Town of Brookline
Local Hazard Mitigation Plan

Town Adoption Date: February 5, 2025
FEMA Final Approval Date: February 10, 2025

Technical Assistance for the Plan development provided by the Windham Regional Commission

In cooperation with

Vermont Emergency Management and the Federal Emergency Management Agency

FEMA

Certificate of Adoption
Town of Brookline, VT

A Resolution Adopting the
Town of Brookline Local Hazard Mitigation Plan

WHEREAS, the Town of Brookline VT has worked with the Windham Regional Commission to identify natural hazards, analyze past and potential future damages due to natural disasters, and identify strategies for mitigating future damages; and

WHEREAS, The *Town of Brookline Local Hazard Mitigation Plan* analyzes natural hazards and assesses risks within the community; and

WHEREAS, the *Town of Brookline Local Hazard Mitigation Plan* recommends the implementation of action(s) specific to the community to mitigate against damage from natural hazard events; and

WHEREAS, the Town of Brookline, VT authorizes responsible agencies to execute their responsibilities to implement this plan for the purposes of long-term risk reduction and increased community resiliency and;

WHEREAS, the Town of Brookline, VT will follow the Plan Maintenance Process outlined in herein to assure that the *Town of Brookline Local Hazard Mitigation Plan* stays up to date and compliant; and

NOW, THEREFORE BE IT RESOLVED that the Town of Brookline, VT adopts the *Town of Brookline Local Hazard Mitigation Plan*. While content related to the Town of Brookline require revisions to meet the plan approval, changes occurring after adoption will not require the Town of Brookline to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by a vote of 5 in favor and 0 against, and 0 abstaining, this 5 day of February, 2025.
month, year

Selectboard Members

Dorothy Maggio – Chair

Douglas Wellman

Stanley Noga – Vice Chair

Michael DeSoicio

Bruce Mello

ATTEST
Vanessa Ballou

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INTRODUCTION AND PURPOSE

The impact of expected, but unpredictable natural events can be reduced through community planning and action. The goal of this Plan is to provide a natural hazards local mitigation strategy that makes Brookline more disaster resistant and more resilient after a disaster.

Hazard mitigation is any sustained action that reduces or eliminates risk to people and property from natural hazards and their effects. Based on the results of previous project impact studies, FEMA and state agencies have come to recognize that it is more cost effective to prevent damage from disasters than to repeatedly repair damage after a disaster has struck. This Plan recognizes that communities also have opportunities to identify mitigation strategies and measures during all phases of emergency management – prevention, preparedness, response and recovery. Hazards cannot be eliminated, but it is possible to understand the potential of hazards and the risk facing the community, and to identify what local actions can be taken to reduce the severity of hazard-related damage.

The purpose of this Plan is to assist the Town in identifying all natural hazards facing the community, ranking them according to local vulnerabilities, and developing strategies to reduce risks from those hazards. Once adopted, this Plan is not legally binding; instead, it outlines goals and actions to prevent future loss of life and property.

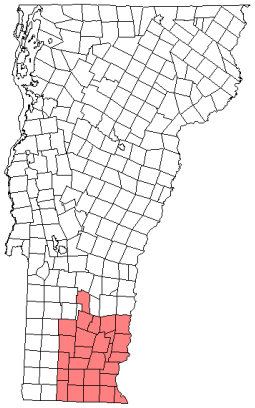
The benefits of mitigation planning include:

- Identifying actions for risk reduction that are agreed upon by stakeholders and the public.
- Focusing resources on the greatest risks and vulnerabilities.
- Increasing education and awareness of threats and hazards, as well as their risks.
- Reducing the degree of injury and inconvenience to the townspeople and their private and municipal property.
- Communicating priorities to State and Federal officials.
- Aligning risk reduction with other community objectives.

Adoption and maintenance of this Hazard Mitigation Plan will:

- Make certain funding sources available to complete the identified mitigation initiatives that would not otherwise be available if the plan were not in place;
- Support effective pre- and post-disaster decision making efforts;
- Lessen each local government's vulnerability to disasters by focusing limited financial resources to specifically identified initiatives whose importance have been ranked; and
- Connect hazard mitigation planning to community planning where possible.

WINDHAM REGION GEOGRAPHY



Situated in Vermont's southeastern corner, the Windham Region consists of 23 towns in Windham County, the neighboring towns of Readsboro, Searsburg, and Winhall in Bennington County, and Weston in Windsor County. The region is bordered by Massachusetts to the south and New Hampshire to the east. At over 920 square miles (590,000 acres), the region accounts for roughly 9.6% of the State's total land area. The Windham Region has several distinctive identities, largely defined by the diverse natural environment.

The Region's topography is relatively flat or gently rolling land in the Connecticut River valley in the east, while the western part of the region is characterized by the Green Mountain ridges and peaks with narrow stream valleys. Stratton Mountain is the highest point in the region at 3,936 feet. The lowest point is along the Connecticut River in Vernon, at 200 feet.

In addition to the Connecticut, other major rivers of the region are the Deerfield, Green, North, Saxtons, West, Williams, and all tributaries of the Connecticut. There are two major flood control reservoirs on the West River, Ball Mountain and Townshend, and two major storage reservoirs for hydropower generation on the Deerfield River, Somerset and Harriman.

COMMUNITY PROFILE

Geography and Land Use

The Town of Brookline is a rural Southern Vermont town of 8,256 acres or 12.9 square miles in the eastern foothills of the Green Mountains in Windham County. It is the smallest town geographically in the Windham Region. Brookline is bordered to the north by Athens, to the east by Putney and Westminster, to the south by Dummerston, and to the west by Newfane and Townshend.

The physical characteristics of Brookline are dominated by the Grassy Brook. The Town runs along the valley of Grassy Brook for 9½ miles, forming Grassy Brook Valley, and is bordered on the east by Putney Mountain.

Brookline does not have a defined town center, and there are not many businesses in Brookline. Over the years farming has played an important role in Brookline's land use and local economy. Many farms have ceased to operate and only a few commercial operations exist today. There are several home businesses and enterprises throughout the town. As far as employment opportunities, Brookline serves mostly as a residential community relying on the commerce and industry of surrounding towns. The Round School House, perhaps Brookline's best-known historic site, was built in 1822 and restored in 2005. It sits across the street from the Town Office

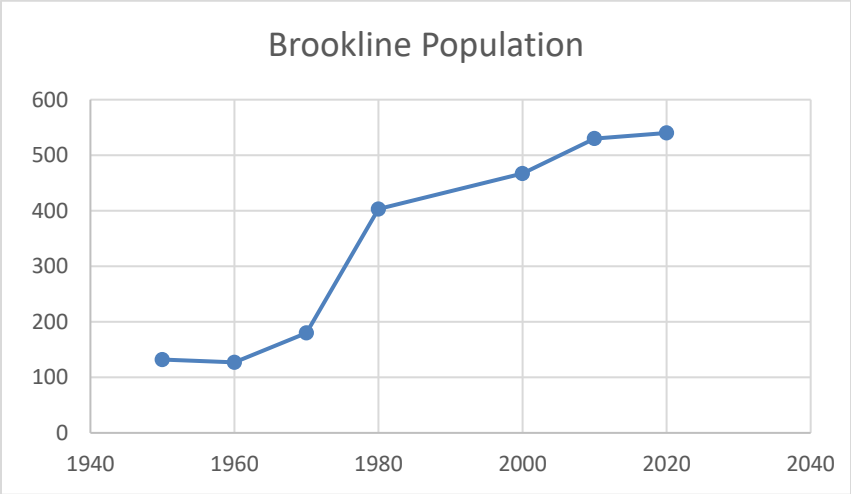
Woodlands are predominant in Brookline and cover a vast acreage of land. These forestlands provide the scenic backdrop for the town and provide wood products, wildlife, maple products and recreation. Most forestland is private, non-industrial ownership. Out of a total acreage of 8294, 3714 acres (44.8%) are enrolled in Vermont's Use Value Appraisal (UVA) program. Public entities, conservation easements, and private non-profit conservation organizations have conserved 1050.7 acres (12.7%) of the land base, some of which may also be enrolled in the UVA program.

The climate is generally temperate with moderately cool summers and cold winters, as in the rest of Vermont. The weather is unpredictable, and large variations in temperature, precipitation, and other conditions may occur both within and between seasons.

Development and Population Trends

As the following table shows, population in Brookline has generally increased between 1950-2010, and has held steady since 2010. Brookline has seen virtually no population change since the last Plan update. This consistency has meant no change to vulnerability level since the last Plan. The Census Bureau has risk factors that increase vulnerability and provided that data at a county level. For Windham County that data shows that 13.1% of the population is below poverty, 27.4% has some type of disability, 5.9% are without a vehicle, and only 71.9% have broadband[1]. For Brookline, 11.0% of the population is in poverty, 12.4% are disabled, 0.6% are without a vehicle, and broadband statistics were not given at the town level. These statistics show that Brookline is slightly less vulnerable compared to other towns in Windham County.[2]

There is an aging population in Brookline, with 30.6% aged 60 or older. There is a sector of the Brookline population that is quite self-sufficient. There is another sector of the town's changing population that expects services that aren't always available in a small town. So, there are a wide variety of people in Brookline and each has their own set of needs and vulnerabilities.



United States Census Bureau: Decennial Census Data

The development pattern has not changed appreciably since the last Plan. Development trends noted by the Town are that more residents work from home than in prior years, and there are more home-based businesses. The planning committee noted that without municipal water and sewer, with areas of flooding that are increasing with climate change, and a significant desire of many residents to remain a rural "bedroom community," there is not likely to be much new development in town.

Over the years, Brookline has changed from a small, rural farming community to a primarily residential one, consisting of permanent dwellers and vacation homeowners. In recent years, there has been little commercial or industrial development in Brookline, however, as technological change facilitates ever more remote workplace and business locations, the presence of home-based businesses and other businesses reliant upon electronic communication and sales could expand. An example of this has been the recent marketing of Airbnb listings in Brookline, to supplement existing area inns and hotels.[3]

Development changes that were noted by the planning committee included:

- A couple of new individual houses were built.
- Few subdivisions of land with small houses going up on the smaller lots.
- A new business was started called Inner Fire. They are a 12 unit therapeutic residential community located at 26 Parker Road.
- New wedding venues have started at White Barn Farm and Indian Acres Farm.

Overall, while there have not been appreciable changes in Brookline since the last Plan update, weather patterns linked to climate change have become more evident.

[1] US Census Bureau, My Community Explorer tool, ACS 2017-2021: Windham County, Vermont statistics.
[2] US Census Bureau, American Community Survey 5-Year Estimates 2017-2021.

[3] 2017 Brookline Town Plan. Page 21

Emergency Services and Resources

Brookline is served by NewBrook Fire and Rescue, an incorporated nonprofit organization. They are a 100% volunteer fire and emergency medical services company located on Route 30 a half-mile north of the Newfane Village center. The Department, run by a Board of Trustees, serves the towns of Brookline and Newfane and has mutual aid agreements with surrounding towns. NewBrook is dispatched by Southwestern New Hampshire District Fire Mutual Aid Dispatch Center in Keene, NH. In an average year NewBrook responds to about 240 calls, including structure fires, vehicle fires, EMS calls, smoke and carbon monoxide alarms, cellar pumping, public assistance calls (for example, to help disabled people), distressed animals, securing scenes of dangerous fallen power lines, and other emergencies. Given the constraints imposed by this type of volunteer support it has neither the financial nor the human resources to provide the level of fire protection that would be required by large-scale development. NewBrook's firefighters undergo a variety of in-house training as well as more formal training in firefighting, hazardous-material handling, use of air-pack breathing equipment, victim extrication from vehicles, putting out chimney fires, arson investigation, and more. NewBrook's rescue workers include state-certified first responders, EMT-Basic and -Advanced trained volunteers.

Police protection can be contracted by the Selectboard annually and the selectboard does not currently contract with an agency. The town is investigating a regional service being formulated by the Windham County Sherriff's Department. The Vermont State Police will be involved in any major crime. Adequate police protection is a significant concern for residents.

The Selectboard Chair, currently Dorothy Maggio, is the appointed Emergency Management Director. The primary method of emergency notification is by email/ text/ phone calls and Vermont Alert. An Emergency Operations Center, located in the Town Office and served by a backup generator, is the command center for town officials and emergency operations staff. The Town Office generator has limited power and does not run the water well. It only provides enough power for heat, some lights and one computer. There is enough power to offer charging of cell phones for residents. There is also a backup generator at NewBrook Fire Station on Route 30 in Newfane. This information and other important details regarding emergency management can be found in the Brookline Local Emergency Management Plan (LEMP).

There are no designated emergency shelters located in Brookline. The Brookline Meeting House and the former Elementary School Building (currently housing a daycare) have been discussed as possible shelters. However, neither building currently meets minimum requirements.

Additional ambulances and rescue vehicles are available through Mutual Aid Dispatch. The nearest hospitals to Brookline are Brattleboro Memorial Hospital in Brattleboro, Grace Cottage in Townshend, and Dartmouth-Hitchcock Medical Center in Keene, NH, (Cheshire Medical Center) and Lebanon, NH.

Public Water and Sanitary Sewer Infrastructure

There are no municipal water or wastewater systems in Brookline.

Transportation Infrastructure and Act 64

State Route 30 is the main road serving the community. The town's roadways consist of two primary roads, Grassy Brook Road and Hill Road. The secondary roads include Putney Mountain Road, Whitney Hill Road, Ellen Ware Road, Kirsch Road, Parker Road, Greer Road, Murdock Drive, Howe Lane, Bush Lane, and Harris Hill Road.

There are 193 town owned culverts in Brookline, of which 6 are in poor condition and 3 are in critical condition. There are 7 town owned bridges, 3 short and 4 long.

Brookline has a total of 19.14 miles of town highways. The amount of mileage in each town highway class is shown in the table below.

Brookline Town Highways Mileage by Class				
Class 1	Class 2	Class 3	Class 4	Total
0.00	4.95	12.07	2.12	19.14

Approximately 10.8 miles or 63.9% of total town road miles (excluding class 4) are hydrologically connected, which means the road is within 100 feet of a water resource (i.e., perennial/intermittent streams, wetlands, lakes or pond). Proximity to water resources can make these sections of road more vulnerable to flooding and fluvial erosion.

Act 64, the Vermont Clean Water Act, requires the state to develop a new Municipal Roads General Permit (MRGP). The MRGP requires Brookline to conduct Road Erosion Inventories (REIs) for hydrologically connected municipal road segments. The ANR Natural Resources Atlas shows a lot of road segments in the town that are included in this regulation. Brookline will also be required to develop Road Stormwater Management Plans for all hydrologically connected road segments not meeting MRGP standards. Brookline would then be required to implement the Road Stormwater Management Plans over time, reaching full compliance by 2035. Road improvements, which generally consist of gravel resurfacing and stone-lined ditching, also can make the roads more resilient in conveying excess water. Roads that were brought up to standard generally fared well in the most recent flood. Ongoing compliance with MGRP will improve the flood resilience of our roads, which are most likely to be damaged in flooding.

Communication Coverage

Access to high-speed internet and cell service coverage are important parts of emergency communication capabilities in a town. The Windham Region, as in many rural areas, has a patchwork of coverage levels with some areas not having coverage. High speed internet access is available in all of Brookline. Many town residents use the Moore Free Library in Newfane, which offers a internet access. Cell phone coverage fluctuates throughout Brookline with some areas getting better reception and some getting none.

PLANNING PROCESS

Plan Developers

Each core Planning Team member serves the community in a number of capacities, creating a balanced perspective:

- Dot Maggio – Selectboard Chair, Emergency Management Director, Animal Control Officer, Health Officer
- Stan Noga – Selectboard Vice Chair, Planning Commission
- Somara Zwick – Selectboard Member, Planning Commission (all at the time of the planning public meetings)
- Vanessa Ballou – Recording Clerk and Community Resident
- Oliver Ames – Community Resident
- Pat Noga – Community Resident
- Leslie Zucker – Community Resident
- Chuck Tattersall – Community Resident
- Alyssa Schmidt – Lister, Community Resident
- Leah Daly –Planning Commission
- E. Mark Bills – Highway Supervisor
- Michael DeSocio – Selectboard Member
- Doug Wellman – Selectboard Member

Margo Ghia, Regional Planner with the Windham Regional Commission, assisted the Town with this update to meet the standards and guidelines of the latest FEMA *Local Mitigation Plan Review Tool*. FEMA Pre-Disaster Mitigation funding supported this process.

Update Process

This Local Hazard Mitigation Plan ('LHMP' or 'Plan') is an update to a Plan approved for the Town of Brookline by the Federal Emergency Management Agency (FEMA) effective 01/30/2017 and expired on 01/30/2022. The below table lists the stakeholders that were provided an opportunity for engagement in this Plan update and how that opportunity was provided:

Stakeholder involvement	Stakeholders were invited to the public meetings through direct verbal invitation and email. As additional information was needed to develop the plan, the planning team consulted with stakeholders on an individual basis depending on their area of service and knowledge.
General public involvement	An online survey was conducted for several weeks in September and October 2023 to gather input on lived experience of natural hazards in Brookline, hazards of concern for the future and ideas for mitigation actions that the town could consider. Survey results are contained in this plan. Advertisement of the survey and public meetings was posted on the town website, sent to a list-serve of Brookline Residents, was advertised on Front Porch Forum Two public meetings were held.
Businesses, academia, and other private and non-profit interests	The draft plan was provided to the following entities for their review and comment via email (see appendix): • Green Mountain Power – Electric Utility. Consulted via email on loss of power statistics and other resiliency projects planned for Brookline. • Grace Cottage Hospital - closest medical provider in the immediate region. • NewBrook Elementary • Sunny Lane Daycare – currently housed in the old Brookline School building, which is town owned • NewBrook Volunteer Fire and Rescue – services towns of Newfane and Brookline – they are also a designated emergency shelter.
Neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development	The draft plan was provided via email for review and comment to: • The Planning Commissions and Emergency Management Directors of the adjacent towns of: Townshend, Athens, Westminster, Putney, Dummerston and Newfane. • Basin Planner for the Agency of Natural Resources Department of Environmental Conservation. • The Plan was also sent to VEM for initial review, so the comments and input from all of the above-mentioned contacts and outreach strategies continued to be incorporated into the plan.
Representatives of nonprofit organizations, including community-based organizations that work directly with or provide support to vulnerable populations or frontline communities	While this list is not exhaustive, here are a number of groups that serve vulnerable residents that received the draft plan for review and input (see appendix for outreach email): • Valley Cares is a local organization that helps residents in need through a non-emergency phone referral service staffed by volunteers, assistance with minor home repairs

	for needy residents, an emergency fuel fund, a medical equipment loan program and more. • Youth Services – resource for young Vermonters • Senior Solutions – resource for aging Vermonters • MOOver – Provides regional bus and shared ride transport service. • The Gathering Place – Safe space for people with physical or cognitive impairments. • Groundworks Collaborative – Based in Brattleboro. Serves people who are facing housing and food insecurity. • Brattleboro Area Hospice – Provides programs to dying and grieving community members. • Health Care & Rehabilitation Services (HCRS) – A comprehensive community mental health provider. • Southeastern Vermont Community Action (SEVCA) – Anti-poverty, community-based non-profit. • Visiting Nurse and Hospice for VT & NH – Home, health, hospice and pediatric services. • Women's Freedom Center – Based in Brattleboro and working to end physical, sexual and emotional violence against women. • VT211 – non-emergency information resource for those facing crisis or are in need of guidance on available resources.

The planning process overview:

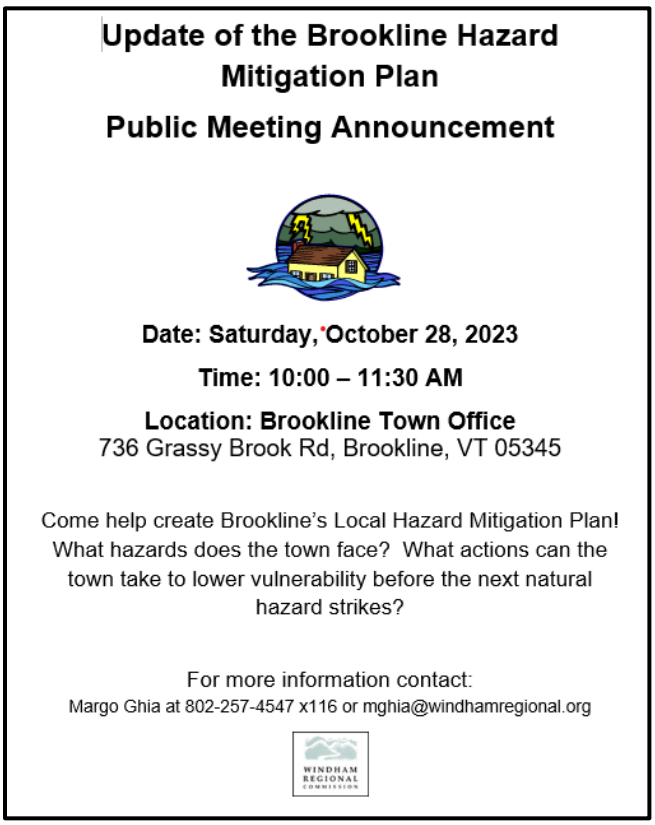
- September 7, 2023 – Kick-off meeting to set up the public meetings and develop the Planning Team. The Selectboard Chair/Emergency Management Director (EMD) was the local lead and invited team members.
- September – October, 2023 – A public survey was advertised and linked on the town website, sent to town residents via the town list-serve, and paper copies were available at the Town Office.
- October 26, 2023 – An email was sent to neighboring communities and frontline organizations to invite them to offer ideas or join the planning process for updating the Brookline LHMP.[4]
- October 28, 2023 – At a public meeting, the committee reviewed the public survey results, the prior plan and completed the hazard assessment.
- November 8, 2023 – At a public meeting of the Planning Team focused on development of new mitigation actions.
- November 8, 2023 – Margo met with the Selectboard Chair/EMD and another member of the Selectboard to finalize updates to the mitigation action progress from the 2017 Plan.
- The draft plan was presented for internal town review to the original planning committee and other town personnel and appointees on July 30, 2024. This internal town review period was from July 30-August 10. Two reviews with comments were received. Margo then finalized the draft.
- August 9 through Friday, August 23, 2024 - The public comment period was open to review and provide feedback on the Plan.
    - All advertising was conducted according to the advertisement process listed below[5]. In addition, handouts were given out at the Primaries voting site on August 13, 2024 inviting residents to review the plan.
    - During the two-week comment period, a total of 30 users downloaded the PDF of the Hazard Mitigation Plan 42 times from the website.

[4] See appendix for copy of email to frontline communities to participate in the beginning of the update process.
[5] See appendix for website posting.

- Emails were sent to all neighboring communities and frontline organizations to review and offer comments on the draft plan.[6] A reply came from Senior Solutions saying they had no comments and thanking the town for including them in the review process.
- Comments and updates were received from 4 residents during the Public Comment Period. Revisions were made to the plan to finalize the draft for VEM submission. Inter-town and provider communication will repeat for future revisions of this Plan.

Advertisements for all public meetings were on the town website, the town Facebook page, Front Porch Forum, sent via a Brookline resident list-serve and at the three designated physical posting locations in town as required by state statute for all public documents. Each meeting lasted for a couple of hours and over the course of both meetings the group completed and discussed:

- **Update of the 2017 Brookline Local Hazard Mitigation Plan**
  - Purpose
  - Process
- **Hazard assessment included:**
  - Discussion of hazard events that have occurred since the last Plan
  - Discussion of online public survey results
  - Review and update of hazard assessment
  - Marking up of the physical map and/or the online Vermont Natural Resources Atlas with local hazard notes
- **Mitigation Goals and Actions**
  - Review/edit prior plan goals
  - Update of prior mitigation actions
  - Create an updated Mitigation Actions Table
  - Identify current gaps and capabilities with implementation
  - Identify any changes in hazard or action prioritization
- **Other Updates**
  - Discussion of recent mitigation work completed by the Town
  - Discussion of development trends – new developments, upcoming developments and vulnerability impacts
  - Overall resiliency concerns or ideas



Data Sources

Information was gathered for this update through a variety of sources listed below. A summary of data sources is provided here with some additional specific references cited elsewhere throughout:

- Surveys and warned, public meetings collecting public comment (comments were addressed in the plan and public meeting)
- 2023 Local Emergency Management Plan – local emergency resources

[6] See appendix for copies of neighboring communities and frontline organizations emails.

