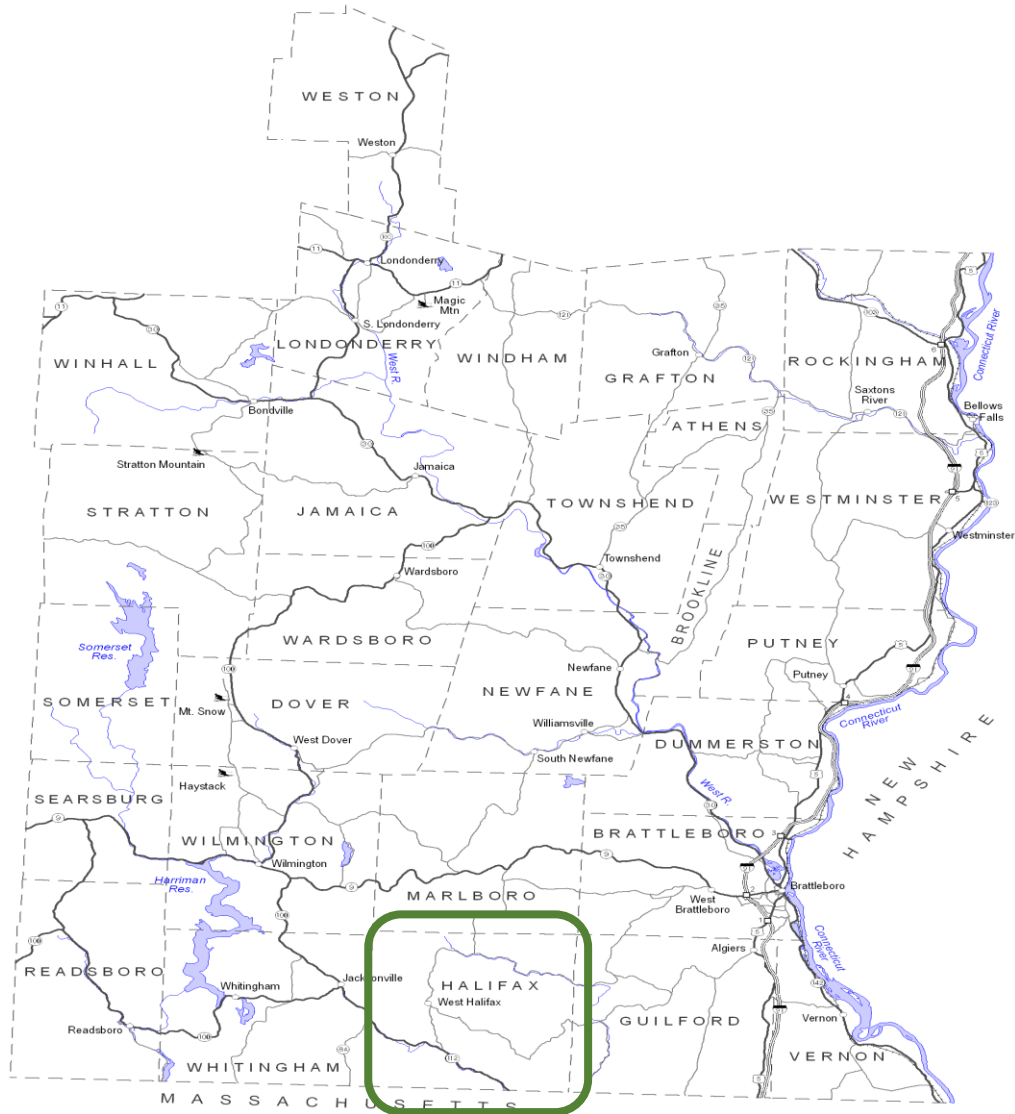


Town of Halifax Local Hazard Mitigation Plan



Adopted TBD
FEMA Final Approved TBD

Prepared for the Town of Halifax
By the
Windham Regional Commission



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INTRODUCTION AND PURPOSE

This Single Jurisdiction Hazard Mitigation Plan is NEW, and has never been approved by FEMA or adopted by the Town of Halifax.

