge structures were designed to accommodate historic patterns of precipitation and runoff, which are rapidly transforming as a result of climate change. As precipitation events become more intense and less predictable, undersized culverts are expected to pose a greater threat of failure and flooding.

Beavers

Concerns about beavers were discussed as an environmental issue, but also, and more critically, as an infrastructure problem. 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. The Batchelor Brook and Weston Brook wetland complex is known to be an area particularly influenced by beavers, although there are additional areas of beaver activity throughout the town

Dams

In addition to beaver dams, man-made dams are a source of concern. Most town-owned dams are regulated under State dam safety regulations, and most are known quantities. For instance, Scarborough Pond Dam is known to present minimal flooding risk, and is therefore not a major concern. A privately-owned dam on the Swift River is known to be high hazard but is under a state consent order and funds exist to perform necessary improvements during the coming year. Less information exists about many of the small dams in Town, particularly private dams. In some cases, it is not even known which dams still exist, let alone their condition or risk potential. Lake Wallace Dam is an example of a dam that is unregulated but could have important consequences if it failed, in this case, the potential to flood the Wastewater Treatment Plant, which could have significant impacts for environmental and public health.

Drinking Water Supply

The drinking water storage tank located just off the Town Common is approximately 100 years old and in need of repair or replacement. The current tank is undersized and, due in part to its age, is seen as being vulnerable to strong winds that may accompany storm events. The Town has explored both the repair and replacement options. Repair was determined not to be a cost effective solution, particularly as replacement would provide an opportunity to increase storage capacity as well, from the existing 100,000 gallon tank to a 250,000 gallon tank. A new tank would be resistant to wind and storms, and the increased capacity would increase resilience in dealing with drought. In parts of town not serviced by public water, private wells are also a source of concern, as they are often shallow, and will be increasingly likely to run dry if drought conditions become more common in Belchertown.

Wastewater Treatment Plant

The wastewater treatment plant is in many ways an asset to the community. However, extreme cold in January 2018 demonstrated the need for cold-hardening to protect tanks and keep temperatures sufficiently high to maintain the microbial activity critical to the treatment process. This could be addressed through the installation of tank covers, but funding is not currently available to make this improvement.

Hazardous Materials Transport

A major freight rail line runs north/south through the Town, passing in close proximity to the schools and Police Station, as well as several sensitive environmental areas (Lake Arcadia, Lake Metacomet, Jabish Brook, and several wetlands). Trains passing through the Town are known to carry a variety of hazardous materials that could pose a significant threat to people or the environment in the event of a spill. It is unknown specifically what the risk could be to this rail line due to climate change, but it is known that both flooding and extreme temperatures can affect the safe operation of trains.

Environmental

Water Conservation

Western Massachusetts has historically been accustomed to ample water supply, so education, outreach, and better conservation practices are needed to address the growing potential for extended drought. This concern applies at all levels of society, from residences, to commercial/institutional facilities, to agricultural practices.

Trees and Forests

Forests provide critical ecosystem services that help buffer the effects of climate change, from 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, Asian Longhorned Beetle) are eliminating certain tree species, and others are in decline due to shifting temperature and precipitation regimes that favor more southerly species. In Belchertown, trees and forests face other man-made threats as well, with land-clearing taking place for utility-scale solar installations and other development. Workshop participants feel there is a need to review existing bylaws, including those for activities like solar development, to incorporate guidelines that would incentivize reuse of already-developed land and sites that are not as high priority in terms of resilience capacity.

Open Space

Open space provides many of the same resilience benefits and threats described above for forests. 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.

Invasive Species

Invasive plants and animals are already a source of concern in Belchertown, 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, and Eurasian milfoil. Critical invasive insect pests already in the area include the Asian Longhorned Beetle and Emerald Ash Borer, both 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.

Societal

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 or Zika and ticks carrying Rocky Mountain Spotted Fever). These changes present a major public and animal health challenge in terms of education, prevention, and treatment.

Emergency Communications and Vulnerable Populations

The Town generally has a robust communications system; however workshop participants acknowledge the challenges of reaching individuals who no longer have a land-line telephone. Moreover, certain populations, including seniors and the homeless, are known to be at higher risk during hazard events and may require support beyond emergency notifications. Understanding what these needs are and how the Town can best prepare to support its entire population are areas that require more exploration.