- Local knowledge of Planning Team members and other stakeholders – community impacts, priorities, trends, and overall plan guidance
- 2017 Brookline Local Hazard Mitigation Plan – prior actions, goals, hazard assessment, and hazard profile information
- Flood Ready Vermont Community reports – NFIP participation data
- Flood Insurance Study (most recent is 2007) – FEMA flood hazard location information
- 2017 Brookline Town Plan – community profile, mitigation related actions and goals
- US Drought Monitor to quantify historic periods of drought in Windham County
- US Center for Disease Control – understanding of the risk of heat-related illness
- National Weather Services, including NOAA Events Data, NOW Data, and Climate at a Glance - climate trends, climate records, and special weather events
- 2020 US Census and American Community Survey 5-Year Estimates - population data
- VTrans Town Highway Bridge Inspection Reports – transportation infrastructure statistics
- Vermont Statewide Highway Flood Vulnerability and Risk Map
- Green Mountain Power - outage data and information on the power infrastructure
- 2023 draft State of Vermont Hazard Mitigation Plan – hazard profile information, state goals, and hazard extent data
- FEMA Disaster Declarations for Vermont – county level declared disasters
- VT ANR Atlas – location of River Corridors and Special Flood Hazard Areas
- FEMA Flood Insurance Rate Maps (effective 12/2/2015) - location of Special Flood Hazard Area
- U.S. Geological Survey National Water Information System - flood extent data
- WRC Local Liaison Reports of Storm Damage – local event impacts
- CRREL Ice Jam Database – mapped ice jams
- Review and input from Dover Conservation Commission Chair – invasive species section
- Local invasive plant list from Peter Bergstrom of the Rockingham Conservation Commission, sent 8/21/2021
- Communication with VT State Forester, Jim Esden, and Windham County Forester, Sam Schneski, on 2/21/20 – invasive species information specific to Windham region
- VT Fish and Wildlife website – invasive species section
- VTinvasives.org – invasive plant and Forest Pest data
- Vermont Department of Health – Heat data

HAZARD IDENTIFICATION AND RISK ASSESSMENT

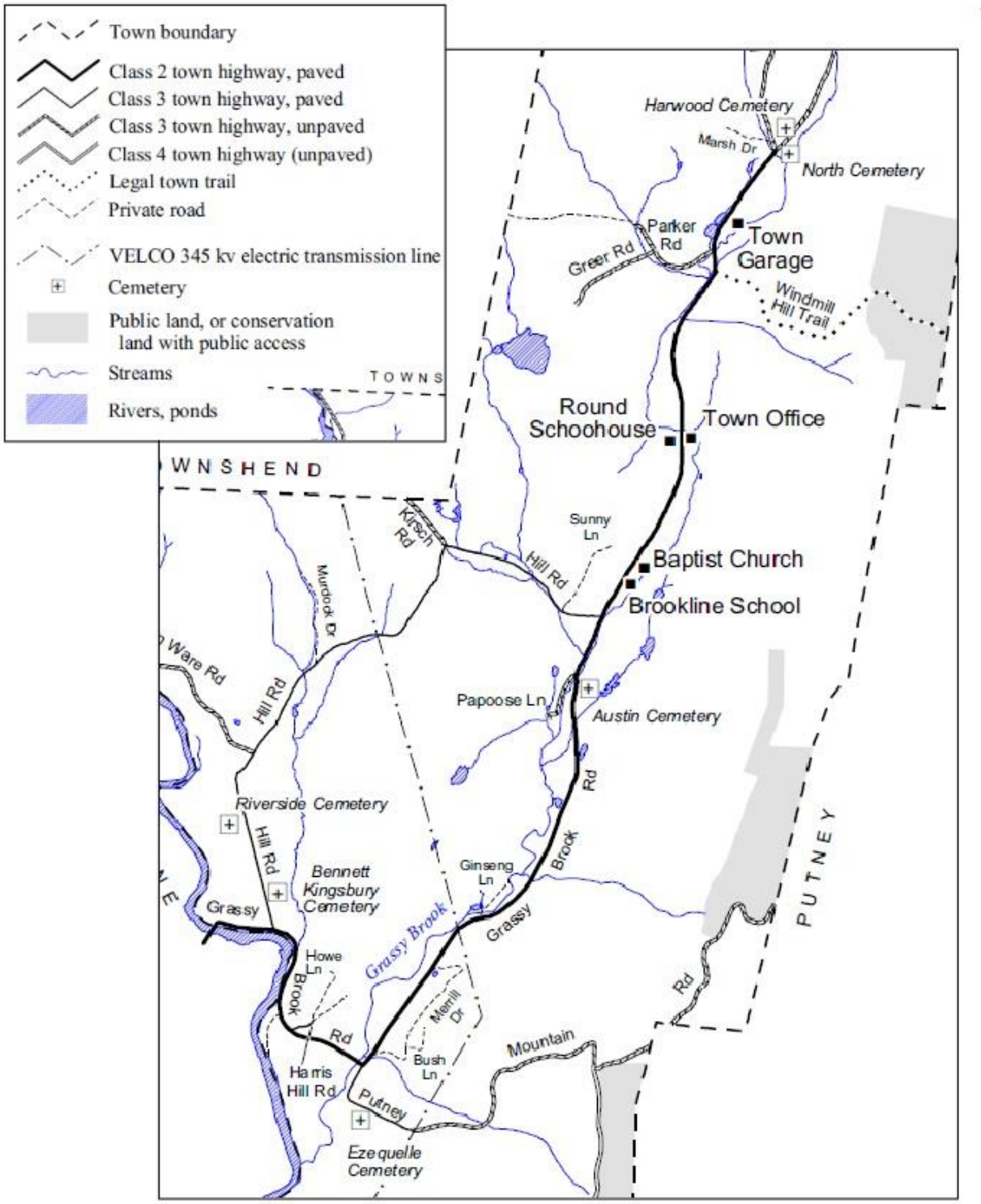
Community Assets

In addition to people, community assets relate to town owned buildings and infrastructure. All of the community assets in Brookline lie within vulnerable range of Grassy Brook (this is shown on the map on the following page). Some of the primary assets noted by the town are:

- Brookline Town Office (Emergency Shelter) – along Grassy Brook, within 50 feet
- Brookline School – Sunny Lane Daycare (Emergency Shelter) – along Grassy Brook, within 50

feet

- Brookline Meeting House – Brookline would like this to also be a shelter – along Grassy Brook, within 50 feet
- Round Schoolhouse – across the street from town office and within 50 feet of the Grassy Brook
- Town Garage - along Grassy Brook



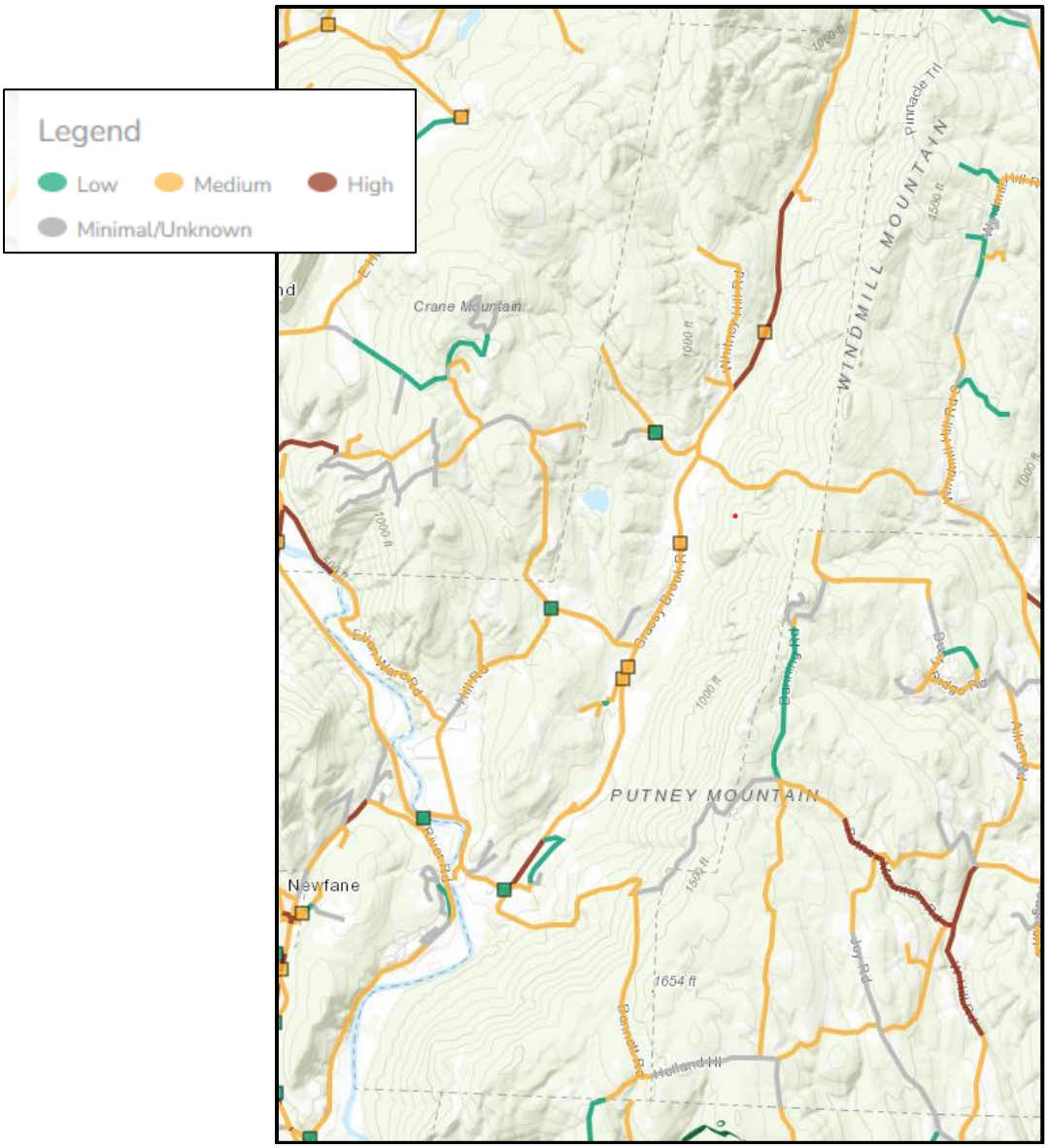
Map showing Brookline Community Assets. Map from the 2017 Local Hazard Mitigation Plan.

VTrans Transportation Infrastructure Vulnerability Mapping

The Vermont Department of Transportation has developed a 'Transportation Resilience Planning Tool' to quantify the flood vulnerability and risk of bridges, culverts, and road embankments throughout the state.[7] Vulnerability assessments were completed for the following infrastructure:

- Road/river embankments along state and town highways
- All long structures (spans greater than 20 feet) on state and town highways
- All culverts and short structures on the state highway system

The map shown below provides a vulnerability analysis of roads and bridges that are at risk of inundation, erosion, or deposition related to a 100-year flood event. The Tool combines river science, hydraulics and transportation planning methods and is applied at a watershed scale. This data can be used to inform project scoping, capital programming, and hazard mitigation planning for state and local highways. The map shown here shows the vulnerability ranking of roads and bridges in the Town.

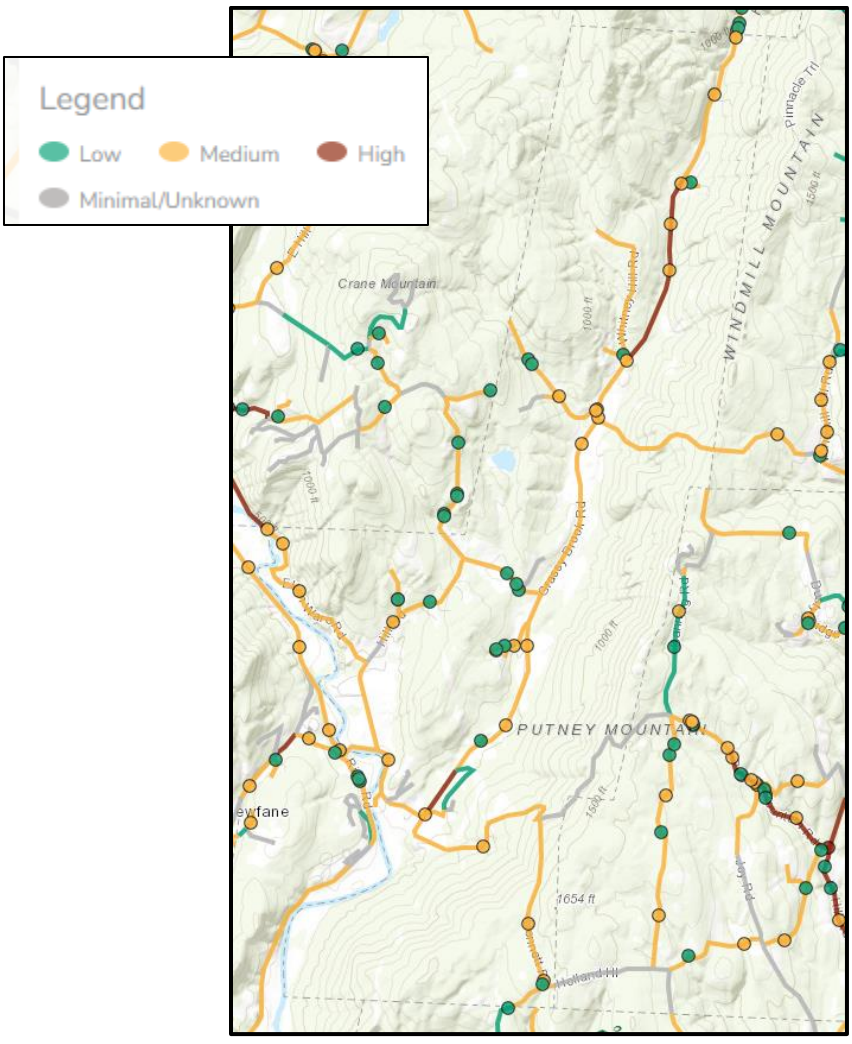


[7] VTrans Statewide Highway Flood Vulnerability and Risk Website: https://vtrans.vermont.gov/planning/transportation-resilience/statewide

The preceding map, generated from the Transportation Resilience Planning Tool, identifies sections of Grassy Brook Road as being highly vulnerable road segments. The segments both rank high in mapped criticality and are prone to erosion. There are no high-risk bridges, but many of the bridges in town have a medium level of vulnerability. No structures are ranked as highly or of medium vulnerability.

While the map shows only a few road segments as highly vulnerable and there are no structures ranked high or of medium vulnerability, the on-the-ground reality in town has shown that there are many highly vulnerable road segments, culverts and structures. The town has been working to identify and upgrade identified priority culverts and road segments to mitigate future damage from high rain events. There are also many private structures, including homes that have flooded multiple times in the past four years. When hazardous road segments, structures and culverts are being analyzed, direct experience from the town should be counted more heavily than just the vulnerability maps.

The below map shows the same data from the Transportation Resilience Planning Tool, but also shows culverts. According to the map, there are no highly vulnerable culverts in town. Once again, the town has identified road segments, culverts and structures in town that have failed or been significantly damaged in town during the large flooding events of the past several years.



The Transportation Resilience Planning Tool is a publicly accessible tool that can be accessed here or by searching for it online.

Federal Disaster Declarations for Windham County

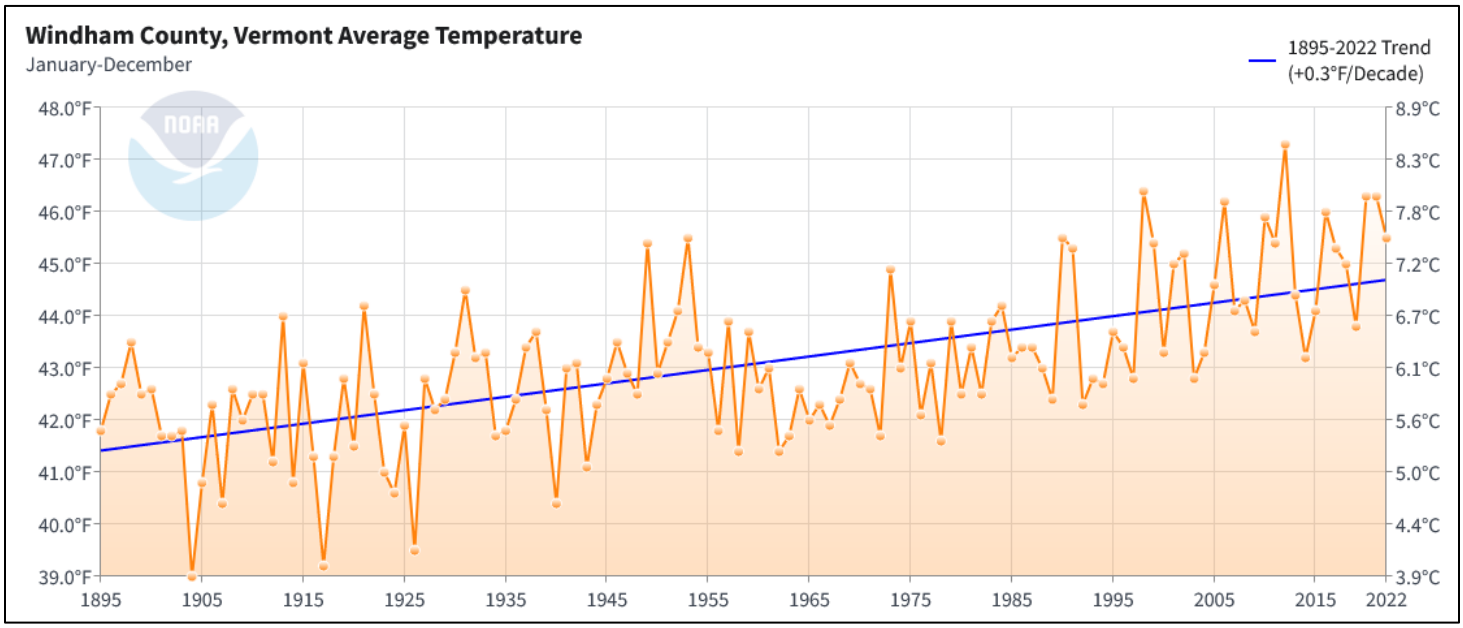
There have been 22 Presidential Disaster Declarations in Windham County since 1953: 8 Floods, 7 Severe Storms, 3 Hurricanes, 2 Biological Incidents (both Covid-19 related), 1 Snowstorm, and 1 Severe Ice Storm.[8] July, August and September are the months that historically have seen the highest number of declarations.

Disaster Declarations for Windham County, VT						
Disaster Number	**Incident Begin Date**	**Incident End Date**	**Declaration Date**	**Incident Type**	**Title**	**Disaster Close Out Date**
3595 / 4720	7/7/2023	7/21/2023	7/14/2023	Severe Storms, Flooding, Landslides, and Mudslides	July 2023 Flooding	
4621	7/29/2021	7/30/2021	9/29/2021	Severe Storm and Flooding	SEVERE STORMS AND FLOODING	
3567	8/22/2021		8/22/2021	Hurricane	Tropical Storm Henri	
4532/ 3437	01/20/2020	5/11/2023	04/08/2020	Biological	Covid-19 Pandemic	
4356	10/29/2017	10/30/2017	01/02/2018	Severe Storm and Flooding	SEVERE STORMS AND FLOODING	
4043	5/20/2011	5/20/2011	11/8/2011	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/14/2020
4022	8/27/2011	9/2/2011	9/1/2011	Hurricane	TROPICAL STORM IRENE	
3338	8/26/2011	9/2/2011	8/29/2011	Hurricane	HURRICANE IRENE	3/10/2014
1816	12/11/2008	12/18/2008	1/14/2009	Severe Ice Storm	SEVERE WINTER STORM	10/15/2014
1698	4/15/2007	4/21/2007	5/4/2007	Severe Storm(s)	SEVERE STORMS AND FLOODING	3/13/2013
1559	8/12/2004	9/12/2004	9/23/2004	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
1488	7/21/2003	8/18/2003	9/12/2003	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
3167	3/5/2001	3/7/2001	4/10/2001	Snow	SNOW	2/28/2005
1336	7/14/2000	7/18/2000	7/27/2000	Severe Storm(s)	SEVERE STORMS AND FLOODING	6/30/2008
1307	9/16/1999	9/21/1999	11/10/1999	Severe Storm(s)	TROPICAL STORM FLOYD	6/30/2008
1124	6/12/1996	6/14/1996	6/27/1996	Flood	EXTREME RAINFALL AND FLOODING	2/23/2005
1101	1/19/1996	2/2/1996	2/13/1996	Flood	ICE JAMS AND FLOODING	2/17/2005
518	8/5/1976	8/5/1976	8/5/1976	Flood	SEVERE STORMS, HIGH WINDS & FLOODING	4/16/1981
397	7/6/1973	7/6/1973	7/6/1973	Flood	SEVERE STORMS, FLOODING, & LANDSLIDES	11/12/1976
277	8/30/1969	8/30/1969	8/30/1969	Flood	SEVERE STORMS & FLOODING	5/26/1972

[8] FEMA tool: Data Visualization: Disaster Declarations for States and Counties: Windham County, VT http://www.fema.gov/data-visualization-disaster-declarations-states-and-counties Accessed 9/15/2021

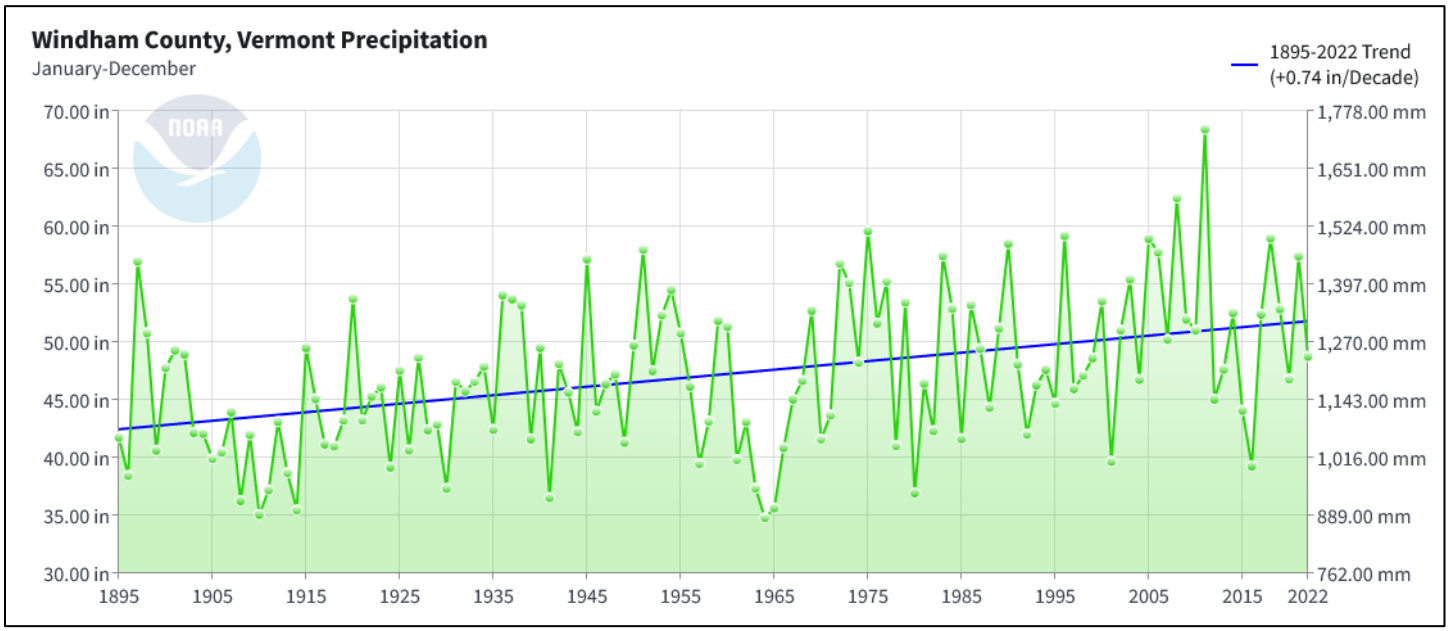
Climate Trends

In recent years, it has become evident that human activities, mostly associated with the combustion of fossil fuel, have added to the natural concentration of greenhouse gases in the atmosphere and are contributing to rapid climate change on a global scale. An analysis of average annual temperature in Windham County shows that temperatures are rising on an average of .3°F per decade (see below graph).



Data source: NOAA Climate at a Glance

Annual precipitation is rising at a rate of about .74” per decade (see below graph). While projections of the effects of climate change vary, it is generally predicted that the region can expect to have warmer temperatures year-round, with warmer, wetter winters, and increasingly erratic patterns of precipitation.



Data source: NOAA Climate at a Glance

Power Outage Statistics[9]

Green Mountain Power provided power outage statistics for the last 5 full years. Power outages present a vulnerability for those without backup power or that rely exclusively on electric for their heating or cooling. The data shows an upward trend over time in the 'number of times a customer was without power per year'.

	Avg Length of Outages in Hours Per Year	Avg # of Times a Customer was Without Power Per Year	# of Hours the Typical Customer was Without Power Per Year
2023	6.10	10.40	63.48
2022	3.17	4.66	14.76
2021	3.15	3.42	10.79
2020	1.96	6.99	13.66
2019	2.19	4.28	9.39
Annual Average 2019-2023	3.78	5.96	22.53

When a power outage occurs, communication systems become compromised. Landline phone service that has been converted from copper wire to fiber relies on an in-home battery back-up. The battery life is typically less than eight hours, whether the phone is used or not. Though most residents use cell phones, service in Brookline is spotty, further complicating the problem of contacting emergency services during power outages.

To mitigate the impacts of power outages, the following public buildings/critical facilities have been equipped with back-up power or generator hook-up:

- Brookline Town Office (the generator provides limited power and does not run the well, only heat, limited lights, and the computers.
- NewBrook Fire Station on Route 30 in Newfane, VT.

