Williamstown, Massachusetts

Community Resilience Building Workshop
Summary of Findings

JUNE 30, 2018

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Town of Williamstown

Community Resilience Building Workshop

Summary of Findings

June 30, 2018

1. Community Resilience-Building Process Overview

The need for municipalities to increase resilience and adapt to extreme weather events and natural hazards is becoming more evident among the 32 municipalities in Berkshire County, Massachusetts. In the recent past Williamstown, a town with the some of the highest elevations in the Berkshires and ample water resources, has experienced flooding due to heavy rains and ice jams along steep, fast running streams, endured prolonged power outages during severe winter snow and ice storms, experienced drought that has negatively impacted local farmers and increased the risk of forest fire, as well as incurred damages due to high winds blowing across the region's mountainous terrain. It is generally acknowledged here that climate change is a reality and will continue to make its presence felt in the future. Regional climate data for western Massachusetts further reinforces this anecdotal evidence.

Williamstown, located in the northwesternmost corner of Berkshire County, has a population of approximately 7,835 (U.S. Census, 2017 estimate) residents, an estimated 2,000 of whom are students at Williams College. The Town encompasses 46.86 square miles and sits in the fertile valleys of the Hoosic River and its major tributary, the Green River, plus two minor tributaries and multiple streams, ponds and wetlands. The community is surrounded by mountains – the Green Mountains of Vermont to the north, the Taconics to the west forming the border with

New York State and to the southeast, the Mount Greylock complex and its state-owned Reservation lands. The views from all points in town are dominated by forested mountains, fast moving streams, and open farmland, still actively used for dairy farming, hay and food crop production. The central business district includes Town Hall, Milne Library, the Elementary School, many retail shops, hotels and inns, plus the Williams College campus and the Clark Art Institute – together, forming the heart of the community.

The topography of Williamstown is one of the steepest in the Commonwealth (USGS data.) The overall vertical slope drops from 3,174 feet near the summit of Mt. Greylock (the actual summit at 3,491 feet is in Adams) to 594 feet in the Hoosic River Valley. These slopes are largely undevelopable because of their steepness and lack of stable soils. Residential and commercial development and transportation networks have historically been sandwiched into the valleys, which are relatively narrow. Other locations in the river valleys are wet, containing very heavy clay soils. These mixed conditions present major problems for flooding and sewage disposal for the community. A sewer system serves the central business district and has been extended to serve certain outlying areas, along Route 7 South to the high school. Some properties not served by municipal sewer must be fitted with oversize leach fields or artificial dry wells for septic treatment. The Hoosic River, running in a northwesterly direction through the northern section of town, provides a natural in-town greenway. Williamstown, along with the neighboring City of North Adams and Town of Clarksburg, have formed the Hoosic River Water Quality District (HWQD) and share a sewage treatment plant situated on the river in the northern part of Williamstown.

Flood plain areas exist along the Hoosic and Green Rivers and along the lower reaches of Broad, Hopper, Hemlock, and Buxton Brooks. The 100-year flood plain covers an area of 1,091 acres, or 3.6% of the town. Of this, 138 acres of floodplain are developed, which is 12.7% of the floodplain.

The population of Williamstown, apart from the college population, is showing a steadily-aging trend. The 2010 U.S. Census data shows decreasing percentages of people in the under 18 cohort, with a concomitant increase in the older adult age categories. By 2030, only 12 years from now, 60% of the population of Williamstown is expected to be age 50 or older. This trend is occurring across Berkshire County, and indeed the Commonwealth as a whole. The aging population brings with it added vulnerability for the Town, in terms of preparedness and response to weather and other natural hazard emergencies.

Changing weather patterns, repeated flooding and its aftermaths and the shift in Williamstown's population toward older, vulnerable residents - including a mix of seasonal visitors - has prompted the Town's leadership to take a proactive approach to assessing their vulnerability to severe weather and other natural hazards that have impacted the Town in the past and could impact the Town again in the future, if measures as not taken to address them.

During the winter of 2017, the Town of Williamstown began a joint planning process to update its expired Multi-Hazard Mitigation Plan (with funding from the Federal Emergency Management Agency) and to develop a Municipal Vulnerability Preparedness (MVP) Plan, (funding from the Massachusetts Executive Office of Energy and Environmental Affairs). The Town formed a Hazard Mitigation / Municipal Vulnerability Preparedness Committee to steer the process. Members of the Committee include municipal department heads and representatives from various town boards and committees from several disciplines, along with representatives of key community stakeholders such as Williams College, the Greylock Regional School District, Clark Art Institute and businesses. The Town retained the Berkshire Regional Planning Commission, a M'VP Provider, to aid them in developing the updated Hazard Mitigation Plan and the MVP Plan. The goal of the Committee's work was to develop a set of Actions for addressing Priority Hazards, using the Community Resilience Building (CRB) Workshop process and methodology as a key stakeholder tool. Approval of the plan by EOEEA will enable the Town to become eligible to apply for funding to implement the various preparedness measures identified through the CRB process.

Figs. 1-3. Workshop Participants Hard at Work

The Committee held a series of meetings to assemble data on the Town's infrastructure, identify known hazards to residents, including seasonal visitors, and review existing plans, procedures, bylaws and protections already in place. In addition, one-on-one interviews were conducted with key Town personnel and some of the main stakeholders identified by the committee, such as the Dept. of Public Works, Greylock Regional School District and the Council on Aging. The responses and collective wisdom received were used to guide Committee meeting discussions and mapping activities.

On May 21, 2018 an all-day Community Resilience-Building Workshop, attended by twenty-seven town officials, residents and other stakeholders, was held at the Milne Public Library. The central objective of the workshop was to first review regional weather events from the past and

climate change data and projections, then collect local data from attendees, and create a climate-related Natural Hazard Risk Matrix for the Town, including a written Summary Report that:

1. Defined the top natural and climate-related hazards in Williamstown
2. Identified existing or future strengths and vulnerabilities
3. Developed Prioritized Actions for Town departments to take, working with the broader stakeholder network and
4. Identified opportunities to collaboratively advance actions to increase resilience and reduce risk to persons, property and the natural environment, both now and in the future

On Thursday, June 7, 2018 at 6:00 p.m. the Town of Williamstown invited the public to an Information & Listening session at Town Hall, to display the results from the May 21st workshop and togain additional knowledge and insight. Residents had the opportunity to make comments and ask questions about the findings. The attendees were asked to confirm by sticker-vote, which of the prioritized actions on the completed Risk Matrices and mapped areas of concern, were the most important to them. Their votes are shown on the Master Matrix with asterisks (***), with each asterisk representing one vote. These additional votes and comments from residents will help to inform the strategies that the Committee and the Town of Williamstown adopt over the coming year.

2. Top Hazards and Vulnerable Areas of Concern

(a) Top Hazards

During the Community Resilience Building Workshop held on May 21, 2018, participants were asked to name the top natural hazards to the Town as identified by the MVP Advisory Committee in previous meetings and interviews. A summary of the discussion around identified hazards was as follows:

Top Four Hazards:

- Flooding from Rivers and streams (listed at each of the 3 tables)
- Snow/Ice (listed at 3 tables)
- Drought (listed at 2 tables)
- Fire (listed at 1 table)
- Wind (listed at 1 table)
- Severe Weather (listed at 1 table)
- Power Outage (listed at 1 table)

(b) Vulnerable Areas

Infrastructure: Bridges, Culverts, Water/Sewer Piping, Roads and Railroad all around Town, but especially in the central and northeast quadrants on the Hoosic and Green River watersheds (*See Critical Facilities and Floodplain Comparison Maps,* Appendix A.)

Shelter: No long-term shelter facility (Elementary or High School)

Neighborhoods: Residential homes in the floodplain including Colonial Village White Oak, N. Hoosic and Sand Springs Road

Vulnerable Populations: Throughout Town - Elders/Medically Vulnerable, Seasonal and Transient Populations

Environmental Integrity: Throughout town – Forest Management and tree replanting plan; river and stream bank erosion; surface water quality impairment

3. Current Concerns & Challenges Presented by Hazards

Flooding of Infrastructure especially the Bridges, culverts, roads, water/sewer piping, Pan Am Rail line and residential homes in the central and northeastern parts of Town, was at the top of the list in all three Workshop groups. In recent memory, those areas have experienced repeated storm impacts during severe rain storms or after prolonged freezing and thawing temperatures caused ice jams and overflows.

After the memorable 2011 flooding caused by Tropical Storm Irene wiped out an entire 250-person mobile home park called The Spruces, flooding from severe storms has been "top of mind" for Williamstown residents. Repeated flooding of homes due to ice jams and heavy rain in the White Oaks, North Hoosic and Colonial Village neighborhoods continues to be a problem. Those neighborhoods are in the delineated FEMA 100-year flood plain, but other areas directly adjacent experience constant damp conditions or seepage/flooding in their basements, as well. In the downtown area, along Water Street as well as at Meacham and Latham Streets, repeated flooding of commercial properties has also occurred along Christmas Brook and other tributaries.

Culverts and bridge abutments have been clogged and damaged by ice and cobbles moving downstream with the floodwaters. The structural support of the 48" subterranean sewer interceptor pipe along the Green and Hoosic Rivers has been seriously undermined by river scouring during recent storm flows. The steep slopes along Sloan Road and at Scott Hill and Stone Hill Roads are newer areas of flood hazard concern.

Severe bank erosion has occurred along many of Williamstown's rivers and streams, causing acreage, crop and vegetative losses. Water quality in multiple water bodies has been negatively impacted by increased turbidity, sedimentation and increased water temperatures – all threats to aquatic life (*See Environmental Concerns map, Appendix A.)*

Another noteworthy concern is the constant action of beavers throughout Williamstown's many pond and wetlands, that has caused the railroad tracks along Bridges Pond and nearby roads to washout or become undermined, with little warning.

The economic impacts of flooding have not been fully assessed during this process. However, debris that washes downstream after a flood has required intensive cleanup efforts, by both the DPW, hired contractors and the utility companies, often taking days or weeks to complete and adding to the overall flood burden.

Power Outage often accompanies storm events throughout the year. The higher elevations in the Town exposes it to the impact of frequent High Winds, often part of heavy rain, snow and ice storm events. Electrical infrastructure in Williamstown is largely exposed to the elements, making it vulnerable to falling trees, branches or coatings with ice. The threat of prolonged power outage, particularly during more frequent winter freezes, is a growing concern. While some residents are prepared with backup heat sources and generators, most others have to make other arrangements on their own. Town Hall as well as a few other locations, have backup generators for short-term warming or cooling, but currently, Williamstown lacks a location with longer-term Sheltering capability.

Drought is seen as a threat, even in this Town of ample surface and ground water resources. Weather pattern changes bringing extreme temperatures and variable precipitation are likely to increase, according to MA Climate Change Projections. While Williamstown's aquifer is judged to be ample and many deep wells supply public water in much of the Town, there are neighborhoods that are still served by private wells. Workshop participants say some wells are dug rather than drilled, and therefore, quite shallow. Shallow wells in flood-prone areas may be more easily contaminated by storm water, hazardous spill or septic system failure, while those in upland areas are more prone drying up, during periods of drought. In the recent summer droughts of 2016 and 2017, farmers experienced some drying up of wells and crop loss to the extent that they had to import hay to feed their livestock. There is presently no procedure in place to provide a backup water supply to farmers nor homeowners on well water, in the event of drought, flood or other contamination.

Williamstown is a historic community surrounded by a heavily forested terrain, with an aging tree cover, including the central business district. Some of the forested properties adjacent to downtown or in nearby neighborhoods are owned/managed by the Commonwealth, or by institutions and private owners, presenting a challenge for effective monitoring and management. The threat of Forest Fire, particularly in periods of drought that could quickly spread to nearby properties, is another area of concern. The need for a Forest Management Program - important for the overall health of the ecosystem – was identified as an important need. Removal of downed trees, controlled burning, control of increasingly-serious infestations by a variety of insects and an ongoing limb- management program to keep roads free of downed branches, were mentioned as areas requiring attention by MVP Workshop attendees. Regular replacement/replanting of aging trees should be integrated into the forest management program, as well.

(a) Specific Categories of Concerns & Challenges

Vulnerable Infrastructure and Utilities

Bridges and Culverts: The high number of stream-crossing bridges and culverts town-wide present a constant set of challenges to Williamstown's DPW. The steep slopes in town make for high velocity stream flows, under normal circumstances. But added volume from heavy downpours, sudden snow melt or severe ice jamming caused by prolonged freezing temperatures, has caused repeated damage to this infrastructure. Broad Brook has a steep, fast moving flow, that carries a lot of cobbles and sediment down from upland areas. The bridge crossing on Rte. 7 is nicknamed "The Boulder Field," because one can hear the boulders moving downstream during heavy flows, often hitting the piers of the bridge as they move. Even though the bridge was completely rebuilt in the early 2000's, today there is very little clearance underneath it. Bulldozers used for dredging and boulder removal can no longer fit underneath it. During Tropical Storm Irene in 2011, floodwaters reached the underside of the bridge.

Smaller culverts too, present similar challenges throughout town. Often multiple culverts along the same stream will become clogged and flood nearby roads, wiping out riverbanks along their paths. The Town regularly cleans out culverts and repairs the banks, only to have the cycle repeat itself later. Such was the case with a memorable rainstorm in May, 2013 at Petersburg & Northwest Hill Rds., pictured here:

Fig. 4. Flooding from Rain Storm 2013

Capacity of Town Water & Sewer: The Town-supplied water system is limited to areas in and around downtown. All other residents and community buildings (including Mount Greylock High School), are reliant on on-site wells. Some of the private wells are shallow wells located both in flood hazard areas, north of downtown and in the farming areas on town edges.

The wastewater treatment plant has difficulty processing sewage during certain high flow periods. Such periods also cause difficulty for stormwater infrastructure although that is currently being addressed in the downtown area by Williams College. Portable back-up generators for various sewer pumps and the three main water pumps that provide potable water service to town are available, but permanent backup generation would be preferable. Other sewer infrastructure issues include the two sewer interceptors that run along the banks of the Green and Hoosic River. These have been periodically undermined by erosion in the past and

require careful monitoring and repairs. The 48" main on the Hoosic is of particular concern as the line carries all wastewater from the City of North Adams to the Hoosic Water Quality District Plant.

Vulnerability of Railroad Tracks: The Pan Am Railroad line that runs in a northwesterly direction along the Hoosic is being undermined by flooding, some due to beaver activity on Bridges Pond. Historically, there has been little if any, regular engagement with the owner/operators of railroad, which carries, among other things, known hazardous materials to area industries. Lack of regular track maintenance was a noted concern, as was the rail owner's reluctance to share their hazard response procedures or plans with the first-responder community.

Vulnerability of Electric and Telephone infrastructure: The mountainous terrain in Berkshire County and the relatively low population (and demand) have left residents with a "spotty" mix of cell and landline phone service and an incomplete broadband network in some areas. In severe weather, cell service is often incapacitated. Electrical infrastructure, particularly power lines, are exposed to the elements. This has direct implications for emergency management and town-wide communications. The need to establish redundancy, or alternate means to "get the word out" is a clear vulnerability for Williamstown.

Lack of Shelter: While many critical Town-owned facilities have backup power generators, and some have been used as short-term heating/cooling shelters in the recent past, currently there is no long-term emergency shelter in Williamstown. Both the Elementary and High Schools have been considered for such a facility. After the need to evacuate 250 people arose suddenly during Tropical Storm Irene, this issue is of critical importance to Williamstown residents and stakeholders.

Limitations of Gravel Roads: Many parts of Williamstown are traversed by gravel roads, that run along and crisscross upland streams, especially on the outskirts of town. These roads present a hazard to residents, as they tend to washout with some frequency, as culverts become inundated with stones, debris and silt. The situation is further exacerbated during winter cycles of freezing and thawing, which often leave the road surface muddy and rutted and inaccessible to emergency vehicles.