The purpose of this plan is to assist the Town of Halifax in identifying all of the hazards facing the town and to identify new and continuing strategies to reduce risks from identified hazards.

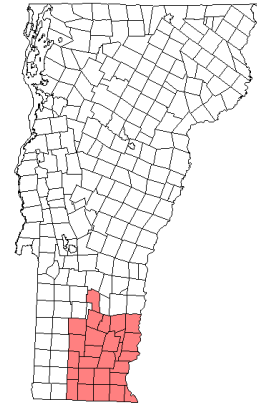
Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and state agencies have come to recognize that it is less expensive to prevent 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 of the other phases of Emergency Management – preparedness, response and recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe and identify what local actions can be taken to reduce the severity of hazard-related damage.

Hazard mitigation strategies and measures alter the hazard by: eliminating or reducing the frequency of occurrence; averting the hazard by redirecting the impact by means of a structure or land treatment; adapting to the hazard by modifying structures or standards; or avoiding the hazard by stopping or limiting development. Mitigation could include projects such as:

- Flood-proofing structures
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying and modifying high traffic incident locations and routes
- Ensuring adequate water supply
- Elevating structures or utilities above flood levels
- Identifying and upgrading undersized culverts
- Planning for land use for floodplains and other flood-prone areas
- Proper road maintenance and construction
- Ensuring critical facilities are safely located
- Establishing and enforcing appropriate building codes
- Providing hazard mitigation information

WINDHAM REGION GEOGRAPHY

Situated in Vermont's southeastern corner, the Windham Region consists of 23 towns in Windham County, the three 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.

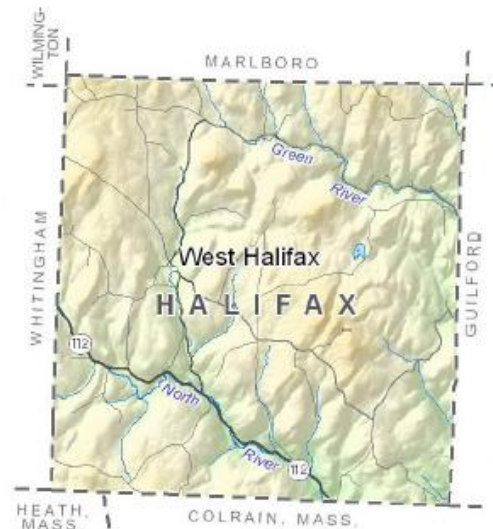


The Region's topography is relatively flat or gently rolling land in the Connecticut River valley in the east, while the western part of the region is characterized by the Green Mountain ridges and peaks with narrow stream valleys. Stratton Mountain is the highest point in the region at 3,936 feet. The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

HALIFAX GEOGRAPHY & TOWN PROFILE

Halifax lies in the foothills of the Green Mountains and is the second-oldest chartered town in Vermont. It consists of mostly northern hardwood forested lands with a few dispersed agricultural areas. The Green River and North River form two distinct valleys in town. The Green River flows southeast through the northern part of town and the East Branch of the North River drains most of the southern part of Halifax. The North River flows through a deep scenic gorge. In Halifax, the most important tributary to the North River is Branch Brook, which rises just north of town and flows south through West Halifax connecting to the North River south of the village. Both the Green River and North River ultimately flow into the Connecticut River via the Deerfield River.