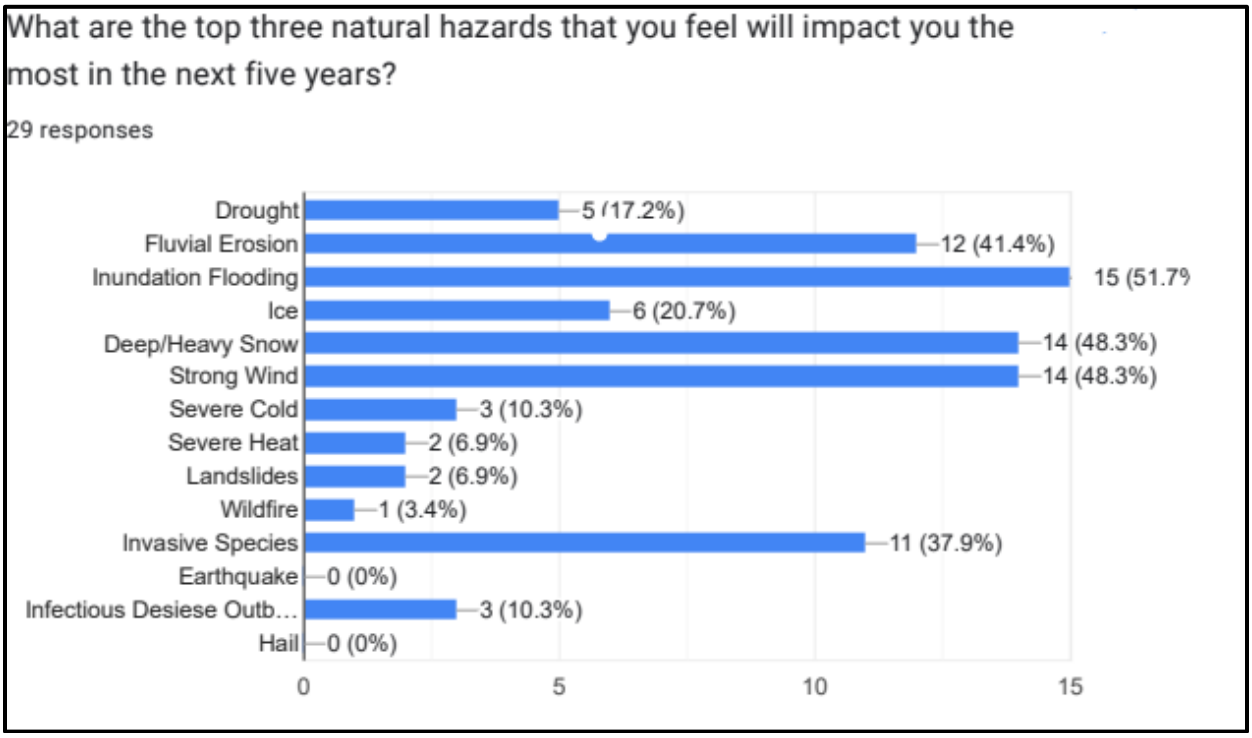
During a disaster, municipal response is managed by the EOC, this would include all communications – from phone calls to internet browsing and 2-way radio.

Connectivity is crucial in times of crisis. Telecommunications are needed for warning systems before disaster, as well as for response during and recovery after.

Hazard Ranking Process

A public survey was conducted to understand what natural hazards have been experienced and are of concern to people Brookline. The survey was open for half of September and October of 2023. Surveys were advertised and available on the Town website, was sent via the Brookline list-serve, was posted on Front Porch Forum and paper copies were available at the Town Offices. There were 29 responses to the survey. The hazards of highest concern are deep and heavy snow, strong winds, ice, inundation flooding, invasive species and fluvial erosion. Survey results were shared with the Planning Committee before they worked on ranking hazards for the plan.

[9] Data provided by Ken Couture of Green Mountain Power via email 11/3/2023.



The hazard ranking process has been revised since the 2017 plan was developed. The hazards considered now only include natural hazards and align with what is contained in the State Hazard Mitigation Plan. The rankings below are based on data in terms of previous occurrences, probability of future events, and links to climate change. Asset impacts accounted for future conditions, including climate change, changes in land use, and demographic shift and/or changes in population. Community input is provided for measuring vulnerability specific to assets and residents. The combination of these factors in a quantified measure produces a score. **Hazards receiving a score of 8 or higher are considered medium or high risk and are profiled in this Plan. For Brookline this includes: Fluvial Erosion and Inundation Flooding (combined, and including ice jams), Invasive Species, Wind (including tropical storms), Ice, Snow and Cold (combined), Heat, Drought, Infectious Disease Outbreak, Wildfire, and Hail.** These hazards are inclusive of the hazards of concern to respondents of the public survey.

Possible Hazard	Previous Occurrences	Probability of Future Occurrences	Linked to climate change (add 1 point)	Vulnerable Assets	Vulnerable Residents	Score:
Inundation Flooding	4	4	1	3	4	**16**
Fluvial Erosion	4	4	1	3	3	**15**
Invasive Species	4	4	1	3	3	**15**
Ice	3	3	1	2	3	**12**
Snow	3	3	1	2	3	**12**
Cold	3	3	1	2	3	**12**
Wind	3	3	1	2	2	**11**
Heat	3	3	1	2	2	**11**
Drought	2	2	1	2	2	**9**

Possible Hazard	Previous Occurrences	Probability of Future Occurrences	Linked to climate change (add 1 point)	Vulnerable Assets	Vulnerable Residents	Score:
Hail	2	2	1	2	2	**9**
Infectious Disease	1	2	1	2	3	**9**
Wildfire	1	2	1	2	2	**8**
Landslides	0	1	1	1	1	4
Earthquake	1	1		0	0	2

The rankings are based on this scoring break down:

Previous Occurrences (data driven):

Score	Meaning
0	No previous occurrences on record
1	One occurrence in last 50 years
2	Once every 10 years
3	Once every 1-5 years
4	More than once per year on average

Community input is made less subjective by quantifying vulnerability in relation to assets at risk and proportion of residents at risk.

Vulnerable assets (Community information):

Score	Meaning
0	None
1	1 asset, no community lifelines
2	2 assets, no community lifelines
3	3 assets, no community lifelines
4	4 or more assets, or any community lifeline

Probability of Future Occurrences (data driven):

Score	Meaning
1	Unlikely: ,1% probability of occurrence per year
2	Possible: 1-10% probability of occurrence per year.
3	Probable: Between 11-75% probability of occurrence per year.
4	Highly Likely: >75% probability of occurrence per year.

Vulnerable residents (Community information, specific to hazard location not the community as a whole):

Score	Meaning
0	None known
1	Less than ¼ of population
2	Less than ½ of population
3	More than ½ of population
4	All residents, town-wide hazard

Hazards with a ranking below 8 have a lack of risk either because of rare occurrence or lack of community exposure. Landslides are not profiled because, according to the VT Landslide Inventory[10],

[10] Vermont Landslide Inventory. Vermont Open Geodata Portal. https://geodata.vermont.gov/datasets/VTANR::landslides/about

there are no mapped landslides in Brookline and the community asset of landscape habitat is unable to be mitigated for. Earthquakes are not common in Vermont and there have been only 15 earthquakes that had epicenters[11] in the state between January 1, 2016 and April 1, 2020. All of those events were recorded at 2.3 or less on the Richter Scale. On the scale, a 2.5 or less is not typically felt by humans. It was determined for Brookline that no community assets or residents were very likely to be affected by this hazard. For hazards not profiled in this Plan (Earthquake and Landslides), the reader can refer to the State of Vermont Hazard Mitigation Plan.

HIGHEST RISK HAZARD PROFILES

Fluvial Erosion and Inundation Flooding

Flooding is the most widespread and destructive hazard in the United States and in the Windham Region. Flooding can occur anytime of the year as a result of heavy rains, thunderstorms, tropical storms, hurricanes, snow melt, or rain on snow. It can result from the overflow of major rivers and their smaller tributaries, or inadequate local drainage. Historically, floods have been a factor in over 80 percent of all federally declared disasters. People living in close proximity to bodies of water such as rivers, lakes, and streams are at greater risk from flooding than those not living in the floodplain. Municipal membership in the National Flood Insurance (NFIP) and having a compliant floodplain ordinance in place gives residents access to discount flood insurance and enables towns to regulate development within their regulated flood hazard area.

Much of the destruction from flooding in Vermont is due to fluvial erosion, which is the destruction of river banks caused by the movement of rivers and streams. This can range from gradual bank erosion to catastrophic changes in river channel location and dimension during flood events. This occurs when the stream has more energy than is needed to transport its sediment load, due to channel alterations or runoff events that increase water speed in the channel, leading to erosion. Major erosion events are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompany these events. The historic road network of many Vermont towns and villages typically follows waterways. This historic settlement pattern creates vulnerability for the road network, infrastructure and development in these areas. Climate change is leading to larger storms and larger flood and fluvial erosion events, putting more development at risk. This trend is discussed in the Climate Change section earlier in this Plan.

This photo shows the real connection of river and road during TS Irene, as the river reclaims its floodplain, edging in on the road. Photo courtesy of wilmingtonvtfloodrelief.com.

A waterway that is constrained or impinged by development is unable to reach geomorphic equilibrium which increases flooding in that area and puts increased pressure and larger flood loads on upstream and

[11] Vermont ANR Department of Environmental Conservation: Recent Earthquakes in Vermont. https://dec.vermont.gov/geological-survey/hazards/earthquakes/recentquake

downstream sections, as well as causing more flooding damage. A river is in geomorphic equilibrium when its water, energy, sediment, and debris are in balance. In this condition a river is neither building up sediment in the channel nor losing sediment from its bed. Importantly, a river in equilibrium has not become overly deep and can continue to overflow onto its floodplains. The water that spills onto the floodplain slows down, and the velocity of the water still in the channel does not become excessively powerful. Mitigation actions that assist with achieving greater stream equilibrium will lessen or even eliminate flooding levels and damages to nearby buildings and infrastructure. Historic development patterns limit or complicate mitigation in some areas.

The biggest flood events in the Windham Region in recent years have been Tropical Storm Irene in 2011 and the July 2023 flooding. Irene (DR4022) caused $31.9 million in public assistance damages for Windham County, $7 million for Bennington County, and $48.6 million for Windsor County. Total damage amounts for the July 2023 floods are still being tabulated as of this writing, but the amounts are expected to exceed that of Irene. All FEMA received funds for Brookline[12]:

DR #	Date of Declaration	Event Type	Awarded Amount
1336	07/27/2000	Severe Storm	$ 15,239.16
1559	09/23/2004	Severe Storm	$ 14,884.3
1698	05/04/2007	Severe Storm	$ 16,979.09
4022	TS Irene: 09/01/2011	Hurricane	$ 38,592.83
4621	09/29/2021	Flood	$ 11,675.14
4720	07/14/2023	Flood	$ 8,297.43

Local Flooding Concerns and Experience

The Town of Brookline runs north and south in a valley formed by hilly/mountainous topography to the east and the west. Because of its topography, many of the roads in town lie along waterways either in the flatter valley or along brooks running out of the hills to the east and west. Therefore, there are a lot of structures that also lie close to waterways.

During the storm of July 2021 (DR-4621-VT) there was significant damage to the community from heavy rains and flooding. Whitney Hill Road had severe damage, primarily fluvial in nature. Merrill Drive, Grassy Brook Road, Putney Mountain Road, Athens Road, Parker Road, Bennett Road, Holland Hill Road, Purple Mountain Road, Hill Road, Kirsch Road, Ellen Ware Road, and Murdock Drive were also impacted. Fourteen different sites experienced damage including sections of roads were washed out and debris was deposited in roads. Most of the damage occurred around the West River or Grassy Brook corridors. There was massive inundation flooding around the intersection of Parker and Grassy Brook Roads with an additive effect from a beaver pond. The July 2023 storm (DR-4720-VT) also resulted in significant damage to similar areas as the 2021 storm.

Fast moving and flashy mountain streams like this one in Brookline feed into Grassy Brook.
Photo courtesy of Thomas Staats.

[12] Open FEMA Dataset: Public Assistance Grant Project Summaries

There is a mapped River Corridor along Grassy Brook and the West River. In addition, the West River is in a Special Flood Hazard Area. A large number of residences in Brookline run along both bodies of water. The main roads through town, Grassy Brook Road, Ellen Ware Road, and Hill Road all run along the West River and see repeat damage during storms.

While the Road Foreman has been very active in replacing undersized culverts, riprapping ditches and pitching the roads to mitigate damages, there are still some areas of town that have been repeatedly vulnerable to flooding. An area that sees repeated damage is around the intersection of Parker Road and Grassy Brook Road.

Flash floods typically occur in high elevation drainage areas as a result of summer thunderstorm activity. Drainage ditches and culverts are the biggest concern for local flash flooding events. Along Athens Road two culverts go under the road and, due to steep slopes and a 90-degree turn, causes debris build-up that overwhelms the culvert.

Ice jam flooding is not very common in Brookline in the early springtime. Brookline doesn't have mapped historic ice jams. However, sometimes jams will form on the West River downstream in Brattleboro along Route 30. At times the ice buildup gets near to Route 30. Extent data is not available. These jams are monitored, but there has not been ice jam flooding that caused any damage to structures or infrastructure to date. Ice jam flooding has not reached onto Route 30 or caused damage to the road in Brattleboro. To date, the probability of ice jam flooding is unlikely. Increasing warmer climate may cause increasing freeze/thaw cycles. Asset impacts may be likely to increase due to the effects of climate change.

Events of the largest magnitude at the nearest recording station:

Highest Precipitation by Day: Marlboro, VT	
Date	**Amount (inches)**
10/30/2017 (DR 4356)	4.11
7/11/2023 (DR 3595/4720)	4.04
12/18/2023	2.99
6/27/2023	2.92
8/5/2020	2.89
9/19/2012	2.56
1/24/2024	2.53
3/14/2023	2.18
4/8/2022	2.17
5/1/2023	2.09
2/4/2022	1.85
11/3/2018	1.83
Period of record: 8/13/2003 to 1/11/2024	

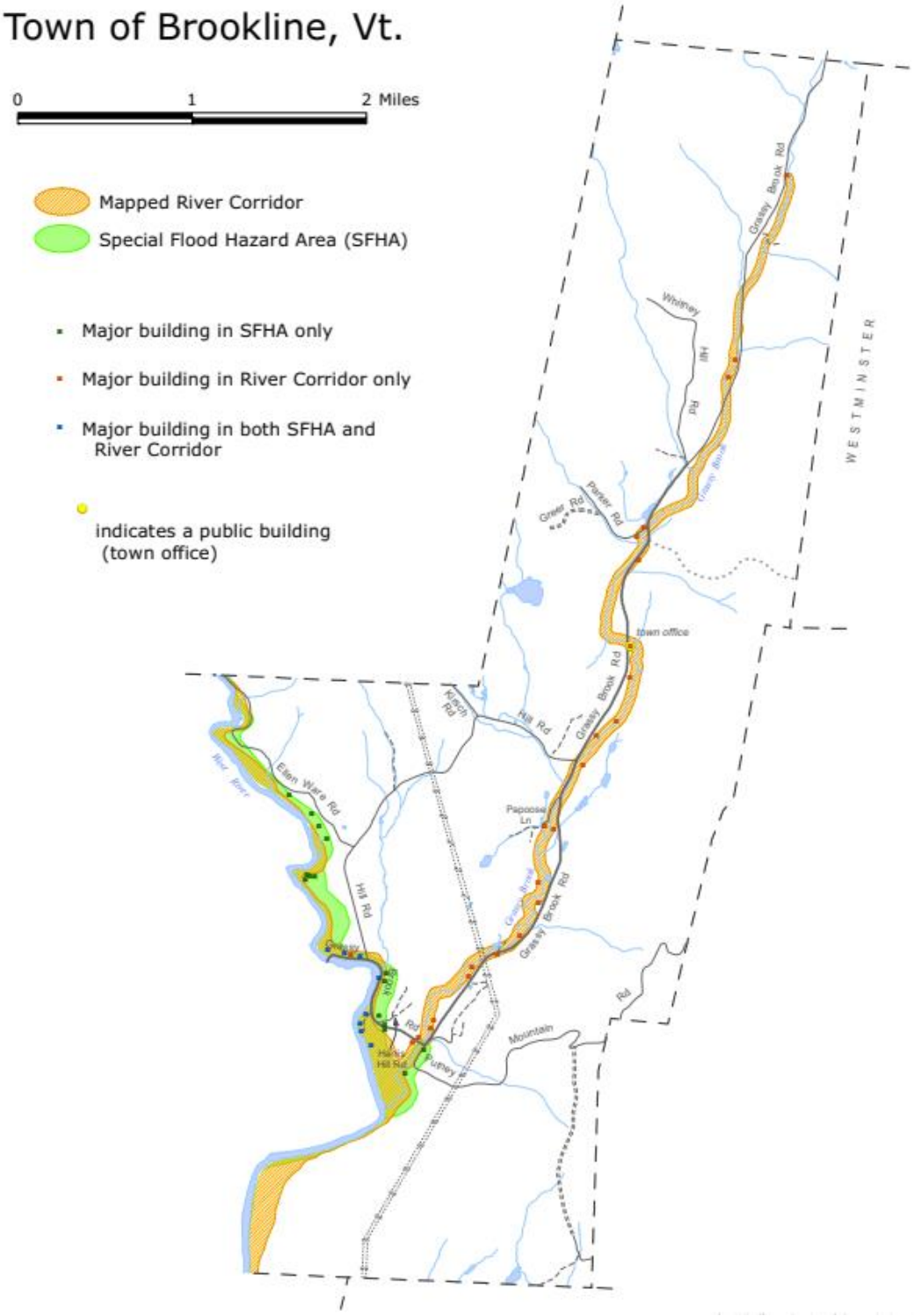
The circled area below, which is around the intersection of Parker Road and Grassy Brook Road is an area of repeated inundation flooding.

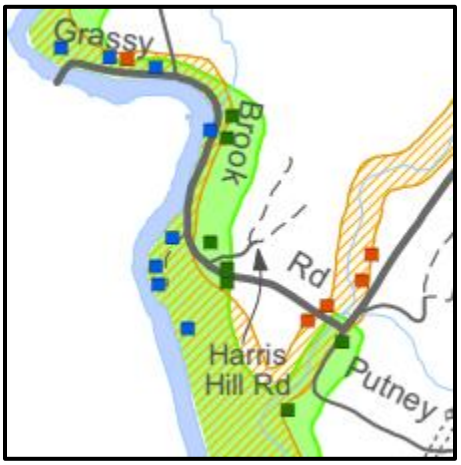
Structures in Mapped Flood Hazard Areas

The map below[13] shows where structures are located in one or more designated flood hazard areas. Note the location of clusters of structures. The Town of Brookline has identified working with FEMA to update the Special Flood Hazard Area (SFHA) as a Hazard Mitigation Action in this plan.

[13] Map by Windham Regional Commission, August 2023.

Town of Brookline, Vt.





These inset views of the above map show the areas of Brookline with either the highest concentration of flood vulnerable structures or a public building in the river corridor.

The FEMA mapped Special Flood Hazard Area or "SFHA" is the area subject to inundation by the 1% annual chance flood (100-year flood). FEMA also maps the .2% annual chance flood or the 500-year flood. To address the shifting dynamics of rivers in Vermont, the Vermont Agency of Natural Resources mapped River Corridors, which areas subject to fluvial erosion. Together this mapping can assist in creating an understanding of where flood hazards exist and where towns should consider limiting development and focusing mitigation strategies. Official flood mapping is viewable by accessing the Vermont ANR Atlas, on the FEMA Map Service Center, or by contacting your Town.

There are 325 major structures in town, as per the E911 data.

There are 23 major structures in the Special Flood Hazard Area (100-year floodplain).

There are 32 major structures in the mapped River Corridor.

Of those above, 8 major structures are in both the Special Flood Hazard Area and the mapped River Corridor.

Note that no SFHA has been delineated along Grassy Brook, so quite a few structures that may be susceptible to inundation flooding won't be in these numbers or on the map.

The town office is in the mapped River Corridor.

Sixty-three structures are in a mapped flood hazard area; including residential dwellings, business and municipal buildings. This number would likely increase if the 500-year floodplain was mapped.

According to FEMA, only 11% of the properties in the SFHA have flood insurance.

There are 0 repetitive loss properties.

32
8
+ 23
63

63 buildings are mapped as being susceptible to flooding hazards

32 buildings are in the River Corridor 32 + 8

23 buildings are in the Special Flood Hazard Area 23 + 8

8 buildings are in both

Brookline does not have the Moderate Flood Hazard Area (500 year floodplain) mapped—if mapped, the number of susceptible buildings in town would likely rise.

Property owners with a federally backed mortgage on a building in the SFHA are required to purchase flood insurance. A town being a member of the National Flood Insurance Program (NFIP) provides residents with access to flood insurance through the NFIP. If a town is not a member of the NFIP, residents must buy the required insurance on the private market. Properties outside of the FEMA floodplain can optionally purchase flood insurance at a lesser expense, and it still covers damages resulting from fluvial erosion in events that damage multiple properties.

Community Vulnerability and Potential Impacts

In the wake of flooding and fluvial erosion, evidence of the water's destructiveness can often be seen in severely damaged homes and public buildings, failure of other town assets, and washouts of roads. These impacts can have a large ripple effect through a small community such as Brookline. Damaged homes can displace residents either for a short-term or permanently. Underserved populations, such as the elderly and the poor, often have the hardest times relocating to safe, temporary housing. Permanent relocation can be very difficult for any residents due to the housing crises that Vermont faces today.

Road closures due to washouts can disconnect the Town from surrounding communities. Loss of access to neighboring communities will result in an increased burden on residents and the Town itself as recovery efforts begin. Grassy Brook Road is the central road through the middle of town. If portions of it are unpassable due to flooding, then residents can become either entirely stranded or access to life-support services can become cut-off and the detour can add up to a half an hour of driving time.

The changing climate patterns in the region are the source of the biggest potential impacts to Brookline's near and long-term future vulnerability. With more frequent and intense rain events, structures in the SFHA and River Corridor will be continually under threat of storm damage. Housing in the higher elevations of town, particularly on Putney Mountain, while not mapped as vulnerable structures due to flooding, will also be under threat. More frequent and intense rain will cause small mountain brooks to become hazardous and damage homes, wash out driveways and make town roads impassable.

Flood Hazard Summary Table

Location	Vulnerability	Extent	Observed Impact	Probability
FEMA SFHA & VT ANR mapped River Corridors	Culverts, bridges, dams; properties near rivers and streams; septic systems. 63 buildings are located in FEMA or ANR mapped flood hazard areas.	The areas most susceptible to both inundation flooding and fluvial erosion is along the Grassy Brook and West River. For fluvial erosion, Putney Mountain Road, Whitney Hill Road, Parker Road, Merrill Drive, Athens Road, Hill Road, Kirsch Road, Murdock Drive, and Ellen Ware Road see damage during storms.	Flooding generally: Damage and debris to roads; flooding to residential properties; some stream bank collapse; streambank erosion.	Score of 4: Highly Likely

Invasive Species: Plants and Forest Pests

Eurasian milfoil is present in over 80 waterbodies in Vermont (Photo courtesy of VT DEC)

Invasive plant species are a region-wide hazard; however, each location will be confronted with a distinct mix of invasive species that thrive under the particular ecological conditions of that place. Each invasive species has a different potential to spread to other areas based on the rate at which it spreads and the ecological suitability of the ecosystem that it is expanding into.

An invasive species can be defined as **an exotic species whose introduction into an ecosystem in which the species is not native and causes or is likely to cause environmental or economic harm or harm to human healt**h[14].

Invasive Plant Species

In the absence or near absence of natural predators or controls, invasive non-native plants are able to spread quickly and out-compete native plants. Invasive plant species can create monocultures, which often provide poor habitat for native animals that have not evolved with the non-native species, resulting in degraded habitat value and increased vulnerability. The invasive plant issue really escalated in the early 1990's. Invasive plants tend to thrive in disturbed areas. Within the Windham region, they are more prolific in the towns along the Connecticut River than they are to the west, because the eastern towns are more populated, contain major transportation routes such as I-91 and the rail corridor, which serve as vectors for their expansion, and tend to have significant land disturbance. Some of these plants were originally planted because of their positive aspects such as their ability to grow in difficult growing conditions, long growing season length, their large seed production and their ornamental value. These same reasons are a big part of why they have become invasive.

Black Swallowwort carpets a bank to the exclusion of almost everything else. It even twines up a utility pole guy wire. Note the abundant seed pods. (Photo courtesy of John Anderson, [Name of

[14] (USDA) https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/technical/ecoscience/invasive/?cid=nrcs142p2_011124

Japanese knotweed, vtinvasives.org

Heavy travel corridors like VT Routes 9 and 100, and I-91, and even waterways, such as the Connecticut and Deerfield Rivers and their riparian areas, act as corridors that invasives can overtake and spread along.

Particular invasive plant concerns in the Windham region are listed in two groups based on their estimated threats to natural and hard infrastructure. All (except spindle tree) are quarantined, Class B Noxious Weeds in Vermont[15].

Group A—Higher threats to infrastructure:

1. There are heavy infestations of Japanese Knotweed (*Fallopia japonica*) along the North Branch of the Deerfield River and the Rock River, as well as the lower reaches of several brooks. It leaves shorelines susceptible to erosion because there is no other vegetation stabilizing the stream bank (Basin 11 Management Plan, Preliminary Draft 2007). TS Irene both (1) eroded stream and river banks, removing many riparian trees, and (2) moved fragments of knotweed to new areas, thus allowing knotweed to flourish on the bare soil left in its wake.
2. Asiatic (Oriental) bittersweet (*Celastrus orbiculatus*), an aggressive climbing vine that can smother trees, utility poles, and buildings.
3. Amur, Morrow's, Tartarian, and Bell's honeysuckle (*Lonicera mackii, morrowii, tatarica, x bella)*
4. Japanese & Common barberry (*Berberis thunbergii & B. vulgaris)*, which promote Lyme disease by harboring high populations of deer mice, one of the intermediate hosts of deer ticks.
5. Common and Glossy (European) buckthorn (*Rhamnus cathartica & R. frangula*), which slow forest regrowth.
6. Burningbush (*Euonymus alatus*)—still a common ornamental in yards, spreading to woods via birds that eat the low-value fruit, little wildlife value, should be excavated.

Burning Bush, vtinvasives.org

Group B—Lesser threats to infrastructure:

7. Mile-a-minute vine (*Persicaria perfoliate*), on Federal invasives list that is included in state list. Considered a "watch list" species in VT, but can cover other plants as well as hard infrastructure.
8. Garlic mustard (*Alliaria petiolate*) is common along roads and in fields and riparian areas, and can invade forests.
9. European spindle tree (*Euonymus europaeus*)-locally problematic, not on VT invasives list; suggested for addition to it. Very hard to control. You can buy seeds on eBay.
10. Goutweed (*Aegopodium podagraria*)—Highly invasive, has solid green leaves, or variegated green & white leaves. Very hard to control.
11. Norway maple (*Acer platanoides*)— inhibits growth of nearby plants spread widely by seeds to

[15] vtinvasives.org is the primary website for information. This list was developed by Peter Bergstrom of the Rockingham Conservation Commission. Email dated 8/21/2021.

nearby woods, little food or habitat value to wildlife. Should not plant any new ones. Provides good breeding habitat for Asian long-horned beetles (ALB).