Floodplain Neighborhood Flooding: At present, there are 156 buildings in Williamstown that are located within the 100-yr floodplain (utilizing MassGIS floodplain data), including some historic structures. Of those, 139 are residential homes, many in the northern part of town along the Green River, Hemlock, Buxton and Broad Brooks (Source: BRPC.) According to the Massachusetts Emergency Management Agency (MEMA) data, there have been only 24 flood insurance claims in town between 1978-2017, totaling $153,000, and no repetitive loss claims during that same period. This same data indicates that only 67 properties have active flood insurance policies, with total coverage equal to $12,000,000. According to the HAZUS flood model, which estimates the potential damages to residential properties (including contents) located in the FIRM 100-year flood area, up to $48 million dollars in damages could occur during

a 100-year flood event. In addition, the need to evacuate those affected residents would require Williamstown to shelter an estimated 600 people.

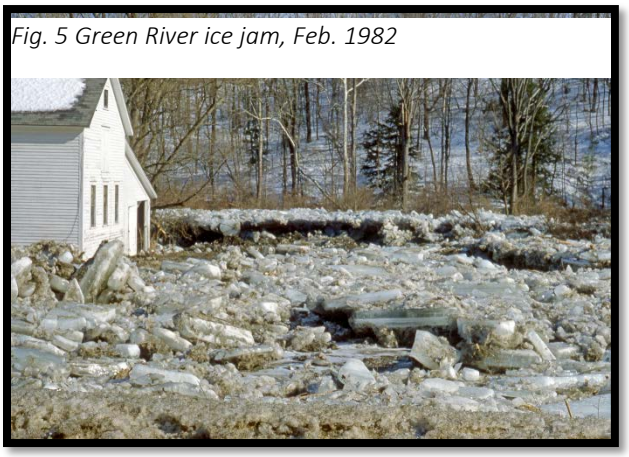

Fig. 5 Green River ice jam, Feb. 1982

The northeastern part of Williamstown, particularly in the White Oaks neighborhood on Sands Springs Road, presents the most immediate flood risk, due to the high velocity and close proximity of Broad Brook during flood events.

In January, 2018 ice jams on Broad Brook stranded 40 workers at Steinerfilm, Inc., who had to be evacuated using a surplus Army truck, when over five feet of water blocked the road to their building. Not only were yards and basements inundated in this jam, but automobiles were set afloat in the waters. The Fire Department was called upon to pump out basements afterwards – a service not normally part of their emergency response regime. Also, this winter, ice jams occurred on Water Street at a meander upstream of Cable Mills. A contractor with a bulldozer had to be hired to free the jam, allowing the floodwaters to return to their normal channel.

When severe weather effectively shuts down the entire town, the negative economic impacts to businesses is measurable. According to the latest HAZUS data and modeling for Williamstown, potential damages to commercial and industrial properties located in FIRM areas from a 100-year flood, including contents, is estimated at over $72 million. The value for business interruption would amount to over $300,000 and up, depending on duration.

Since most residents and businesses do not own flood insurance and many have been affected by flood events, both in the past and more recently, building resilience and mitigating natural hazards to the extent possible, is of paramount importance.

Vulnerable Societal Issues

Vulnerable Populations: Apart from the Williams College student body, Williamstown's resident population is 'aging', creating a potentially more difficult challenge to emergency management. Prolonged power outage or flooding often brings health impacts, especially for the medically vulnerable, of any age. Some of the more populous and popular sections of town happen to be in the floodplain. Aside from older adults, young school children, persons living in private nursing or rehab facilities, and those living in group housing in town, also require special consideration when crafting a Municipal Vulnerability Plan.

Community-Wide Communications: Williamstown is a cultural destination, home to the Berkshire Theater Festival and the Clark Art Institute and other attractions. And as the home of

Williams College, it is an academic hub, as well as an attractive retirement community, especially for faculty. As such, there is a large seasonal population, including students, parents, second homeowners, theater and arts-loving tourists, hikers and campers. While Williams College is largely self-contained, having their own emergency plans for the academic community, other visitors would, naturally, be largely unaware of how to seek shelter, or whom to call, in case of a sudden natural hazard emergency. Coordination between and among the Town, its residents, second homeowners, the College and other private institutions, students, parents, seasonal campers, the tourist hotel and property rental community, presents another important challenge for Williamstown's natural hazard response and sheltering strategy.

Inadequate Volunteer & First Responder Staff: A related effect of the aging of the population is a growing shortage of volunteers for both the Fire Department and Ambulance services in Williamstown and the rest of Berkshire County. Because the total population of the county numbers only about 126,300, (US Census 2017 projected population) it has been difficult to retain medical doctors and specialists in the region. With the closing of the hospital in neighboring North Adams some years ago, there is currently no full-service critical-care facility located in or near Williamstown. All these factors will be considered when crafting the Williamstown Hazard Mitigation Plan.

Vulnerable Environmental Issues

Williamstown's historic nickname of "the Village Beautiful" is still applicable today. The beauty of this lush, mountainous region with abundant water resources and wildlife, makes it ideal for any type of outdoor recreation and enjoyment, all year 'round. But changing weather patterns have created challenges for the Town's natural assets, which many believe are directly attributable to climate change.

Degraded Water Quality: The town's abundant streams, ponds and wetlands are showing signs of degradation in water quality. Heavy precipitation, increased temperature and bank erosion translate into increasing turbidity and sediment deposition that together, decreases overall hydrologic and biologic functioning. The long-term effects of these changes on the flora and fauna of the region, remains to be seen.

Negative impacts to Farm Production: Raising livestock and growing crops has become less economically viable and productive, due to changes in precipitation patterns, higher temperatures and drought. Some irrigation wells that also water livestock, have dried up, necessitating a change away from livestock production, to less water-intensive uses. Hay, normally grown for feed, often has to be trucked in from out of the region. Bank erosion has meant a loss of overall acreage, trees and other vegetative losses.

Need for Forest Management: Williamstown is surrounded by forest, which could provide ample fuel for forest fire, especially during drought periods. Forest tree species including ash, maple and oak trees, have a long lifespan. But, aging tree cover is prone to a variety of ills, including insect infestation, such as the emerald ash borer and the wooly adelgid– both of which have

been a growing threat in the region. In recent years, Williamstown's urban tree cover is showing signs of aging out – with both limbs and whole trees coming down during storm events. The need for a forest management plan, including greater species diversity and a reforestation scheme, were raised as important concerns to the overall health of the forest and town center ecosystems.

4. Current Strengths & Assets in Williamstown

Because of Williamstown's historic and recent experiences with extreme weather, the Town and CRB Workshop participants are aware of the existing strengths within the community. Reinforcing and expanding these assets, policies and supportive practices, will generate greater benefits to the entire community through increased resiliency to future storms of greater frequency and intensity, or when faced with long-term changes in precipitation and temperature levels.

Infrastructure Strengths

- Water supply pumps and wellheads are protected
- Public water aquifer is extensive, and system has additional capacity to extend to new users
- Williams College is installing extensive new storm water system in downtown (Christmas Brook)

Societal Strengths

- Community is proactive, cohesive and generally supportive of protection and enhancement efforts for benefit of all
- Mutual Aid during emergencies between Towns in region is excellent
- Williams College has its own evacuation plan
- Nursing & rehab facilities are self-contained and have backup power
- COA maintains list of "vulnerable" seniors and has an outreach program to reach them; Senior Center is cooling/warming place
- Town has storm water bylaw, requiring on-site storage already
- Town has a functional Code Red system that can be enhanced/broadened
- Local Emergency Preparedness Committees are active in ongoing training of first responders

Environmental Strengths

- The Spruces Site Reuse Committee is actively working on a plan appropriate to floodplain location
- Extensive forest cover has cooling effect and provides rich habitat for a wide variety of plant and animal species
- Aquifer is extensive, and water is of good quality

5. Top Recommendations to Improve Resilience to Hazards in Williamstown

By focusing on multiple storm events and their impacts on infrastructure, business facilities and operations, neighborhoods and residents, CRB Workshop attendees gained greater clarity on what lessons were learned from those experiences. More importantly, they gained insight into what procedures need to be improved, to make emergency preparedness and response, part of the fabric of the community. It was generally agreed that no single Town department had the resources to do all the strategic planning and implementation that is required. Attendees felt strongly that all community members needed to "take ownership" of emergency preparedness and response to hazards and that it was "doable" in this forward-thinking, tight-knit community.

Fig. 6. Top Priorities from the Workshop

Infrastructure

- Create a prioritized list of Bridges, Culverts, Pipes and Roads
- Seek grant funding for repair/replacement of infrastructure (as above) is a first order recommendation for this area of concern.
- Ongoing beaver monitoring and track maintenance to prevent flooding of tracks
- Study the expansion of the public water and sewer systems to serve those areas currently using private wells and septic systems in flood hazard zones identified.

Education & Public Outreach

- Educate the public about emergency procedures and emergency services, access to critical resources - like food and potable water supply, medical services, fuel, and identifying the locations with backup generators for short-term shelter and shared use, should be made widely available.

- Research and educate homeowners and businesses on flood water storage best management practices, low-impact development tactics, integrated with the Public Education & Outreach about storm and natural hazards generally, is a recommendation.
- Town wide communication through a variety of means and creating a backup communication system for when cell phones or power is out
- Conduct outreach on how to sign up for Code Red and encourage enrollment in this and other emergency notification systems
- Outreach to residents for how to "Shelter in place" including creating a home emergency kit, and where to go to find a cooling or warming shelter for the day, was deemed important. Evacuation routes and the locations of regional shelters should also be made more generally known. Holding multiple public forums and creating targeted educational campaign(s) to 'multiple publics' in Williamstown - including to tourist sites, hotels and inns, second homeowners, campsites and to rental property owners, etc., also needed to be developed an integrated into the overall Shelter Strategy.

Sheltering

- Develop an overall Shelter Strategy both for short and long-term needs was identified as one of the top recommendations to increase resilience in Williamstown. While some of the critical facilities in Town have a backup generators and can provide short-term, small-scale shelter for a few, there is currently no "full" shelter for larger populations and for a longer stay, in Williamstown.
- Make required upgrades to the Elementary School to serve as an adequate long-term shelter facility.

Workshop Top Priority Recommendations for Williamstown From Matrices

Highest Priorities

- Develop an overall Shelter Strategy; consider school buildings for sites
- Develop a prioritized list of critical infrastructure, including bridges, culverts, pipelines, that need evaluation/improvement/replacement including specific sites identified at Workshop
- Seek grant funding to replace or expand infrastructure
- Establish a system to monitor beaver activity to prevent flooding at Railroad/other locations
- Establish public information/outreach/education program on issues and procedures, including voluntary sign up for Code Red, sheltering, preparedness, evacuation procedures, etc.
- Adopt, educate, assist and enforce use of flood mitigations methods/strategies for property owners in flood prone areas
- Study extension of public water system to areas on well water
- Update Town-wide All Hazards Plan

Moderate Priorities

- Expand Council on Aging resources for growing elder population
- Advocate for protecting vulnerable electrical grid
- Assign Select Board members as community liaisons to transient community

- Create short-term warming and cooling sites w/backup generators at Elementary school and Senior Ctr.
- Agricultural Committee to research/educate farmers on resources
- Encourage volunteerism and create incentives, especially for Fire District
- Investigate enlarging storm sewer system in Colonial village/other locations
- Engage and coordinate with Railroad owner/operator for hazardous spills response procedures
- Broad Brook cobbles – maintain as needed work with Fed./state agencies on permitting
- Gravel roads – maintain and enlarge drainage as needed
- Urban tree cover – proactively seek financial resources for new trees

Lower Priorities

- Assess condition of bridges at stream crossings impacted by ice/cobbles (Rte. 7 and Cole, etc.)
- Flooding at Colonial Village
- Promote Forest Management plan for invasive insects, downed timber and replanting pro
- Land subsidence on Scott Road – assess conditions/control water uphill of site
- Hoosic Water Quality District monitoring - assess sewer treatment plant capacity and low flow
- Work with utilities to assess vulnerable power lines for relocation underground
- Investigate feasibility of extending water system to northeast section of town
- Educate residents to prep for drought – conservation measures; use of drought tolerant lawn and plants; identify resources
- Make residents aware of presence of geologic fault line; include in emergency preparedness literature and public education program

6. CRB Workshop Invitees / Attendees* with Affiliations

Below is a list of Williamstown stakeholders that were invited to participate in the CRB Workshop. Those with an asterisk, (*) are those who attended the Workshop.

Name	Affiliation	Attendee*
Brian O'Grady	Director, Council on Aging	*
Mike Ziemba	Williamstown Police Dept.	
Steve McMahon	Housatonic Valley Assn	*
Mike Evans	Zilkha Center for the Environment, Williams College	*
Bill Power	The Clark Art Institute	*
Dave Fitzgerald	Williams College	
Carrie Gagne	Williams College	
Jane Allen	Former School Principal & Select Board Mbr.	
Fred Puddester	Williams College	

Mike St.Pierre	The Buxton School	
Matt Noyes	The Clark Art Institute	*
Tammy Andrews	Director, Williamstown Housing Authority	
S Leblanc	Sweetbrook Berkshires Rehab & Nursing	
Pam Weatherby	Williamstown Rural Lands Fdtn. & Author, *Flora of the Berkshires*	
Allen Hall	Business Owner/Youth sports	
Tom Sheldon	Select Board	
Sue Wells	Pine Cobble School	
Amy Jeschawitz	Planning Board	*
Jeff Kennedy	Board of Health	*
Sue Briggs	Chamber of Commerce	*
Sue Hamblin	Williamstown Community Pre-school	
Jason Hoch	Town Administrator	*
Joelle Brookner	Elementary School	*
Kim Grady	Superintendent of School Distr	*
Tim Kaiser	DPW	*
Brad Furlon	Hoosic Water Quality District	
Carin DeMayo-Wall	BonnyLea Farm	*
Jim Kolesar	President's Office, Williams College	*
Todd Cairns	Williamstown Common Nursing & Rehabilitation (Berkshire Health Systems)	*
Frank Pekarski	Mgr. Safety & Enviro Compliance Williams College Facilities Dept.	*
Andrew Groff	Director, Planning & Community Develop't	*
Stephanie Boyd	Director, Zilkha Center for the Environment at Williams College & Planning Board	*
Sarah Gardner	Williamstown Agricultural Commission	*
Craig Pedercini	Chief, Fire Dept.	*
Kyle Johnson	Williamstown Police Dept.	*
Laurence Stevens	Hoosic River Watershed Assn.	*
David Dethier	Williams College	*
Alexander Carlisle	Planning Board	*
Susan Abrams	COOL (Lowering Co2) Committee/Williams College	*
Mark Longhurst	Pastor, First Church of Williamstown	
Ryan Contenta	Building Commissioner	*

Rob Wnuk	Facilities, Mt. Greylock Reg'l School District	*
Lauren Gaherty	Senior Planner, Berkshire Regional Planning Commission (MVP Provider/Workshop Facilitator)	*
Margaret McDonough	Planner, Berkshire Regional Planning Commission (MVP Provider/Team Leader)	*
Mark Maloy	GIS, Data & IT Specialist, Berkshire Regional Planning Commission (Team Leader)	*
Will Sikula	Planner, Berkshire Regional Planning Commission (Team Leader)	*

Williamstown Hazard Mitigation / MVP Committee

Name/Title	Williamstown Title or Other Affiliation
Andrew Groff	Director, Planning & Community Development Department; Project Team Leader
Craig Pedercini	Chief, Fire Department
Jason Hoch	Town Administrator; Workshop Project Team
Henry Art	Williams College
Amy Jaschawitz	Planning Board
Timothy Kaiser	DPW
Kyle Johnson	Police Dept.
Jeff Kennedy	Board of Health Inspector
Matthew Noyes	Clark Art Institute
Tony King	Clark Art Institute
Brian O'Grady	Director, Council on Aging
Joelle Brookner	Principal, Williamstown Elementary
Sue Briggs	Chamber of Commerce
Bill Powers	Clark Art Institute
Jim Kolesar	President's Office, Williams College
Kim Grady	Supt., Mt. Greylock School District

7. Acknowledgements

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8. Citation

Williamstown Hazard Mitigation / Municipal Vulnerability Preparedness Committee, 2018. *Williamstown Community Resilience Building Workshop Summary of Findings*, Williamstown, MA.