The walls of these river valleys are rather rugged, but they give way to a moderate, rolling landscape once settled by farm families. Many of these former farms are now overgrown with second and third growth forest. They were once connected by a network

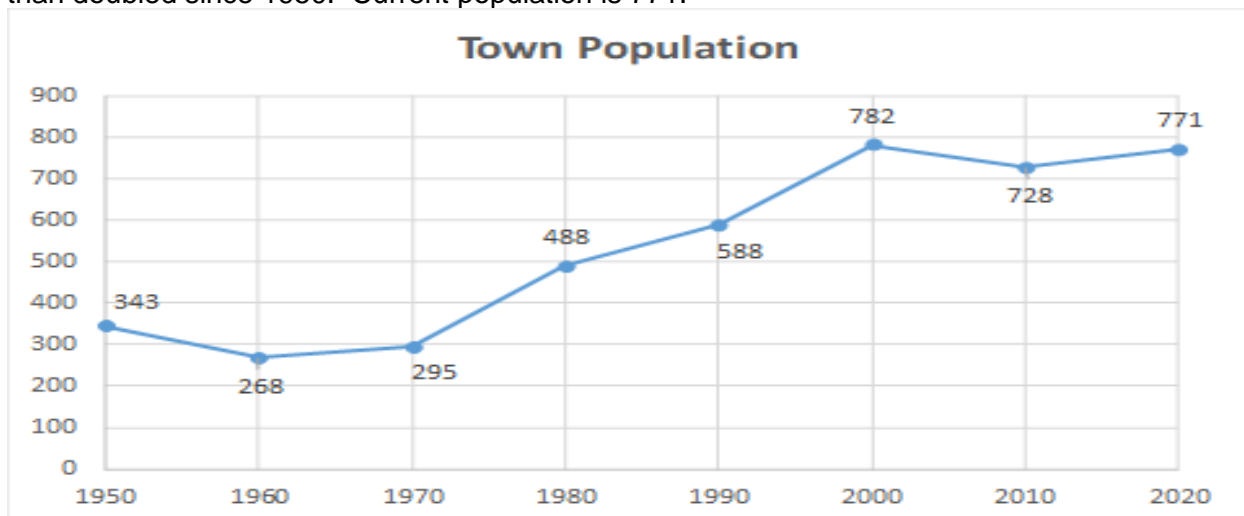
of roads, many of which were abandoned when automobiles replaced horses as a means of transportation. Halifax currently has approximately 71 miles of roadway, 18 miles of which are paved including approximately 5.8 miles of State Highway 112 and 52 miles are unpaved with the remainder being class 4 town roads and town trails. Jolly Mountain (elevation 2,038 ft.) is the highest peak in Halifax and is located in the central part of town. Several other hills, nearly as high, are scattered throughout the town including Ballou Mountain (elevation 1,997 ft.) which slopes rather steeply toward the Green River on the north. Halifax is a quite mountainous town with most roads either on slope sides, along waterways, or bounded by both. Though it's fairly close to other larger towns, driving into Halifax can give the outsider the sense of leaving much behind and venturing into a place set apart and secluded from the outside world. This is due in part because of the terrain and low population density.

Halifax is bounded to the north by Marlboro and Brattleboro, to the east by Guilford, to the west by Whitingham and Wilmington, and to the south by Heath and Colrain in Massachusetts. Municipal services are concentrated in the small village of West Halifax. The village holds the town office, elementary school, community hall, historical society, fire station, post office and a short distance away, the town garage.

This rural town has a very community-minded and established population. The town population is 771, yet the resident volunteer base is larger percentage-wise than that of many other towns. One example of this was after the 2008 ice storm, the town had sixteen volunteers who pulled together enough resources and man hours to assist the town road crew in having all the town roads open within three days. This wouldn't have been possible without the assistance of town residents. Of note is that during the 2008 ice storm the town had no electricity, no cell phone or internet service, and no radio station. The community had to band together for themselves and their neighbors.

Development Trends and Town Vulnerability

Town population is shown on the graph below. Population increased since 2000, and more than doubled since 1950. Current population is 771.



The majority of development in Halifax has occurred as low-intensity residential development along secondary roads. Some small-scale commercial activity, mainly from home-based businesses are interspersed. There is minimal development pressure in Halifax resulting in very few residential or commercial building projects. New development is difficult in West Halifax village, the central village development because there is very little developable land left. There is also no public water or wastewater system in Halifax requiring all new structures to provide a well for potable water and on-site septic systems for wastewater. Most new development takes place outside the Village in rural residential settings on back roads in the hills and mountains.