12. Purple loosestrife (*Lythrum salicaria*)
13. Yellow flag iris (*Iris pseudacorus*)—wetland plant
14. Amur maple (*Acer ginnala*)
15. Tree-of-heaven - Looks very similar to sumac and walnuts (black and butternut) but has smelly leaves when crushed, and smooth leaf margins except at the base.
16. Wild Chervil *(Anthriscus sylvestris)* - This invasive plant can be seen starting in May alongside roads, and is notable in our rolling Vermont fields. Often confused for Queen Ann's Lace which blooms later in the summer.

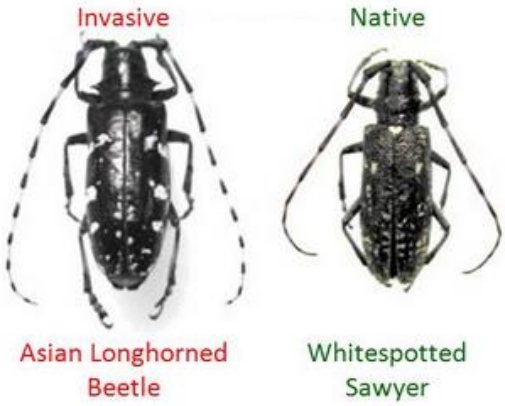
Five groups of invasive plants, listed below, are thought to pose the highest threat to native and/or hard infrastructure. Barberry is also a human health threat (Lyme disease).

Common name	Latin name	Locations	Threats	Control
Japanese Knotweed	*Fallopia japonica*	Banks of all rivers and many brooks. Located along many roads too.	Can grow through asphalt, into basements, and block trails; more likely to wash out than natives	Mowing (endless), repeated cutting & digging (3-10 years), mesh or cover with very thick black plastic
common and glossy (European) buckthorn	*Rhamnus cathartica & R. frangula*	Clearcuts, woodland edges	Prevents regrowth of native trees	Excavation including roots
Japanese & Common barberry	*Berberis thunbergii & B. vulgaris*	Planted shrub, escapes to woods	Increases deer mice which harbor deer ticks with Lyme disease	Excavation including roots
Burningbush	*Euonymus alatus*	Planted as ornamental, birds spread seeds to woods	Displaces native shrubs	Excavation including roots
Amur, Morrow's, Tartarian, and Bell's honeysuckle	*Lonicera mackii, morrowii, tatarica, x bella*	Planted as ornamental, birds spread seeds to woods	Displaces native shrubs	Excavation including roots

Invasives tend to come up early and flower early, allowing them to get established before native plants have the chance. It may be possible to slow down or even halt the spread of these species by identifying and removing plants as soon as they appear. Early detection is the key. This detection can be aided by educating residents about the identification of and problems caused by invasive species. Preventing the spread of invasive plants is something that everyone can assist with. The first step is to not plant non-native plants on your property and to remove invasives that exist. Additionally, it is important that when soil is disturbed, to plant native cover before invasives have a chance to establish themselves. Proper disposal of non-native vegetation is critical to avoid its spread, safely burning the material when possible. Avoid transporting non-native plants, including firewood and garden debris, as this is critical to prevent the spread of non-native seeds and forest pests. Mowing roadsides from the north to the south can also help prevent the migration of invasive seeds on-site.

Invasive Forest Pests

Non-native invasive species cause irreversible impacts on tree health, forest composition, and biodiversity. Species of concern include:



- Ash yellows – present throughout VT
- Asian longhorned beetle – not confirmed in VT; closest identified known location is Worchester County, Mass. in 2008; this insect will have a major impact if it becomes established in Vermont.
- Balsam wooly adelgid - present throughout VT
- Beech bark disease - present throughout VT
- Beech leaf disease - confirmed in southeastern Vermont
- Butternut canker - present throughout VT
- Chestnut blight - present throughout VT
- Dutch elm disease – has spread throughout VT
- Elm zigzag sawfly – not yet confirmed in VT
- Elongate Hemlock scale – confirmed in parts of VT
- Emerald Ash borer – confirmed and spreading in VT
- Hemlock wooly adelgid – confirmed in southern VT
- Jumping worms (3 species found in VT) - confirmed in all Vermont counties with the exception of Essex and Orleans
- Oak wilt – not yet detected in VT, but has recently been found in in multiple locations in New York state.
- Pear thrips - present throughout VT
- Red pine scale – not confirmed yet in VT
- Sirex woodwasp – confirmed in parts of VT
- Spongy moth – established in VT
- Spotted lanternfly - been found in several states, including Pennsylvania, Connecticut, Delaware, Maryland, New Jersey, New York, Virginia, and West Virginia and Ohio; not yet established in VT, but an interception of truck cargo in VT did find 3 adults of the species
- Thousand cankers disease – never been detected in VT
- Wandering broadhead planarian - distribution is currently unknown. This species was recorded for the first time in Montréal, Canada in 2019
- White pine blister rust - present throughout VT
- Winter moth - never been detected in Vermont.

Between emerald ash borer (EAB), Asian longhorned beetle (ALB) and hemlock wooly adelgid (HWA) alone, more than 14 different species of trees in Vermont are threatened including: maple, elm, horse chestnut, willow, ash, poplar, European mountain ash, hackberry, and hemlock. EAB is spreading fast; within the Windham region, as of this writing EAB is present in these towns, listed with detection year:

- Brattleboro 2023
- Guilford 2023

- Halifax 2023
- Londonderry 2019
- Marlboro 2023
- Newfane 2024
- Putney 2023
- Readsboro 2020
- Somerset 2022
- Townshend 2022
- Vernon 2021
- Westminster 2023
- Whitingham 2023
- Wilmington 2021


Emerald Ash borer insect

EAB only feeds on Ash trees, but that is 7% of Vermont's tree species. EAB is often moved around on firewood that people transport. Eradicating the insect on wood requires heating it to at least 140 degrees or higher for greater than 60 minutes.

EAB essentially girdles the ash trees, killing them. It lives between the inner bark and the wood, so it isn't that deep. Woodpeckers like feeding on EAB, but the woodpecker population isn't large enough to significantly impact the EAB population. Also the woodpeckers don't generally detect the insects in the trees until they have been present for about two years, which is too late to save the tree. One of the best diagnostic methods for detecting EAB is called "blonding". "Blonding" is a clear symptom of EAB infestation. It occurs when woodpeckers, while foraging for the succulent EAB larvae, flake off outer layers of bark, revealing the lighter or blond-colored inner layers of bark.[16]
The hemlock woolly adelgid (HWA), *Adelges tsugae*, is a tiny insect from east Asia that attacks forest and ornamental hemlock trees. It feeds on young twigs, causing needles to dry out and drop prematurely. Trees may die in four to six years. Some survive, but with sparse foliage, losing value as shelter for wildlife and their ability to shade streams.


Blonding with pecked holes on ash trees is a sign of EAB infestation.

Sustained cold leads to kill off of the adelgid insects. Mortality rates of even 91%, however, can still lead to population growth through the warm season because they reproduce asexually so it only takes one for the population to expand. The HWA mortality rate shifts each year based on temperature patterns throughout the year, especially cold winter temperatures cause die off.

In the Windham region, it was initially found in Brattleboro and the Guilford area. It is now found in 14-15 Windham Region towns, and has been recently found in Springfield in Windsor County. HWA is moving south to north in lower elevations first, and is mostly throughout southern Vermont at this point. Dead or dying hemlocks are a sadly regular sight in the region. It was first found at the SIT campus in


Hemlock wooly adelgid presence

[16] University of New Hampshire Cooperative Extension – Blonding on Ash trees information sheet. <http://extension.unh.edu/resources/files/Resource004103_Rep5824.pdf> Accessed 3/2/15.

2010 and is now found throughout the town of Brattleboro.

Hemlock trees and even whole stands are showing signs of decline, but trees in Vermont have not been reported to have been killed from HWA alone. Foresters have been watching infested trees for eight years, and the trees haven't been killed yet most likely because winter temperatures kill off enough of the HWA to give the tree a temporary reprieve. HWA does weaken the trees to the point that other secondary stresses, such as funguses and disease, may result in their mortality. Another pest, Hemlock elongate scale was found recently for the first time in Guilford, Vernon and Brattleboro.

Jumping Worms,(Pheretimoids), also known as snake worms, are a rising invasive concern. There are approximately 19 species of earthworms known throughout Vermont. All species of earthworms are invasive to Vermont, but the recent arrival of the Jumping Worm has caused concern for Vermont forests and gardens.

Jumping Worm - smooth, glossy dark gray/brown color. Bodies are firm and not coated in "slime".

Jumping worms arrived in Vermont through horticulture, recreational fishing, and worm composting systems. Jumping Worms, or their cocoons, arrive with plant and soil materials. They are also imported to be used as live bait for fishing, or have been shipped to Vermont for use in worm composting bins. Populations of Jumping Worms are growing rapidly. The worms are mostly parthenogenetic, so it only takes one worm to found a new colony. They are prolific reproducers, and colonies can grow quickly.

Jumping Worms pose an ecological threat to all of Vermont's forests. They feast on forest floor organic matter and the herbaceous layer, leaving the forest floor with little leaf litter, which is an essential component to the regrowth of forests and the food chain of forest animals. The change in the forest habitat structure may lead to a decline in native species and facilitate the spread of invasive plant species. Jumping worms also pose a threat to horticulture and the maple sugar industry.

Community Vulnerability and Potential Impacts

Invasive Plants

There are heavy infestations of Japanese Knotweed along the banks of the West River and Grassy Brook. TS Irene eroded the banks along the West River so much and allowed for the flourishing of invasives on the bare soil left in its wake. Six years later, the trees were starting to get reestablished in these riparian areas, and they are knocking back the Japanese knotweed somewhat by shading it out. This tree-cover may self-contain it until the next storm. Purple loosestrife is commonly seen in many riparian and wetland habitats in the region. Phragmites is a newer invasive, a tall grass, that invades wet areas to the point where nothing else will grow. Other species such as Oriental bittersweet, certain species of honeysuckle, Japanese barberry, yellow flag iris, and common and glossy (European) buckthorn have become well established in many locations including in the Windmill Hill area. Garlic mustard has been found along roads in Brookline. Knapweed is semi-invasive that has been found along the power line corridors and railroad tracks—where it seems capable of withstanding spraying. Yellow rattle is another invasive flowering plant, a parasite on grass, is now being seen on power lines.

Invasive plants can lead to stream bank erosion, less timber that can be harvested from forested areas, and excessive strain on labor on farms. Riparian invasives such as Japanese Knotweed overtake river banks and force out native plants. The shallow roots of Knotweed leads to unstable river banks and a greater likelihood of fluvial erosion occurring during high water events. Unstable banks put community assets and private homes in the SFHA and/or River Corridors in further danger. Invasive plants in the forest ecosystem, such as Buckthorn, decrease the regeneration of native species which can cause a long-term economic decline to the forest products industry, which is an important economic asset in town.

Other invasive species, such as Barberry, provide a great habitat for ticks, which carry diseases harmful to human health. Tick-born diseases are likely to rise and impact the health of residents and visitors.

Invasive Pests

Invasive pests can be found all throughout the Town of Brookline. Jumping worms, perhaps the newest concern to Brookline residents, poses a threat to horticulture and the maple sugar industry as soil health is degraded. Both horticultural farming and Maple Sugaring are economic activities that are important in the Town of Brookline. Other invasive pests, such as Emerald Ash Borer, can infect trees along Brookline's roadways, causing series injury to passing motorists as dead trees come down. EAB will also likely affect Ash Trees in the forest ecosystem which will negatively impact the forest products industry that is prevalent in Brookline.

The warming weather patterns in the region, both during the hot summer months and winters that are seeing less long durations of freezing weather will contribute to the rise and spread of invasive species currently in Brookline. The changing climate, and a more global trade economy, will also see new invasive species coming into the region with further compromise to the natural ecosystem as well as economic impacts to farms and forestry.

Invasive Species Summary Table

	Location	Vulnerability	Extent	Observed Impact	Probability
Plants	Elevations generally below 1,500 feet are most susceptible to invasive species, although any land with some sort of major disturbance (from wind, water, logging, or land clearing and development) could potentially host them.	Areas at particular risk are road sides, newly cleared areas, disturbed land, riparian buffers, especially eroded buffers; power line right of ways	There are heavy infestations of Japanese Knotweed along the West River banks. Japanese barberry and common and glossy buckthorn have become well established in many of the wooded locations throughout Town. Garlic mustard has been found along roads in Brookline.	Dead and dying trees along roadways and powerlines, and near buildings; invasive plants along roadways and waterways; Compromised soil stability along waterways. Overgrowth in shallow waters that kill off other plants and block sunlight.	Score of 4; Highly Likely
Forest Pests	Town-wide; areas where firewood is transported into the area from away, like campsites, are at higher risk	Forests, agriculture, waterways, native species; risk of downed trees in public rights of way from EAB and other pests.	EAB is present in 13 Windham region towns and spreading; HWA is ubiquitously present in Brookline. Over half of the trees in Vermont are host species of one of these main pests, so the potential impact is great. Jumping worms have been found	Dead and dying trees along roadways and powerlines, and near buildings; threats real and potential to local forest economy related to maple syrup industry, fall tourism, and logging	Score of 4; Highly Likely

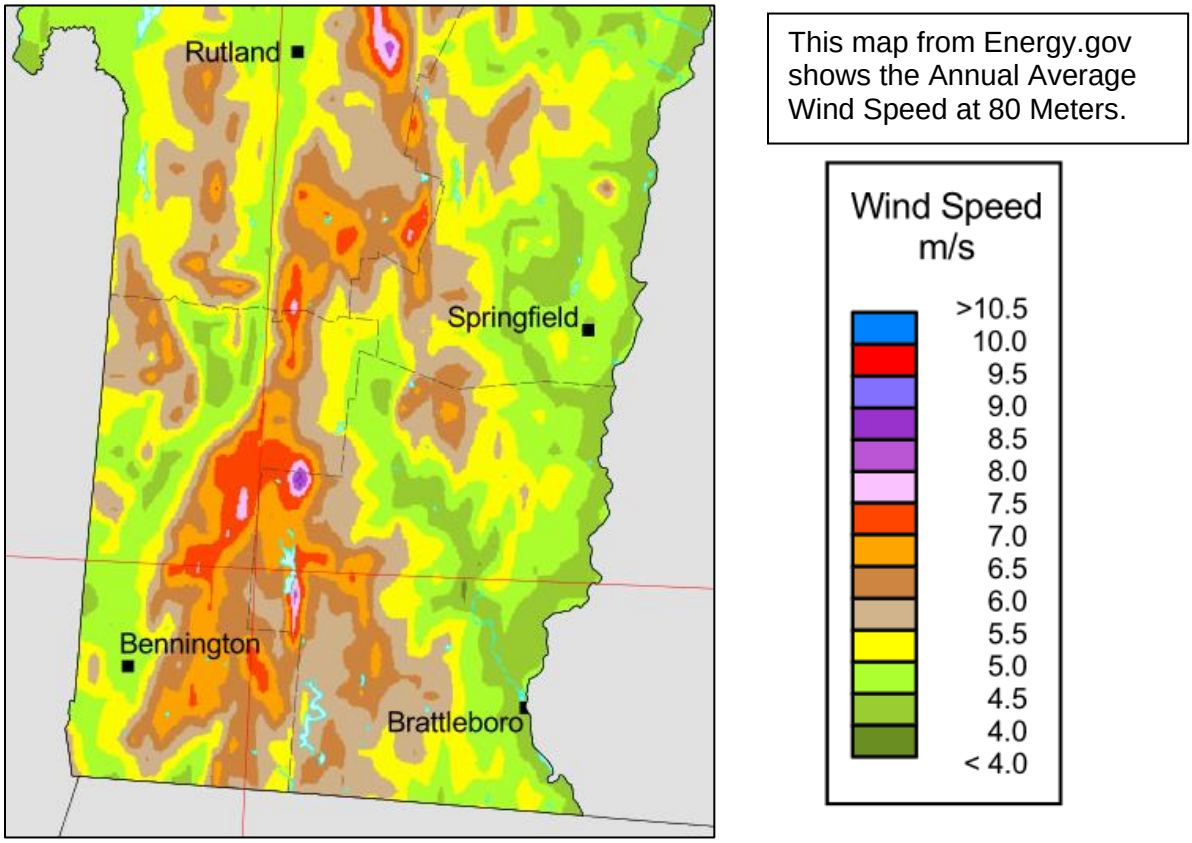
			in home gardens and in some of the agricultural fields.		

High Winds

High winds in the region can be associated with thunderstorms, microbursts, straight-line winds, snowstorms, hurricanes, tropical storms or tornadoes. High winds tend to sweep through after the passage of a weather front. Power outage is primarily caused by high wind events taking trees down onto lines, even more so than ice. Trees downed by high winds can damage structures, block roads, and down power and communications lines. Mobile home parks and houses on ridge lines are at greater risk from wind damage. Blowing and accumulating snow is an issue of winds during winter months for open roadways.

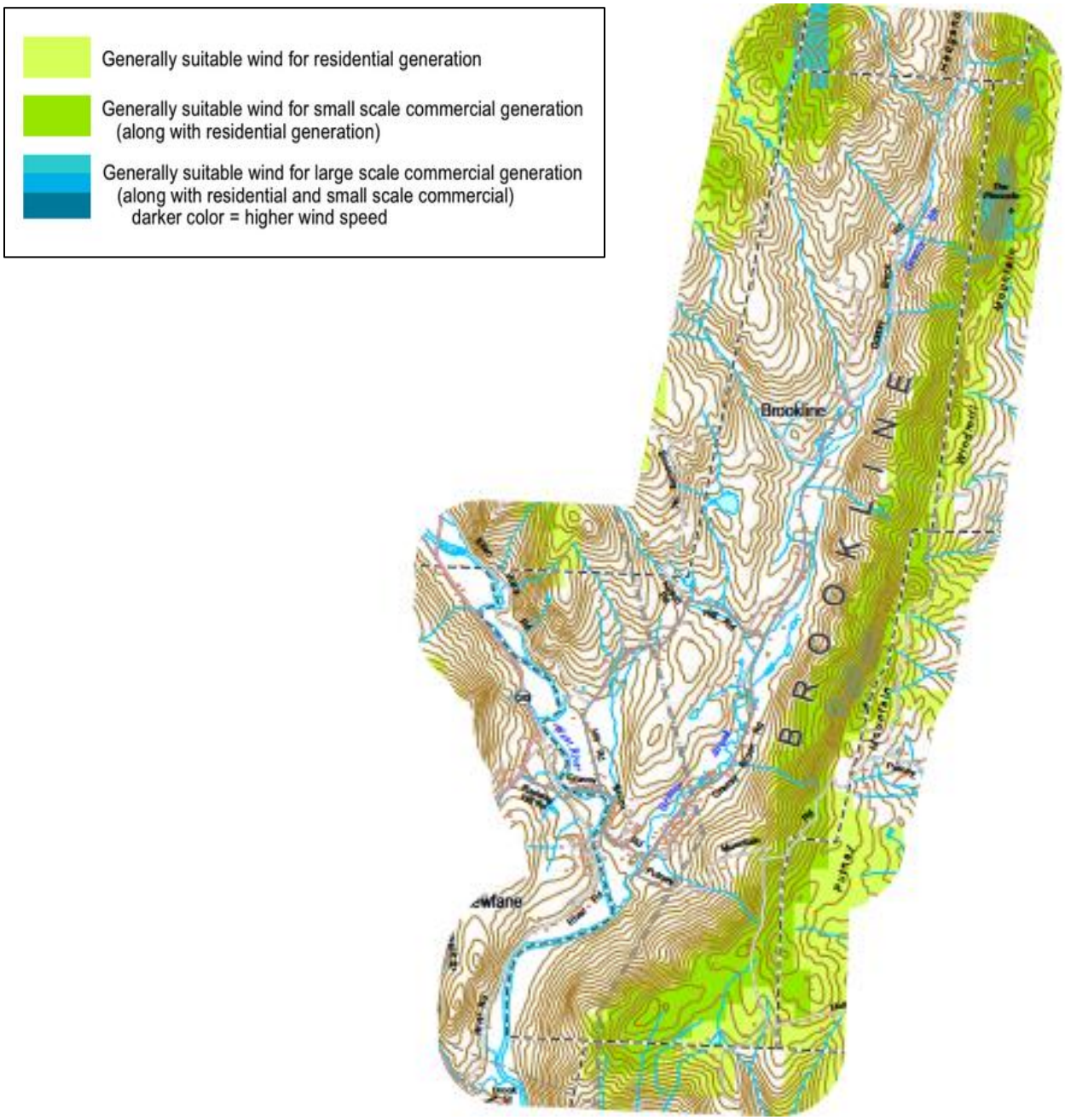
There are many trees in close proximity to roads, buildings and power lines. GMP trims trees near their lines only. There are areas where power lines go through the forest, so tree trimming is not as practical. Town road crews generally do tree and limb cleanup, but there is not a lot of *preventative* tree maintenance at the town level.

High winds can affect any location, though higher elevations are at more risk. The below map shows annual average wind speeds for southern Vermont, and the spine of the Green Mountains predictably has the highest speeds. The purple area to the north of the highlighted square is Stratton Mountain, which gets particularly high winds and is the highest peak in the Windham Region.



This map from Energy.gov shows the Annual Average Wind Speed at 80 Meters.

For a more localized look at wind speed, the below map shows wind power opportunity correlated only to wind speed[17]. The higher elevations in town, areas such as the Pinnacle Ridgeline to the eastern portion of town have the highest wind speeds.



[17] This map was developed by the Windham Regional Commission for use by the Town and Region in energy planning efforts In 2017.

The Beaufort Wind Scale, one of the first scales to estimate wind speeds, was created by Britain's Admiral Sir Francis Beaufort in 1805 to help sailors estimate the winds via visual observations. The scale starts with 0 and goes to a force of 12. The Beaufort scale is still used today to estimate wind strengths. This scale is applicable to tropical storms within the 'Hurricane' scale wind speeds.

Force	Speed		Land Conditions
	knots	mph	
0	<1	<1	Calm, smoke rises vertically
1	1-3	1-3	Light air, direction of wind shown by smoke drift only
2	4-6	4-7	Light breeze, wind felt on face, leaves rustle, vanes moved by wind
3	7-10	8-12	Gentle breeze, leaves and small twigs in constant motion, wind extends light flag
4	11-16	13-18	Moderate breeze, raises dust, loose paper, small branches move
5	17-21	19-24	Fresh breeze, small trees in leaf begin to sway
6	22-27	25-31	Strong breeze, large branches in motion, umbrellas used with difficulty
7	28-33	32-38	Near gale, whole trees in motion, inconvenience felt walking against the wind
8	34-40	39-46	Gale, breaks twigs off trees, impedes progress
9	41-47	47-54	Strong gale, slight structural damage occurs
10	48-55	55-63	Storm, trees uprooted, considerable damage occurs
11	56-63	64-73	Violent storm, widespread damage
12	64+	74+	Hurricane, extreme destruction

The Enhanced Fujita Scale or EF Scale is used to assign a tornado a 'rating' based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of Damage Indicators and Degrees of Damage which help estimate better the range of wind speeds the tornado likely produced. From that, a rating (from EF0 to EF5) is assigned[18]. There have been 2 EF1 tornadoes and 1 EF2 tornado in Windham County since 1990.

EF SCALE	
EF Rating	**3 Second Gust (mph)**
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

According to NOAA records, there have been 169 days with wind events since 1950 in Windham County, 66 of which caused property damage. Damage totals for these events together are $1,411,400. Most record of wind events indicates in the 40-60 mile per hour range, with damages of several thousand dollars. More current and extreme events experienced in Windham County include:

5/16/2022	Wardsboro	70 mph	Thunderstorm winds
3/7/2022	Region-wide	40-50 mph	Thunderstorm winds
5/15/2020	West [Name of Town]	50 mph	Thunderstorm winds
8/21/2019	Windham	EF1	Tornado
7/28/2018	Regionwide	50-60 mph	Thunderstorm winds
11/10/2017	Region-wide	40-50 mph winds	High winds
9/5/2017	Region-wide	50-60 mph winds	Thunderstorm winds
6/8/2011	Northern Windham C.	50 mph	Thunderstorm winds
7/20/2008	Region-wide	50 mph	Thunderstorm winds
2/17/2006	Region-wide	60 mph generally; Stratton Mtn measured 143 mph gusts	High winds, likely snow storm

[18] National Weather Service < https://www.weather.gov/oun/efscale>

7/21/2003	Stratton	EF1	Tornado; $100,000 in damages
6/5/2002	Windham	EF2	Tornado; $75,000 in damages
9/16/1999	Region-wide	60 mph	Hurricane Floyd; $175,000 in damages
7/6/1999	Guilford	90 mph	Microburst; $150,000 in damages
7/3/1997	Eastern Windham C.	Not recorded	Thunderstorm winds caused $100,000 in damages
9/21/1938	Region-wide	100+ mph	Hurricane Igor; $400 million damages across southern Vermont; 600 lives lost; widespread destruction

Community Vulnerability and Potential Impacts

As climate patterns continue to change, Brookline is seeing an increase in high winds associated with storms earlier in the spring and later into the fall. High winds can cause downed powerlines which will impact businesses, homes, and municipal or emergency operations due to a loss of power. A loss of power will cause issues such as loss of some communications (ex. computers and wifi), loss of refrigeration for food and medication, loss of water pumps, loss of power for lights and life support equipment and other consequences. Some of the most vulnerable populations will be those with health conditions that require certain medications or life support equipment, and business owners that depend on refrigeration for their products.