Appendix A – Workshop Materials

Town of Williamstown
Community Resilience Building Workshop, May 21, 2018

~ Workshop Objectives ~

1) Understand connections between ongoing issues, hazard, and local planning and actions in your Community. Define top hazards.
2) Identify and map vulnerabilities and strengths to develop infrastructure, societal and environmental risk profiles for your Community.
3) Develop and prioritize actions that reduce vulnerabilities and reinforce strengths for your community - local organizations, academic institutions, businesses, private citizens, neighborhoods, and community groups.
4) Identify opportunities to advance actions that further reduce the impact of hazards and increase resilience in your Community.

ACTIVITIES and OBJECTIVES
9:00 a.m. -- Welcome, Workshop Overview, Introductions, Posters *Objective: Workshop purpose*
9:30 a.m. -- Overview Presentation on Hazards and Vulnerability *Objective: Identify risks – What has already been identified? What is the data telling us?*
10:30 a.m. – Small Team Exercise *Objective: List Top 4 Hazards in the Town and List Community Vulnerabilities and Strengths*
Noon – 1:00 p.m. – Lunch! Please View Posters
1:00 p.m. – Reconvene Small Teams – List and Prioritize Actions *Objective: List and Prioritize Actions – Choose Top 4 Actions*
2:00 p.m. – Small Teams Report Out to the Full Group *Objective: Present findings and Prioritization of Top 4 Actions*
2:40 p.m. – Top Priorities *Objective: Collectively Prioritize Central Action List*
3:30 p.m. -- Wrap up and Next Steps

A FEW KEY TERMS FOR TODAY

Natural Hazard – Source of harm or difficulty created by a meteorological, environmental or geological event

Risk – Potential for damage, loss, or other impacts created by the interaction of natural hazards with people, structures, facilities and systems that have value to the community

Vulnerability – Characteristics of people, structures, facilities and systems that make them susceptible to damage from a given hazard

Preparedness – Actions taken to plan, organize, equip, train and exercise to build and sustain the capabilities necessary to prevent, protect against, mitigate the effects of, respond to, and recover from those threats that pose the greatest risk

Mitigation – Sustained actions taken to reduce or eliminate long-term risk to life and property from hazards; *the work done up front to reduce the impacts of a hazard*

100-Year Flood Event – one that has a 1% annual chance of occurring, commonly called 100-yr flood event; this is statistical occurrence only – a town could experience two 100-yr flood events in a short period of time (or conversely not experience any within 100 years or more)

100-Year Floodplain – area of flooding associated with a 1% annual probability of occurrence; the boundary of the 100-yr floodplain is used by many agencies to assign flood risk, including FEMA and the National Flood Insurance Program

Natural Hazard Mitigation and Municipal Vulnerability Preparedness



Town of Williamstown
May 21, 2018

What is a Hazard Mitigation Plan?

A Mitigation Plan…

- Describes the natural hazards in a community
- Assesses the vulnerability of a community to the identified hazards
- Describes activities that can be done to mitigate the hazards before they occur
- Mitigation Plan is a REQUIREMENT to maintain eligibility for HMGP & PDM funds (Federal Disaster Mitigation Act of 2000)

Municipal Vulnerability Preparedness Program 2017

Why MVP?

- Consider weather pattern observations and climate change projections
- MVP certified communities will have priority status for some state grant opportunities
- MVP grant funds may be more flexible than FEMA for local mitigation projects

State and local partnership to build resiliency to climate change

1. Engage Community
2. Identify CC impacts and hazards
3. Complete assessment of vulnerabilities & strengths
4. Develop and prioritize actions
5. Take Action

A Few Key Terms for Today

Natural Hazard – Source of harm or difficulty created by a meteorological, environmental or geological event

Risk – Potential for damage, loss, or other impacts created by the interaction of natural hazards with people, structures, facilities and systems that have value to the community

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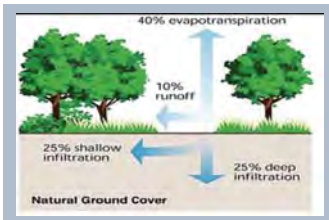
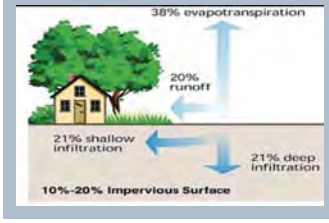
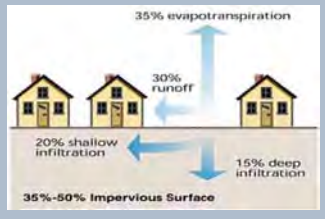




Changes in water patterns:

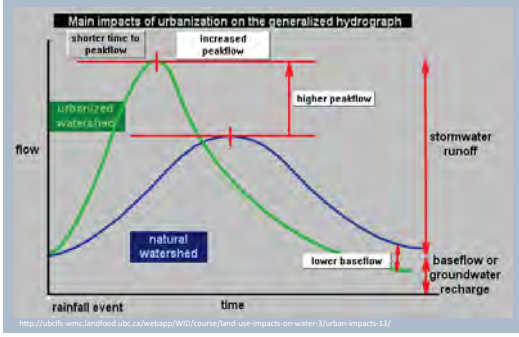
Impervious Surface = Increased Runoff



+ Piped runoff =

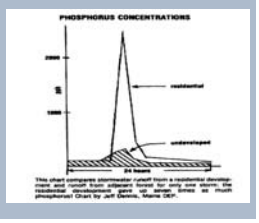


= Quicker, higher peak flow volumes

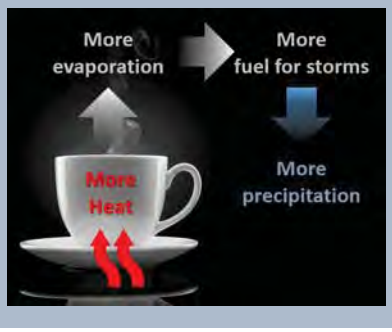


http://ubclfs-wmc.landfood.ubc.ca/webapp/WID/course/land-use-impacts-on-water-3/urban-impacts-13/

(And higher pollutant loads)



And Then There's Climate Change



Key Observed Climate Changes in MA

Temperature: ↑ **2.8°F** since 1895 (7-10°F by 2100)
Berk. temp. up 1.7°F since 1960

Growing Season: ↑ **10 Days** Since 1950

Strong Storms: (heaviest 1% of annual) ↑ **71%** Since 1958

Extreme Heat Days in Hoosic Watershed

	Current		Projected by Mid-Century (2050s)	Projected by End Century (2090s)
Days per year above 90°F	≤1	↑	+ 4 - 17	+ 6 - 50
Days per year above 95°F	0	↑	+ 0 - 5	+ <1 - 11
Degree Cooling Days		↑	+ 4 - 16%	+ 35 – 460%

Observed Number of Warm Nights

- Number of Nights where minimum temp. > 70° F

Observed No. Extreme Precip. Events

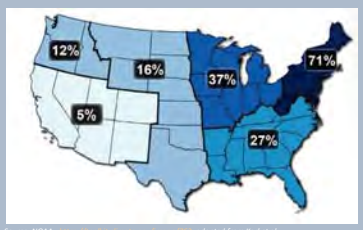
- Number of Events w/ Precipitation > 2" in 1 day*
  "Stepped Increase" in 1970-80s
  Increase of up to additional 1/5 day mid-century in Hoosic, with summer higher risk*

https://statesummaries.ncics.org/ma

** Different sets of data*

More Extreme Precipitation

71% Observed 1958-2012



Source: NOAA - https://health.climate.gov/images/1902, adapted from Karl et al.

Photo: Ricci, NRCS

Change in 24-hour, 100-year Design Storms (inches)

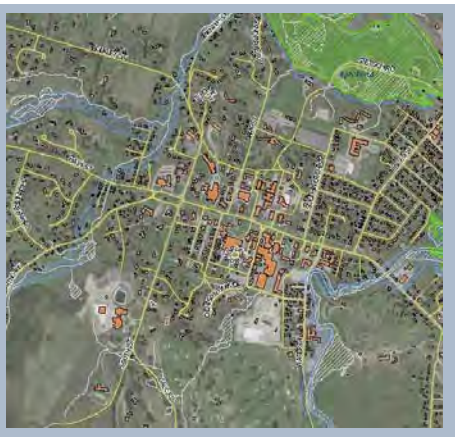
	NOAA TP-40	NOAA Atlas 14	Change
Boston	6.6	7.8	+1.2"
Worcester	6.5	7.6	+1.1"

Flood-plain Mapping

Flood-plain Mapping

Same building, March 2010 flood (approximately 40-year flood)

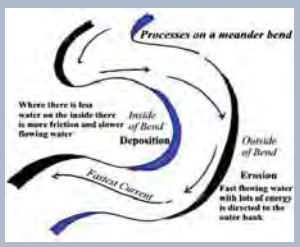
Floodplain boundaries in Williamstown



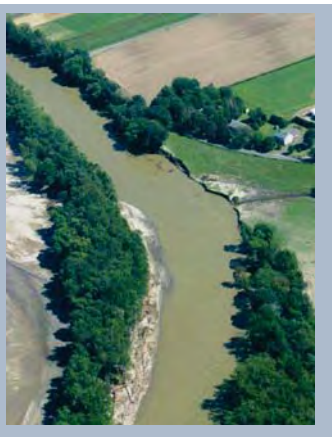
Rivers Move – Give 'em Room

Scour on the outside of meander bends.

Deposition on inside of bend



courtesy Carrie Banks, MA Division of Ecological Restoration

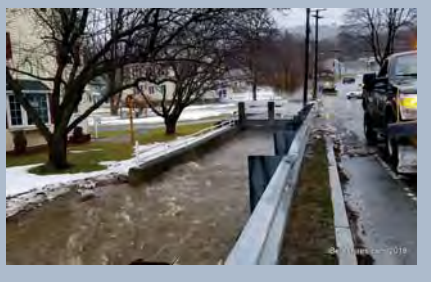


Leave that floodplain open for the Big Event

Winter Weather Changes

Cycles of cold and warm will increase, alter risks

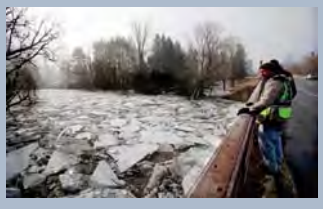
- **Warmer temps:** Less snow pack = altered water regimes and soil moisture
  - **More rain-on-snow events =** Increased runoff, risk of winter floods
  - **Less groundwater recharge** = lower baseflow in streams, rivers, reservoirs
  - **Loss of snow insulation** = freeze/thaw = increased risk of frozen pipes, drains
  - **Dryer spring soils**



Winter Weather Changes

Cycles of cold and warm will increase, alter risks

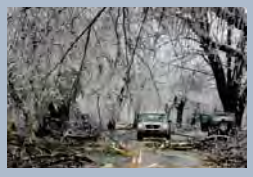
- **Ice Risks:**
  - Ice jams
  - Ice storms = potential loss of electricity

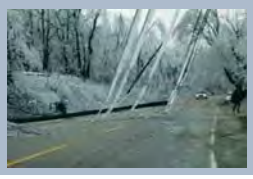


Ice Jams Jan. 2018 in Stockbridge, Cheshire

Ice Storm December 2008

- **Loss of electricity for 1+ million customers**
- **Some for more than 2 weeks**
- **FEMA obligates >$32 million in Mass.**
  - State costs >$7 million
  - Municipal costs >$5 million
  - National Grid claims damages of >$30 million
  - Small businesses without electricity "lose tens of millions of dollars"*



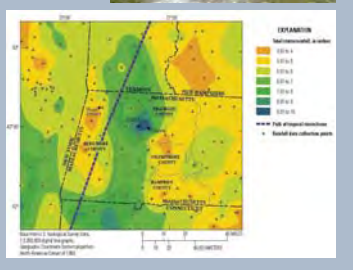


** MA Climate Change Action Plan*

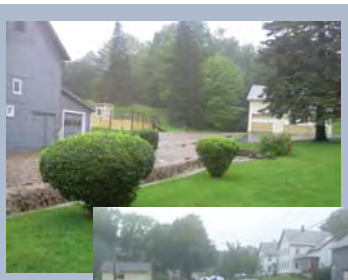
T.S. Irene 2011

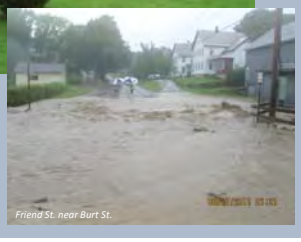
- 500,000+ MA residents without electricity
- 6 out of 8 stream gages in Deerfield & Hoosic Rivers reach highest peaks of record
- Calculated as 100-year flood in Hoosic River in Adams
- Dubbed the "costliest Category 1 storm" ($15.8 billion in damages)
- Fed. Disaster: FEMA $5.6 million to MA households, $30 million for MA public assistance
- Fed. Highways: $46 million for roads and bridges, much of it for Rt 2

T.S. Irene and the Hoosic River



Adams had widespread flooding




Friend St. near Burt St.


Lime, North Summer Sts.

Irene @ Rt. 2 and Shelburne Falls

Don't take Water for Granted

- Drought recurrence intervals may shorten
- Due to increased temp. and evaporation
- Lower groundwater recharge
- More water in summer/fall comes in extreme storm events with higher peak flows and more runoff
- Berkshires got off lightly this time

Natural Hazards Evaluated

Hazards Evaluated	
Flood	Tornado
Dam Failure	Extreme Temperature
Hurricane / Tropical Storm	Drought
Nor'easter	Wildland Fire
Snow & Blizzard	Major Urban Fire
Ice Storm	Earthquake
Thunderstorm	Landslide
High Winds	Ice Jam
Beaver Activity	

The Most Deadly Berkshire County Incidents

- **Hoosic River Floods**
  - 1938 -- Adams & North Adams – 2 deaths, many injuries
- **Dam failures**
  - 1886 -- Mud Pond Dam – Lee – 7 deaths
  - 1901 -- Basset/Dean's Dam – Adams – 1 death
  - 1968 -- Lee Lake Dam – Lee 2 deaths
- **Tornadoes**
  - 1973 -- W. Stockbridge – 4 deaths, 36 injured
  - 1995 -- Great Barrington – 3 killed, 24 injured

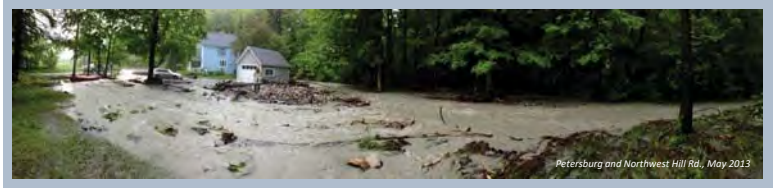
Outside of T.S. Irene –

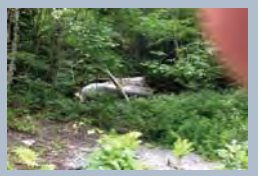
What is the most injurious or damaging incident that you have had to respond to in Williamstown or a neighboring town?

Concerns around Williamstown

- Severe storms, some with little warning
- Steep, flashy streams with quick peak flood stages
- Cycles of bank erosion and damages, repair, and repeat damages

Concerns around Williamstown





Treadwell Hollow Rd., May 2013

Concerns around Williamstown

Ice Jams on Green River Feb. 1982

Concerns around Town

Ice Jams on Green River Feb. 1982

Assessing Vulnerability in Williamstown

- Approx. 3 miles of roadway travel through floodplain
- 156 Buildings in the Town are in the 100-yr floodplain (BRPC 2018)
  - 139 are residential homes, many along Green River, Hemlock, Buxton, Broad Brooks
  - Been 24 flood insurance claims in town 1978-2017 = ~$153,000
  - No repetitive loss claims 1978-2017
  - 67 properties have active flood insurance policies = $12 million

Buildings in the 100-year Floodplain							
Residential		Commercial		Industrial		Total	
No. Bldgs.	Percent Res. Bldgs.	No. Bldgs.	Percent Com. Bldgs.	No. Bldgs.	Percent Ind. Bldgs.	No. Bldgs.	Percent Total Bldgs.
139	6.5%	16	12.5%	1	20%	156	7%

Assessing Vulnerability in Williamstown

- Potential damages in FIRM areas from 100-year flood (in millions)*

Residential Property	Res. Contents (50% Prop. Value)	Commercial Property	Com. Contents (100% Prop. Value)	Industrial Property	Ind. Contents (125% Prop. Value)	Total Loss Estimate
$31.9	$15.9	$3.2	$3.2	$0.05	$0.063	$54.3

- HAZUS model est. $72.4 million in losses**
- $300,000 in business interruption
- Up to 256 households (~600 people) may seek shelter

*Sources: *BRPC , ** HAZUS*

Are you Ready for Electricity Outages?