Halifax is a notable community for the fact that they discuss mitigation in their town plan. They recognize the importance of mitigation as part of a complete emergency management policy. This is likely due to the severe effect and substantial financial assistance needed after Tropical Storm Irene.

To reiterate what was stated in the introduction of this report, population has dropped slightly since 2000. Halifax has a lower population than any of its neighbors. Halifax nonetheless should expect some growth as high-speed fiber internet reaches all corners of the town and distance to physical workplaces for knowledge workers is less critical following the COVID-19 pandemic. Keeping a balance with workers in skilled trades to help serve a growing population will be important. In addition, property taxes are higher in Halifax than some surrounding areas. The town has increasingly become a bedroom community for Brattleboro and Greenfield, Massachusetts, as well as nearby ski resort areas in Wilmington and Dover. Household income is comparable to surrounding towns. There are no trends that stand out as causing particular vulnerability for Halifax. Population loss is somewhat of a concern, but that is a trend seen in the Windham region and the many areas in the State of Vermont generally and relates to larger economic forces at play, such as a shortage of well-paying jobs. This leaves economic vulnerabilities for rural areas, such as Halifax, but not specific to Halifax alone. The fact that Halifax's economy is not based on tourism serves to lessen vulnerability for the town because a disaster or tourism decline would not impact them as much as town that relies heavily on tourism for its economy.

There is not much development in Halifax. Locals have desire for a mix of development and desire for things to stay the same. The latter usually wins out, with some exceptions. On average, Halifax issues 30-35 building permits a year. There are some new houses, but most of these permits are for alterations to existing properties or accessory structures. The town is not aware of any development in particularly vulnerable areas. The existing built environment of Halifax is vulnerable because a lot of structures are in areas of fluvial erosion susceptibility. Development in remote areas is vulnerable to being cut off during a disaster. When granting permits for new development, Halifax should consider the vulnerability of the new development and the means that the town has to get to the area where the development will be located if a disaster happens and roads are out. Special attention should be paid to properties accessible only by private bridges, a number of which were washed out in Tropical Storm Irene.

Unit Type	2000	2010	2020	% change 2010-2020	% change 2000-2020
owner occupied	269	293	302	3%	12%
renter occupied	43	37	39	5%	-9%
Seasonal	160	189	152	-20%	-5%
Vacant	21	23	34	48%	62%
total units	493	542	527	-3%	7%
Avg household size	2.51	2.2	2.26	3%	-10%
Number of households	312	330	341	3%	9%