Mobile Home Parks

Due to their very nature as semi-permanent structures, mobile homes can be particularly vulnerable to storm events and high winds. At Sportshaven Mobile Home Park, many of the homes are not properly anchored, further exacerbating this problem. Sportshaven's water supply is also susceptible to drought; the park had to implement strict water rationing during the drought of 2016.

Transportation and Commuting

Transportation was not seen as a major infrastructure vulnerability, but it did come up during the workshop in the context of societal concerns. Belchertown is primarily a bedroom community, with many of its residents commuting outside the Town for work. If a storm or flooding event were to cut off access to major roadways, this could leave residents either stranded away from home or unable to get to work, with potentially substantial economic impacts.

Agriculture

Although farming is not as central to the community today as it once was, Belchertown still has a variety of agricultural activity, from hobby farms and individual horse-ownership, to larger operations like Austin Brothers Valley Farm, which produces pasture-raised beef, and Shattuck's Sugarhouse, a maple sugaring operation. The Town is also home to the New England Small Farm Institute, a non-profit which seeks to encourage sustainable regional agriculture and serves as an incubator for new farms. Drought, excessive rain, and changing temperatures may affect agriculture and livestock at all scales. For instance, maple sugaring may no longer be economically viable at some point in the future, and some agricultural producers may be forced to consider alternate crops or altogether different sources of income.



Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well. Belchertown's identity as a small-town community is in itself a strength, as it fosters participation, cooperation, and support for and among local residents and businesses. With regards to water supply infrastructure, the Town benefits from the built-in redundancy of drawing from two different aquifers, and the Town is already making important strides toward addressing known needs and increasing resiliency in the system. The Town's existing open space and facilities are also strengths that they can continue to build upon.

- Small-town identity produces high level of communication and cooperation.
- Belchertown already has a robust emergency communications system.
- The wastewater treatment plant is currently only at 40% capacity. This allows a buffer for population growth as well as extra storage capacity in the event of an extended power outage that prevented treatment operations. Moreover, the Town has a priority restoration agreement with National Grid to bring the system back online quickly in the event of a power failure.

- The Town recently conducted modeling to evaluate the existing water supply infrastructure and capacity.
- The Town water supply is drawn from two different aquifers which are isolated from one another. This separation enhances resiliency in the event of contamination, although workshop participants noted that the Jabish aquifer could not alone provide sufficient service capacity on an ongoing basis.
- The Town benefits from the efforts of National Grid which has invested time and money into clearing hazard trees and improving the robustness of the electrical system.
- The Town has an immense amount of accumulated staff knowledge about the Town, its systems, needs, and strengths, all of which is attributable to many accumulated years of dedicated service.
- The Town has been proactive in pursuing stormwater management and currently has a \$50,000 stormwater grant from Mass DEP to study creation of a Stormwater Utility that would provide funding for continued infrastructure improvements.
- The existing Senior Center is a resource that provides support for one of the Town's potentially vulnerable populations.
- The Town already has a strong base of open space and recreation land to build on for climate resiliency and nature-based solutions.
- Belchertown's schools and library are resources that can potentially be used to provide cooling or heating stations or develop emergency shelters in times of need.

Top Recommendations to Improve Resilience in Belchertown

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. Management of water, both dealing with excesses of water due to flooding, and maintaining sufficient, safe water supply during drought or other hazards, was a key theme that emerged in the small and large group discussions. Likewise, the need to bolster nature-based mitigation solutions by preserving open space, managing for resilient landscapes, and incorporating green infrastructure was an element that came up many times in the context of discussions on all three topic areas. Most of the Town's high priority action items fall under one (or both) of these themes, with management of increasing pests and disease vectors as a third high priority focus.

Highest Priority

- Conduct 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.

- Develop comprehensive plan for beaver management to mitigate against unpredictable flooding/impoundment impacts.
- Assess green infrastructure opportunities to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects.
- Replace drinking water storage tank for increased storage capacity (to counter drought) and decrease vulnerability of the water supply to wind and storms.
- Assessment of mosquito/pest control options, including: viability study of joining existing mosquito control district versus options for the town to manage control independently, 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.
- Build water conservation, collection, and irrigation resiliency: implement a cistern-based water collection system as demonstration project at the high school and coordinate an education and outreach program to encourage residential and agricultural best practices.
- 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).
- Acquire open space consistent with Town planning priorities and focused on areas that will create flood resiliency through increasing storage capacity in floodplains and/or infiltration capacity in uplands.