Wind Hazard Summary Table

Location	Vulnerability	Extent	Observed Impact	Probability
Town-wide	Downed trees, downed power lines, extended power outages; potential for injuries from falling debris or power lines; disruption to services and businesses	High winds in large storms are typically in the 40-60 mph range and in 1938 there was an extreme 100 mph event.	Wind Shear during the spring of 2023 brought downed trees and infrastructure damage from downed trees and branches	Score of 3: Probable

Ice, Snow, and Extreme Cold

Winter weather often results in temporary road closures, school and business delays, and even power outages. Given the high amount of snowfall this region experiences, the town and residents are generally well prepared to deal with normal winter weather conditions. Severe winter storms, however, have been shown to affect the entire region resulting in:

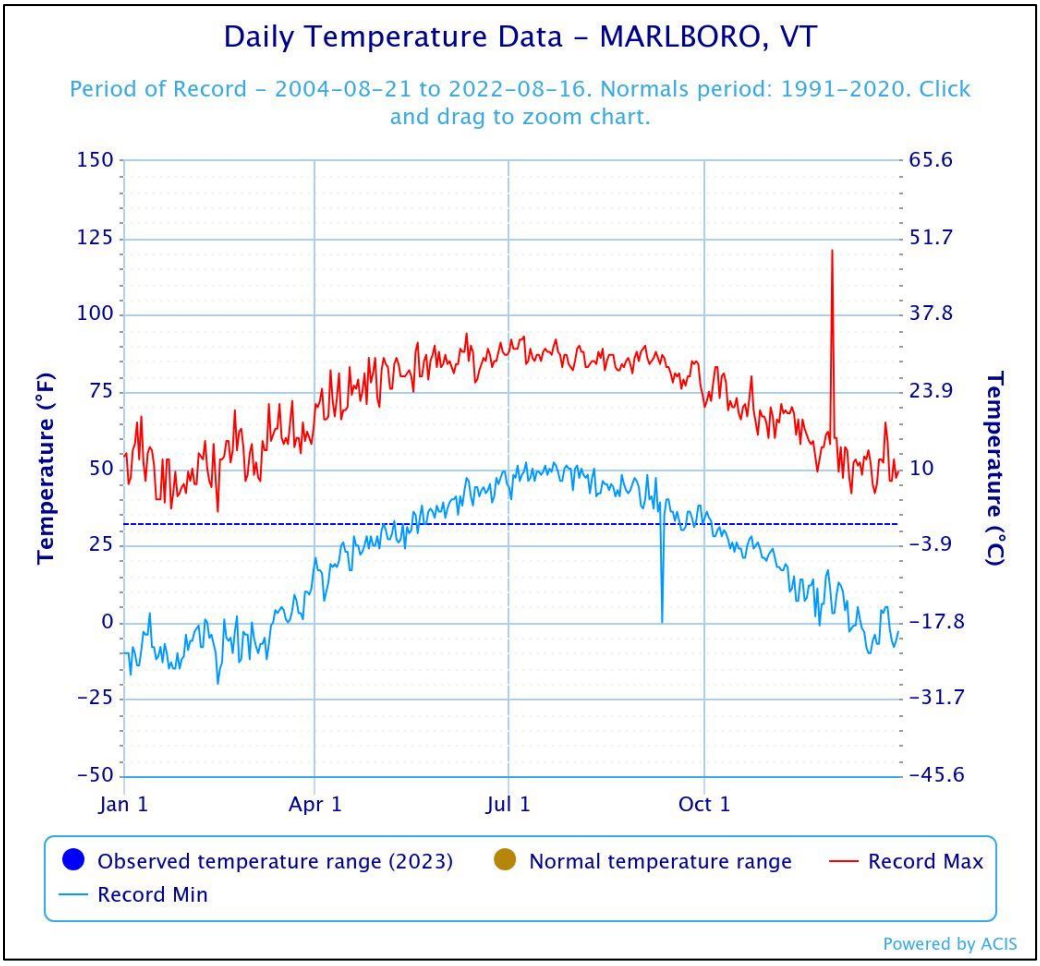
- Extensive damage to above-ground power and utility lines and extended power outages (March 13-15, 2023 storm);
- Road shutdowns, making general travel, transport, and emergency vehicle access difficult;
- Shutdown of schools, businesses, and local government services, limiting access to goods and services;
- Structural failure from excessive snow loading, especially barns (storm of Dec 2008, DR 1816);
- Injuries and fatalities from poor driving conditions, frostbite, hypothermia, heart attacks from overexertion, and carbon monoxide poisoning from blocked vents.

Severe winter weather affects the entire planning area, though higher elevations generally experience more extremes. An ice storm crossed the region in December of 2008 causing widespread downed trees and power outages in the region. The total cost of damages across the region triggered a Presidential Disaster Declaration DR-1816. Damage consisted of roads being blocked due to downed trees and utility lines. Thousands lost power for varying lengths of time and several shelters were opened. An event in March 2023 had similar results and 1-to-5-day power outages varying throughout the region, but did not trigger a federal declaration.

Extreme cold can cause damage to buildings and infrastructure. Cold temperatures alter the chemical composition of mortar, grout, and adhesives used in building construction which over time can lead to unsecured components. Extreme cold can cause frozen pipes which can cause significant damage to buildings. Town buildings should be winterized, with pipes drained and water shut off, in the event an extreme cold event is forecast. Additionally, town highway and fire department vehicles are vulnerable to damage. Keeping them indoors and properly maintained can help to limit damage.

Snow accumulation typically has not made the Town vulnerable to loss of road accessibility. The Town's fleet of snowplows ensures all roads are accessible, even in major accumulation events. Roads adjacent to critical facilities are well maintained. The change of winter storm events from mostly snow to rain and ice has increased the Town's risk with downed trees and resulting power outages, which are previously discussed in the High Wind hazard profile.

The below chart depicts historic temperature variations in the region (Marlboro is the NWS monitoring station for the region) to the present. The observed extreme temperatures for the period of record for each day are shown in highs (red) and lows (blue) with records going back to 2004. The coldest temperature on record is -15° on February 15, 2016, although wind chill factors have probably approached or even exceeded that benchmark on occasion.



The region usually experiences at least one large event every year or two. There have been three winter storm related declarations in Windham County:

- Winter Storm (DR1816) – December 11-18, 2008
- Snowstorm (DR3167) – March 2001
- Ice Jams and Flooding (DR1101) – January 1996

Extreme snowfall records are 36” in one day measured in West Wardsboro on December 19, 1986; the multi-day extreme recorded snow event was 41.6” measured in Marlboro on March 15, 2023.

Community Vulnerability and Potential Impacts

Much like Brookline's vulnerability from high winds, a changing weather pattern is leading to more ice accumulation, which causes downed powerlines and a loss of power. A loss of power, whether from ice or snow accumulation will cause issues such as loss of some communications (ex. computers and wifi), loss of refrigeration for food and medication, loss of water pumps, loss of power for lights and life support equipment and other consequences. Some of the most vulnerable populations will be those with health conditions that require certain medications or life support equipment, and business owners that depend on refrigeration for their products.

While the trend has been to have warmer winters, the instability of the changing weather can also lead to some extreme and prolonged cold spells. Extreme cold can leave the most vulnerable residents at risk of cold exposure. Heating bills rise as systems use more fuel. Residents of low income may have to make hard decisions between basic life needs such as food and heat.

Ice, Snow, and Extreme Cold Summary Table

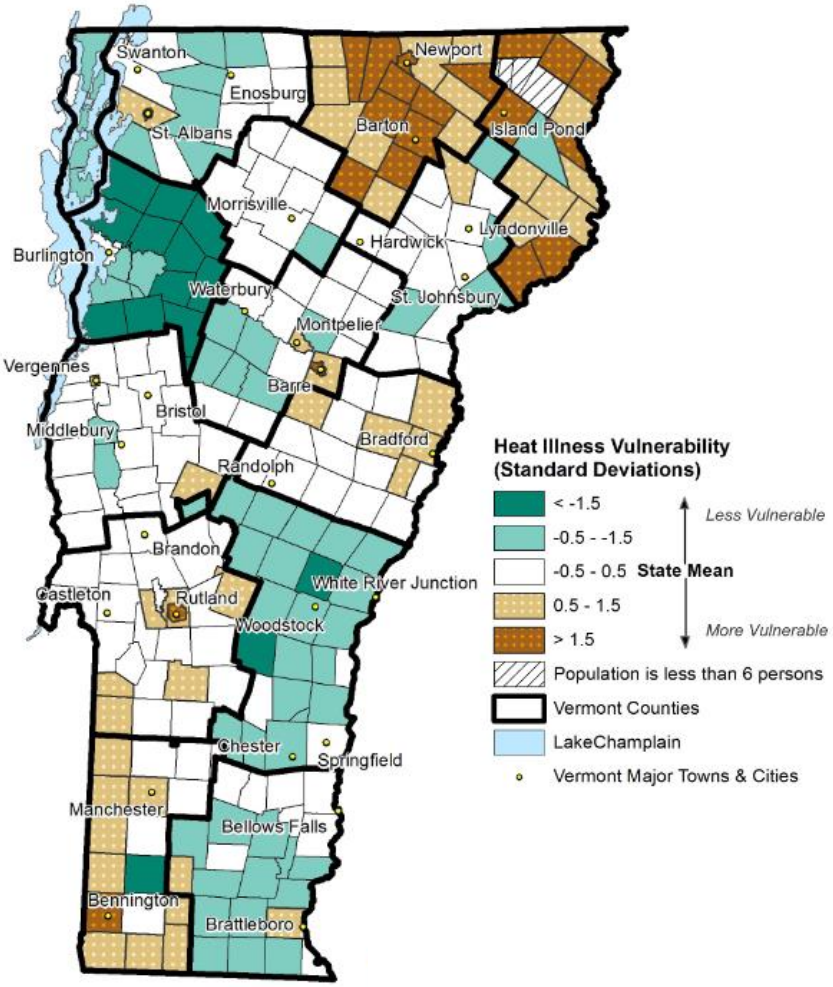
	Location	Vulnerability	Extent	Observed Impact	Probability
Ice	Town-wide, with higher elevations being at greater risk of extremes	Road accidents, power outages, damage to property, docks, shorelines	The Ice Storm of January 6, 1998 (DR-1201) was an unusual combination of precipitation and temperature that led to the accumulation of more than 3" of ice in many locations, causing closed roads, downed power lines, and damage to thousands of trees. This storm was estimated as a 200-500 year event.	Extended power outages; road accidents; carbon monoxide from improper use of generators	Score of 3; Probable
Snow	Town-wide, with higher elevations being at greater risk of extremes	Roofs prone to collapse from weight; Power lines and trees; impassable roads due to snow drifts; indirect injuries from overexertion;	Extreme snowfall records are 36" in one day measured in West Wardsboro on December 19, 1986; the multi-day extreme recorded snow event was 41.6" measured in	Roof collapse on at risk structures; road accidents; power outages from downed trees and wires; school cancellations and delays; outdoor	Score of 3; Probable

		Unsafe travel, especially for school buses and ambulances	Marlboro on March 15, 2023. Heavy snow in Brookline this multi-day event resulted in loss of power for some residents for up to three days.	recreation events cancelled;	
Cold	Town-wide, with higher elevations being at greater risk of extremes	People living in older structures; energy burdened households Structure fires Damage to water pipes Damage to agricultural crops	The coldest temperature on record is -15° on February 15, 2016 in Marlboro	Burst water pipes and flooding; school cancellations and delays; outdoor recreation events cancelled;	Score of 3; Probable

Heat

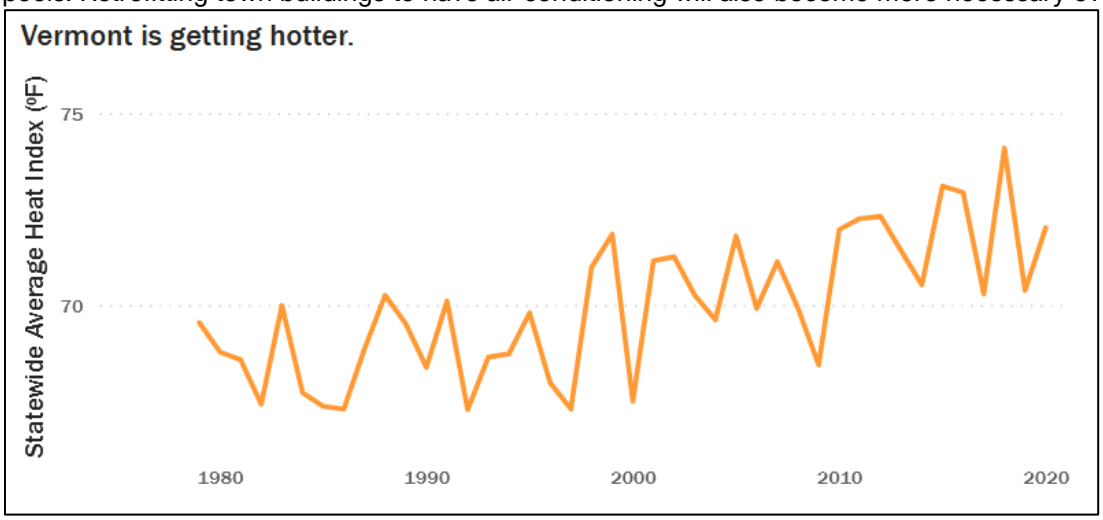
The Centers for Disease Control reports that more people die from heat than other weather-related events. The actual number of deaths are most likely underreported because heat can exacerbate other underlying conditions such as heart and respiratory disease, leading to death[19]. The impacts of extreme heat can be particularly challenging in areas like the Windham Region where residents are not accustomed to high temperatures and are less likely to live in air-conditioned structures.

[19] Centers for Disease Control, Heat Related Illness: Picture of America Report



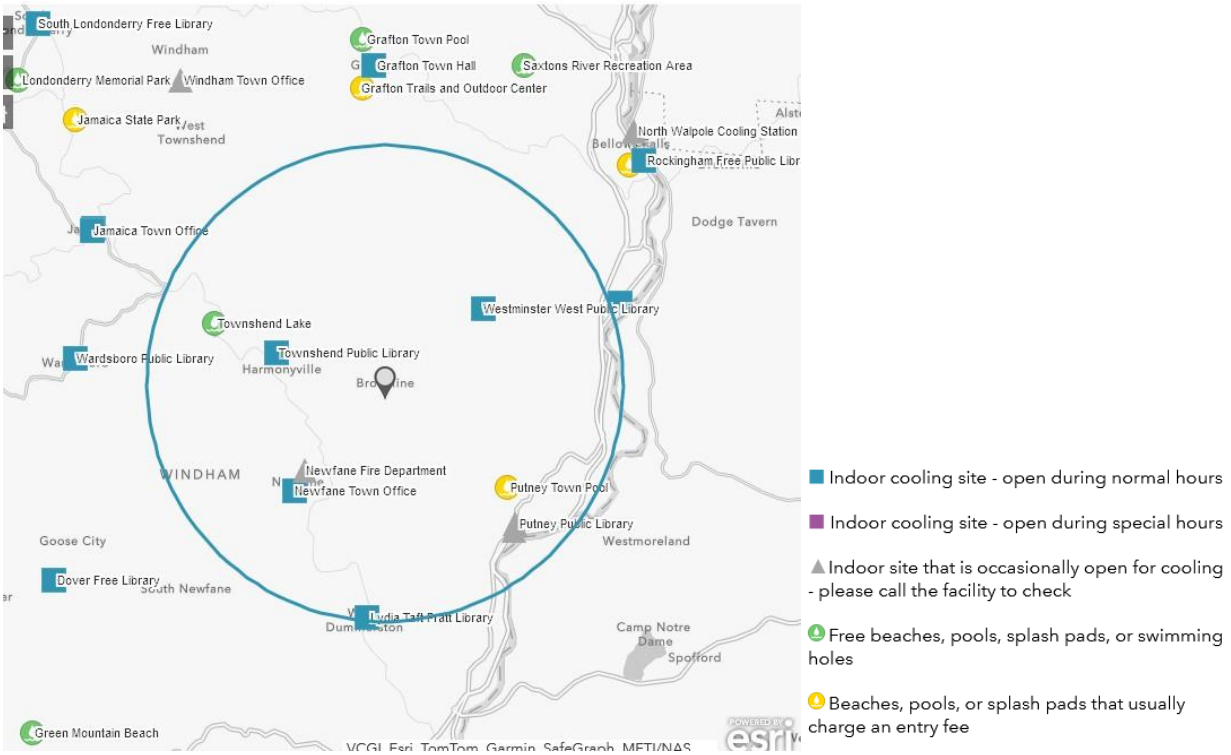
The map to the left is a Heat Vulnerability Index developed by the Vermont Department of Health. The Vermont Heat Vulnerability Index draws together 17 different measures of vulnerability in 6 different themes: population, socioeconomic, health, environmental, climate, and heat illness. These measures are combined to measure the overall vulnerability of Vermont towns to heat-related events.

Windham County has an average of 12 excessive heat days per year; Windsor County has 14 days yearly on average; and Bennington County has 9. Overall, the graph below shows that the statewide average heat index is increasing over time. With this trend, towns should be considering ways to assist residents with managing and getting cool during excessive heat days, through cooling shelters and community pools. Retrofitting town buildings to have air conditioning will also become more necessary over time.



There are no official cooling centers in Brookline. There are several posted on the Vermont Department of Health Hot Weather website that are located in nearby communities.[20] The site continues to be updated and information on each cooling station, its location, hours and any other site-specific important information can be found.

Cooling Sites within 10 Miles of Brookline, Vermont



From the VT Department of Health Hot Weather Cooling Map

Community Vulnerability and Potential Impacts

As a rule, the National Weather Service considers "excessive heat" to be an event when the maximum heat index is expected to be 105° or higher for at least two days and nighttime air temperatures will not drop below 75°. As temperatures continue to rise during the summer months due to changes in the weather pattern, there will continue to be a rise in excessive heat days. The primary impact of extreme heat or prolonged periods of hot weather is to human life. Hot conditions, especially when combined with sun and high humidity, can limit the body's ability to thermoregulate properly. Prolonged exposure to hot conditions can lead to heat cramps, heat exhaustion, heat stroke, or exacerbate other pre-existing medical conditions. Some of these impacts require medical attention and can be fatal if left untreated. Children and the elderly are especially vulnerable to heat-related illnesses.

Heat Summary Table

Location	Vulnerability	Extent	Observed Impact	Probability
Town-wide	Children, elders, people with underlying conditions,	NOAA recorded an excessive heat event in Vermont on July 1, 2018 in	Increased hospitalizations due to heat-related illness (VT Dept. of Health data),	Score of 3; Probable

[20] Vermont Department of Health: Hot Weather. https://www.healthvermont.gov/environment/climate-health/hot-weather

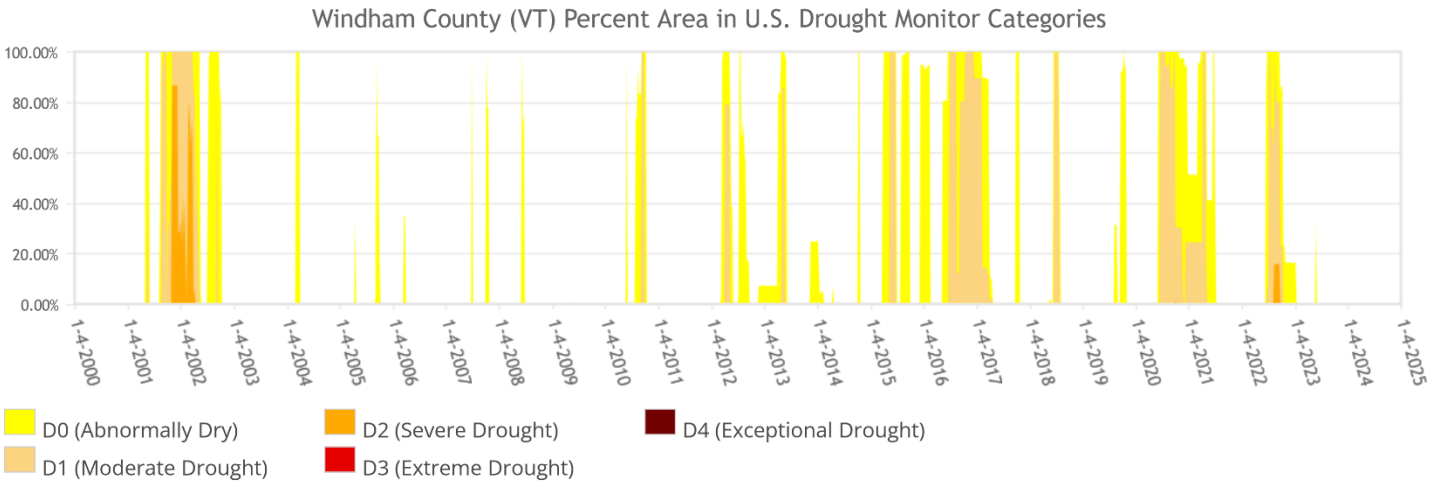
	people below the poverty line; water supplies and water bodies; livestock	Bennington and Windham Counties. Temperatures were recorded in the mid-90s with heat indices registering at 105 degrees. The high temperature in Brookline during this event was 93 degrees.	five heat-related deaths reported statewide in the summer of 2018	

Drought

Drought is defined as a shortage of water relative to need. According to the Vermont 2023 Hazard Mitigation Plan, drought is a complex phenomenon for several reasons:

- [It] is difficult to monitor and assess because it develops slowly and covers extensive areas, as opposed to other disasters that have rapid onsets and obvious destruction.
- The effects of drought can linger long after the drought has ended.
- The northeast United States can also experience "flash" or rapid-onset droughts with intense dry periods of about 2 to 6 months followed by a period of above-normal precipitation.

It seems paradoxical that while climate change is generally bringing increased levels of precipitation that Vermonters should experience drought. However, climate change also is linked to climate instability and extremes. Due to climate change the increasing frequency and duration of droughts will also increase impacts to town assets. According to the US Drought Monitor, Windham County has experienced some level of drought every year since 2012. Minor portions of the county also experienced severe drought (D2) in August 2022. The worst period of drought on record was between November 2001 until March 2002.[21]



From the U.S. Drought Monitor website, https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx, 1-17-2024

[21] US Drought Monitor website: https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx, accessed 1/17/2024

In late 2020, USDA Farm Services Agency issued a declaration of drought-related disaster conditions, making all Vermont farmers eligible to apply for emergency loans. With drought conditions persisting for more than a year, the State of Vermont reactivated its Drought Task Force in July 2021.

The Agency of Natural Resources maintains a crowd-sourced database called the ANR Drinking Water Drought Reporter. https://anrmaps.vermont.gov/websites/droughtreporter/. As of this writing, three private wells are showing water shortages in the Windham Region.

Community Vulnerability and Potential Impacts

In Brookline, drought conditions will likely increase over time as the instability of weather patterns leads to more extreme weather. This can lead to loss of potable drinking water, increase in wildfires, and loss of income in agricultural operations.

Extended periods of drought during a Vermont growing season can be devastating for agriculture. USDA data show occasional payouts from crop insurance due to drought damage, but this data is at the county level. Furthermore, not all local growers carry crop insurance. Forestry operations are susceptible to drought as well, because extended warm and dry seasons can increase risk of disease. Drought also weakens or kills wildlife, and the dieback of vegetation and increased risk of wildfire destroys habitat.

Drought can also result in loss of potable water when wells run dry. Although the surface waters may appear to have recovered from a period of drought following a return to normal precipitation, replenishing groundwater levels is a longer process. Low water levels in wells can yield higher concentrations of metals (uranium, iron, sulfur, arsenic, and manganese) in drinking water, making the water unsafe to drink.

Drought conditions are also favorable for wildfires. Low water levels can also affect recreation and fishing. Low water levels, paired with rising temperatures, can trigger occurrence of blue-green algae in lakes and ponds. High winds, low humidity, and extreme temperatures can all amplify the severity of the drought. The severity of a drought depends on the duration and extent of the water shortage, as well as the demands on the area's water supply.

Drought Summary Table

Location	Vulnerability	Extent	Observed Impact	Probability
Town-wide	Crop loss, loss of drinking water, higher occurrence of algae blooms; increased risk of wildfire	Worst drought was Nov 2001 to March 2002; some level of drought experienced yearly since 2012	Loss of drinking water	Score of 2: Possible

Infectious Disease Outbreak

COVID's unprecedented disruption of daily life is a grim reminder that climate change increases the risk of future infectious disease outbreaks. According to the Centers for Disease Control, vector borne illnesses such as Lyme disease, West Nile virus disease, and Valley fever are already on the rise and spreading to new areas of the United States. Milder winters, warmer summers, and fewer days of frost make it easier for these and other infectious diseases to expand into new geographic areas and infect more people.

The COVID-19 pandemic resulted in the first ever major disaster declaration of all 50 states, five territories, and the District of Columbia. In March of 2020, by Executive Order No. 01-20, the Governor declared a State of Emergency for Vermont, and restrictions to protect public health were enacted.

While a variety of measures were recommended by the Center for Disease Control and the Vermont Department of Health to help curb the spread of disease, including frequent hand washing, wearing masks, and keeping a distance of 6 feet from other persons, vaccination was identified as the best way to keep from getting and spreading COVID-19. In Vermont, the vaccine was first made available to residents and staff of long-term care facilities in December 2020, and then to those 75 and older in mid-January 2021. The Vermont State of Emergency was extended for over a year until all restrictions were lifted on June 14 of 2021, when the benchmark of an 80% vaccination rate for the eligible population of Vermont was reached.

Even though the State of Emergency is behind us, the long-term impacts are still unclear. As of August 2023, the Vermont Department of Health reports that COVID hospitalizations are low, and there is one case reported in Orleans County. As of January 2024, the US Centers for Disease Control report 1,101 COVID deaths in Vermont. As of December 2023, the Vermont Department of Health reported 101 deaths in Bennington County, 54 deaths in Windham County, and 75 deaths in Windsor County, since January 2020. The death toll is based on death certificates that list COVID as a cause or probable cause of death. The Department of Health does not publish death counts at the municipal level.