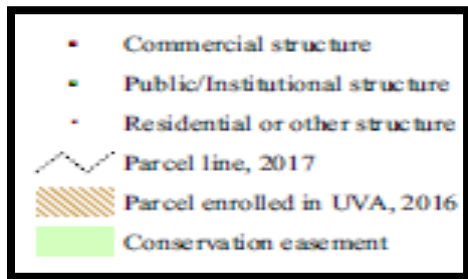
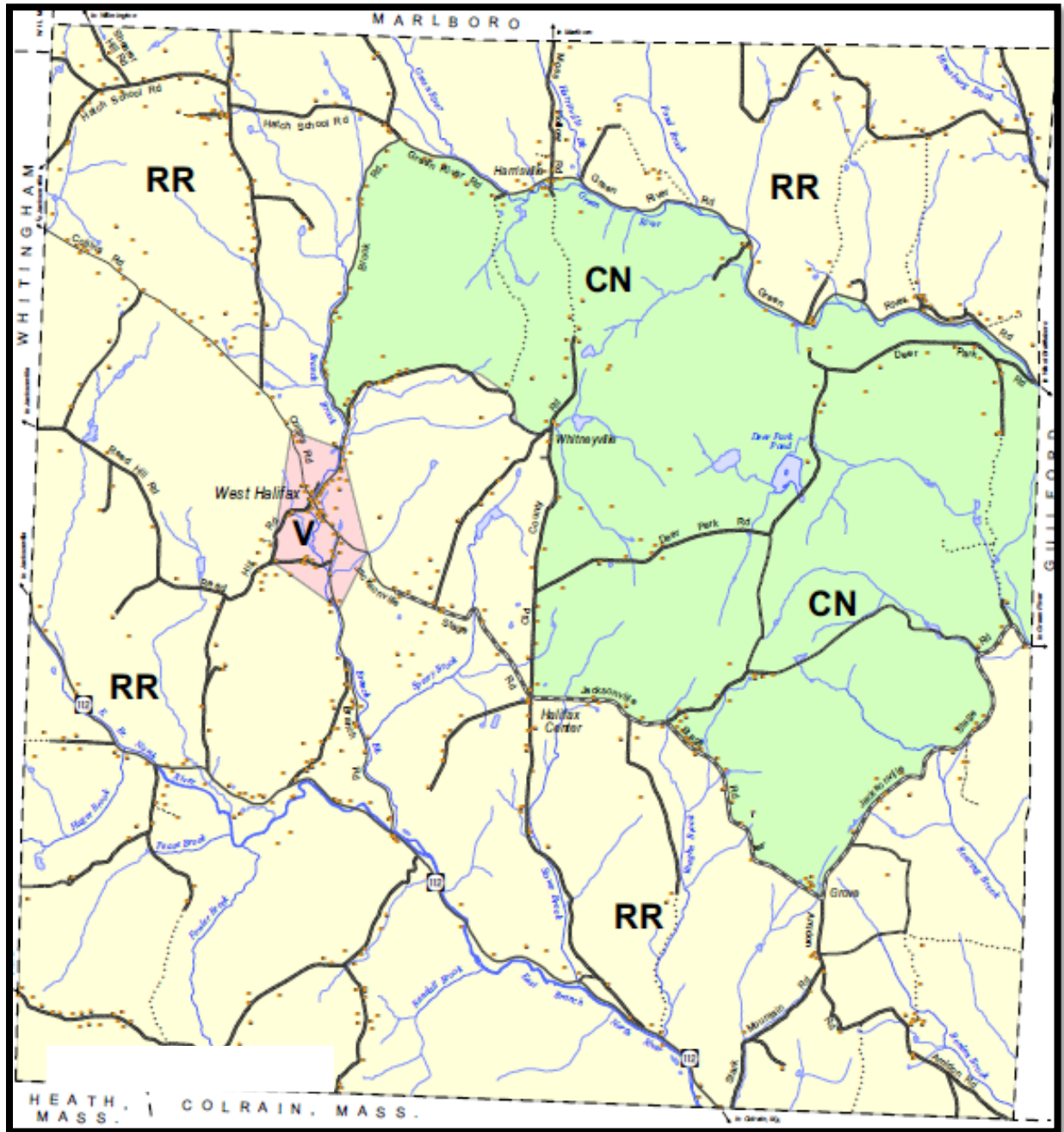
The table to the left shows the occupancy of Halifax's housing along with trends in the total number of housing units from 2000 to 2020. Of note, vacant housing has substantially increased and seasonal housing

has decreased. Overall, there was a 7 percent increase in housing units in Halifax between 2000 and 2020. From 2010 to 2020, the total number of housing units in Halifax is estimated to have decreased from 542 to 527, still above the 2000 number of 493.