Moderate Priority

- Develop/implement emergency communications system with focus on expanding an already robust system with text alerts and/or finding other ways to reach homes and individuals that do not have access to land lines.
- Improve resiliency of mobile home parks including improving water supply system to guard against drought and better anchoring of structures to prevent catastrophic damage due to wind and storm events.
- Conduct transportation resiliency planning to ensure that access is maintained in and out of town during hazard events, with dual focuses on 1) facilitating emergency operations and 2) preventing a largely commuter-based population from becoming stranded, either unable to get home or unable to reach their jobs.
- Install wastewater treatment plant upgrades to establish cold weather protections and maintain operations during extreme temperatures. (Note that the wastewater treatment plant already benefits from a priority restoration agreement with National Grid to guard against the impacts of power outages).

- Analyze hazardous materials risk to develop an understanding of how climate-change induced hazards could potentially increase the risk of accidents or spills involving the major freight railroad line that runs north-south through Town and quantify the potential risks to the Town that could result from accidents involving various classes and types of materials.
- Conduct strategic planning to support agricultural community in the face of climate change. All of the identified hazards (flooding, drought, extreme temperatures, storm events) have the potential to significantly impact agricultural production, with corresponding threats to livelihoods. Planning should address hazard resiliency as well as long-term plans to transition producers to new techniques and/or into new crops to replace crops/industries that may no longer be viable due to climate change (e.g. maple sugar industry).
- Develop comprehensive invasive species management from inventory stage through management planning and implementation to address existing invasive populations that threaten features such as open space or forests, both of which contribute to resiliency, as well as anticipate new invasives that are likely to move into the area as climates shift.
- Build resiliency of town wells to protect water supply, particularly by purchasing additional land in adjacent areas and managing for infiltration, groundwater recharge, and water quality.
- Assess public and private dams including town-wide survey to update information on which small dams still exist, establish an understanding of condition, and determine risks and priority projects.
- Explore funding and logistics for cooling stations and emergency shelters to develop expanded offerings, potentially at one of the local schools, that would address residents' needs during hazard events, including extreme temperature events, floods, or storms.
- Plan for transfer of institutional knowledge so that the wealth of knowledge about the Town, its departments, systems, strengths, and vulnerabilities is not lost as many current Town officials near retirement age.

Lower Priority

- Plan for ongoing increases in population size. Belchertown is one of the fastest growing communities in Massachusetts, which means that infrastructure and services must be not only robust but also adaptable to growing population numbers, increasing density of development, and expansion into areas of new development. As an inland community with room to grow, Belchertown may also experience population growth driven by climate change, as some residents of coastal communities or southern states migrate to avoid climate impacts in their home communities.
- Develop Quabbin Reservoir Emergency Response Plan specific to Belchertown to provide education and outreach about hazards, communications planning in case of an emergency situation that threatens the integrity of the reservoir, and recovery strategy for the Town in case of catastrophic failure. This plan would supplement the existing Emergency Action Plan required to be maintained by the Commonwealth as the dam owner.
- Develop communications and outreach strategy for vulnerable populations, particularly seniors, mobile home residents, and the homeless, that may be more vulnerable to climate-

induced risks, such as extreme temperatures, may lack appropriate shelter during increasingly intense storms, or that may be unprepared if stranded or cut off from supplies due to flooding or storm events.

- Expand support for senior center to build on existing strengths that serve a potentially vulnerable population.
- Maintain small-town culture that supports communication and cooperation among neighbors and is an asset during hazard events.
- Address inappropriate land uses in floodplain through increased inspection and enforcement of existing regulations.

CRB Workshop Participants

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

Name	Position/Organization
Paul Adzima*	Building Commissioner
Doug Albertson*	Town Planner
Daniel Beaudette*	Planning Board
Ted Bock	Fire Chief
Gary Brougham*	Town Administrator
LeeAnne Connolly	Former Conservation Administrator
Karol Coffin	Superintendent of Schools
Erica Cross*	Conservation Administrator
Kristin DeBoer	Kestrel Land Trust
Mike Hofler*	Planning Board
Eric LeBeau	School Department Facilities
Judy Metcalf*	Public Health Director
Sierra Pelletier*	Planning Board
Chris Pronovost	Chief of Police
Catherine Ratte*	Pioneer Valley Planning Commission
Will Shattuck	Agricultural Commission
Lynn Sikes	Administrative Assistant, Planning and Inspection Department
Mark Spiro	Planning Board
Bill Terry	Belchertown Economic Development Industrial Corporation
Kyle Thibeault	Recreation Department
Chris Volonte	Kestrel Land Trust
Mark Wamsley	Kestrel Land Trust
Steve Williams*	DPW Director

* indicates attendees

Citation

Fuss & O'Neill (2018). Community Resilience Building Workshop Summary of Findings. Town of Belchertown, Fuss & O'Neill, Inc. Belchertown, Massachusetts.