Essential services, government operations, schools and businesses were severely disrupted during COVID, requiring rapid implementation of safety protocol to continue critical operations. While "social distancing" was an appropriate response to mitigate the spread, all sectors of the regional population experienced some form of disruption, especially those with no broadband or spotty broadband coverage. The pivot to a virtual environment has demonstrated that reliable broadband is a vital utility for business, work, school, healthcare, and civic involvement.

Community Vulnerability and Potential Impacts

To cope with Covid-19, Brookline public facilities had to quickly learn how to move to a remote work setting. Unreliable communication capabilities made it difficult sometimes and the town should invest in technology to increase remote capacity. Training of town staff may be necessary to build comfort with new methods

The potential increase in infectious disease may be linked to climate change and warming temperature patterns. Warmer weather increases the ranges of vectors of disease that might have normally been unable to survive in Vermont. Higher temperatures also allows for increased breeding and increased heat resistance for diseases. Vulnerable populations, such as the chronically ill, very young, and elderly are at the highest risk of suffering extreme reactions to infectious diseases. Brookline's population, like the rest of Vermont, is aging and infectious diseases may prove to be a bigger threat in the future.

Infectious Disease Summary Table

Location	Vulnerability	Extent	Observed Impact	Probability
Town-wide	Total population, especially older adults, young children, and those with underlying health conditions; critical facilities and services, healthcare providers, and schools	Statewide emergency declaration from March 13, 2020 to June 14, 2021 for COVID-19	54 deaths in Windham County, local outbreak, no published data on death counts at the municipal level, job loss, remote schooling, loss of business revenue, food insecurity; isolation	Score of 2; Possible

Wildfire

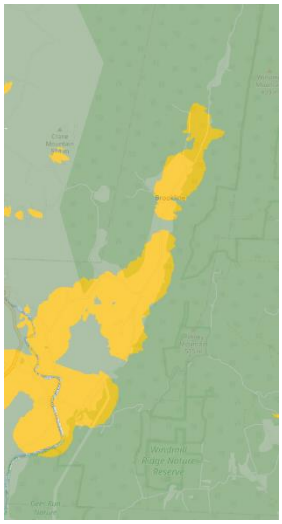
Wildfires pose a unique danger to communities and individuals. Wildfire conditions are typically most dangerous in spring when dead grass and fallen leaves from the previous year are dry and in the late summer and early fall. Drought conditions and high winds also increase the risk of wildfire. The most common cause of wildfires in Vermont is humans through burning refuse, or untended or improperly extinguished campfires. Lightning strikes are also a less common cause of fires.

FEMA has the following four categories for wildfires:

1. Wildfire: fueled by natural vegetation. These most often occur in national forestlands. Federal agencies are responsible for fire management.
2. Interface or Intermix Fires: vegetation and built environment (buildings) provide fuel for fire.
3. Firestorms: occur during extreme weather events.
4. Prescribed Fires and Prescribed Natural Fires: intentionally set for a beneficial purpose.

Most of Windham is heavily forested and there is potential, given the right conditions, for wildfires. As residential areas expand into forested areas, fires increasingly threaten people and residences. Protecting structures in these areas from fire poses special problems and can stretch firefighting resources. If heavy rains follow a major forest fire, other natural disasters can occur, including landslides, mudflows, and floods. Once ground cover has been burned away, little is left to hold soil in place on steep slopes and hillsides. A major wildfire can leave a large amount of scorched and barren land, and affected areas might not return to pre-fire conditions for decades.

Community Vulnerability and Potential Impacts



Because a large portion of Brookline is forested, the geographic area of the hazard covers the majority of the community. Areas prone to wildfires are described as “interface” or “intermix.” Interface areas can be found along the divide between urban scale development and natural areas. Brookline is characterized by “intermix” areas where residential dwellings are interspersed within heavily forested areas.

According to the Wildland Urban Interface map created for Vermont by the University of Wisconsin in 2010, specific areas in town that may be more susceptible to wildfires are the lands along Kirsch Road, Hill Road, Grassy Brook Road and portions of Ellen Ware Road. The map to the right shows identified “intermix” areas in orange.

According to the NewBrook Fire Department, the largest wildfires in Brookline occurred on Harris Hill (approximately in 2013) and Putney Mountain (approximately in 2018) in a heavily forested area. In 2022 there was a several acre grass fire on Purple Mountain Road. The NewBrook Volunteer Fire Company responds to roughly 1 wildfire every few years. The town does not have data on the number of acres burned per event. The Fire Company is part of a mutual aid system, so some of the wildfires that they respond to may occur outside of Brookline as well.

Climate change is anticipated to impact the likelihood of wildfire occurrence in Windham County in the future. As Brookline experiences warmer summer days and increasing chances of drought, the risk of wildfire will likely increase.

Wildfire Summary Table

Location	Vulnerability	Extent	Observed Impact	Probability
Town-wide	Damage to public infrastructure, utilities, private residences and businesses	The extent of wildfire risk can be hard to predict because it is so dependent on soil moisture, drought, and current weather conditions. The U.S. Forest Service maintains the Wildland Fire Assessment System, which provides national fire danger ratings and is updated daily. Danger level is ranked as low, moderate, high, very high, or severe. Wildfire conditions are typically most dangerous in spring when dead grass and fallen leaves from the previous year are dry and in the late summer and early fall.	A fire several years ago on Purple Mountain Road in remote south Brookline burned several acres only. Fire ponds and streams served as a source of water to keep the burned area to a minimum.	Score of 2: Possible

Hail

Hail is pellets of frozen rain that form during storms where air flows carry rain upwards into the cold atmosphere and freeze. As pellets freeze, they combine together, creating balls of ice that rain down onto the land. These pellets of ice balls typically range from 5-50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms. The size of hailstones is a direct function of the severity and size of the thunderstorm by which it is produced. No matter the size, hail can damage agricultural crops, structures, and cause bodily harm to those unfortunate enough to be caught outside.

Since the last plan, there have been 4 reported hail storms in Windham County. These storms were located in Jacksonville, West Halifax, West Brattleboro and Brattleboro. The neighboring community of Newfane had a quarter size hail event in 2013 and another event with quarter to golf ball size hail in 2011. The town of Townshend reported penny size hail in 2007. The Town of Athens, just north of Brookline, had nickel size hail in 2001

TORRO Hailstorm Intensity Scale

	Intensity Category	Typical Hail Diameter (mm)	Probable Kinetic Energy (J/m2)	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Destructive	25-40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		Severe damage to aircraft bodywork
H9	Super Hailstorm	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorm	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Community Vulnerability and Potential Impacts

Hailstorms usually occur in Vermont during the summer months and generally accompany passing thunderstorms. Thunderstorms, including those with hail, are very localized and may affect one municipality, or part of one, and not another. In areas where hail occurs, it can be significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage, including both structures and vehicles.

Hail Summary Table

Location	Vulnerability	Extent	Observed Impact	Probability
Town-wide	Agriculture, homes, businesses, vehicles	While not common, hail storms can crop up with isolated thunder storms. The neighboring community of Newfane had a quarter size hail event in 2013 and another event with quarter to golf ball size hail in 2011. The Town of Athens, just north of Brookline, had nickel size hail in 2001.	Agricultural plant damage and vehicle damage	Score of 2; Possible

MITIGATION STRATEGY

Goals of Mitigation

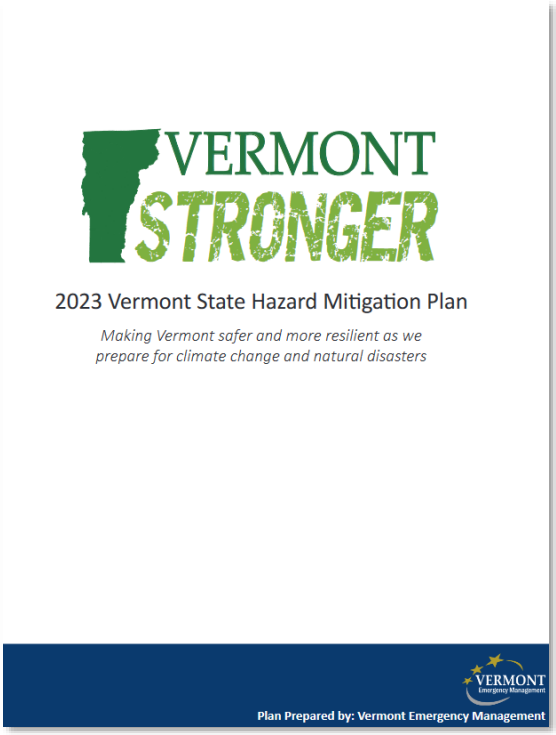
The Town Goals listed here were reviewed in this update. The Town's overall goals of this Plan remain the same since the last update.

- Reduce the loss of life and injury resulting from all hazards.
- Reduce the impact of hazards on the town's water bodies, natural resources, and historic resources.
- Reduce the economic impacts from hazard events.
    - Minimize disruption to the road network and maintain access,
    - Mitigate financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to disasters,
    - Ensure that community infrastructure is not significantly damaged by a hazard event.
    - Being proactive in implementing any needed mitigation projects for public infrastructure such as roads, bridges, culverts, municipal buildings, etc.
- Hazard mitigation planning is incorporated into other community planning projects, such as the Town Plan, Capital Improvement Plan, and Town Local Emergency Operation Plan.
- The general public continues to participate and be actively involved in the hazard mitigation planning process.

Comparing the above Town goals with the below goals from the Draft State Hazard Mitigation Plan, they align in an overarching way.

Goals shown in the Draft 2023 Vermont State Hazard Mitigation Plan:

- Protect, restore, and enhance Vermont's natural resources to promote healthy, resilient ecosystems.
- Enhance the resilience of our built environment – our communities, infrastructure, buildings, and cultural assets.
- Develop and implement plans and policies that create resilient natural systems, built environments, and communities.
- Create a common understanding of – and coordinated approach to – mitigation planning and action.



Community Capabilities

Each community has a unique set of capabilities, including authorities, programs, staff, funding, and other resources available to accomplish mitigation and reduce long-term vulnerability. Brookline's mitigation capabilities that reduce hazard impacts or that could be used to implement hazard mitigation activities are listed below.

➢ Administrative and Technical

In addition to the Emergency Management Services described in the Community Profile section, elected town officers that can be used for mitigation planning and to implement specific mitigation actions include: 1 Lister, 5 member Selectboard, Town Clerk, and Treasurer.

In addition to elected officials, there are the appointed Assistant Town Clerk, an Assistant Treasurer, Building Supervisor, DVFiber Representatives, Emergency Management Director, 2 Fire Warden, 2 Health Officers, 1 Lister, a 5-member Planning Commission, Road Commissioner, Town 911

Coordinator, Tree Warden, Valley Cares (not an official municipal committee), Volunteer Fire Department and several other town groups.

To augment local resources, the Town has formal mutual aid agreements for emergency response – fire and public works. Technical support is available through the WRC in the areas of land use planning, emergency management, transportation, GIS mapping, and grant writing. Technical support is also available through the State ANR for floodplain administration and VTrans Districts for hydraulic analyses.

➢ Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Examples of planning capabilities that can either enable or inhibit mitigation include land use plans, capital budgeting programs, transportation plans, stormwater management plans, disaster recovery and reconstruction plans, and emergency preparedness and response plans. Examples of regulatory capabilities include the enforcement of zoning ordinances, subdivision regulations, and building codes that regulate how and where land is developed, and structures are built.

Town Plan: Adopted March 21, 2018
Description: A framework and guide for how future growth and development should proceed.
Relationship to Natural Hazard Mitigation Planning: Includes goals, policies, and action steps related to flood resilience. While this may not have been done in past updates, going forward there should be a distinct consideration of natural hazards in choosing sustainable areas intended for growth and expansion.

Flood Hazard Area Bylaws: adopted December 7, 2005
Description: Provides for orderly community growth promoting the health, safety, and general welfare of the community.
Relationship to Natural Hazard Mitigation Planning: Works to minimize and prevent the loss of life and property, disruption of commerce, the impairment of the tax base and the extraordinary public expenditures and demands on public services that result from flooding and other flood related hazards. Ensures that the design and construction of development in flood and other hazard areas are accomplished in a manner that minimizes or eliminates the potential for flood and loss or damage to life and property.

Road and Bridge Standards: Adopted April 20, 2022
Description: Provide minimum codes and standards for construction, repair, maintenance of town roads and bridges.
Relationship to Natural Hazard Mitigation Planning: Standards include management practices and are designed to ensure safety of the traveling public, minimize damage to road infrastructure during flood events, and enhance water quality protections.

Road Erosion Inventory Report: Full Inventory completed 6/18/2019 and updated annually
Description: Prioritizes those infrastructure projects necessary to improve transportation network resiliency and water quality.
Relationship to Natural Hazard Mitigation Planning: Improvements are designed to minimize or eliminate flood impacts on hydrologically connected road segments.

Local Emergency Management Plan: Adopted April 7, 2021 and renewed each year
Description: Establishes lines of responsibility and procedures to be implemented during a disaster and identifies high risk populations, hazard sites, and available resources.
Relationship to Natural Hazard Mitigation Planning: Includes actions for tracking events and response actions including damage reports to facilitate funding requests during recovery. This type of information can be essential to preparing hazard mitigation project applications for FEMA funding.

Fire Department ISO Rating: Currently Under Review
Description: NewBrook's Volunteer Fire Department's ISO rating is currently being reviewed. This rating is a score from 1 to 10 that indicates how well-protected the community is by the local fire department.
Relationship to Natural Hazard Mitigation Planning: Everyone wants to keep family, home, and business safe from fires. The ISO rating is a measure of the effectiveness of a community's fire services.

Status of Other Plans & Regulations:

- Transportation Plans: No stand-alone plan currently in place.
- Stormwater Management Plan: No stand-alone plan currently in place.
- Zoning Ordinances: Brookline does not have zoning at this time.
- Subdivision Regulations: Brookline does not have subdivision regulations at this time.
- Building Codes: Brookline does not have its own building codes and uses building codes required by the state.

➢ Financial

Financial capabilities are the resources that a community has access to or is eligible to use to fund mitigation actions.

Brookline's FY24 annual operating budget was $588,782.00, of which $409,520.00 funds the Highway Department. Brookline has had FEMA Flood Declarations for the 2021 and 2023 storms.

The NewBrook Volunteer Fire Department serves the towns of Newfane and Brookline and operates one firehouse and collects fees for the provision of fire protection. The Department's annual expenses for FY23 was $192,282. The town of Brookline provided $9,000 in funding to the Department and Newfane contributed $50,000. The Department fundraises the difference to meet their budget.

➢ Education and Outreach

Brookline has several education and outreach opportunities that could be used to implement mitigation activities and communicate hazard-related information:

- Town Website
- Front Porch Forum
- Brookline Community Facebook Page
- Brookline Email List
- Brattleboro Reformer (local newspaper)
- The Commons (local newspaper)
- Moore Free Library
- Valley Cares

NFIP Compliance

The Town joined the National Flood Insurance Program (NFIP) in 1985. The effective date of the current Flood Insurance Rate Map (FIRM) is September 28, 2007. The Floodplain Administrator enforces NFIP compliance through permit review requirements in the Flood Hazard Area regulations. The Floodplain Administrator reviews all development permit applications to determine if the property and/or building is located in any floodplain boundaries. If so, the Administrator reviews the application to ensure that all relevant regulations are adhered to and does any needed inspections before working with the Planning Commission on issuing a permit. If an application is for rebuilding of a damaged structure, the history of damages is reviewed and a consultation with ANR will assist in how to proceed with permitting. For additions/improvements to existing structures, a determination of location in relation to waterway must be understood, as well as whether the improvement is considered substantial. ANR has 30-days to review all applications in floodplain boundaries and may offer comment to the town. ANR

review opportunity is required before the town can issue a permit, and serves as a second technical review of applications which can assist the town in deciding whether to issue or deny a permit. For permitting following an event, coordination with ANR is necessary for Substantial Damage Determinations. Once determinations are made, joint communication with property owners, ANR, VEM, and the insurance provider will assist in decisions about rebuilding, buyouts, or relocations.

Brookline's regulations outline detailed minimum standards for development in FEMA Special Flood Hazard Areas. The town administers the NFIP minimum requirements related to substantial damage and substantial improvement thresholds. The Town works with the WRC and ANR to correct and prevent NFIP compliance issues through continuous communications, training and education.

The Town discussed the following as possible actions to continue NFIP compliance:

- Prepare, distribute, or make available NFIP insurance explanatory pamphlets or booklets.
- Participate in NFIP training offered by the State and/or FEMA.
- Establish mutual aid agreements with neighboring communities to address administering the NFIP following a major storm.
- In March of 2024 Brookline reviewed its NFIP maps and provided suggested revisions to NFIP and FEMA.

State Incentives for Flood Mitigation

Vermont's Emergency Relief Assistance Funding (ERAF) provides state funding to match FEMA Public Assistance after federally declared disasters. Eligible public costs are generally reimbursed by FEMA at 75% with the State matching 7.5%. The State will increase its match to 12.5% or 17.5% of the total cost if communities take steps to reduce flood risk as described below.

12.5% funding for eligible communities that have adopted four (4) mitigation measures:

1. NFIP participation
2. Town Road and Bridge Standards
3. Local Emergency Plan
4. Local Hazard Mitigation Plan

Brookline's current ERAF rate is 7.5%. As soon as this LHMP is approved, they will have met all four base standards and will be at 12.5%.

17.5% funding is available if a community does either or both of these enhanced mitigation measures:

1. Regulates development in ANR mapped River Corridors
2. Joins FEMA's Community Rating System

Identification of Mitigation Actions

Based on community priorities identified since the last plan as well as during the planning process of this plan, the Planning Team discussed the mitigation strategy, reviewed projects from the 2017 Plan, and identified possible new actions from the following categories for each of the high scoring natural hazards identified in the Risk Assessment.

1. **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.

2. **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This applies to public or private structures as well as critical facilities. These projects may be eligible for funding through FEMA's Hazard Mitigation Funding Programs.

3. **Natural Systems Protection:** These actions minimize damage and losses and preserve or restore the functions of natural systems.

4. **Education and Awareness Programs:** These actions inform and educate the public about hazards and potential ways to mitigate them. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. Greater understanding and awareness are more likely to lead to community support for direct actions.

For the selected actions, the Planning Team assigned a responsible party to lead the implementation of each action; identified potential funding; and developed a timeframe for implementation.

MITIGATION IN ACTION								
Local Plans and Regulations								
	HAZARD(S) ADDRESS-ED	**ISSUE/ CONCERN**	**ACTION DESCRIPTION / CURRENT STATUS**	**RESPON-SIBLE ENTITIES (Lead party in bold)**	**TIME-FRAME**	**POTENTIAL FUNDING**	**Community Lifeline Connection Y/N**	**MITIGATION / PREPARED-NESS / PREVENTION / MAINTENANCE**
1	All Hazards/ Flooding/ Wildfire/ Infectious Disease	Paper records are vulnerable to destruction by a variety of hazards. Town Hall is located in a flood prone area, is vulnerable to fire and digitized records would be beneficial during social distancing time during infectious disease outbreaks.	Digitizing the town records (covering 50 years) is a goal of the town to ensure their perpetuity. Some manually digitization has occurred.	**Town Clerk** & Assistant Town Clerk	Winter 2025 – Fall 2030	Town Operational Budget	N	Prevention
2	Flooding / Fluvial Erosion	Floodplain administration is complicated and training is needed as regulations change quickly.	Establish a Floodplain Administrator and obtaining training through FEMA/EMI class, online). Seeking to share and/or locate trained individual.	**Floodplain Administra-tor** and establish a Review Committee	Summer 2024 - June 2025	Town Operational Budget	Y	Preparedness / Maintenance/ Prevention
3	Flooding / Fluvial Erosion	Brookline's current FEMA mapping is inaccurate and the town has advised FEMA of needed changes.	Coordinate with FEMA & NFIP programs on updating the Brookline Special Flood Hazard Areas.	**Select-board** with WRC Support	Fall 2024 - December 2025	Funding not needed beyond volunteer time	N	Mitigation / Prevention

4	Flooding / Fluvial Erosion	There is frequent flooding and fluvial erosion in town. The town does not currently have River Corridor By-laws in place.	Research River Corridor Bylaws when the town is working on updating its Town Plan. Met with State representatives to review River corridor process and options.	**Select-board** and Planning Committee	Summer 2024 - December 2026	WRC support	Y	Preparedness / Mitigation
5	Heat	Planning for how to assist residents during high heat events is needed.	Develop hot weather annex to the LEMP.	**EMD**	January 2025 - December 2025	Town Operational Budget / WRC support	Y	Preparedness / Mitigation
6	Flooding/ Fluvial Erosion	The Vtrans Resilience Mapping Tool seems to under represent hazardous road segments, structures and culverts in town.	Coordinate with Vtrans on reviewing the vulnerability of roads, structures and culverts in town to reflect town experiences.	**Select-board** with the assistance of WRC	January 2025 – December 2025	No funding needed besides volunteer time	N	Mitigation/ Prevention
	Structure and Infrastructure Projects							
	HAZARD(S) ADDRESS-ED	**ISSUE/ CONCERN**	**ACTION DESCRIPTION / CURRENT STATUS**	**RESPON-SIBLE ENTITIES (Lead party in bold)**	**TIME-FRAME**	**POTENTIAL FUNDING**	**Community Lifeline Connection Y/N**	**MITIGATION / PREPARED-NESS / PREVENTION / MAINTENANCE**
7	Flooding / Fluvial Erosion	The intersection of Grassy Brook Road and Parker Road sees repeated flooding.	Pull together stakeholders to do a walk through and study of the water drainage of the surrounding area. Completed a hydrologic study of the area, which recommended replacing the existing culvert with an approximately 26 foot bridge. Filed pre-application with DPS/ Hazard Mitigation. Met with Hazard Mitigation employee & ANR	**Select-board** & Future Floodplain Administrator	Summer 2024 - December 2025	FEMA HMGP or VT DEC Clean Water Funding and possibly town funds	Y	Mitigation & Prevention

8	Flooding / Fluvial Erosion	Water off of Putney Mountain has overtopped culverts and the water has no place to go.	Pull together stakeholders to do a walk through and study of the water drainage of the area. A hydraulic study has been requested for 119 Grassy Brook Road.	**Select-board**	Summer 2024 - December 2025	FEMA HMGP or VT DEC Clean Water Funding	Y	Mitigation
9	Flooding/ Fluvial Erosion	Fluvial erosion on Grassy Brook Road and Parcel #03-005.00. Deteriorating after each rain event.	Plantings or stone fill needed to prevent further erosion.	**Select-board**	May 2025 - December 2025	Trees for Streams: WCNRCD	N	Mitigation
10	Flooding/ Fluvial Erosion	Erosion happening on Whitney Hill Road near intersection with Grassy Brook Road.	Install a culvert to assist in diverting water and limiting erosion.	**Road Foreman**	May 2025 - December 2025	Town Highway Budget	Y	Mitigation
11	Flooding/ Fluvial Erosion	Ice is accumulating on a private driveway on Hill Road due a clogged culvert.	Work with the landowner to keep the culvert clear of accumulated leaves.	**Private Land-owner**	Winter 2024 - with on-going regular maintenance by land-owner	Volunteer landowner assistance.	Y	M
12	Flooding/ Fluvial Erosion	Institutional knowledge on culverts in town is held by the Town Road Foreman and is not transferable in case of emergency.	Town should maintain an inventory of culverts for planned maintenance and emergency use.	**Road Foreman** working with Select-board	Summer 2024-December 2025	Town Highway Budget for Staff Time	Y	Mitigation/ Preparedness
13	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert #3 Water sheets across the pavement during flooding	A hydraulic study is needed on Culvert #3 to ensure proper drainage in this area.	**Road Foreman** working with Select-board	Summer 2024-Fall 2027	FEMA HMPG	Y	Mitigation/Preparedness
14	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert #8 is overwhelmed during high rain events. Recent event caused	Upsize Culvert #8 on Grassy Brook Road	**Road Foreman** working with Select-board	Summer 2024-Fall 2027	FEMA HMPG	Y	Mitigation/Preparedness

		bridge deck damage and undermined guard rail at Putney Mtn. intersection bridge B-12						
15	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert #16 is overwhelmed during large rain events and chokes with debris.	Upsize Culvert #16 on Grassy Brook Road	**Road Foreman** working with Select-board	Summer 2024 – Fall 2027	FEMA HMPG	Y	Mitigation/Preparedness
16	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert #17	Replace culvert #17 with a box culvert for increased water flow in that area. Currently on the State structural grant wait list.	**Road Foreman** working with Select-board	Summer 2024 - December 2029 (Contingent on being accepted through the Wait List.)	Vermont Structures Grant, FEMA HMPG	Y	Mitigation/Preparedness
17	Flooding/ Fluvial Erosion	Grassy Brook Road: Bridge #5. This area is narrow and road sheeting and erosion occurs during high rain events.	Bridge #5 should have an engineering study completed to examine road widening and bridge replacement.	**Road Foreman** working with Select-board	Summer 2024 - Fall 2028	Vermont Structures Grant, FEMA HMPG , VT DEC Enhancement Grant	Y	Mitigation/Preparedness
18	Flooding/ Fluvial Erosion	Grassy Brook Road: Bridge # 11 (Town Long Bridge). Center abutment blocks debris and causes erosion on both ends of the bridge.	Have engineering completed bridge #11. Hydrolic study completed.	**Road Foreman** working with Select-board	Summer 2024 - December 2027	FEMA HMPG, VT DEC Enhancement Grant	Y	Mitigation/Preparedness
19	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert #34. Relieves water from low lying area with homes, but does not relieve enough during high water events.	Upsize culvert #34	**Road Foreman** working with Select-board	Summer 2024 - December 2029	FEMA HMPG, VT Structures Grant	Y	Mitigation/Preparedness
20	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert #35. Hydrolic survey shows culvert size insufficient for quantity of	Upsize Culvert #35	**Road Foreman** working with Select-board	Summer 2024 - December 2027	FEMA HMPG	Y	Mitigation/Preparedness

		water passing through.						
21	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert # 39. Culvert chokes with debris as it comes down Whitney Hill at a high rate.	Hydraulic study on culvert #39 needed to determine proper upsize needed.	**Road Foreman** working with Select-board	Summer 2024 - December 2026	FEMA HMPG	Y	Mitigation/Preparedness
22	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert # 57. Failing culvert needs replacing. The angle of the culvert inlet encourages debris collection and storms have damaged the road at this culvert during Irene and in 2021 and 2023.	A hydraulic study is needed on Culvert #57 to determine upgrades needed.	**Road Foreman** working with Select-board	Summer 2024 - December 2026	FEMA HMPG	Y	Mitigation/Preparedness
23	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert # 84. Roadway was damaged during the last several high volume events.	Hydraulic study showed that culvert # 84 needs to be upsized and the angle of the water flow needs to be changed to prevent debris blockage on the inlet side.	**Road Foreman** working with Select-board	Summer 2024 - December 2029	FEMA HMPG	Y	Mitigation/Preparedness
24	Flooding/ Fluvial Erosion	Putney Mountain Road: Culvert #30. Culvert does not have a visual opening and collapse is suspected.	Culvert # 30 should be upsized and possibly a parallel culvert should be installed.	**Road Foreman** working with Select-board	Summer 2024 - Fall 2027	FEMA HMPG, Town Highway Budget	Y	Mitigation/Preparedness
25	Flooding/ Fluvial Erosion	Hill Road: Culvert #6. Erosion off of Murdock Hill causes debris to litter the road surface.	Hydraulic study needed on Culvert #6 and surrounding area.	**Road Foreman** working with Select-board	Summer 2024 - Fall 2027	FEMA HMPG	Y	Mitigation/Preparedness
26	Flooding/ Fluvial Erosion	Hill Road: Culvert #11. Culvert with historic stone arch damaged during 2021 and 2023 high water events.	Have an engineering study done for Culvert #11 to mitigate and or repair culvert.	**Road Foreman** working with Select-board	Summer 2024 - December 2025	FEMA HMPG	Y	Mitigation/Preparedness