The energy sector's three major climate change concerns:

1. Flooding (increased precipitation, flooding)
2. Extreme events (hurricanes, snow, ice storms)
3. Increased temperature (demand surge, heat damage to distribution system)

One projection: household summer peak demands increase 3 fold from that of 1960-2000

Are you Ready for Electricity Outages?

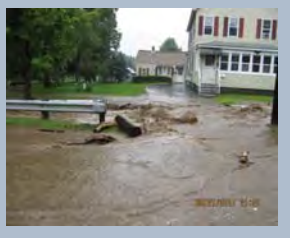
- **Do you know where vulnerable populations are that need electricity?**
  - Elderly (21% of town's pop. 65+ yrs*), disabled
  - Medical needs like oxygen, dialysis
- **Do you know where to bring them for their needed services?**

- **Are you prepared to shelter residents in extreme cold and heat?**

** 2010 census*

Where can we reasonably focus our Mitigation Efforts?

- **Flooding is our prime target**
  - Several hazards result in flooding (hurricanes, thunderstorms, snow, ice jams, dam failure)
  - Severe rain events cause localized flooding
  - Predictable boundaries (but needs adjustment)
  - Relative ease of implementing mitigation measures
  - Focus of grant programs
  - Local bylaws and zoning offer local control



Bronson Brook, Worthington

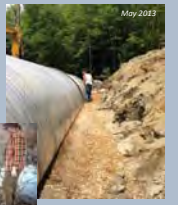
- 2- 10 foot box culverts washed out in 2003. Road was closed to all traffic.
- Culvert had a history of clogging with debris

Bronson Brook Post Irene

- A channel spanning tree located upstream of this culvert prior to the storm was mobilized and easily passed through this crossing.
- Road remained open and passable.

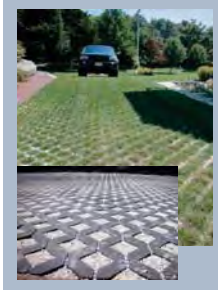
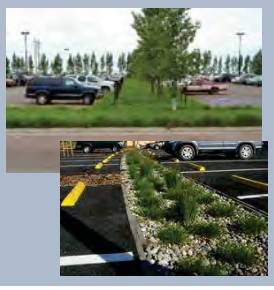
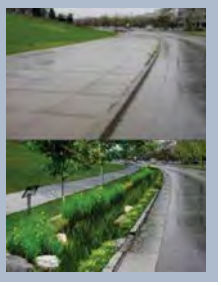
Examples of Mitigation Activities

- **Structural Projects**
  - Flood-proof, elevate or relocate buildings and infrastructure in floodplain or in flood zones
  - Armor infrastructure on bridges
  - Reduce road pavement widths *(narrowing 2 miles of road by 4' per lane can save $500,000 in reconstruction)*
  - Stream Crossing Standards = 1.2 X bank width
  - Maintain and/or improve drainage systems
    - Can we disconnect or re-route the pipe?
    - Beaver deceivers



Examples of Mitigation Activities

- **Structural Improvements – Disconnect the Pipe**
  - Bioretention cells, swales, rain gardens, pervious pavers

Examples of Mitigation Activities

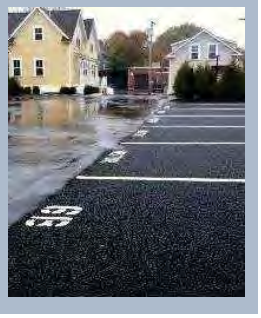
- **Creative Development – Increase Infiltration**
  - Bioretention cells, swales, rain gardens


Photos: Horsley Witten Group, Inc.

Permeable Pavement

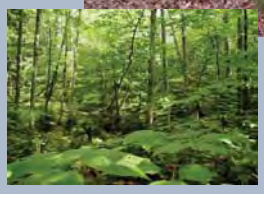
Redevelopment: Parking Lots, Walkways

- Higher initial cost ($12/sf vs $5-7/sf)
- Reduces the amount of land needed for stormwater management
- Can infiltrate as much as 70-80% of annual rainfall
- Can reduce salt use by as much as 75%



Examples of Mitigation Activities

- **Maintain Natural Cover on Building Lots**
  - Minimize disturbance of natural vegetation and soils
  - Maintain natural tree and shrub cover
    - *A mature evergreen intercepts up to 4,000 gal. of water per year*
    - *A mature deciduous tree intercepts 500-2,000 gal/yr*
  - Natural cover especially important in water supply overlay district

Mitigation Policies

Guide Future Development –

- Strictly enforce floodplain bylaws
- Revisit zoning – does the town:
  - *Require that stormwater runoff be retained on site*
  - *Encourage or require max. allowable lot clearance*
  - *Encourage Low Impact Development techniques that infiltrate runoff*
  - *Restrict development on steep slopes*

Ongoing Monitoring

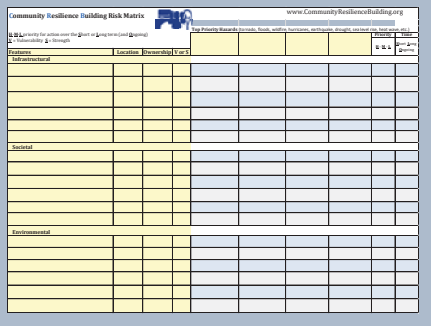
Incorporate New Data for Mitigation, Resilience, Adaptation

- Incorporate new floodplain data and boundaries when available
- Monitor data and climate change projections for infrastructure improvement projects

Now It's Your Turn

Identify the 4 Priority Hazards

- **Infrastructural:** municipal infrastructure, housing, utilities, commercial bldgs., municipal bldgs. and operations
- **Societal:** collective ability to respond – first responders, health services, goods and services
- **Environmental:** natural systems that protect, provide services or pose risk


Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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

Priority: H, M, L

Time: Short, Long, Ongoing

Features | Location | Ownership | 1 or 5

Infrastructural

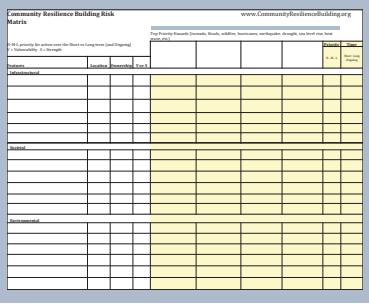
Societal

Environmental

Actions and Priorities

List and Prioritize Actions to Address your vulnerabilities

1. **Develop Your Actions**
2. **Prioritize them H-M-L and Time**
3. **Choose the Top 4 Priorities that your think are the greatest risks and should be addressed**
4. **Bring your Top 4 to the Full Group**


Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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

Priority: H, M, L

Time: Short, Long, Ongoing

Features | Location | Ownership | 1 or 5

Infrastructural

Societal

Environmental

We Can Adapt

Snowshoe Hare *(Lepus americanus)*

Centuries ago, even decades ago, there would likely be some snow cover in December to provide camouflage for this species.

Picture taken Hoosac Range, Dec. 2012.

Horsley Witten Group

Sustainable Environmental Solutions

FEMA

Mass Audubon

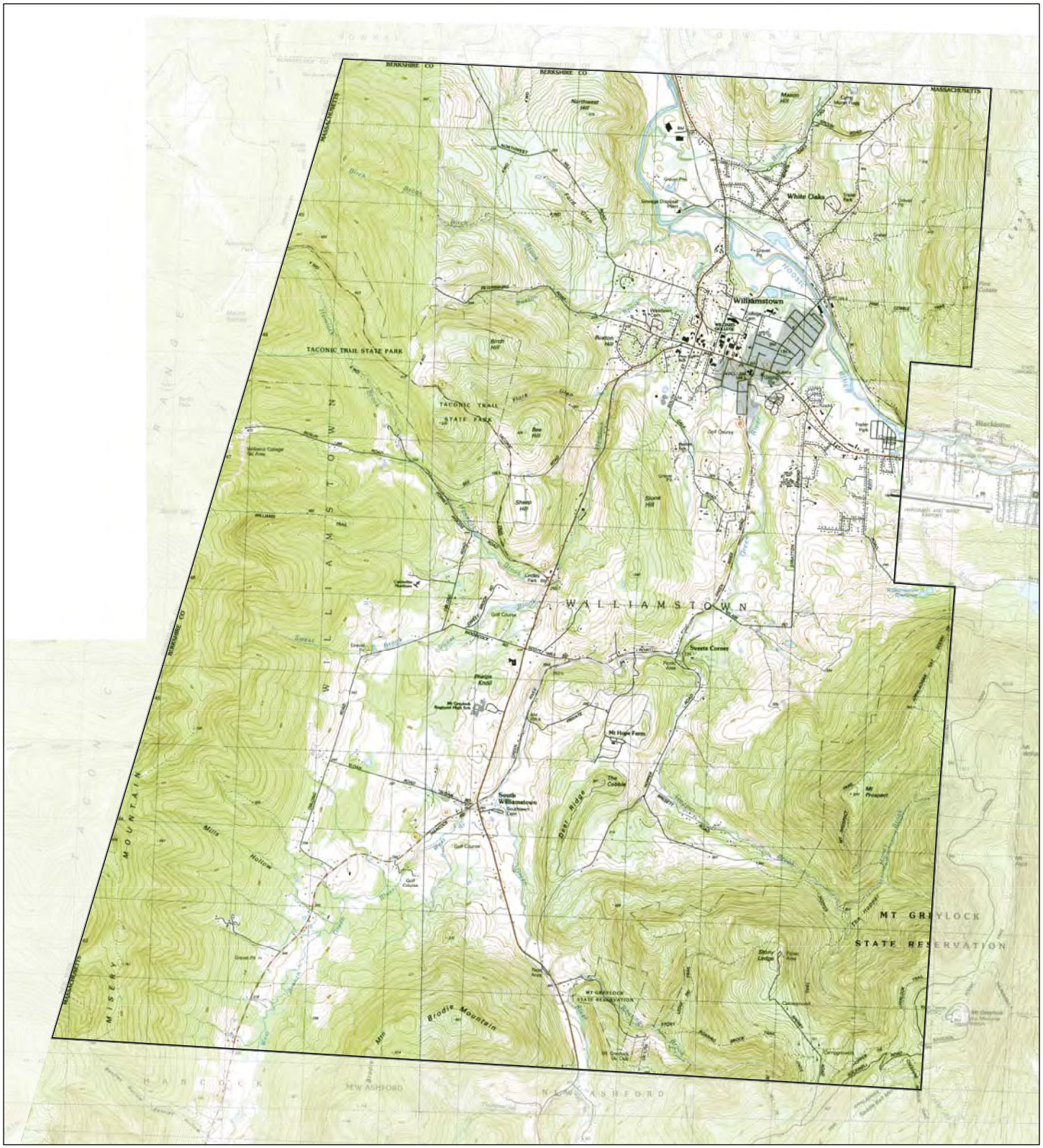
Protecting the Nature of Massachusetts

The Nature Conservancy

nature.org

SRPEDD

Town of Williamstown- Topographic Map



0 0.5 1 2 Miles

N

Berkshire Regional Planning Commission

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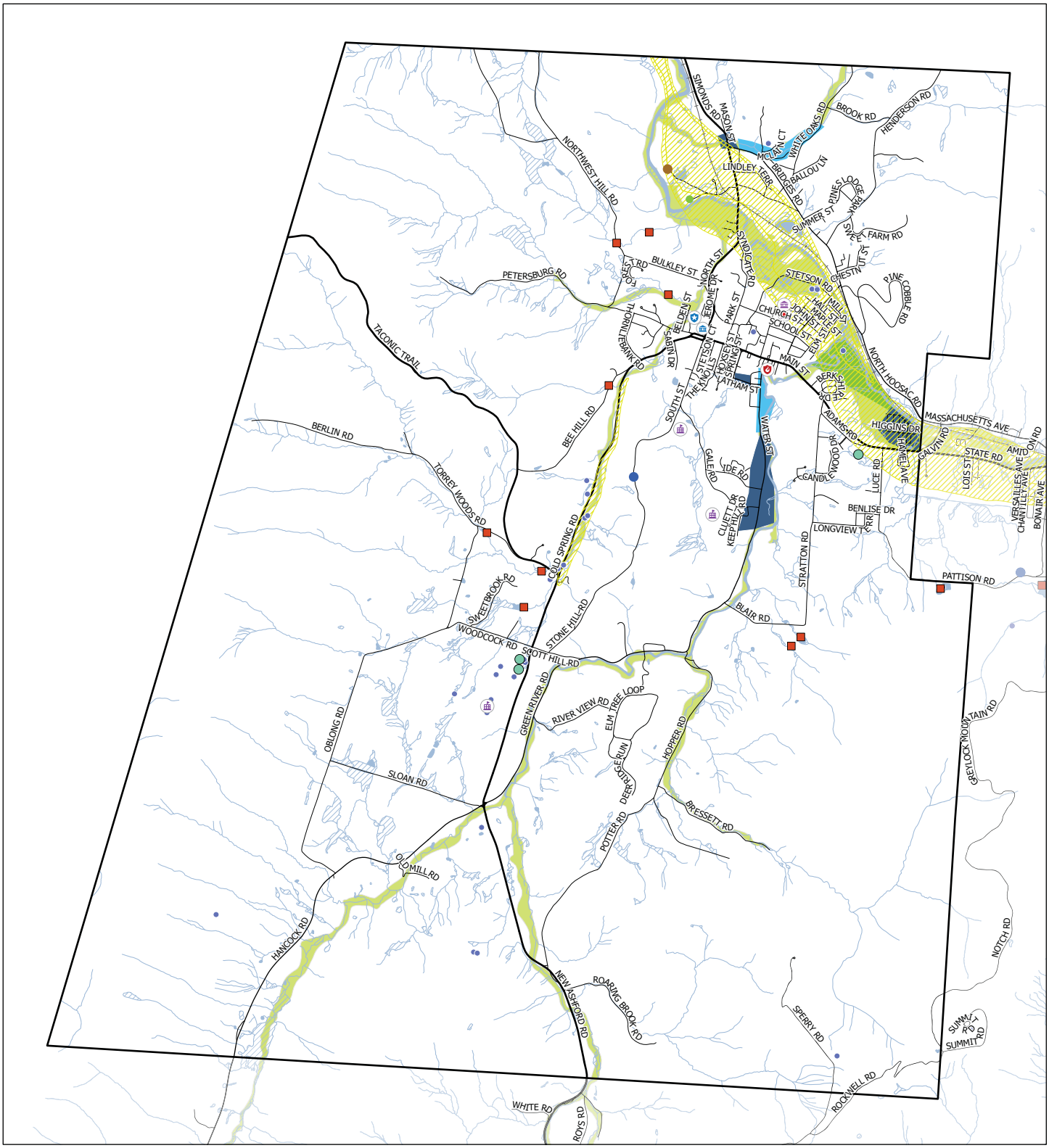
Town of Williamstown - Critical Facilities and Areas of Concern



- Flooding
- Landslide/Erosion
- Ice Jam
- Sewer Pipe Exposure
- FEMA 100yr Floodplain
- Aquifers
- PWS
- Town Hall
- Fire Station
- Police Station
- DPW
- Shelter
- Senior Center
- Nursing Homes
- School
- Wastewater System
- Water System
- Dam
- Interstate
- Major Road
- Minor Road
- Local Road
- Railroad
- Stream
- Wetland
- Open Water