CRB Workshop Project Team: Organization, Name, Role

Name	Organization	Role
Doug Albertson	Town Planner	Project Coordinator/Core Team Member
Daniel Beaudette	Planning Board	Core Team Member
Julianne Busa	Fuss & O'Neill	Facilitator/Scribe
Karol Coffin	Superintendent of Schools	Core Team Member
LeeAnne Connolly	Former Conservation Administrator	Core Team Member
Eric Lebeau	School Department	Core Team Member
Diane Mas	Fuss & O'Neill	MVP Lead Facilitator
Judy Metcalf	Public Health Director	Core Team Member
Sierra Pelletier	Planning Board	Core Team Member
Chris Pronovost	Chief of Police	Core Team Member
Steve Williams	DPW Director	Core Team Member

Acknowledgements

Many thanks to the MVP Core Team members, CRB workshop participants, and to Town Planner Doug Albertson who acted as the local Project Coordinator. Thanks to the Town of Belchertown for providing a meeting space for the Core Team Meeting and refreshments for the CRB Workshop. Thanks to the Belchertown Recreation Department and Kyle Thibeault for providing meeting space for the CRB workshop.

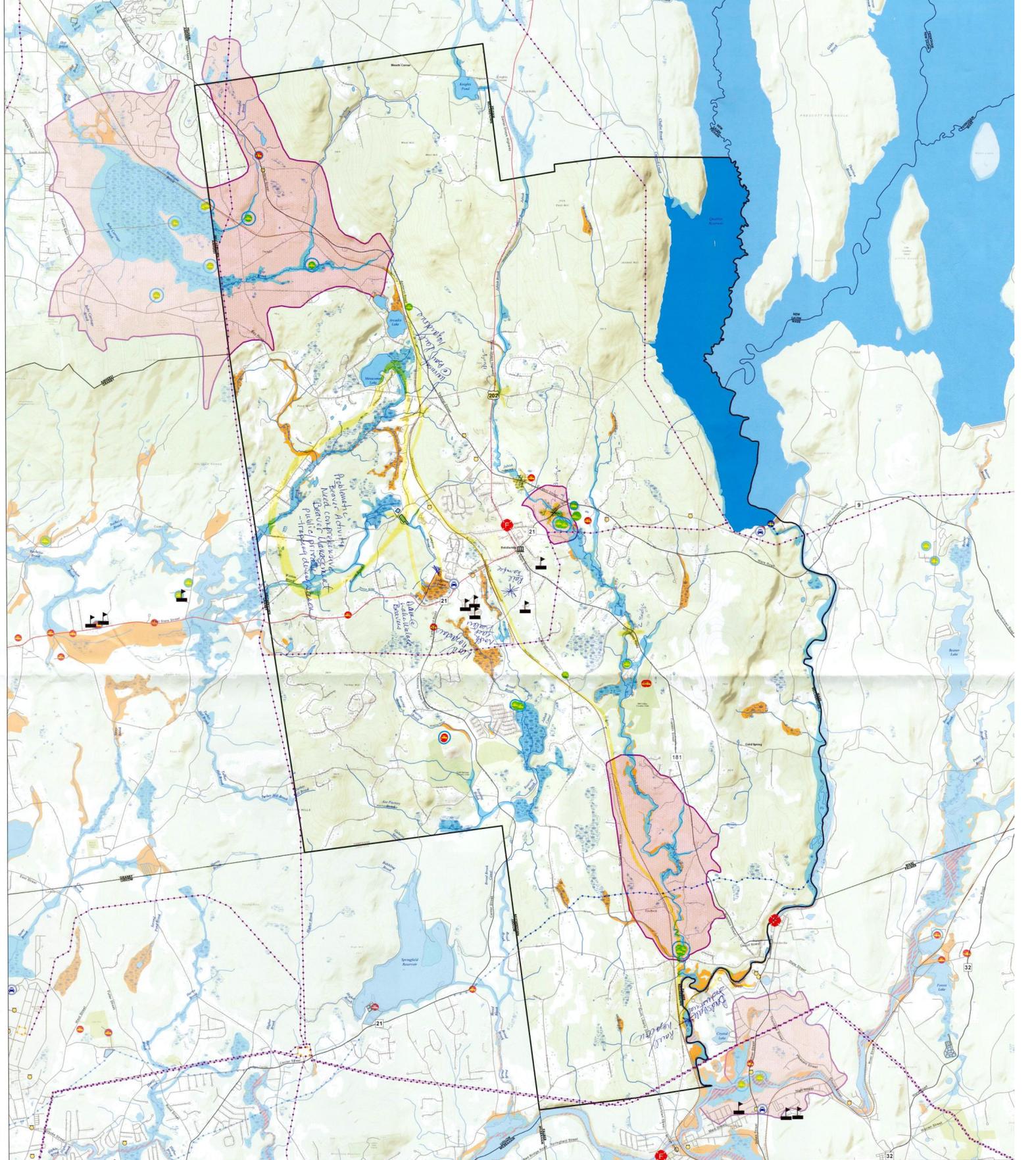
Funding for the CRB Workshop was provided through a Massachusetts MVP grant.