27	Flooding/ Fluvial Erosion	Ellen Ware Road: Culvert #14. Outlet scouring and erosion leading into the West River	Have an engineering study done for Culvert #14.	**Road Foreman** working with Select-board	Summer 2024 - December 2025	FEMA HMPG	Y	Mitigation/Preparedness
28	Flooding/ Fluvial Erosion	West River Elbow bend: Log base from trees rotting and shoulders are dropping.	An engineering study is needed to stabilize the embankment and widen the road.	**Road Foreman** working with Select-board	Summer 2024 - December 2027	FEMA HMPG	Y	Mitigation/Preparedness
29	Flooding/ Fluvial Erosion	Grassy Brook Road: Culvert # 17. Outlet is eroding away residential property as it makes a 90 degree turn.	Stabilize the soil on the Grassy Brook banks around the outlet of Culvert #17.	**Road Foreman** working with Select-board	Summer 2024 - December 2025	FEMA HMPG , Town Highway Budget	Y	Mitigation/Preparedness
30	Ice/ Snow/ Wind	Power outages throughout town.	Work with Green Mountain Power on Resilience Zone planning.	**Energy Committee**	On Green Mountain Powers Timeline, but Within the 5-year planning cycle	Green Mountain Power	Y	Mitigation/ Preparedness/ Prevention
31	All Hazards/ Extreme Cold, Ice/ Snow/ Wind	The Town Office's current generator is undersized and does not operate the water pumps, therefore the building cannot accommodate residents in need of a place to go during hazards events.	Acquire and install a generator at the Town Office that can accommodate access to water pump.	**Select-board**	January - December 2025	Town Operational Budget	Y	Preparedness
	Natural Systems Protection and Nature-based Solutions							
	HAZARD(S) ADDRESS-ED	**ISSUE/ CONCERN**	**ACTION DESCRIPTION / CURRENT STATUS**	**RESPON-SIBLE ENTITIES (Lead party in bold)**	**TIME-FRAME**	**POTENTIAL FUNDING**	**Community Lifeline Connection Y/N**	**MITIGATION / PREPARED-NESS / PREVENTION / MAINTENANCE**

32	Flooding / Fluvial Erosion	Stone line ditching has helped a lot with road washouts; the town is prioritizing the worst spots. This also helps keep sediment out of streams and in this way improves water quality.	Complete stone line ditching - this has been going on for 6 years and will take more years to complete identified road segments - this is an ongoing action. Ditches that have been completed have less washout damage.	**Road Foreman**	Ongoing process that will be completed when all hydrologically connected road segments are complete. A few completed every year	Grants in Aid and Town Highway Budget	Y	Preparedness / Prevention / Maintenance
33	Invasive Species	Invasive plant species are spread during the maintenance of roadsides through mowing.	Train the road crew on Best Management Practices for slowing the spread of invasive plant material.	**Road Foreman** with support from VT Department of Forest Parks and Rec	January - December 2025	Trainings are free from Vtrans and VT State Forest Parks and Rec Department. Town Highway Budget for Staff time	N	Mitigation / Prevention / Maintenance
34	High wind / Ice	Vulnerable trees near power lines is a leading cause of power outages.	Hire an arborist to trim branches/trees along roads. Some being cut in 2024.	**Select-Board**	Spring – Fall 2024 and as needed within the 5-year planning cycle	Town Operational Budget	Y	Mitigation / Prevention / Maintenance
35	Invasive Species	Emerald Ash Borer (EAB) has been found in the neighboring town of Newfane. EAB can eventually kill Ash trees and the trees are very difficult to remove once dead.	Identify and remove Ash Trees in the Road Right of Way. Consider whether to plant a replacement plant that is shorter so as to not interfere with power lines.	**Road Foreman**	May 2024 and on-going as needed through the end of the 5-year planning cycle	Town Highway Budget	Y	Mitigation/ Prevention/ Maintenance
	Education and Awareness Programs							
	HAZARD(S) ADDRESS-ED	**ISSUE/ CONCERN**	**ACTION DESCRIPTION / CURRENT STATUS**	**RESPON-SIBLE ENTITIES (Lead**	**TIME-FRAME**	**POTENTIAL FUNDING**	**Community Lifeline Connection Y/N**	**MITIGATION / PREPARED-NESS /**

				party in bold)				PREVENTION / MAINTENANCE
36	Invasive Species	Invasive plants and pests disrupt the natural cycles in forests, open lands, and rivers. This can lead to economic losses as well as natural function losses.	Educational outreach to residents about how they can take measures to control for invasive plants and pests.	**Select-Board**	April 2025 - through Fall 2029	Town Operational Budget	N	Mitigation / Prevention / Maintenance
37	Extreme cold / Ice / Snow / Wind / Flooding / Fluvial Erosion	Improper generator use by the public is preventable with little training.	Education on safe use of generators.	**EMD** and Fire Chief	January - December 2025	Town Operational Budget	Y	Preparedness / Prevention
38	All Hazards	Public awareness of what to do in hazards including: flooding, fluvial erosion, ice jams, ice, snow, high wind, heat, drought, cold, and landslides is limited.	Update the EM page on the town website to house emergency related educational materials, including a list of items to have in case of emergency. Have sections that address: Extreme Cold, Excessive Heat, Drought, Wildfire, Flooding, High Wind and Ice.	**EMD** and Town Website Administra-tor	January - December 2026	Town Operational Budget	Y	Preparedness / Prevention
39	All Hazards	EMD needs to be able to communicate with residents during all hazardous events.	EMD will work with VEM to understand VTAlert sign-up rate in town and encourage residents to sign up	**EMD**	Fall 2024 - December 2025	Town Operational Budget	Y	Preparedness
40	All Hazards / Infectious Disease Outbreak	Brookline is part of a new communications union district. Expanding access to high-speed internet is of benefit to all residents and increases ability to function in isolation, if needed	Support DV Fiber in expanding fiber lines to underserved or not served areas of Brookline	**DVFiber Reps from Brookline** and DVFiber Board	January 2024 and as needed through the 5-year planning cycle	ARPA funding	Y	Preparedness / Prevention

41	All Hazards	Portable radios are limited without repeaters.	Installation of repeaters in each fire engine and at Brookline Town Garage; this would increase range of portable radios to that of mobile radio sets ad respond to necessary highway issues.	**Fire Chief** and Select-board	Currentl y in the 10-year plan; by 2034	Fire Department funding and Town Operational Budget	Y	Preparedness / Response
42	All Hazards/ Hail, Extreme Cold, Heat and Wildfire	Unhoused populations are at significant risk during hazardous events.	Determine if there are unhoused individuals in town and provide education about where to access services, especially during hail, high winds, extreme cold and heat.	**Selectboar d**	April 2026 – October 2026	Volunteers and reaching out to social service agencies that service town	Y	Preparedness/ Prevention

Mitigation Action Evaluation

For each mitigation action identified above, the Hazard Mitigation Planning Team evaluated its potential benefits and/or likelihood of successful implementation. Each action was evaluated against a broad range of criteria, including a planning level assessment of whether the costs are reasonable compared to the probable benefits. Results of this evaluation are presented in the table below.

Note that the Town will make every effort to maximize use of future Public Assistance Section 406 Mitigation opportunities when available during federally declared disasters.

Action Evaluation Criteria:

- Life Safety – How effective will the action be at protecting lives and preventing injuries?
- Property Protection – How effective will the action be at eliminating or reducing damage to structures and infrastructure?
- Technical – Is the mitigation action a long-term, technically feasible solution?
- Political – Is there overall public support/political will for the action?
- Administrative – Does the community have the administrative capacity to implement the action?
- Other Community Objectives – Does the action advance other community objectives, such as capital improvements, economic development, environmental quality, or open space preservation?

Each of the above criteria is ranked with a -1, 0, or 1 using the following table:
1= Highly effective or feasible
0 = Neutral
-1 = Ineffective or not feasible

Estimated Cost:
1 = less than $50,000;
2 = $50,000 to $100,000;
3 = more than $100,000

C/B – Are the costs reasonable compared to the probable benefits? Yes or No

MITIGATION ACTION EVALUATION AND PRIORITIZATION										
	Local Plans and Regulations									
ID	**ACTION DESCRIPTION**	**Life Safety**	**Prop Protect**	**Tech**	**Political**	**Admin**	**Other Obj**	**Benefit Score**	**Est Cost**	**C/B**
1	Digitizing the town records (covering 50 years) is a goal of the town to ensure their perpetuity. Some manually digitization has occurred.	0	0	1	1	-1	0	1	2	No
2	Develop the role of the Planning Commission in nominating a Floodplain Administrator. Provide access to training for the Floodplain Administrator (FEMA EMI class, online STARR classes, etc.)	0	1	1	1	1	0	4	1	Yes
3	Coordinate with FEMA & NFIP programs on updating the Brookline Special Flood Hazard Areas.	0	1	1	1	1	0	**4**	1	Yes
4	Research River Corridor Bylaws when the town is working on updating its Town Plan. Met with State representatives to review River corridor process and options.	0	1	1	1	1	1	**5**	1	Yes
5	Develop hot weather annex to the LEMP.	1	0	0	1	1	0	**3**	1	Yes
6	The Vtrans Resilience Mapping Tool seems to under represent hazardous road segments, structures and culverts in town.	0	0	1	1	0	1	**3**	1	Yes
	Structure and Infrastructure Projects									
	ACTION DESCRIPTION	**Life Safety**	**Prop Protect**	**Tech**	**Political**	**Admin**	**Other Obj**	**Benefit Score**	**Est Cost**	**C/B**
7	Pull together stakeholders to do a walk through and study of the water drainage of the surrounding area. Completed a hydrologic study of the area, which recommended replacing the existing culvert with an approximately 26 foot bridge. Filed pre-application with DPS/ Hazard Mitigation. Met with Hazard Mitigation employee & ANR	0	1	1	1	1	0	**4**	1	Yes
8	Pull together stakeholders to do a walk through and study of the water drainage of the area. A hydraulic study has been requested for 119 Grassy Brook Road.	0	1	1	1	1	0	**4**	1	Yes

9	Plantings or stone fill needed to prevent further erosion.	0	1	0	1	1	0	**3**	1	Yes
10	Install a culvert to assist in diverting water and limiting erosion.	0	1	1	1	1	0	**4**	1	Yes
11	Work with the landowner to keep the culvert clear of accumulated leaves.	0	1	1	1	1	0	**4**	1	Yes
12	Town should maintain an inventory of culverts for planned maintenance and emergency use.	0	1	1	1	1	0	**4**	1	Yes
13	A hydraulic study is needed on Culvert #3 to ensure proper drainage in this area.	1	1	1	1	1	0	**5**	1	Yes
14	Upsize Culvert #8 on Grassy Brook Road	1	1	1	1	1	0	**5**	2	Yes
15	Upsize Culvert #16 on Grassy Brook Road	1	1	1	1	1	0	**5**	2	Yes
16	Replace culvert #17 with a box culvert for increased water flow in that area. Currently on the State structural grant wait list.	1	1	1	1	1	0	**5**	3	Yes
17	Bridge #5 should have an engineering study completed to examine road widening and bridge replacement.	1	1	1	1	1	0	**5**	2	Yes
18	Have engineering completed bridge #11. Hydrolic study completed.	1	1	1	1	1	0	**5**	2	Yes
19	Upsize culvert #34	1	1	1	1	1	0	**5**	2	Yes
20	Upsize Culvert #35	1	1	1	1	1	0	**5**	2	Yes

21	Hydraulic study on culvert #39 needed to determine proper upsize needed.	1	1	1	1	1	0	**5**	1	Yes
22	A hydraulic study is needed on Culvert #57 to determine upgrades needed.	1	1	1	1	1	0	**5**	1	Yes
23	Hydraulic study showed that culvert # 84 needs to be upsized and the angle of the water flow needs to be changed to prevent debris blockage on the inlet side.	1	1	1	1	1	0	**5**	3	Yes
24	Culvert # 30 should be upsized and possibly a parallel culvert should be installed.	1	1	1	1	1	0	**5**	2	Yes
25	Hydraulic study needed on Culvert #6 and surrounding area.	1	1	1	1	1	0	**5**	1	Yes
26	Have an engineering study done for Culvert #11 to replace culvert.	1	1	1	1	1	0	**5**	2	Yes
27	Have an engineering study done for Culvert #14.	1	1	1	1	1	0	**5**	2	Yes
28	An engineering study is needed to stabilize the embankment and widen the road.	1	1	1	1	1	0	**5**	2	Yes
29	Stabilize the soil on the Grassy Brook banks around the outlet of Culvert #17.	1	1	1	1	1	0	**5**	1	Yes
30	Work with Green Mountain Power on Resilience Zone planning.	1	1	1	1	1	0	**5**	1	Yes
31	Acquire and install a generator at the Town Office that can accommodate access to water.	1	0	1	1	1	0	**4**	1	Yes

	Natural Systems Protection and Nature-based Solutions									
	ACTION DESCRIPTION	**Life Safety**	**Prop Protect**	**Tech**	**Political**	**Admin**	**Other Obj**	**Benefit Score**	**Est Cost**	**C/B**
32	Complete stone line ditching - this has been going on for 6 years and will take more years to complete identified road segments - this is an ongoing action. Ditches that have been completed have less washout damage.	1	1	1	1	1	0	**5**	3	Yes
33	Train the road crew on Best Management Practices for slowing the spread of invasive plant material.	0	1	1	1	1	0	**4**	1	Yes
34	Hire an arborist to trim branches/trees along roads.	1	1	1	1	1	0	**5**	1	Yes
35	Identify and remove Ash Trees in the Road Right of Way. Consider whether to plant a replacement plant that is shorter so as to not interfere with power lines.	1	1	1	1	1	0	**5**	2	Yes
	Education and Awareness Programs									
	ACTION DESCRIPTION	**Life Safety**	**Prop Protect**	**Tech**	**Political**	**Admin**	**Other Obj**	**Benefit Score**	**Est Cost**	**C/B**
36	Educational outreach to residents about how they can take measures to control for invasive plants and pests.	0	1	1	1	1	0	**4**	1	Yes
37	Education on safe use of generators.	1	1	1	1	1	0	**5**	1	Yes

38	Update the EM page on the town website to house emergency related educational materials, including a list of items to have in case of emergency.	1	1	1	1	1	0	**5**	1	Yes
39	EMD will work with VEM to understand VTAlert sign-up rate in town and encourage residents to sign up	1	1	1	1	1	0	**5**	1	Yes
40	Support DV Fiber in expanding fiber lines to underserved or not served areas of Brookline	1	0	1	1	1	0	**4**	1	Yes
41	Installation of repeaters in each fire engine; this would increase range of portable radios to that of mobile radio sets.	1	1	1	1	1	0	**5**	3	Yes
42	Determine if there are unhoused individuals in town and provide education about where to access services.	1	1	0	0	0	0	**2**	1	Yes

Incorporating Mitigation into Other Local Planning Mechanisms

As part of the planning process, local planning mechanisms were reviewed for how well they consider and incorporate the mitigation goals of the town. Areas of improvement should be considered when each of these planning tools is updated. The more that tools can align and reflect each other, the more effective the town can be in consideration of hazard mitigation when making choices and decisions. There is no timeframe set for updating the below referenced plans and regulations, however, as each document is updated the hazard mitigation plan will be reviewed for incorporation. The goals of this hazard mitigation plan will be incorporated in the upcoming town plan update to ensure that emergency preparedness and mitigation planning efforts are considered, with particular attention to furthering the projects in the Mitigation Actions Table herein.

Plans and Studies

Capability	Description	Incorporation of Previous Plan	Improvement Opportunity
Town Plan	Plan for coordinated town-wide planning for land	The Town Plan was adopted in March of 2018 before the Hazard Mitigation Plan was	A comprehensive integration of the Local Hazard Mitigation Plan should occur with updates of the Town Plan.

	use, municipal facilities, etc.	adopted. There was not a lot integration at that time.	
Local Hazard Mitigation Plan (LHMP)	Plan that identifies hazards in community and proposes actions to reduce or eliminate risk to people, property, and the natural environment.	The mitigation actions from the previous plan were reviewed and actions considered still relevant were carried forward into this plan.	Plan has a 5-year lifespan. Maintaining an up-to-date plan keeps the town eligible for FEMA mitigation grant funding. Review yearly and reference when updating Town Plan.
Stormwater Plan	Plan that identifies stormwater improvements for municipal roads.	The Town does not have a Stormwater Master Plan. Town received a General Permit to discharge stormwater from municipal roads.	A Stormwater Master Plan is not a high priority for Brookline. The LHMP incorporates several mitigation actions that will improve stormwater runoff.
Local Emergency Management Plan (LEMP)	Municipal procedures for emergency response.	The LHMP influences a lot of the actions in the LEMP and the two plans reference each other.	Updated yearly. The goal is to complete all LEMP appendices.
Invasive Species Management Plan	Plan that provides guidance on effective management of invasive species.	The Town does not have an Invasive Species Management Plan and the LHMP lists mitigation actions the town identifies as needed.	This has not been done and is recommended.
Culvert Inventory	An inventory of the size, material, condition and location of culverts. Updated annually by Public Works Department.	A full town Culvert Inventory was completed in 2019. An inventory of the private culverts in town was completed in 2023. The Culvert inventory is directly tied into the mitigation actions that were outlined in the 2018 plan and influenced the creation of the current plan.	None identified.
School Emergency Response Protocol	School procedures for emergency response	The 2018 LHMP was not integrated into this protocol.	None identified

Administrative Capacity and Capability

Capability	Description	Incorporation of Previous Plan	Improvement Opportunity
Emergency Management Director	Prepares plans and procedures for responding to natural disasters other emergencies and leads response efforts.	The EMD was involved in the 2018 plan and works to implement mitigation activities laid out in the plan.	None identified

Planning Commission	Municipal body responsible for planning for the community, including maintaining the town plan, zoning bylaws, and subdivision regulations.	The Planning Commission was involved in the 2018 plan and worked to implement mitigation activities that they were the lead on.	None identified.
Development Review Board	Municipal body responsible for evaluating and deciding on proposed development.	The town does not have a Development Review Board.	None identified.
Zoning Administrator	Administrative officer responsible for administering zoning bylaws.	Brookline does not have a Zoning Administrator.	A hazard mitigation action is to examine adopting River Corridor Bylaws.
Tree Warden	Responsible for trees on public property, including town properties, schools, and within public right-of-way.		Recommendation to have the Tree Warden identify any Ash Trees on municipal properties and create a management plan for them.
Selectboard	Legislative body of the town for all purposes required by the state.	The Selectboard was involved in the 2018 plan and worked to implement mitigation activities that they were the lead on.	None identified.
Mutual Aid Agreements – Emergency Services	Agreement for regional coordinated emergency services.	SWNH Dispatch for fire and rescue dispatch – written agreement/contract; State police act as a backup service	None identified.
Mutual Aid Agreements – Public Works	Agreement for regional coordinated emergency highway maintenance services.	The 2018 LHMP was not integrated into any agreements.	Recommendation to formalize agreements with adjacent towns.
VEM Training	Training provided by state to ensure emergency responders are adequately prepared to respond to emergency incidents.	The 2018 LHMP was not integrated into any trainings.	Recommendation to have emergency responders at NewBrook Fire attend a Vermont Emergency Management training if they have not completed one in awhile.

Highway Department	Municipal department responsible for overseeing all aspects of municipal road network, including maintenance and construction.	The Highway Department was involved in the 2018 plan and worked to implement mitigation activities that they were the lead on.	None identified
Town Clerk & Treasurer	Responsible for receiving and recording town archives, recording deeds, filing vital statistics information, running treasury.		None identified

Financial Resources

Capability	Description	Incorporation of Previous Plan	Improvement Opportunity
Town Budget	Annual municipal operating budget, approved at Town Meeting	The Town added budget items into the Town Budget based on actions the Town was working on from the 2018 plan.	Consider creating a special line-item for a structures fund to be used to improve structures damaged in hazardous events.
Taxing Authority	Ability to assess and collect property taxes.	The 2018 LHMP was not integrated into tax decisions.	None identified

Zoning and Regulations

Capability	Description	Incorporation of Previous Plan	Improvement Opportunity
National Flood Insurance Program (NFIP)	Provides ability for residents to acquire flood insurance.	The 2018 LHMP did not influence the NFIP membership of the Town.	None identified. Member in good standing.
SFHA bylaws	Regulates development in FEMA identified SFHAs.	The 2018 LHMP was not integrated into SFHA bylaws.	Adopted 2005. Consider including River Corridor regulations in next update.
Zoning	Regulates the development and division of land, standards for site access and utilities	Brookline does not have zoning and therefore the 2018 LHMP was not integrated.	Brookline does not have zoning.
Building codes	Codes for fire and building safety are in place for multifamily structures and are regulated by the Division of Fire Safety. There are also Statewide	The 2018 did not integrate in with Town building codes as the Town does not have additional requirements from the State.	None identified.

	Standards for Energy Efficiency and Electrical Safety for buildings.		
Road Standards	Design and construction standards for roads and drainage systems.	The 2018 LHMP was not integrated into road standards.	None identified. State road and bridge standards adopted.
Wetland Protections	Protection of environment, water resources, wildlife, biota. Protected by 1990 Vermont Wetland Rules	The 2018 LHMP was not integrated into wetland protections	None identified.
River Corridor bylaws	Regulates development in River Corridors as identified by Vermont ANR.	The 2018 plan influenced the town's decision to add exploring adoption of River Corridor Bylaws as an action in the current LHMP	Consider adopting River Corridor bylaws
Sewage Regulations	Regulates on-site sewage systems.	The 2018 LHMP was not integrated into any local sewage regulations.	None identified. Governed by state sewage regulations.

Outreach and Education

Capability	Description	Incorporation of Previous Plan	Improvement Opportunity
Town Website	Municipal website providing relevant information to residents and businesses about public meetings, resources, etc.	The 2018 plan did not integrate with the Town Website except for posting announcements of public engagement, plan adoption, and hosting the adopted plan.	Create an emergency page for residents providing contact information and emergency shelter information.

PLAN MAINTENANCE PROCESS

Yearly Review and Plan Monitoring

Once the plan is approved and adopted, the Emergency Management Director, along with interested and appointed volunteers and stakeholders, will work with the Windham Regional Commission (WRC) or a private consultant to monitor, evaluate, and update the plan throughout the next 5-year cycle. The plan will be reviewed annually after Town Meeting Day at a Selectboard meeting in conjunction with the review of the town's Local Emergency Management Plan (LEMP). This meeting will allow town officials and the public to discuss the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects. In addition to tracking progress in implementing the plan, the EMD will lead town officials in evaluating the effectiveness of the plan in meeting plan goals and reducing vulnerability. WRC will assist with this review if requested by the Town. The plan evaluation will address:

- Progress in implementation of plan actions and goals.

- Discuss the effect of completed mitigation actions and their impact on vulnerability.
- Evaluation of unanticipated challenges or opportunities and their effect on capabilities of the town.
- Evaluation of hazard-related public policies, initiatives and projects.
- How mitigation strategy has been incorporated into other planning mechanisms
- The effectiveness of public and private sector coordination and cooperation.

Progress on actions will be kept track using a "mitigation action tracking table" or another monitoring tool of the Town's choice. There will be no changes to the plan unless deemed necessary by the Town, and if so, the post disaster review procedure will be followed.

Five-Year Update Process

Hazard mitigation planning is dynamic with changes in land use, changes caused by events, and the effects of climate change. To ensure that the Town maintains a current and relevant LHMP, it is important that it undergo a major update periodically as required in 44 CFR § 201.6(c)(4)(i). This update process will be thorough and occur at least every five years, and will include an evaluation, incorporate any new requirements that FEMA has set, and account for changes in the Town. To ensure funding for this comprehensive update, the Town should be applying for FEMA funding at the 2½ year point. Awarded grants can be put out to bid using the Town's procurement rules and a Consultant hired to assist with the following procedure[22]:

1. The Emergency Management Director (EMD) will gather a team to serve as the Planning Team. Members may include: Selectboard members, Fire Chief and fire personnel, Zoning/Floodplain Administrator, Constable or Police Chief, Road Commissioner/Foreman, Planning Commission members, Town Health Officer, prominent business owners, longtime residents, impacted residents, and any interested stakeholders, etc.