0 0.5 1 2 Miles

N

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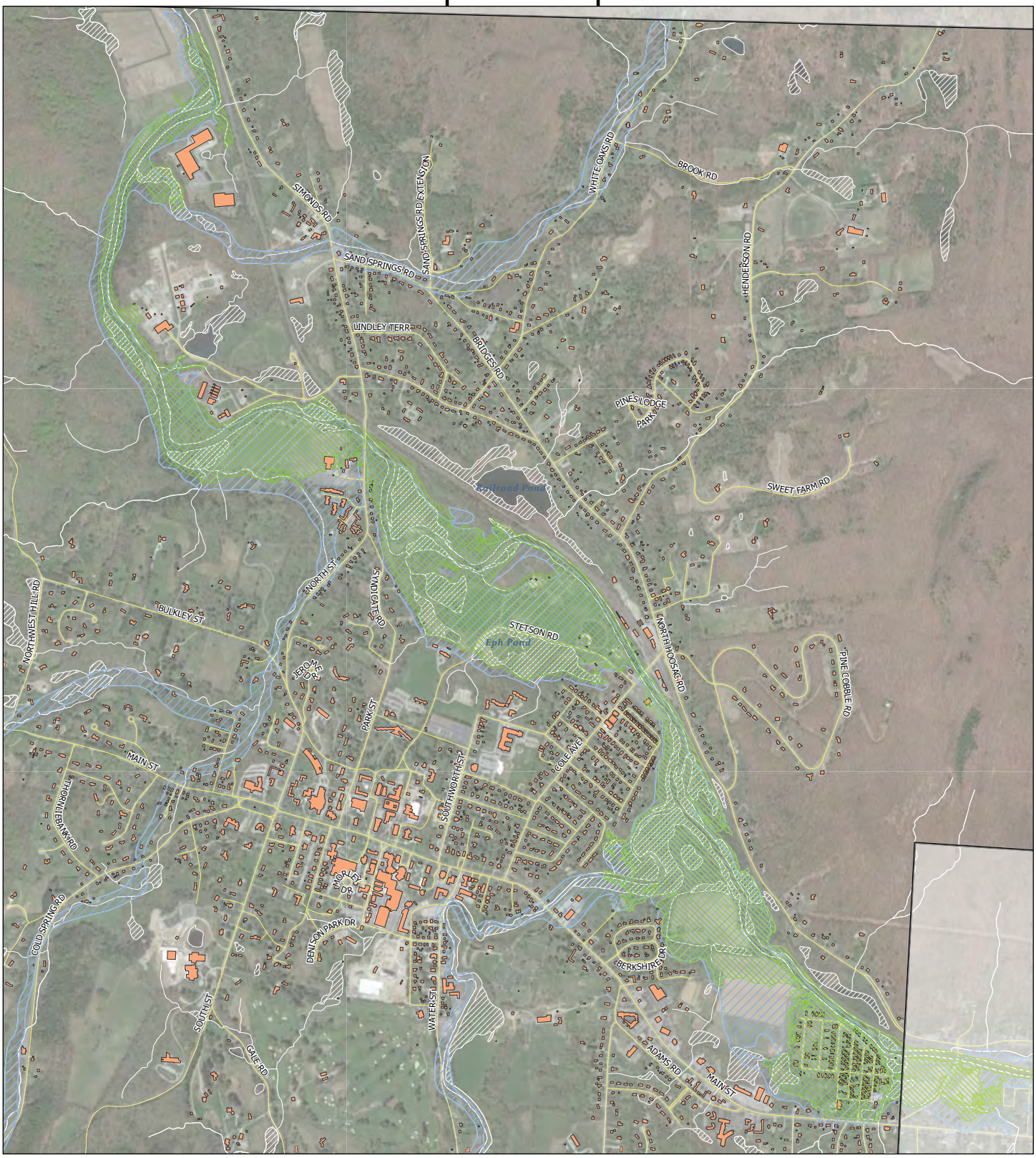
Town of Williamstown- Floodplain Comparison



USGS Hoosic River 100yr Floodplain
FEMA 100yr Floodplain
Buildings
Stream
Wetland

0 0.3 0.6 1.2 Miles

N

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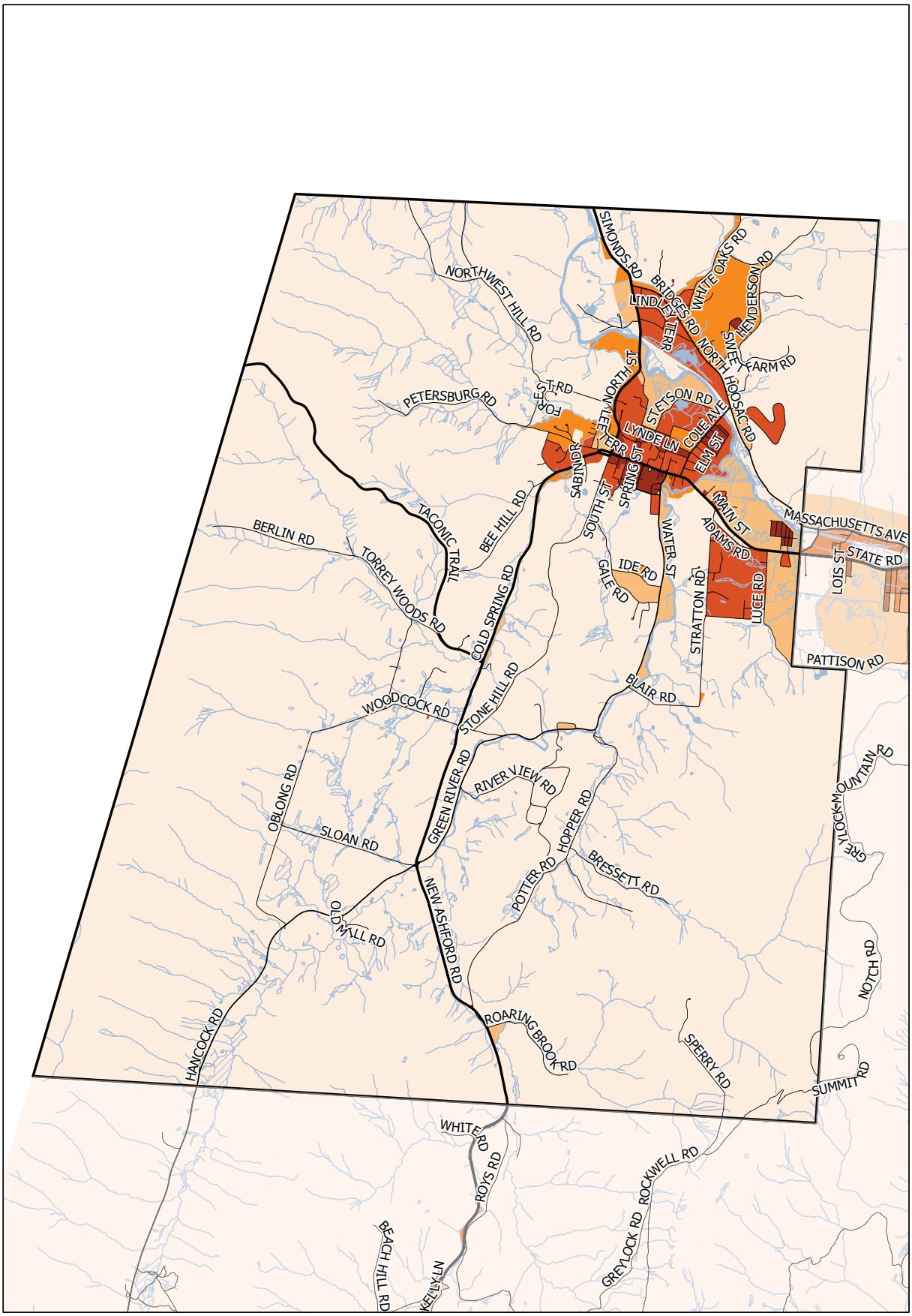
Town of Williamstown - 2010 Population Density

(US Census - Does not include Seasonal Population)



- <0.5 people/acre
- 0.5-0.9 people/acre
- 1.0 - 1.9 people/acre
- 2.0 - 4.9 people acre
- > 5.0 people/acre

N

0 0.5 1 Miles

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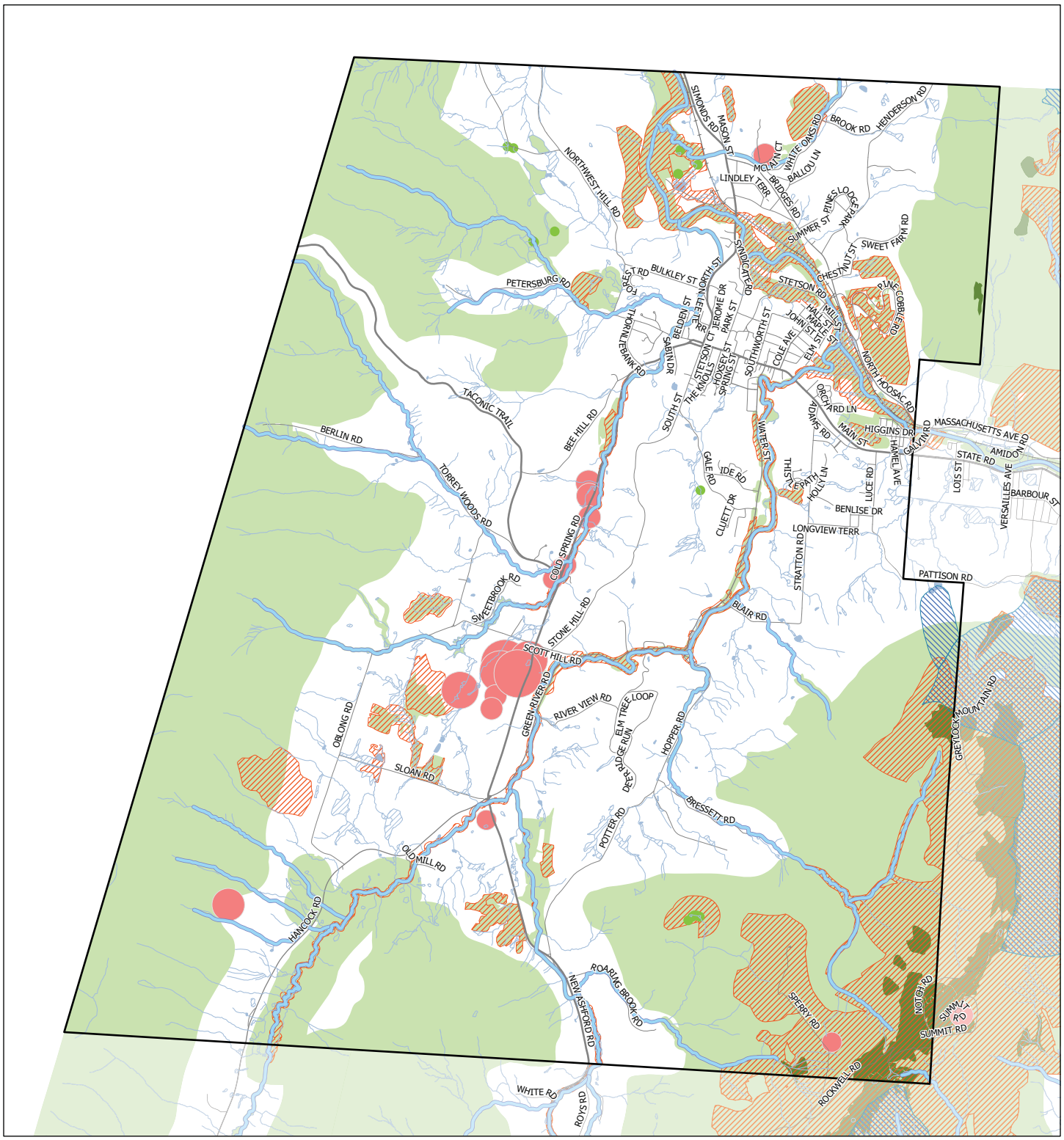
Town of Williamstown- Environmental Concerns



- Cold Water Fisheries
- BioMap2 Core Habitat
- NaturalCommunities
- Priority Habitats of Rare Species
- Outstanding Resource Watershed
- Interim Wellhead Protection Area
- Certified Vernal Pools
- Railroad
- Interstate
- Major Road
- Minor Road
- Local Road
- Stream
- Wetland
- Open Water

0 0.5 1 2 Miles

N

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Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

WILLIAMSTOWN, MASSACHUSETTS

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

Items with asterisks ** received extra priority votes in public listening session

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

Infrastructural Features	Location	Ownership	V or S	FLOOD (INCL. ICE JAM)	POWER OUTAGE	SEVERE STORMS	DROUGHT/FIRE	Priority	Time
								H - M - L	Short Long Ongoing
Stream Crossing Bridges	Cole Ave & Rte7	STATE	V	Evaluate Condition of Bridges structurally impacted by severe floodwaters and ice jamming				L	O
Shelter** (High School/outside of downtown)	n/a	TOWN	V	Develop an overall Shelter Strategy, including in-town, long-term facility				H	S
Pumping Stations for Water & Sewer	Various	Water Dept & HWQD	V	Consult with Departments - Action Plan?				?	S
Housing in the Floodplain	Sand Springs Rd & Grn River	TOWN	V	Investigate/Educate Flood Mitigation Strategies; Encourage Voluntary enrollment in Emergency Notification Sys				H	S
Commercial Center Flooding	Meacham & Latha	WILLIAMS COLL	S	Installation of multiple Culverts, retention facilities and etc.				H	S
Treatment Plant - Low Flow	Plant	HWQD	V	Extend Muni Svce to other neighborhoods/Towns				L	O
Residences with shallow wells (drought)	Various	PVT	V	Investigate Water Line Extension, Encourage new Housing in areas served by Town water				L	O
Cell Tower Spotty Coverage*	Various	PVT/TOWN	V	Advocate with carriers for full cell service				L	O
Power Lines	Various	PVT	V	Investigate burying lines in high risk areas?				L	O
Town Water Supply is Adequate/Good Quality	Various	TOWN	S						
Railroad Track Condition & Hazardous Material Transport	Along Green Riv	RR & TOWN	V	Engage with RR to discuss Hazard Vulnerability Plan				M	L
Culverts/Bridges are undersized**	Townwide	Town	V	Proactively think about future load when replacing				H	O
Sewer pipe in the Hoosic River / Green River	Townwide	Town	V	Work with DEP/NHESP on permitting				M	O
Undersized Storm Sewer System	Townwide	Town	V	Review system for issues, correct as found				M	O
Water Supply Pumps protected	Townwide	Town	S						
Undersized culverts & bridges	mostly rural areas	Town/private	V	Chapter 90 highway funds to upgrade smaller culverts, grants to upgrade and replace larger culverts				H	L
Railroad Flooding	Rt 7/ bridges, poi	Private	V	Study options to fix bridge pond as leverage for csx to make improvements to harden rail bed				H	L
Vulnerable above-ground electric infrastructure		Private	V	Advocate for areas to have utilities underground				M	O
Hoosic Water Quality District (sewer)	HWQD	Joint	V	Continue to monitor				L	O
Public Water System	Town	Town/private	S	Study expansion of public water into Hoosic Street and other streets with deteriorating pipes or private water				H	L
High School is outside of downtown	Town	School District	V/S	Consider more than one Shelter location (Elementary School)					
Flooding at Colonial Village	Colonial Village	Town/Homeowne	V	Study/improve stormwater system				L	L
Beavers causing flooding along railroad at Bridges Pond	Bridges Pond	Town/Railroad	V	Clean channel, trap (Maintenance)				H	O
Christmas Brook / Williams College new stormwater system	Christmas Brook	Williams	S						
Gravel Roads issues at water crossings	Townwide	Town	V	Maintain,enlarge drainiage as needed				M	O
Cobbles in Broad Brook	Broad Brook	Town	V	Maintain as needed, work with state/federal agencies on permitting				M	L
Infrastructure (pipes) where they cross water is of concern	Townwide	Town	V	Plan and replace as needed				M	O