Appendix A

CRB Workshop Base Map

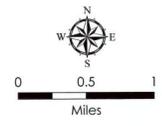
Appendix B

CRB Workshop Outputs: Participatory Mapping Exercise & Risk Matrices



- Town Hall
- Police Station
- Fire Station
- School
- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Emergency Surface Water
- Underground Storage Tanks
- Railroads - Active Service
- Powerline
- Powerline Arbitrary Extension
- Substation
- Landing Strip/Airport
- Stream
- Intermittent Shoreline
- Manmade Shoreline
- Ditch/Canal
- Aqueduct

- Pond, Lake, Ocean
- Reservoir
- Wetland
- Inundated Area
- Wellhead Protection Zone I
- Wellhead Protection Zone II
- Flood Zone Designations**
- 1% Annual Chance of Flooding
- Regulatory Floodway
- 0.2% Annual Chance of Flooding



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

BELCHERTOWN, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM



Overall Pelchen town



Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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

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

Features	Location	Ownership	V or S	FLOODING/ HEAVY PRECIP.	HEAT	DROUGHT	WIND/ STORM EVENTS	Priority	Time
				H-M-L	H-M-L	H-M-L	H-M-L	Short Long Ongoing	

Infrastructure									
* CULVERTS / BRIDGES				Field inventory of culverts, followed by re-site / replacement					S/L
* BEAVER MGMT PLANNING				COMPREHENSIVE PLAN → excavated post/inspections/health issues			*		S/O
* DRINKING H ₂ O STORAGE TANK				INCREASE CAPACITY → DECREASE STORM VULNERABILITY					S
TREES									
TOWN WELLS	Public →			DROUGHT PROTECTION INTERVENTIONS / USE RESTRICTIONS CITY- AND / AG. PRESERVATION AROUND TANKS!					
Wastewater Treatment Plant upgrades	Cold weather protections back-up generators			existing priority restoration agreement w/ National Grid					
Societal MICROGRID				→ EIT outreach component					
* PEST / VECTORS / MOSQUITO				Development of Moquito Control District / feasibility of joining vs. other options for town on its own				H	S/O
EMERGENCY COMMUNICATIONS				expand already robust + systematic text alerts				M/L	S/O
MOBILE HOME PARKS				encourage anchoring of structures				M/L	S/O
TRANSPORT, esp. related to commuting				Maintaining roads in/out of town				M/L	S/O
Δ / ↑ Population				↑ due to coastal refugees / southern refugees + stresses on systems				M/L	S/O
Environmental									
* IRRIGATION / H ₂ O COLLECTION / CONSERV.				Cistern demoled. program @ High School					
* TREE MANAGEMENT				Identify problem trees / replace w/ climate-resilient species - Preserving intact forest - solar guidelines; encourage already developed land					
* GD OPPORTUNITIES				investigate GE/LID techniques + priority sites					
* Open Space Acquisition									