2. The Consultant will guide the Team through the evaluation and update processes. These processes will include advertised public meetings. The update will address:
   - Incorporating hazard events that have occurred since the last plan update.
   - Changes in community and government processes which impact hazard response.
   - Community growth and development trends and their impact on vulnerability.
   - Incorporation of new mitigation actions and goals.
   - Impacts of climate change on the locality.

3. From the information gathered, along with data collected, the Consultant will prepare the updated draft in conformance with the latest *Local Mitigation Plan Review Tool* and *Local Mitigation Planning Policy Guide* developed by FEMA.

4. The Town will have a chance for an internal review of the draft Plan update and changes will be incorporated. Emphasis in plan updates will be put on critically looking at how the plan can become more effective at achieving actions and meeting goals.

5. The draft Plan will then be made available for public comment and advertised locally. The draft Plan will simultaneously be distributed for review and comment to adjacent towns and entities serving vulnerable populations within the town or regionally. Comments will be addressed and a final draft will be developed.

6. The final draft Plan will be provided to Vermont Emergency Management (VEM) for their review. Any received comments that need addressed for Plan compliance will be addressed and revised draft submitted back to VEM.

[22] Towns can also choose to use funding in-house to develop their LHMP without outside assistance.

7. Once VEM designates the Plan 'approved pending adoption' the Consultant will inform the Town that the Plan is ready for adoption. The adopted Plan will be submitted to VEM and FEMA. FEMA will issue notice of 'final approval' and set the date that an updated LHMP needs to be complete in order to maintain having a compliant plan in place.

Post-Disaster Review/Update Procedure

Should a significant disaster event occur, a special review by the town's Planning Team should occur in regards to the LHMP within 6-months of the event. This review will serve to document the facts of the event and assess whether completed mitigation actions effectively lessened town damages. Newly needed mitigation projects will be discussed and placed on the town's mitigation action tracking sheet to ensure they are considered for the next plan update and/or pursued prior. An 'After-Action Report' will be distributed to the Team to the Selectboard for their awareness. The Report should note whether the Plan needs to be amended. If the Team determines that modification of the plan is needed, then the Team drafts an amended Plan based on the recommendations. VEM can be consulted for guidance during this process. The amended plan will need to be re-reviewed and adopted as in the Plan update process discussed above.

Ongoing Public Participation

Maintenance of this Plan and support on the implementation of the stated mitigation actions is a smooth process when there is continued participation of community members. To keep the public engaged in hazard mitigation efforts, the Town proposes to do the following:

- Provide engaging hazard mitigation information at Town Meeting, including education about individual and family resiliency measures.
- Yearly review and tracking of progress on mitigation actions using a tracking tool. This should be done at a Planning Commission or Selectboard public meeting and with the participation of Team members that helped in Plan development.
- Post the Plan on the town website for public access and share pertinent hazard related information on the Town website, Town sponsored social media, and at local public notice locations.

This Plan is a tool to promote hazard mitigation discussions with the goal of leading to actions that increase resiliency and lessen or eliminate hazard impacts.

APPENDIX

1. Mitigation Action Tracker
2. Update on Mitigation Actions identified in the prior Hazard Mitigation Plan
3. October 28, 2023 Meeting flyer and agenda
4. November 8, 2023 Public Meeting Announcement to Brookline's Email List-serve
5. Initial input request for adjacent towns and frontline organizations to provide ideas or join Brookline in the update to their plan.
6. Email sent to adjacent towns for comment on the draft plan
7. Email sent to frontline organizations for comment on the draft plan
8. Flyer advertising availability of Draft Hazard Mitigation Plan for public comment

1. Mitigation Action Tracker

Town of Brookline Local Hazard Mitigation Action Tracker

Mitigation Action Tracker Date Updated _____

Mitigation Action Tracker						
	Action	Timeframe for Completion			Current Status	
		Responsible Party	Timeframe for Completion	Funding Source	Date Began	Current Status
1	Digitizing the town records (covering 50 years) is a goal of the town to ensure their perpetuity. Some manually digitization has occurred.	**Town Clerk** & Assistant Town Clerk	Ongoing with a goal for full completion by 2032	Town Operational Budget		
2	Establish a Floodplain Administrator and obtaining training through FEMA/EMI class, online). Seeking to share and/or locate trained individual.	**Floodplain Administra-tor** and establish a Review Committee	Ongoing with an end goal of June 2025	Town Operational Budget		
3	Coordinate with FEMA & NFIP programs on updating the Brookline Special Flood Hazard Areas.	**Select-board** with WRC Support	Ongoing with an end date of December 2025	Funding not needed beyond volunteer time		
4	Research River Corridor Bylaws when the town is working on updating its Town Plan. Met with State representatives to review River corridor process and options.	**Select-board** and Planning Committee	Ongoing with an end of December 2026	WRC support		
5	Develop hot weather annex to the LEMP.	**EMD**	January 2025 - December 2025	Town Operational Budget / WRC support		
6	Coordinate with Vtrans on reviewing the vulnerability of roads, structures and culverts in town to reflect	**Select-board** with the assistance of WRC	January 2025 – December 2025	No funding needed besides volunteer time		

	town experiences.					
Structure and Infrastructure Projects						
	ACTION DESCRIPTION / CURRENT STATUS	**RESPON-SIBLE ENTITIES (Lead party in bold)**	**TIME-FRAME**	**POTENTIAL FUNDING**	**Date Began**	**Current Status**
7	Pull together stakeholders to do a walk through and study of the water drainage of the surrounding area. Filed pre-application with DPS/ Hazard Mitigation. Met with Hazard Mitigation employee & ANR	**Select-board** & Future Floodplain Administrator	On-going through the end of 2025	FEMA HMGP or VT DEC Clean Water Funding and possibly town funds		
8	Pull together stakeholders to do a walk through and study of the water drainage of the area. A hydraulic study has been requested for 119 Grassy Brook Road.	**Select-board**	Ongoing through the end of 2025	FEMA HMGP or VT DEC Clean Water Funding		
9	Plantings or stone fill needed to prevent further erosion.	**Select-board**	May 2025 through December 2025	Trees for Streams: WCNRCD		
10	Install a culvert to assist in diverting water and limiting erosion.	**Road Foreman**	May 2025 through December 2025	Town Highway Budget		
11	Work with the landowner to keep the culvert clear of accumulated leaves.	**Private Land-owner**	Started January 2024 with on-going regular maintenance by land-owner	Volunteer landowner assistance.		
12	Town should maintain an inventory of culverts for planned maintenance and emergency use.	**Road Foreman** working with Select-board	Started in 2024 and completed by December 2024	Town Highway Budget for Staff Time		
13	A hydraulic study is needed on Culvert #3 to ensure proper drainage in this area.	**Road Foreman** working with Select-board	2024 through 2027	FEMA HMPG		
14	Upsize Culvert #8 on Grassy Brook Road	**Road Foreman** working with	2024 through 2027	FEMA HMPG		

		Select-board				
15	Upsize Culvert #16 on Grassy Brook Road	**Road Foreman** working with Select-board	2024 through 2027	FEMA HMPG		
16	Replace culvert #17 with a box culvert for increased water flow in that area. Currently on the State structural grant wait list.	**Road Foreman** working with Select-board	Started in 2014. End in 2029 (as soon as it is accepted off of the wait list.)	Vermont Structures Grant, FEMA HMPG		
17	Bridge #5 should have an engineering study completed to examine road widening and bridge replacement.	**Road Foreman** working with Select-board	2024 through 2028	Vermont Structures Grant, FEMA HMPG , VT DEC Enhancement Grant		
18	Have engineering completed bridge #11. Hydrolic study completed.	**Road Foreman** working with Select-board	2024 through 2027	FEMA HMPG, VT DEC Enhancement Grant		
19	Upsize culvert #34	**Road Foreman** working with Select-board	2024 through 2029	FEMA HMPG, VT Structures Grant		
20	Upsize Culvert #35	**Road Foreman** working with Select-board	2024 through 2027	FEMA HMPG		
21	Hydraulic study on culvert #39 needed to determine proper upsize needed.	**Road Foreman** working with Select-board	2024 through 2026	FEMA HMPG		
22	A hydraulic study is needed on Culvert #57 to determine upgrades needed.	**Road Foreman** working with Select-board	2024 through 2026	FEMA HMPG		
23	Hydraulic study showed that culvert # 84 needs to be upsized and the angle of the water flow needs to be changed to prevent debris blockage on the inlet side.	**Road Foreman** working with Select-board	2024 through 2029	FEMA HMPG		
24	Culvert # 30 should be upsized and possibly a parallel culvert should be installed.	**Road Foreman** working with Select-board	2024 through 2027	FEMA HMPG, Town Highway Budget		

25	Hydraulic study needed on Culvert #6 and surrounding area.	**Road Foreman** working with Select-board	2024 through 2027	FEMA HMPG		
26	Have an engineering study done for Culvert #11 to replace culvert.	**Road Foreman** working with Select-board	2024 through 2025	FEMA HMPG		
27	Have an engineering study done for Culvert #14.	**Road Foreman** working with Select-board	2024 through 2025	FEMA HMPG		
28	An engineering study is needed to stabilize the embankment and widen the road.	**Road Foreman** working with Select-board	2024 through 2027	FEMA HMPG		
29	Stabilize the soil on the Grassy Brook banks around the outlet of Culvert #17.	**Road Foreman** working with Select-board	2024 through 2025	FEMA HMPG , Town Highway Budget		
30	Work with Green Mountain Power on Resilience Zone planning.	**Energy Committee**	On Green Mountain Powers Timeline, but Within the 5-year planning cycle	Green Mountain Power		
31	Acquire and install a generator at the Town Office that can accommodate access to water pump.	**Select-board**	January through December 2025	Town Operational Budget		
Natural Systems Protection and Nature-based Solutions						
	ACTION DESCRIPTION / CURRENT STATUS	**RESPON-SIBLE ENTITIES (Lead party in bold)**	**TIME-FRAME**	**POTENTIAL FUNDING**	**Date Began**	**Current Status**
32	Complete stone line ditching - this has been going on for 6 years and will take more years to complete identified road segments - this is an ongoing action. Ditches that have been completed have less washout damage.	**Road Foreman**	Ongoing process that will be completed when all hydrologically connected road segments are complete. A few completed every year	Grants in Aid and Town Highway Budget		
33	Train the road crew on Best Management Practices for	**Road Foreman** with support from VT	January through December 2025	Trainings are free from Vtrans and VT State		

	slowing the spread of invasive plant material.	Department of Forest Parks and Rec		Forest Parks and Rec Department. Town Highway Budget for Staff time		
34	Hire an arborist to trim branches/trees along roads. Some being cut in 2024.	**Select-Board**	Started in 2024 and as neededwithin the 5-year planning cycle	Town Operational Budget		
35	Identify and remove Ash Trees in the Road Right of Way. Consider whether to plant a replacement plant that is shorter so as to not interfere with power lines.	**Road Foreman**	Started in 2024 and on-going as needed through the end of the 5-year planning cycle	Town Highway Budget		
Education and Awareness Programs						
	ACTION DESCRIPTION / CURRENT STATUS	**RESPON-SIBLE ENTITIES (Lead party in bold)**	**TIME-FRAME**	**POTENTIAL FUNDING**	**Date Began**	**Current Status**
36	Educational outreach to residents about how they can take measures to control for invasive plants and pests.	**Select-Board**	Begin in 2025 and continue through 2029	Town Operational Budget		
37	Education on safe use of generators.	**EMD** and Fire Chief	January through December 2025	Town Operational Budget		
38	Update the EM page on the town website to house emergency related educational materials, including a list of items to have in case of emergency.	**EMD** and Town Website Administra-tor	January through December 2026	Town Operational Budget		
39	EMD will work with VEM to understand VTAlert sign-up rate in town and encourage residents to sign up	**EMD**	Begin in 2024 through December 2025	Town Operational Budget		

40	Support DV Fiber in expanding fiber lines to underserved or not served areas of Brookline	**DVFiber Reps from Brookline** and DVFiber Board	Begin in 2024 and as needed through the 5-year planning cycle	ARPA funding		
41	Installation of repeaters in each fire engine and at Brookline Town Garage; this would increase range of portable radios to that of mobile radio sets ad respond to necessary highway issues.	**Fire Chief** and Select-board	Currently in the 10-year plan; by 2034	Fire Department funding and Town Operational Budget		
42	Unhoused populations are at significant risk during hazardous events. Determine if there are unhoused individuals in town and provide education about where to access services, especially during hail, high winds, extreme cold and heat.	**Selectboard**	April 2026 – October 2026	Volunteers and reaching out to social service agencies that service town		

2. Update on Mitigation Actions identified in the prior Hazard Mitigation Plan

Below is an update on mitigation actions listed in the 2017 Brookline Local Hazard Mitigation Plan. The planning participants reviewed these actions and provided an update to WRC at the outset of the Plan update process. Current status is listed here in the last column, and prioritization changes are called out where applicable. Changes in priorities are reflected throughout the Plan and in the prioritization of new actions identified.

	All Hazards			
1	Make the Baptist Church/ Brookline Meeting House into an emergency shelter	Selectboard / Brookline Meeting House Committee	High	Not completed, but due to challenges of the building, do not carry over to the next plan.
2	Acquire and install generators at town office and the newly established emergency shelter; Establish the town office as the EOC	Selectboard / EMD	High	Completed, except for Town Hall doesn't have a generator strong enough to power the water pump. Carry that over to the next plan.
3	Adopt VTAlert	Selectboard	High	Continue to provide education to the public.
4	Install a cell phone booster in the town church tower	Selectboard	High	Action updated and a Wi-Fi Hotspot is now available outside of the Town Office.
	Fluvial Erosion			
5	Update the Floodplain ordinance to include River Corridors	Floodplain Administrator / WRC	High	Not complete. Need to work with FEMA to update maps in the Ellen Ware Road, parts of Hill Road and Harris Road areas.
6	Grassy Brook Road improvements/ledge blast out on stretch in northern part of town	Road Crew and Contractor	High	Complete
7	Alter Grassy Brook Road between Hill Road and Harris Hill Road along the West River.	Road Crew and Contractors; VTrans	Medium	Not complete. Need to carry over to new plan.
	Beaver Dam Failure			
8	Upgrade Bridge number B5 on Grassy Brook Road. What's existing is a rusted out culvert. The Road Foreman is monitoring it.	Road Foreman	Medium	Complete
	Flooding/ Fluvial Erosion/ Beaver Dam Failure			
9	Upgrade culvert 23	Road Foreman and Contractor	High	Complete
10	Upgrade culvert 18. Concrete repairs should increase the lifespan by five years.	Road Foreman and Contractor	Medium	Complete
11	Upgrade culvert 21	Road Foreman and Contractor	High	Complete
12	Upgrade culvert 57 on Grassy Brook Road (on the dirt section on the north end of town)	Road Foreman and Contractor	Low	Complete
	Invasive Species			

13	Educational outreach to residents about how they can take measures to control for invasive species	Town / UVM Extension / Vermont Invasives	High	Have provided some education but it is on-going. Add to the next plan.
14	Develop a mowing schedule for town owned land to prevent the spread of invasive species. The ultimate goal is to get mowing equipment themselves so that they can control timing better to avoid seed spread.	Town / Contractor	High	Complete

Additionally, the Town requested hydrolic studies for the following locations following the July 2023 storm. These areas are on the FEMA list of repairs to complete in the town of Brookline.

1	At the Athens/Brookline Town Line on Grassy Brook Road at stone culvert #84
2	Last culvert at the Townshend/Brookline Town Line on Ellen Ware Road - 6 foot diameter culvert #14
3	Large culvert under Grassy Brook Road near Parker Road Intersectrion Culvert #35 – Enlarge to a 7 or 10 foot squash culvert
4	Culvert area at the base of Joe Slaters driveway under Grassy Brook Road at Culvert #48
5	Culvert under Grassy Brook Road near AS Clark Property Access
6	Near Kirsch Road intersection/ Stone Arch bridge area known as bridge #11 Stone Arch

3. October 28 Meeting flyer and agenda

Update of the Brookline Hazard Mitigation Plan

Public Meeting Announcement

Date: Saturday, October 28, 2023

Time: 10:00 – 11:30 AM

Location: Brookline Town Office
736 Grassy Brook Rd, Brookline, VT 05345

Come help create Brookline's Local Hazard Mitigation Plan! What hazards does the town face? What actions can the town take to lower vulnerability before the next natural hazard strikes?

For more information contact:
Margo Ghia at 802-257-4547 x116 or mghia@windhamregional.org

WINDHAM REGIONAL COMMISSION

Brookline Vt - Selectboard is inviting you to a scheduled Zoom meeting.

Topic: Brookline Hazard Mitigation Meeting Part 1
Time: Oct 28, 2023 10:00 PM Eastern Time (US and Canada)

Join Zoom Meeting
https://us02web.zoom.us/j/84988636582?pwd=Mlp1ekJ6QXdZVVpJajFXWngxRFF3Zz09

Meeting ID: 849 8863 6582
Passcode: 217192
Find your local number: https://us02web.zoom.us/u/ketENYubGK

Hazard Mitigation Discussion Session Part 1

10:00	1.	Call the meeting to order
10:01	2.	Changes to the agenda
10:05	3.	Introduction
	A.	Margo Ghia - Windham Regional Commission
	B.	Attending members of the Selectboard
	C.	Attending members of the Community
10:10	4.	Hazard Mitigation Discussion led by Margo Ghia
11:20	5.	Set Agenda for the next meeting on Wednesday November 8, 2023 at 6:30 PM to 8:00 PM at the Town Hall and Via Zoom
11:30	6.	Adjourn the meeting.

4. November 8, 2023 Public Meeting Email List-serve Invite

DM

Dorothy Maggio <dmaggio.brooklinevt@gmail.com> | Julie Lavorgna; Margo Ghia; Town of Brookline, VT; Stan Noga Jr.; Mello, Bruce; Paul Madalinski; + 2 | 11/6/2023

Please send via list serve! Dot

You replied to this message on 11/7/2023 7:42 AM.

Attention Brooklinerѕ!
The second phase meeting for the Brookline Hazard Mitigation Committee will be meeting in person at Town Hall at 6:30 this Wednesday. If you can not attend in person, please consider joining us via Zoom by using the link below. The last meeting was about an hour long during which we completed a risk assessment survey on Types of Hazards, Fluvial Erosion, Beaver Dams, Invasive Species and weather condition predictions. We are looking to clearly identify repetitive loss areas, vulnerable assets in town, development trends, mitigation goals, ongoing efforts and actions. Please consider joining us on Wednesday evening. Your selectboard, with the help of the Windham Regional Commission, wants to be better prepared for future events that may disrupt how we normally live day to day in our little town of Brookline. Please join in on this project as well as any of our other ongoing projects and committees in progress such as the Energy Committee and the Municipal Technical Access Plan (MTAP) committee. Securing grants to protect the infrastructure, ecology and safety here in Brookline takes planning and discussion. This is everyone's opportunity to share information. The expired Hazard Mitigation Plan can be found on the town's website.
https://www.brooklinevt.com/documents/brookline-hazard-mitigation-plan-adopted-01-30-2017

Brookline Vt - Selectboard is inviting you to a scheduled Zoom meeting.

Topic: Brookline Hazard Mitigation Meeting Part 2
Time: Nov 8, 2023 06:30 PM Eastern Time (US and Canada)

Join Zoom Meeting
https://us02web.zoom.us/j/83368726633?pwd=SUJpdnlVVVV1NDNrMU4rK0grbFkrQT09

Meeting ID: 833 6872 6633
Passcode: 796239

Find your local number: https://us02web.zoom.us/u/kd5uXSkIx

Hazard Mitigation Discussion Session Part 2

6:30 1. Call the meeting to order

6:31 2. Changes to the agenda

6:35 3. Introduction
- **A. Margo Ghia - Windham Regional Commission**
- **B. Attending members of the Selectboard**
- **C. Attending members of the Community**

6:40 4. Hazard Mitigation Discussion led by Margo Ghia

5. Initial input request for adjacent towns and frontline organizations to provide ideas or join Brookline in the update to their plan.

Reply Reply All Forward

MG

Margo Ghia <mghia@windhamregional.org> 'manager@putneyvt.org'; 'manager@westminster.org'; 'newfanegarage@newfanevt.org'; 'slakejr@townshendvt.gov'; + 5 1 10/26/2023

Invitation to Participate in Brookline's Hazard Mitigation Planning

Hazard Mit. Meet Oct 28 agendapart 1.pdf
59 KB

Hello

Windham Regional Commission has begun working with the Town of Brookline on updating their Local Hazard Mitigation Plan (LHMP). I am reaching out to you because you are an Emergency Management Director or Town Manager of a neighboring community. As the Town of Brookline works on updating their plan to mitigate for natural hazards before they happen, we would appreciate any ideas or feedback that you might have on this topic as it relates to Brookline.

There are two ways to be a part of the process:

1) Attend the Public Meeting scheduled for Saturday, October 28 at 10:00am or the follow up meeting on Wednesday, November 8 at 6:30pm. Please see the attached agenda for the first meeting.
2) Provide some ideas or thoughts on natural hazards or mitigation actions that Brookline should consider as they update their plan. You can email your ideas to Windham Regional Commission Planner Margo Ghia, who is guiding the Town through the plan update. Her email is: mghia@windhamregional.org

I know most of you are fairly familiar with Local Hazard Mitigation Plans, but for anyone who is new to them here is a quick overview of what a LHMP is.

Brookline's Hazard Mitigation Plan (LHMP or Plan) identifies natural hazards that affect the Town of Brookline, assesses risk and vulnerability to these hazards, and identifies top priority mitigation actions at the Town level to remove vulnerability and create a more resilient community. The Plan must be updated and submitted to Vermont Emergency Management (VEM) and to the Federal Emergency Management Agency (FEMA) for approval every five years. Updating the Plan is required in order for Brookline to remain eligible to receive FEMA funding following disasters.

Thank you and please reach out to me if you have any questions or comments on the plan.

Margo Ghia

Margo Ghia, Energy & Natural Resources Planner
Windham Regional Commission
139 Main St., Suite 505
Brattleboro, VT 05301
mghia@windhamregional.org
802.257.4547 ext. 116

Reply Reply All Forward

MG

Margo Ghia <mghia@windhamregional.org> 'newfanegarage (newfanegarage@newfanevt.com)' 1 9:43 AM

Brookline Local Hazard Mitigation Plan for Review and Comment

Brookline Haz Mit Plan Draft 8_9_24.pdf
4 MB

Hello Towns Adjacent to Brookline,

Attached please find a draft of the updated Brookline Local Hazard Mitigation Plan. The Town of Brookline has recently worked on updating their plan with the assistance of Windham Regional Commission. It is now being sent to you as an opportunity for review and comment per FEMA requirements. Please share this draft with your town Planning Commission and Selectboard. Please provide any comments back to the Windham Regional Commission by August 23, 2024. Please use the contact information in my signature.

I would appreciate you letting me know that you have reviewed the draft, even if you do not have any comments. I appreciate your time and assistance in this matter. If you have any questions, please let me know.

Thank you,

Margo Ghia, Energy & Natural Resources Planner
Windham Regional Commission
139 Main St., Suite 505
Brattleboro, VT 05301
mghia@windhamregional.org
802.257.4547 ext. 116

6. Email sent to adjacent towns for comment on the draft plan

7. Email sent to frontline organizations for comment on the draft plan

Send

To... 'stabachnick@windhamcentral.org'; 'sunnylanedaycare@yahoo.com'; 'ganylavorgna@gmail.com'; 'info@greacecottage.org'; 'jlillson@windhamcentralboard.org'; 'information@seniorsolutionsvt.org'; 'info@moovet.com'; 'info@brattleborohospice.org'; 'seva@seva.org'; 'Caduto, Marie'

Cc... Dorothy Maggio

Subject Brookline Local Hazard Mitigation Plan - Opportunity for Comment

Greetings,

Windham Regional Commission has been working with the Town of Brookline on updating their Local Hazard Mitigation Plan (LHMP). I am reaching out to you and your organization because you provide essential services (or community lifelines) for the Town of Brookline, VT. The Town has created a Draft LHMP and it is now available for public review. Because of your organization's service for Brookline, we would appreciate any comments or questions you might have about the Draft Plan.

The public comment period for this Draft Plan is open until August 2: Brookline in
A copy of the Brookline draft LHMP is attached.

Since Local Hazard Mitigation Plans (LHMP's) are likely new to most of you, here is a quick overview of what a LHMP is.

Brookline's Hazard Mitigation Plan (LHMP or Plan) identifies natural hazards that affect the Town of Brookline, assesses risk and vulnerability to these hazards, and identifies top priority mitigation actions at the Town level to remove vulnerability and create a more resilient community. The Plan must be updated and submitted to Vermont Emergency Management (VEM) and to the Federal Emergency Management Agency (FEMA) for approval every five years. Updating the Plan is required in order for Brookline to remain eligible to receive FEMA funding following disasters.

Thank you and please reach out to me if you have any questions or comments on the Plan.

Margo Ghia, Energy & Natural Resources Planner
Windham Regional Commission
139 Main St., Suite 505
Brattleboro, VT 05301
mghia@windhamregional.org
802.257.4547 ext. 116

8. Flyer advertising availability of Draft Hazard Mitigation Plan for public comment

Brookline Local Hazard Mitigation Plan

PUBLIC COMMENT PERIOD

The draft Brookline Local Hazard Mitigation Plan is now available for public review on the town website: https://brooklinevt.com/
Hard copies can be made available at the Town Office.

The Plan is open for comment until

August 23, 2024.

Anyone who would like to comment on the plan should contact Margo Ghia at the Windham Regional Commission. She can be reached via phone at 802-257-4547 x116 or email at mghia@windhamregional.org.
We encourage your review and participation!