Community Resilience Building Risk Matrix

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WILLIAMSTOWN, MASSACHUSETTS

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

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

Societal Features	Location	Ownership	V or S	FLOOD (INCL. ICE JAM)	POWER OUTAGE	SEVERE STORMS	DROUGHT/FIRE	Priority H - M - L	Time Short Long Ongoing
Fire, General Volunteer and Doctor shortages**	Various	TOWN	V	Community driven economic development					
Outreach/Communications/Coordination*	Various	TOWN	V	Town Admin focus on outreach/disperse radios from Police Station					
Vulnerable Populations: Elders, School-age, Disabled, Medical	Various	TOWN & PVT	V	Town-wide discussion & Communications strategy to include				M	O
Growing Senior population living independently**	Various	TOWN & PVT	V	Expansion of COA Resources				M	S
All Hazards Plan is outdated	Various	TOWN	V	Update Plan				H	O
Arnold, Mill Streets & Pine Lodge transient populations are underrepresentaed			V	Assign Select Board members as neighborhood liaisons				M	O
Sheltering & Cooling /Warming Stations*	Various	TOWN	V	Put generators in Senior Center and elementary school and put A/C in school				M	O
Emergency Communications***	Various	TOWN	V	Identification, Location, Effective Messaging, System Improvement				M	O
Transient Populations: Parents, 2nd Homeowners, Tourists, Theatre, Etc	Various	TOWN & PVT	V	Go for grant from Homeland Security or State to do				M	O
Emergency Preparedness*	Town-wide	TOWN	V	Voluntary, Educational Programs, Tie In with Regional Response Team				M	O
Loss of Business Revenue and post-disaster effects	Various	CHAMBER, TOWN, INSTIT.	V	Post-Disaster Planning				M	O
Supply water to well-water residents during drought	Various	TOWN & PVT	V	Extend Muni Svce to Others; Low Impact Development, Educate on Residential Strategies to mitigate				M	L
Community is supportive	ALL	TOWN & PVT	S	Engage community in improving communications and emergency prep					
Health Impacts of Floodwater and long freezes	Town-wide	TOWN & PVT	V	Educational Programs, Tie In with Regional Response Team				M	L
Williams College has its own evacuation plans	Williams	Williamstown	S	Coordinate with Town-wide plan; include other institutions' plans					
Volunteers are needed for the Fire Department**	Townwide	Fire District	V	Make sull-time employees, provide incentives				M	O
Mutual Aid between surrounding towns*	Townwide	Town/Fire Distric	S						
Nursing homes are self-contained	Townwide	Private	S	Coordinate with Town-wide plan					
Council On Aging maintains a list of vulnerable populations	Townwide	Council on Agin	S						
On-site storage bylaw for stormwater	Townwide	Town	S						
Lack of knowledge by public on problems**	Townwide	Town/Private	V	Convene public forums and eduaation campaigns on threats				H	S
People living in the floodplain	Townwide	Town/Private	V	Educate residents in floodplain				M	O
Reverse 911 (Code Red)**	Townwide	Town	S	Test/Educate Public				H	S

Community Resilience Building Risk Matrix

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WILLIAMSTOWN, MASSACHUSETTS

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

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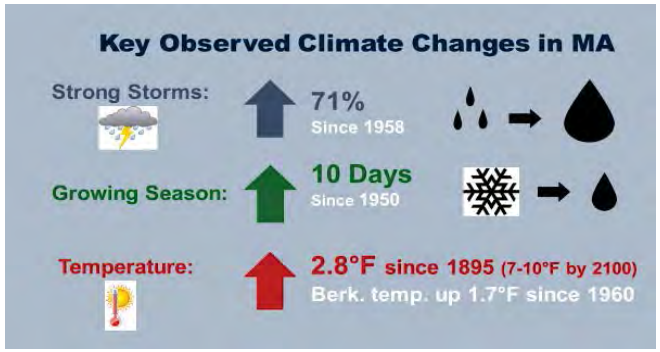
H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

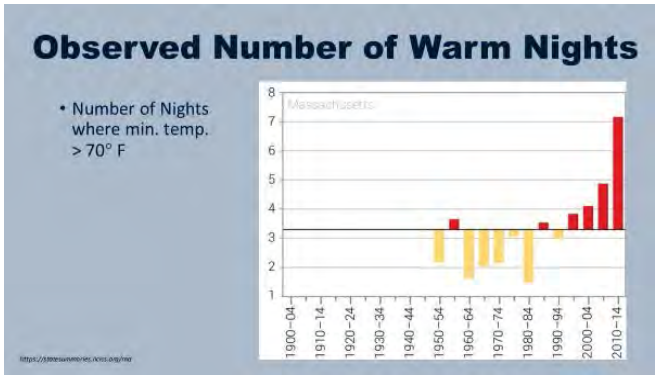
Environmental Features	Location	Ownership	V or S	FLOOD (INCL. ICE JAM)	POWER OUTAGE	SEVERE STORMS	DROUGHT/FIRE	Priority H - M - L	Time S Short L Long O Ongoing
Impacts of storm flooding - water quality, bank erosion, turbidity **	Various	TOWN, NGO's, PVT, INSTIT	V	Educational Programs, Mitigation Strategies				M	S
Wetlands & ponds siltation; loss of function	Various	as above	V	Update Williams College Graduate Wetlands & Riparian Survey town-wide				M	S
Forest cover - aging & infestation; cooling effect	Various	as above	V/S	Reforestation/Replanting program				M	O
Flood cleanup - hazardous material & debris	Various	as above	V	Post-Disaster Planning				M	O
Drought - pestilence & fire hazard increase	Various	as above	V	Education, Signage and Water Conservation				L	O
Drought - loss of veg & topsoil; agricultural impacts*	Various	ALL	V	Education; Water Conservation, Drought Tolerant & Native Plants				L	O
Ticks/Other Pests moving north***	Various	ALL	V	Outreach concerning particular areas they are in, actual risk, and prevention such as tick tubes				H	O
Food Supply During Disasters *	Various	ALL	V	Expansion of Council on Aging activities to identify vulnerable populations, monitoring				H	O
Agricultural production down	Various	PVT	V	Agricultural Committee strength/education on available resources to farmers				M	O
Forest Management for fires*	Various	TOWN	V	Fire Dept in conjunction with Hopkins Forest should study controlled burns				L	O
Shallow Wells in rural areas	Various	TOWN	V	Study expansion of public water to existing homes				H	L
Fault Line	Various	TOWN	V	General preparedness and all of the above will help during that type of event				L	L
Not enough or diverse urban tree cover*	Townwide	Town	V	Provide more financial resources for new trees. Proactively plan and write grants for tree replacement				M	L
Former Spruces	Spruces MHP	Town	S	Committee working on reuse plan					
Haz Mat and condition of the railroad	Railroad	Railroad	V	Engage with RR; Continue working with Local Emer.Preparedness Committees and continue training local responders					
Invasive bugs and lack of fires a concern for forests	Townwide	State/Private	V	Promote forest management plans				L	L
Land subsidence along Scott Road	Scott Road	Private	V	Control water uphill of site				L	L

CLIMATE CHANGE OBSERVATIONS

The Basics for the Berkshires

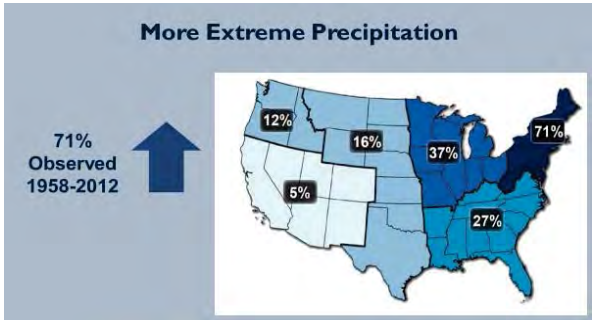


- **Warmer Temperatures** –
  - More evaporation, less soil moisture, increased risk for fire, drought, human health risks (particularly for elderly, other vulnerable pops.)
  - Greater temp. increases in winter
    - Less snow, but still cycles of freezing temperatures = infrastructure vulnerability
    - Rain-on-Snow = more overland winter flooding, ice jams
  - Increased temps. = increased heat stress for people, livestock, wildlife
  - Higher evening temps. = inability for people and homes to cool down and "catch up" to normal temps.
  - Increased risk of thunderstorms and other severe rain events
  - New and expanding pests: ticks, mosquitos, forest and crops
  - Increased growing season
    - Pros: new farming opportunities
    - Cons: increased allergen season and increased potency



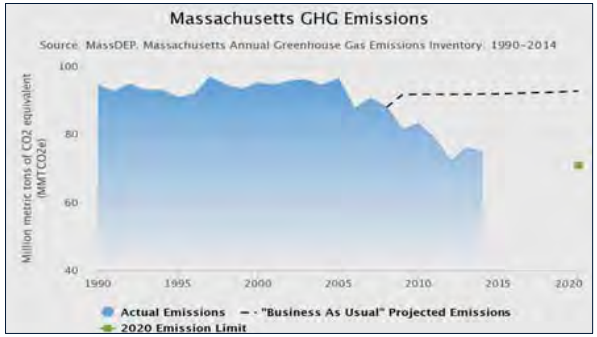
Precipitation Trends

- **Increase in Extreme Rain Events** = increased risks and damages to municipal infrastructure
- **Engineering Standards** -- engineers now directed to use new data sets that include post-1970s precipitation data



MA Energy Reduction – Success

MA GHG Emissions dropped 21% while Gross State Product increased 70% in same time period



Severe Weather Bursts

- **Steep slopes and severe rain bursts May 2013** = road flooding and culvert destruction.
- **Severe stream and bank erosion** can occur, including sediment transport

A Last Thought

Pity the Snowshoe Hare
December 2012

Its instinct is to sit still when danger approaches, thinking it blends in with its surroundings .

Centuries ago, even decades ago, there would likely be some snow cover to provide camouflage for this species.

Humans have the ability to adapt, unlike our hare.

TROPICAL STORM IRENE: an inland storm of reference for the Berkshires

The Basics

- Tropical Storm (39-73 mph) hit the Berkshires August 28-29
- Eye of the storm travels over Berkshires approx. winds of ~50 mph
- “Catastrophic floods” in NYS and New England, with rain totals of 5”-10” in Western Mass., 7”-10”+ in VT and NYS; this rain fell on already saturated soils from previous rainstorm events
- Devastating flash flooding across mountain valleys ranking second worst in history; entire villages in Catskills uninhabitable and VT residents stranded for days by washed out bridges and roads; 500,000+ MA residents without electricity
- 6 out of 8 stream gages in Deerfield & Hoosic Rivers reach highest peaks of record
- Calculated as >100-year but <500-year flood in Hoosic River
- 50-year storm (2% chance flood event) in central Berkshire County
- Roads washed out, bridges damaged or washed out across many towns in Berkshire County; Rt. 2 is closed for 3 ½ months for repairs
- Dubbed the “costliest Category 1 storm” ($15.8 billion in damages)
- Fed. Disaster DR 4028: FEMA $5.6 million to households, $30 million for public assistance
- Fed. Highways: $46 million for roads and bridges, cost $23 million o repair 6 miles of Rt 2

Rain Totals

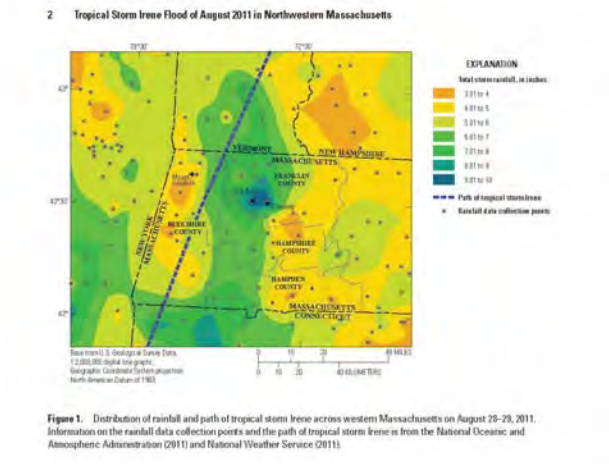


Figure 1. Distribution of rainfall and path of tropical storm Irene across western Massachusetts on August 28–29, 2011. Information on the rainfall data collection points and the path of tropical storm Irene is from the National Oceanic and Atmospheric Administration (2011) and National Weather Service (2011).

Raging Rivers and Streams

T.S. Irene estimated to be near or more than the 100-yr storm along the Hoosic River

Shelburne Falls

Deerfield River in Shelburne Falls flowed at 30,000 cubic feet per second – 40 times normal flow

Left – Bridge of Flowers during storm and under normal conditions.

Below – Bridge Street bridge – critical link to town

The Spruces, Williamstown

- Building and health inspectors declare 75% of homes uninhabitable
- If >50% of home value is damaged, current building codes must be met
- If FEMA funds used to repair or replace homes it must be elevated 6’–10’ above floodplain elevation + additional 2’ clearance; this requires that some homes to be placed 12’ above ground level
- Residents in all 225 mobile home units permanently displaced

Route 2 and Green River Dam

Left: Historic covered bridge in Greenfield damaged by dam failure upstream

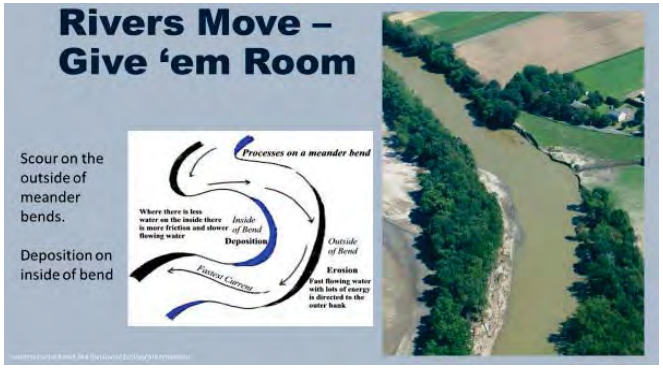
Right, below: Rt. 2 road collapse and landslide along Cold River in Florida & Charlemont

Dalton – 50-year storm

Evacuations at Pomeroy Manor and risks to water, sewer, gas lines on Main St Bridge

OPPORTUNITIES TO REDUCE RISK

Water Movement



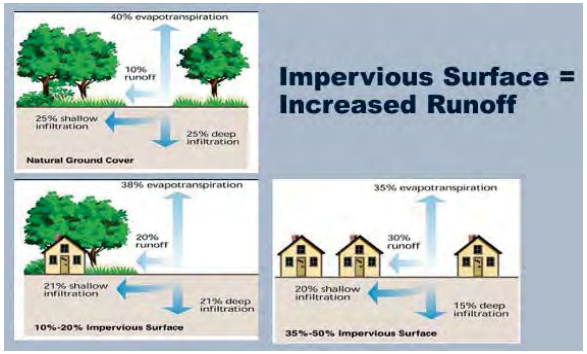
Above: Housatonic River at New Lenox Rd, Lenox

Right:

Sediment deposition dur to flood waters in floodplain area

Water Movement Altered

Impervious surfaces like buildings, road and parking lots = increased surface runoff and less ground infiltration

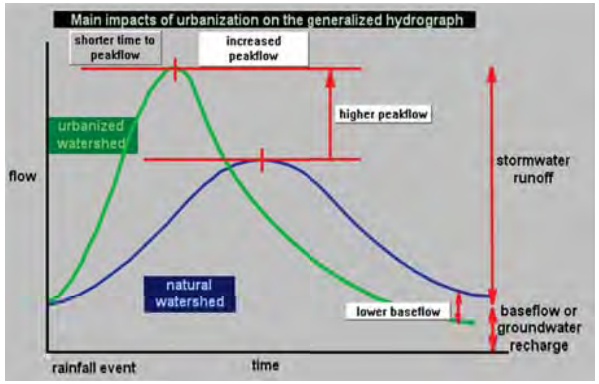


More Frequent Flood Impacts and Less Groundwater Recharge

Greater surface runoff leads to accelerated and higher peak stream and river flows = more severe flooding.

It can also lead to stream base flow and groundwater recharge.

This could lead to more frequent well failures, especially during drought conditions – see below.



Why Focus on Flood Risks?