connected



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			Time
				H	M	L	
Infrastructural							
Beaver Management Structures Planning	Wetland Complex	Private + Public	V				S+O
Quabbin Reservoir	Quabbin	Public	V/S				L
Waste Water Treatment	Georgetown	Public	V/S				M
Electrical Service (National Grid/Solar/etc)	Town-wide	Public/Private	V/S				M/H
Drinking Water Storage Tank	Quabbin	Public	V/S				S
Bridges	State Road 101, Mill Valley Rd, Pond Street	Public	V				L
Societal							
RR Hazards - Spills, etc.	Town-wide	Private	S/V				M
Δ Pests / Vectors / Disease Control	Town-wide	Private Public	V				S/O
Emergency Services	Town-wide	Public	V/S				M
Senior Community Population	Town-wide	Private Public	V/S				M
Agri-cultural Community (Livestock, Irrigation)	Town-wide	Private Public	V/S				M
Increase (or Δ) Population	Town-wide	Private Public	V/S				L
Environmental							
Beaver Management Planning	Wetland Complex	Private + Public	V				H
Open Space Acquisition	Town-wide	Public	V/S				M
Plant Community Changes	Town-wide	Private Public	V/S				L
Irrigation (Agricultural, etc)	Town-wide	Private Public	V/S				H/M
Invasives (Plants/Animals) Management	Town-wide	Private Public	V				M
Forestry Management	Town-wide	Private Public	V				M

Flood/Heavy Precipitation
 human factors, conduct from Comprehensive mitigation plan
 community level
 Cold front protection → tank covers
 - keep pumps up to maintain efficiency
 keep and tree cleaning in progress / ongoing
 keeping trees healthy / fighting pests.

Heat waves
 Solar panel / solar / solar etc.
 (capacity)
 Physical Integrity
 allows tank (existing, etc.) to be used year-round
 200,000 gal

Droughts
 National regard, infrastructure → complete
 → to be a control district plan to maintain it
 (communication = text + email)
 (communication = text + email)
 (communication = text + email)
 Planning for change in climate impact / change / etc.
 → How to address, assessing services
 transit

Wind Events Storms
 forested upland reg. for infiltration
 encourage southern species
 outreach + education
 from residential rain barrels to commercial infiltration / recharge to agriculture, etc.
 prioritize existing tree conservation on land
 outreach + ed to plant landowners - help them get grants for central multi-use land mitigation - e.g. solar w/ grazing etc.
 converted to solar vegetation used forward-thinking species choices



Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquakes, 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	Top Priority Hazards			Priority		Time
				Flood/heavy precipitation	heat	drought	Wind/storm events	H - M - L	
Infrastructural									
Culverts (problem culverts)	town-wide	municipal + state	V	resizing and/or green stormwater infrastructure/identifying	X		ditto	H	Some S Some O
town wells	around Jubisk Brook	Municipal	V	X	purchase land around them		X	M	S
generators	Wastewater treatment plant + River St	municipal	V	replace	replace		replace	M	L
dams (town dams) - 1 high hazard	town-wide	state + municipal	V	inspections - office at Dan Safety	X		inspections inventory	M	S
bridges	town-wide	municipal + state	V				detailed survey, possible replacement/rehab	L-M	O
New wastewater treatment plant only at 40% capacity	town-wide	municipal + state	S					L	O
Societal									
Senior center	State St	municipal	S	continue/expand funding				L-M	O
emergency communications	Police, Fire town-wide	Municipal	S	interdepartmental compatibility assurance				L-M	O
small-town culture - people know each other			S	Keep Culture				L	O
mobile home parks			V	similar to econ vulnerable populations	assess wells		encourage to anchor homes	M	L
economically vulnerable + homeless	town-wide, but some in commercial strip + mobile home		V	(lack of AC) cooling stations	(lack of water) improved access		(displacement) places for town	L	L
travel/community - we are bedroom community, people travel to work	mostly state roads		V	maintain roads + bridges	X		ditto	L	L
Environmental									
street trees (esp. ash)	town-wide	municipal	V	ditto + pests	ditto		inventory, removal of vulnerable trees, replant	M-H	O
Inappropriate S and feathered uses in flood plain			V	more inspection + enforcement				L-M	L
Open space + recreation		municipal	S	protection + acquisition				M	O
pests/vectors			V	increased disease				L-M	O
New species - plants animals insects			V	new disease + pests - research + monitor			public education, public testing for disease	L	O

Appendix C

CRB Workshop Presentation Materials



October 2011 Snowstorm (MassLive)



Cambridge Reservoir, Lincoln, MA (Boston Globe)

Municipal Vulnerability Preparedness Program Community Resilience Building Workshop Town of Belchertown April 20, 2018

Fuss & O'Neill Overview



At Fuss & O'Neill, we place great emphasis on collaboration; both within the company and with our clients. We are guided by what is best for the client and the project – in identifying client champions, naming project leaders, building project teams, and providing responsive service and quality deliverables.