- **Flood events and recurrence intervals calculated (even if they need to be adjusted)**
- **Floodplain boundaries delineated (even if they need to be adjusted)**
- **Benefits of keeping development out of floodplains well documented**
- **Predicting large storm events and warning times are fairly reliable**
- **Mitigation techniques are feasible and benefits tangible**
- **Engineering standards can adapt – see below.**

Change in 24-hour, 100-year Design Storms (inches)

	NOAA TP-40	NOAA Atlas 14	Change
Boston	6.6	7.8	+1.2"
Worcester	6.5	7.6	+1.1"

Bridges and Culvert Improvements

Bronson Brook, Worthington

Left:

- *Box culvert washed out in 2003, closing road to all traffic.*
- *Had a history of clogging with debris.*

Left:

- *Post-T.S. Irene*
- *Channel-spanning tree was mobilized above this bridge, but passed through this upgraded design.*
- *Road remained open and passable.*

OPPORTUNITIES TO REDUCE RISK – LAND DEVELOPMENT TECHNIQUES

Land Use Policies

Guide Future Development

- Strictly enforce floodplain bylaws and wetlands protection to maintain flood storage resiliency
- Revisit zoning – does the town:
  - *Require that stormwater runoff be retained on site*
  - *Encourage Low Impact Development techniques that minimize land disturbance and maximizes the site's natural landscape*
  - *Concentrate development and maintain open natural landscapes for connectivity*
  - *Restrict development on steep slopes*

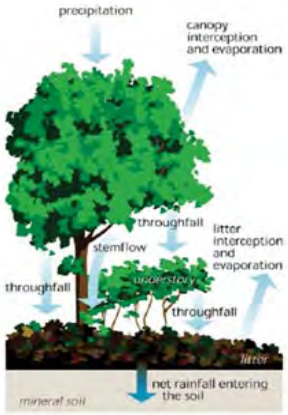
Incorporate New Data for Mitigation, Resilience, Adaptation

- Incorporate new floodplain boundaries when available – new floodplain data is available for the Hoosic River
- Monitor data and climate change projections

Develop Carefully

Maintain the Natural Landscape

- A mature deciduous tree intercepts 500-2,000 gallons of water per year.
- A mature evergreen intercepts up to 4,000 gallons / yr.
- Root systems of trees and understory hold soil in place.
- Natural cover is particularly important on steep slopes, such as those that surround the town center.



Disconnect the Pipe

- **Reduce the amount of hard, impervious surface areas like homes, parking lots and buildings**
- **Capture the runoff that IS created rather than pipe it into a storm drain system – which discharges into the nearest waterway (accelerated, higher peak flows)**

Left: Reduce pavement, capture runoff in rain gardens, biorentention cells

Below:

Capture roof runoff in rain gardens

Infiltrate More - Pervious Pavers and Pavement

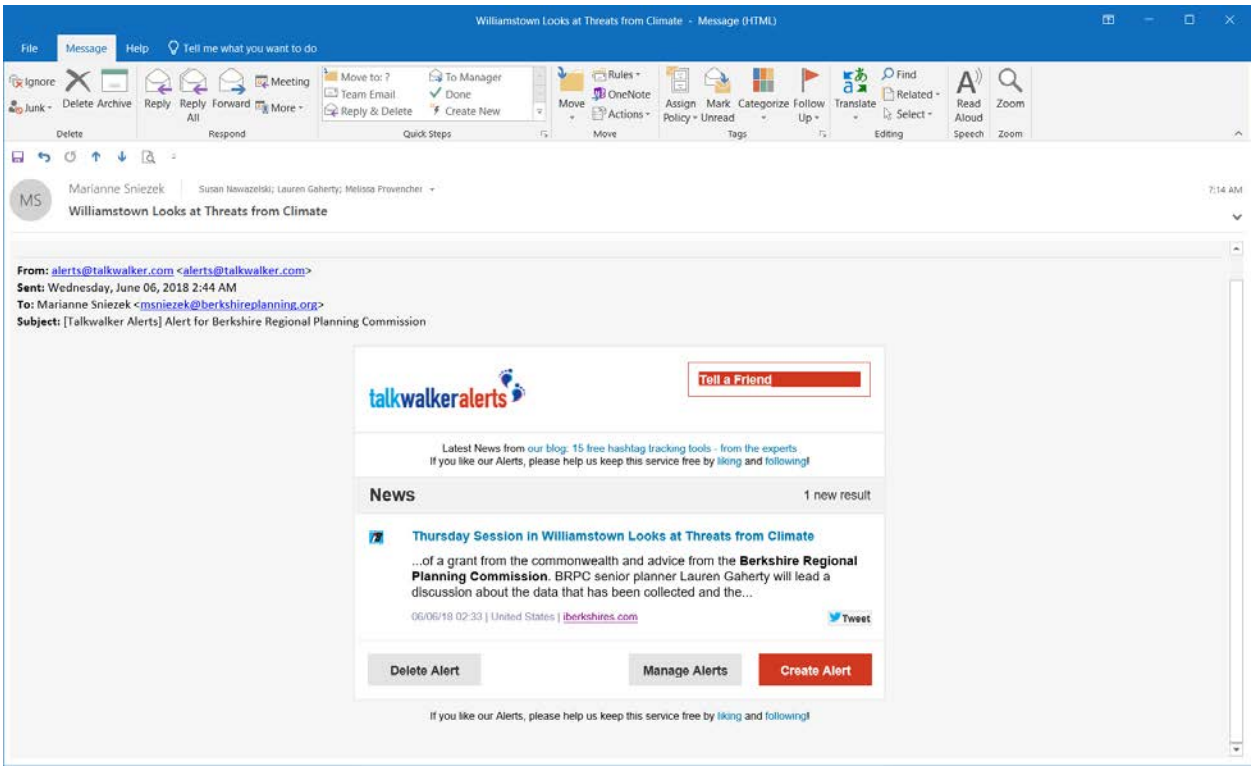
Pavers allow infiltration while providing structure for cars

Pervious Pavement for Parking and Walkways

- Higher initial cost, but:
- Reduces land needed for retention ponds and other management
- Can infiltrate as much at 70-80% of rainfall
- Can reduce salt use by up to 75%
- Not for use where sand is applied in winter

Appendix B – Public Listening Session Materials

Local Blog Post



Thursday Session in Williamstown Looks at Threats from Climate Change

By Stephen Dravis *iBerkshires Staff*
02:33AM / Wednesday, June 06, 2018

Flash flooding in Williamstown four years ago cut through several roads and yards and displaced metal culverts on Treadwell Hollow Road. The town is one of several in the Berkshires using state grants to evaluate their vulnerability to natural events.

WILLIAMSTOWN, Mass. — You cannot really know where or when the next natural disaster is going to hit. But you can consider the possibilities and plan for the worst.

On Thursday at 6 p.m., Williamstown takes a step in that planning process when it holds a listening session for members of the public to consider the Municipal Vulnerability Plan the town is developing with the help of a grant from the commonwealth and advice from the Berkshire Regional Planning Commission.

BRPC senior planner Lauren Gaherty will lead a discussion about the data that has been collected and the threats that have been identified by a town-sponsored working group that last month held a daylong workshop.

Town Planner Andrew Groff this week explained that the MVP, a state initiative, will help Williamstown develop an updated Hazard Mitigation Plan, which he hopes to complete by later this year.
"To qualify for [Federal Emergency Management Agency] grants, like the one we received for the Spruces, we have to maintain an up-to-date, FEMA-approved Hazard Mitigation Plan," Groff said.

Although the MVP is a separate document, it will help inform the more comprehensive Hazard Mitigation Plan. And the MVP alone will help the town qualify for other grants.

Williamstown is one of several communities in the Berkshires in various stages of the MVP process, Gaherty said on Tuesday.

Adams will have its public forum next Thursday, June 14, at Town Hall. Lanesborough and Monterey currently are in the middle of their processes. And Dalton, North Adams, Pittsfield, Sandisfield and Sheffield each were successful applicants in the second round of MVP grants. The state has also set up a "climate change clearinghouse" to gather data for planning ahead for severe conditions.

The more towns that go through the process, the more their findings can help inform the discussions in other towns, Gaherty said.

"We have some of the data we can pull and use for the next towns," she said. "But it really comes down to the local level: Where do you have flooding in your town. Every town experiences it slightly differently. It's really important to plan on the town level to help them to … identify the risks and get grants or get things in the town meeting budgets for capital improvements and that sort of thing."

The threats to local communities are changing as the climate changes, and the data point to a combination of more frequent and severe weather events (rain storms, ice storms and the like) coupled with more frequent droughts.

"I think our big risks in Williamstown include … these big temperature fluctuations in the wintertime," Groff said. "Look at the ice jams we had in the Green River. That's a big issue. The extremes are getting more extreme. In the wintertime, you have these rapid melts that are a problem. Or there's the possibility we could get more ice storms than snow storms, which would lead to more sustained power outages.

"But the biggest thing overall from a climate change risk perspective is a warmer atmosphere that can hold more moisture and create larger, quicker bursts in precipitation. We've seen it locally with the flash flooding that occurred in 2013. It was super localized, right along the Taconic range. One of the more nationally known stories is those poor folks in Ellicott City, Md., who got hammered with two 'thousand year' flash floods within two years of each other."

A weather event does not have to be a "named" storm or a catastrophic event like Tropical Storm Irene to cause significant damage. An event like the 2008 ice storm cost the state more than $7 million and left more than 1 million Massachusetts residents without electricity, some for as much as two weeks.

"I think we need to think about how our rain patterns are evolving and how [Ellicott City] could happen to us, too," Groff said. "Luckily, our downtown is not in a narrow, tiny valley surrounded by streams. But we definitely have some streams that are susceptible to flash flooding."

The Thursday evening meeting will be a chance for residents to learn about some of the threats that have been identified and share information about potential problems that may not have been considered.

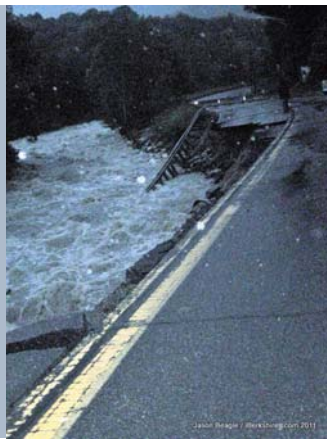
"We're going to basically report out what we heard in the workshop," Gaherty said. "There will be a short presentation to set the stage for the public about changing weather patterns, and we'll say, 'This is what people found in the workshop. These are the biggest changes that should be addressed.'

"And then we'll ask, 'Did we get it right? Did we miss anything? What are your thoughts?' Basically, we're going to ask the public to weigh in."

Municipal Vulnerability Preparedness

TONIGHT'S AGENDA

1. **View posters: Natural Hazards & Climate**
   6:00 - 6:20 pm
2. **Presentation on findings**
   6:20 - 6:45 pm
3. **Public feedback and suggestions**
   6:45 – 8:00 pm



What Are We Evaluating?

Hazard Mitigation Plan –

- Describes activities that can be done to mitigate the hazards before they occur
- Mitigation Plan is a requirement to maintain eligibility for some FEMA funds

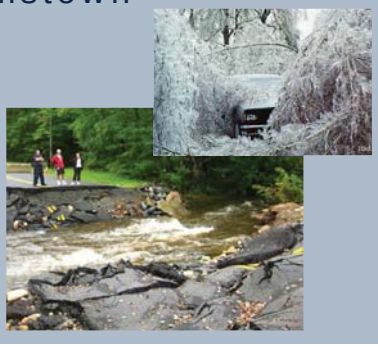
Municipal Vulnerability Preparedness & Workshop

- Consider weather pattern observations and climate change projections
- MVP certified communities will have priority status for some state grants

Shout out to those on the HM Committee & Attendees!

Natural Hazards Evaluated for Williamstown

Hazards Evaluated	
Flood	Tornado
Dam Failure	Extreme Temperature
Hurricane / Tropical Storm	Drought
Nor'easter	Wildland Fire
Snow & Blizzard	Major Urban Fire
Ice Storm	Earthquake
Thunderstorm	Landslide
High Winds	Ice Jam
Beaver Activity	



Key Observed Climate Changes in MA

Strong Storms: ↑ **71%** Since 1958

Growing Season: ↑ **10 Days** Since 1950

Temperature: ↑ **2.8°F since 1895** (7-10°F by 2100)
Berk. temp. up 1.7°F since 1960

Extreme Heat Days in Hoosic Watershed*

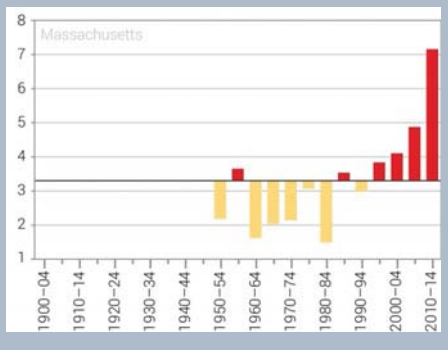
	Current	*Projected by Mid-Century (2050s)*	*Projected by End Century (2090s)*
Days per year above **90°F**	≤1 ↑	+ 4 - 17	+ 6 - 50
Days per year above **95°F**	0 ↑	+ 0 - 5	+ <1 - 11

* MA Climate Change Clearinghouse

Observed Number of Warm Nights

Observed In MA:
Number of nights where minimum temp. > 70° F in MA*

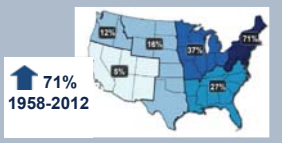
Projected In Berkshires:
Day temps. > 90° F increase from 2 per year to 27 by 2090**



* https://statesummaries.ncics.org/ma
** MA Climate Change Clearinghouse

Observed No. Extreme Precip. Events

- Number of Events w/ Precipitation > 2" in 1 day
  "Stepped Increase" in 1970-80s, and continues



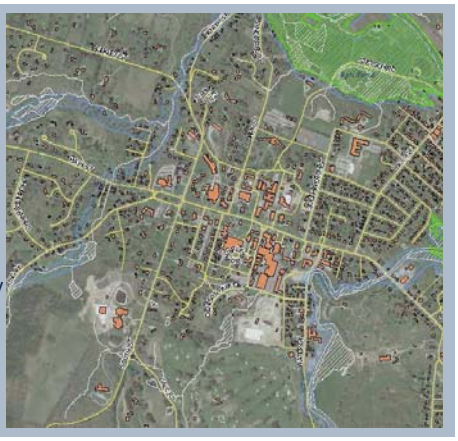
71%
1958-2012

https://statesummaries.ncics.org/ma

Flood-plain Mapping

Floodplain Development

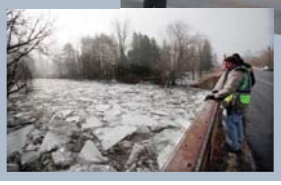
- 3 miles of roads in floodplain
- 156 Buildings in the floodplain
- 139 are residential homes, many along Green River & Hemlock, Buxton, Broad Brooks



Winter Weather Changes

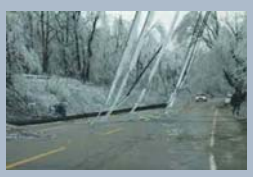
Cycles of cold and warm will increase, alter risks

- **Warmer temps:** Less snow pack = altered water regimes and soil moisture
  - **More rain-on-snow events =** Increased runoff, risk of winter floods
  - **More Ice Jams** = damage to infastructure
  - **Less groundwater recharge** = lower baseflow in streams, rivers, reservoirs
  - **Loss of snow insulation** = freeze/thaw = increased risk of frozen pipes, drains
  - **Dryer spring soils**



Ice Storm December 2008

- **Loss of electricity for 1+ million customers**
- **>500,000 lost power during peak of storm, some for > 2 weeks**
- **FEMA obligates >$32 million in Mass.**
  - + State costs >$7 million
  - + Municipal costs >$5 million
  - + National Grid claims damages of >$30 million
  - + Small businesses without electricity "lose tens of millions of dollars"*



* MA Climate Change Action Plan

T.S. Irene 2011

- 500,000+ MA residents without electricity
- 6 out of 8 stream gages in Deerfield & Hoosic Rivers reach highest peaks of record
- >100+ year flood in Hoosic River
- Dubbed the "costliest Category 1 storm" ($15.8 billion in damages)
- Fed. Disaster in MA: FEMA $5.6 million to households, $30 million for public assistance
- Fed. Highways: $46 million for roads and bridges, much of it for Rt 2
- 50-year storm (2% chance flood event) in central Berkshire County

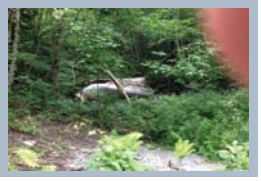
Don't take Water for Granted

- Drought cycles due to increased temperatures and evaporation
- Lower groundwater recharge
- More water in summer/fall comes in extreme storm events with higher, earlier peak flows and more runoff
- Berkshires got off lightly 2016-17

Concerns around Williamstown

- Severe storms, some with little warning
- Steep, flashy streams with quick peak flood stages naturally
- Cycles of bank erosion and damages, repair, and repeat damages
- Undersized culverts & bridges

Concerns around Williamstown



Treadwell Hollow Rd., May 2013

Concerns around Williamstown

Ice Jams on Green River Feb. 1982 – Photos courtesy Hank Art

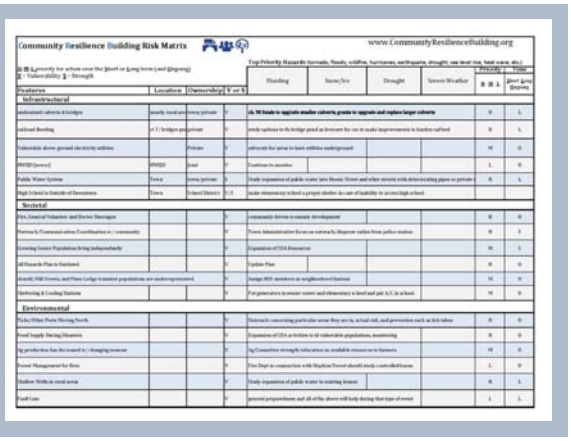
Are you Ready for Electricity Outages?