We strive to partner with our clients to understand their businesses and to be stewards of their resources as if they were our own, and aim to develop services and solutions that anticipate evolution of their unique business needs.



MVP Project Team



Diane Mas

Diane is an environmental engineer in the Water Environment and Natural Resources group at Fuss & O'Neill. Her current areas of practice focus on climate change resiliency and adaptation for water resources; water quality assessment, modeling, and watershed management; harmful algal bloom impacts; and the relationship between water quality and public health.



Julie Busa

Julie is an environmental scientist in the Water Environment and Natural Resources group of Fuss & O'Neill. She has over 10 years of experience in the areas of global biodiversity and forest conservation, sustainability, and ecological modelling.



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 Belchertown
- Discussion by Belchertown representatives on status of current planning
- Introduction to CRB Workshop process
- Large group
 - Determine top four hazards
- Small work groups (Using Risk Matrix)
 - Identify Belchertown's vulnerabilities and strengths
 - Prioritize response actions
- Large group
 - Report out from small groups
 - Determine overall priority actions for the Town
- Discussion on next steps
- Conclusion



Belchertown MVP Program

- Grant Supports Climate Change Vulnerability Assessments and Resiliency planning
 - Comprehensive Approach
 - Infrastructure
 - Society
 - Environment
 - Scope and Process Use the Guidance in the Community Resilience Building Workshop Guide
 - Municipalities That Complete This Process Will Be Designated Municipal Vulnerability Preparedness (MVP) Municipalities

MVP Designation May Lead to Enhanced Standing in Future Funding Opportunities



MVP Action Grant NEW

- Grant supports priority actions identified at Community Resilience Building Workshop
- \$10,000 - \$400,000 available
- Local match of 25% - can be in-kind
- Request for Responses issued April 13th
- Application deadline Friday, May 18th
- Project award June 1st
- Projects must be completed by June 30, 2019
- Next funding round anticipated Fall 2018

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



Terminology

Climate Change

The Change in Usual Climate Conditions

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



Rising Temperature

Increases Across All Seasons

Average Temperatures (Projected)

Season	Baseline (°F)	Hampshire County			
		Projected change in Average Temp. (°F)			
		2030s	2050s	2070s	2090s
Annual	46.22	+3.35	+4.92	+6.35	+7.45
Fall	48.54	+3.76	+5.22	+6.77	+7.8
Spring	44.53	+2.77	+3.94	+5.42	+6.48
Summer	66.96	+3.42	+5.19	+6.6	+8.04
Winter	24.49	+3.62	+5.26	+6.74	+7.54

<http://www.resilientma.org/map/>



Rising Temperature

Increase in Number of Days > 90 F

Days > 90 °F
(Projected)

Hampshire County

Season	Baseline (Days)	Projected change in # days above 90°F			
		2030s	2050s	2070s	2090s
Annual	4.15	+11.45	+19.66	+30.4	+39.57
Fall	0.18	+0.94	+1.6	+3.11	+4.58
Spring	0.22	+0.41	+0.72	+1.35	+2.12
Summer	3.74	+9.86	+17.23	+25.44	+32.14
Winter	0	0	0	0	0

<http://www.resilientma.org/map/>



Changing Precipitation

Increases in All Seasons, especially Spring

Total
Precipitation
(Projected)

Hampshire County

Season	Baseline (Inches)	Projected change in inches of total precip.			
		2030s	2050s	2070s	2090s
Annual	47.88	+2.62	+3.78	+4.36	+4.77
Fall	12.29	+0.41	+0.57	+0.33	+0.13
Spring	12.48	+0.89	+1.22	+1.53	+1.84
Summer	12.48	+0.63	+0.88	+0.94	+0.91
Winter	10.62	+0.64	+1.06	+1.65	+2.18

<http://www.resilientma.org/map/>



Changing Precipitation

More Annual Dry Days, Greatest in Fall

Consecutive Dry Days (Projected)