- **Do you know where vulnerable populations are that need electricity?**
  - Elderly (21% of town's pop. 65+ yrs.*), disabled
  - Medical needs like oxygen, dialysis
- **Do you know where to bring them for their needed services?**
- **Are you prepared to shelter residents in extreme cold and heat?**

** 2010 census*

MVP Workshop May 21st

- 25 Attendees
- Town officials
- Residents
- Businesses
- Institutions



Climate, Emergency Preparedness and the Public

- **Public Works**
  - Plan, respond, implement infrastructure
  - Impacts of climate change on plant species not on radar
- **Public Health**
  - Impacts of climate change on insect populations and human health
  - Preparedness and securing sheltering
- **Farming Community**
  - Changing weather adds to uncertainty

Emergency Preparedness and the Public

- **Only Berkshire town to have mass evacuations and sheltering**
  - Great job by first responders, public officials and public support
  - What can we do better?
  - Still need to develop shelter strategy
- **Communication is Key!**
  - Need more uniform effort and public message
  - Public awareness of natural hazards and climate change
  - Who takes on that central role?
  - "Ownership" by residents is needed for emergency preparedness

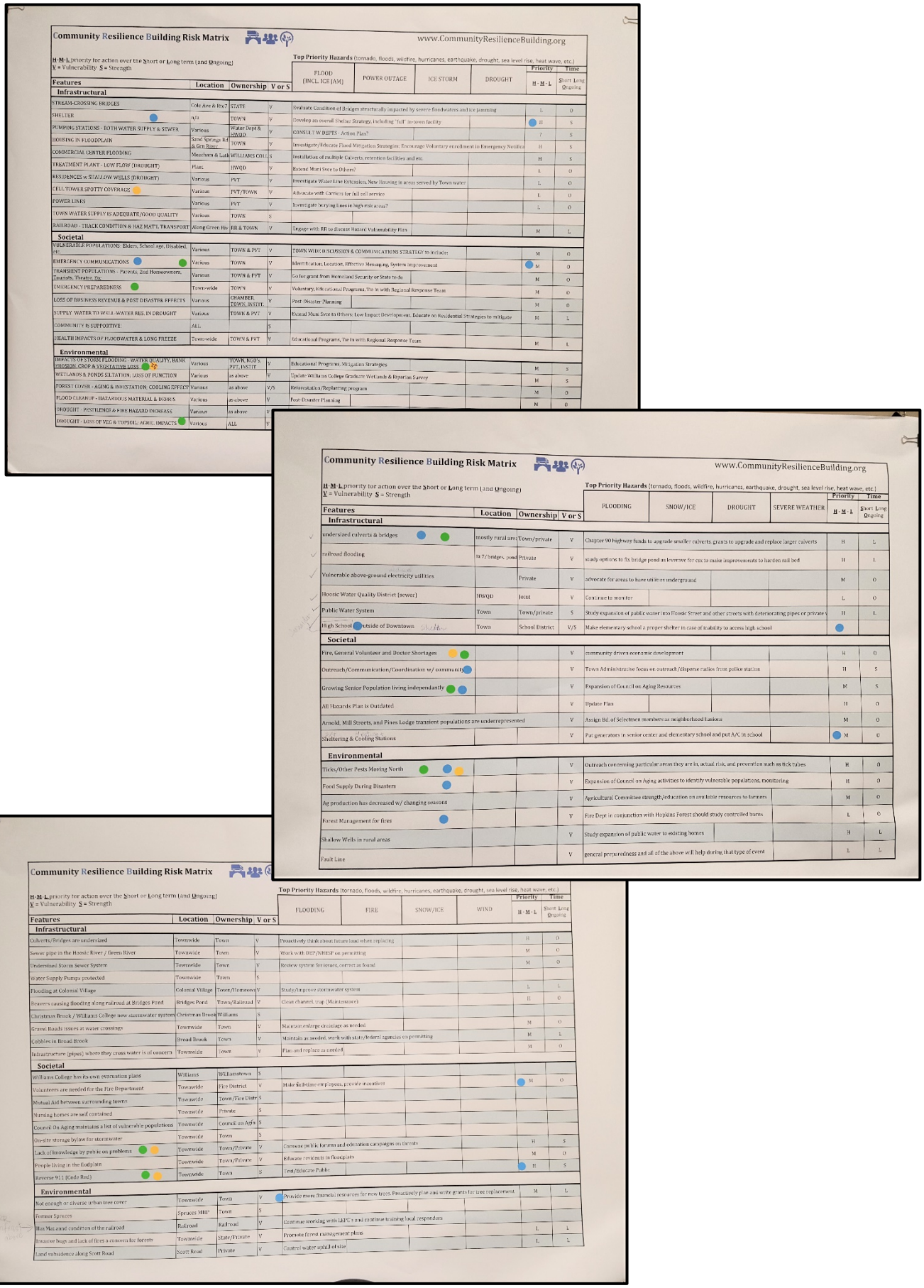
Now it's Your Turn!

Help town officials, first responders and fellow residents prioritize the most important actions

MUNICIPAL VULNERABILITY PREPAREDNESS

TOP RECOMMENDED ACTIONS FOR HAZARD REDUCTION & PREPAREDNESS

INFRASTRUCTURE
Develop prioritized list of bridges, culverts, interceptor and other pipes
Seek grant funding to upgrade/replace undersized culverts, bridges and piping
Ongoing beaver monitoring and maintenance to prevent flooding
Study expansion of public water system into areas served by private wells (White Oak & Hoosic St.)
OUTREACH & COMMUNICATIONS
Develop Communications Strategy - Conduct public outreach on Code Red and other emergency-preparedness info at existing community events / venues to encourage awareness and full participation, esp. by seasonal residents
Develop public education program on flood mitigation and runoff reduction strategies – best management practices, low impact development, etc. Use Clark staff expertise, as appropriate.
SHELTERING
Develop a Shelter Strategy
Make required upgrades to Elementary School and/or High School to be a long-term shelter



Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

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

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

Features	Location	Ownership	V or S	FLOOD (INCL. ICE JAM)	POWER OUTAGE	ICE STORM	DROUGHT	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
STREAM-CROSSING BRIDGES	Cole Ave & Rte 7	STATE	V	Evaluate Condition of Bridges structurally impacted by severe floodwaters and ice jamming				L	O
SHELTER	n/a	TOWN	V	Develop an overall Shelter Strategy, including "full" in-town facility				H	S
PUMPING STATIONS - BOTH WATER SUPPLY & SEWER	Various	Water Dept & HWQD	V	CONSULT W DEPTS - Action Plan?				?	S
HOUSING IN FLOODPLAIN	Sand Springs Rd & Gen Rose	TOWN	V	Investigate/Educate Flood Mitigation Strategies; Encourage Voluntary enrollment in Emergency Notifica				H	S
COMMERCIAL CENTER FLOODING	Meacham & Lath	WILLIAMS COLL	S	Installation of multiple Culverts, retention facilities and etc				H	S
TREATMENT PLANT - LOW FLOW (DROUGHT)	Plant	HWQD	V	Extend Main Svce to Others?				L	O
RESIDENCES w SHALLOW WELLS (DROUGHT)	Various	PVT	V	Investigate Water Line Extension, New Housing in areas served by Town water				L	O
CELL TOWER SPOTTY COVERAGE	Various	PVT/TOWN	V	Advocate with Carriers for full cell service				L	O
POWER LINES	Various	PVT	V	Investigate burying Lines in high risk areas?				L	O
TOWN WATER SUPPLY IS ADEQUATE/GOOD QUALITY	Various	TOWN	S						
RAILROAD - TRACK CONDITION & HAZ MAT'L TRANSPORT	Along Green Riv	RR & TOWN	V	Engage with RR to discuss Hazmt Vulnerability Plan				M	L
Societal									
VULNERABLE POPULATIONS - Elders, School Age, Disabled, etc.	Various	TOWN & PVT	V	TOWN WIDE DISCUSSION & COMMUNICATIONS STRATEGY to include:				M	O
EMERGENCY COMMUNICATIONS	Various	TOWN	V	Identification, Location, Effective Messaging, System improvement				M	O
TRANSIENT POPULATIONS - Parents, 2nd Homeowners, Tourists, Theatre, Etc	Various	TOWN & PVT	V	Go for grant from Homeland Security or State to do				M	O
EMERGENCY PREPAREDNESS	Town-wide	TOWN	V	Voluntary, Educational Programs, Tie in with Regional Response Team				M	O
LOSS OF BUSINESS REVENUE & POST DISASTER EFFECTS	Various	CHAMBER TOWN, INSTIT.	V	Post-Disaster Planning				M	O
SUPPLY WATER TO WILL-WATER RES. IN DROUGHT	Various	TOWN & PVT	V	Extend Main Svce to Others; Low Impact Development, Educate on Residential Strategies to Mitigate				M	L
COMMUNITY IS SUPPORTIVE	ALL		S						
HEALTH IMPACTS OF FLOODWATER & LONG FREEZE	Town-wide	TOWN & PVT	V	Educational Programs, Tie in with Regional Response Team				M	L
Environmental									
IMPACTS OF STORM FLOODING - WATER QUALITY, BANK EROSION, CROP & VEGETATIVE LOSS	Various	TOWN, NGO's PVT, INSTIT.	V	Educational Programs, Mitigation Strategies				M	S
WETLANDS & PONDS SILTATION, LOSS OF FUNCTION	Various	as above	V	Update Williams College Graduate Wetlands & Riparian Survey				M	S
FOREST COVER - AGING & INFESTATION; COOLING EFFECT	Various	as above	V/S	Reforestation/Replanting program				M	O
FLOOD CLEANUP - HAZARDOUS MATERIAL & DEBRIS	Various	as above	V	Post-Disaster Planning				M	O
DROUGHT - PESTILENCE & FIRE HAZARD INCREASE	Various	as above	V						
DROUGHT - LOSS OF VEG & TOPSOIL; AGRIC. IMPACTS	Various	ALL	V						

Community Resilience Building Risk Matrix

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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	FLOODING	SNOW/ICE	DROUGHT	SEVERE WEATHER	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
undersized culverts & bridges	mostly rural area	Town/private	V	Chapter 90 highway funds to upgrade smaller culverts, grants to upgrade and replace larger culverts				H	L
railroad flooding	rt 7/ bridges, pond	Private	V	study options to fix bridge pond as leverage for cox to make improvements to harden rail bed				H	L
Vulnerable above-ground electricity utilities		Private	V	advocate for areas to have utilities underground				M	O
Hoosic Water Quality District (sewer)	HWQD	Joint	V	Continue to monitor				L	O
Public Water System	Town	Town/private	S	Study expansion of public water into Hoosic Street and other streets with deteriorating pipes or private				H	L
High School outside of Dowatown	Town	School District	V/S	Make elementary school a proper shelter in case of inability to access high school					
Societal									
Fire, General Volunteer and Doctor Shortages			V	community driven economic development				H	O
Outreach/Communication/Coordination w/ community			V	Town Administrative focus on outreach/disperse ratios from police station				H	S
Growing Senior Population living independantly			V	Expansion of Council on Aging Resources				M	S
All Hazards Plan is Outdated			V	Update Plan				H	O
Arnold, Mill Streets, and Pines Lodge transient populations are underrepresented			V	Assign Bd. of Selectmen members as neighborhood liaisons				M	O
Sheltering & Cooling Stations			V	Put generators in senior center and elementary school and put A/C in school				M	O
Environmental									
Ticks/Other Pests Moving North			V	Outreach concerning particular areas they are in, actual risk, and prevention such as tick tubes				H	O
Food Supply During Disasters			V	Expansion of Council on Aging activities to identify vulnerable populations, monitoring				H	O
Ag production has decreased w/ changing seasons			V	Agricultural Committee strength/education on available resources to farmers				M	O
Forest Management for fires			V	Fire Dept in conjunction with Hopkins Forest should study controlled burns				L	O
Shallow Wells in rural areas			V	Study expansion of public water to existing homes				H	L
Fault Line			V	general preparedness and all of the above will help during that type of event				L	L

Community Resilience Building Risk Matrix

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	FLOODING	FIRE	SNOW/ICE	WIND	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Culverts/Bridges are undersized	Townwide	Town	V	Proactively think about future load when replacing				H	O
Sewer pipe in the Hoosic River / Green River	Townwide	Town	V	Work with DEP/NHESP on permitting				M	O
Undersized Storm Sewer System	Townwide	Town	V	Review system for issues, correct as found				M	O
Water Supply Pumps protected	Townwide	Town	S						
Flooding at Colonial Village	Colonial Village	Town/Homeowr	V	Study/Improve stormwater system				L	L
Beavers causing flooding along railroad at Bridges Pond	Bridges Pond	Town/Railroad	V	Clean channel, trap (Maintenance)				H	O
Christmas Brook / Williams College new stormwater system	Christmas Brook	Williams	S						
Gravel Roads issues at water crossings	Townwide	Town	V	Maintain enlarge crossings as needed				M	O
Cobbles in Broad Brook	Broad Brook	Town	V	Maintain as needed, work with state/federal agencies on permitting				M	L
Infrastructure (pipes) where they cross water is of concern	Townwide	Town	V	Plan and replace as needed				M	O
Societal									
Williams College has its own evacuation plans	Williams	Williamstown	S						
Volunteers are needed for the Fire Department	Townwide	Fire District	V	Make full-time employees, provide incentives				M	O
Mutual Aid between surrounding towns	Townwide	Town/Fire Distr	S						
Nursing homes are self contained	Townwide	Private	S						
Council On Aging maintains a list of vulnerable populations	Townwide	Council on Agin	S						
On-site storage bylaw for stormwater	Townwide	Town	S						
Lack of knowledge by public on problems	Townwide	Town/Private	V	Convene public forums and education campaigns on threats				H	S
People living in the floodplain	Townwide	Town/Private	V	Educate residents in floodplain				M	O
Reverse 911 (Code Red)	Townwide	Town	S	Test/Educate Public				H	S
Environmental									
Not enough or diverse urban tree cover	Townwide	Town	V	Provide more financial resources for new trees. Proactively plan and write grants for tree replacement				M	L
Former Spruces	Spruces MHP	Town	S						
Haz Mat annd condition of the railroad	Railroad	Railroad	V	Continue working with LEPC's and continue training local responders					
Invasive bugs and lack of fires a concern for forests	Townwide	State/Private	V	Promote forest management plans				L	L
Land subsidence along Scott Road	Scott Road	Private	V	Control water rabbit of site				L	L