Hampshire County

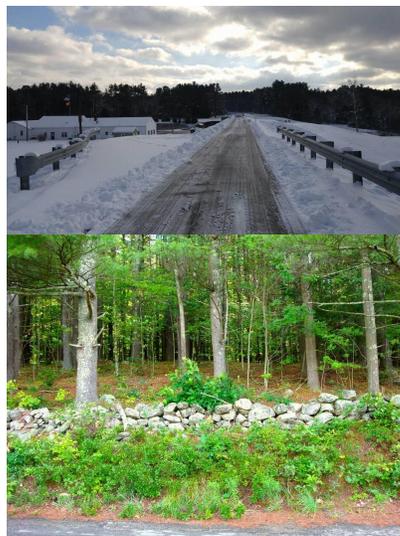
Season	Baseline (# Consecutive Days)	Projected change in # of consecutive dry days			
		2030s	2050s	2070s	2090s
Annual	16.45	+0.54	+0.91	+0.83	+0.81
Fall	11.85	+0.82	+0.94	+1.23	+1.26
Spring	12.04	-0.22	-0.05	-0.13	-0.14
Summer	11.63	+0.28	+0.25	+0.45	+0.33
Winter	11.5	+0.13	+0.4	+0.07	+0.06

<http://www.resilientma.org/map/>



Climate Change Impacts - Temperature

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



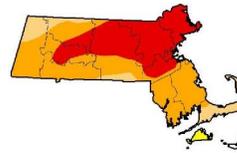
Climate Change Impacts - Precipitation

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



U.S. Drought Monitor
Massachusetts

October 25, 2016
(Released Thursday, Oct. 27, 2016)
Valid 8 a.m. EDT



Climate	Drought Conditions (Percent Area)				
	None	Slight	Modest	Severe	Extreme
Current	0.7%	15.3%	84.8%	0.0%	0.0%
Last Week	0.0%	10.0%	89.0%	0.0%	0.0%
1 Month Ago	0.0%	10.0%	90.0%	0.0%	0.0%
3 Month	0.0%	11.1%	88.9%	0.0%	0.0%
6 Month	0.0%	10.0%	90.0%	0.0%	0.0%
1 Year Ago	0.0%	17.1%	82.9%	0.0%	0.0%
5 Year Ago	0.0%	17.1%	82.9%	0.0%	0.0%

Legend:
 D1: Moderate Drought
 D2: Severe Drought
 D3: Extreme Drought
 No Drought
 No Drought
 No Drought

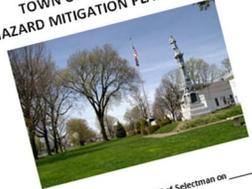
The Drought Monitor focuses on broad-scale conditions. For detailed analysis, see the underlying data source.

Author:
 David Goodrich
 National Operational Climate Center



Concurrent Planning Efforts

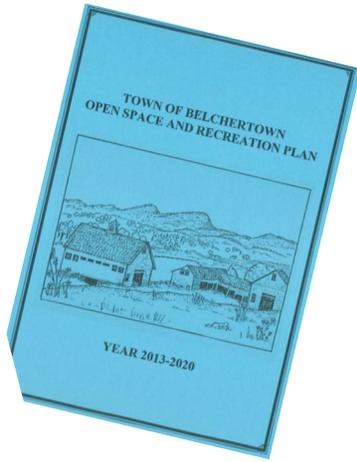
TOWN OF BELCHERTOWN HAZARD MITIGATION PLAN UPDATE



Adopted by the Belchertown Board of Selectmen on _____

Prepared by:
 Belchertown Hazard Mitigation Committee
 and
 Pioneer Valley Planning Commission
 60 Congress Street First Floor
 Springfield, MA 01104
 (413) 781-8000
www.pvpc.org

This project was funded by a grant received from the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation Services (formerly the Department of Environmental Management)



TOWN OF BELCHERTOWN OPEN SPACE AND RECREATION PLAN

YEAR 2013-2020



MVP Program

- Identify Top Four Hazards
 - Review MVP Sectors
 - Map 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



FUSS & O'NEILL

Climate Change Hazards

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



FUSS & O'NEILL

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



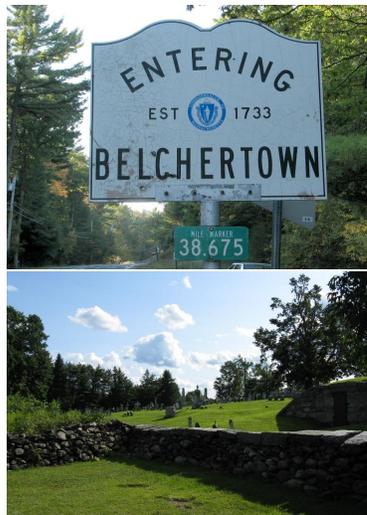
MVP Sectors

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



MVP Sectors

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



Community Resilience Building Workshop

Next Steps:

Public Review of Priorities
Monitor and Update
Annual Review

Community Resilience Building Workshop

Questions?