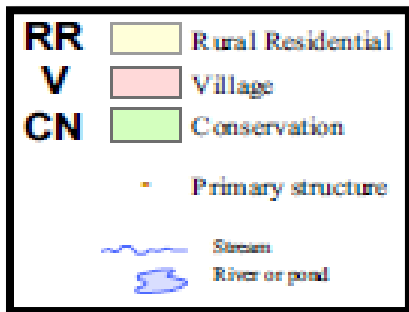
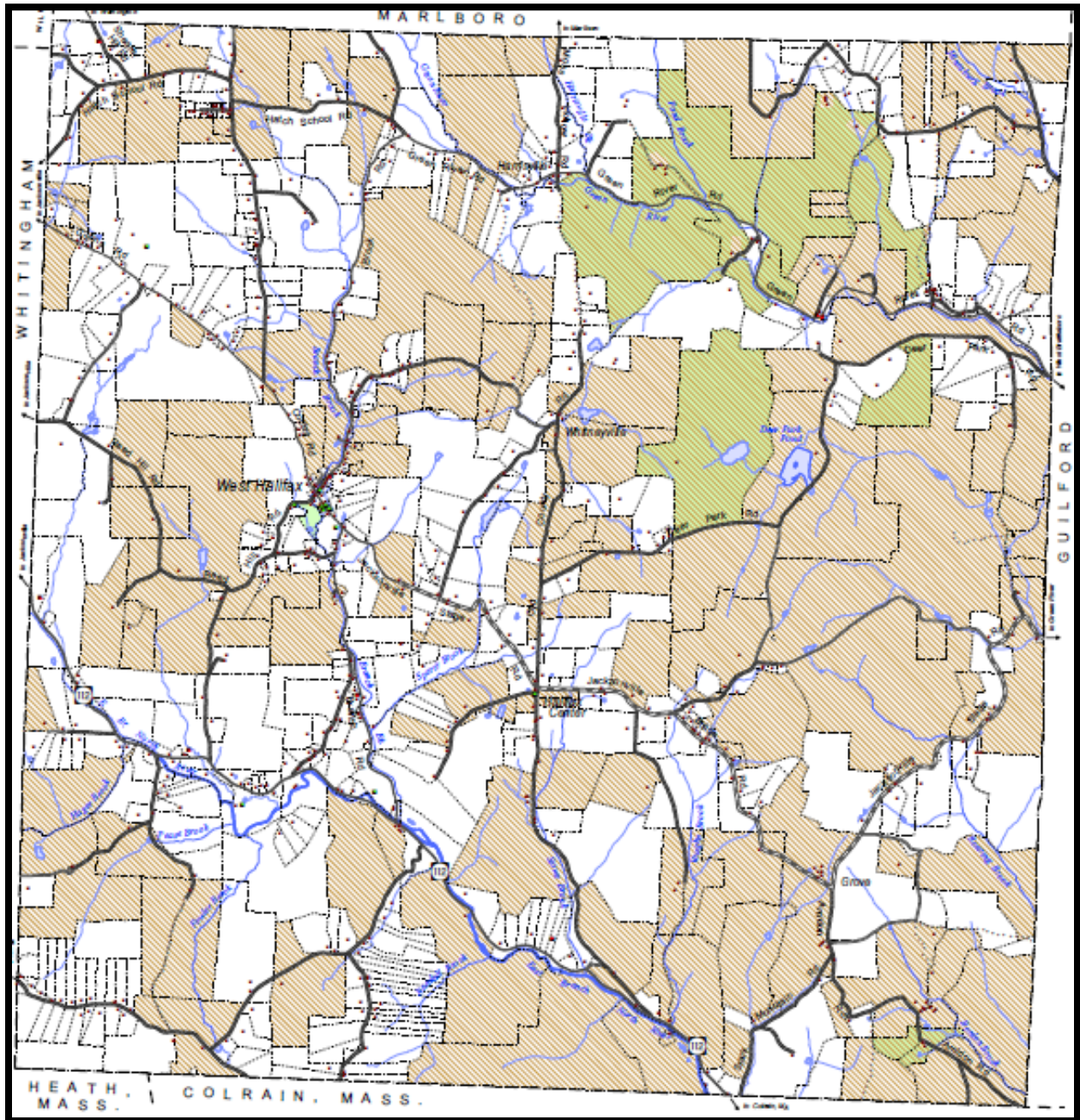
Approximately 28% of Halifax's housing units are seasonal homes, some of which are also used for short term rentals. This shows the importance of tourism and how much the population can vary from mid-week to weekends. The development pattern has not changed appreciably over the years, so the historic settlement pattern remains predominant. The little new development that is occurring is residential, with little to no commercial development. The village is built out with little land left for new developments, and much of the housing is older. It remains to be seen if very recent state law changes to encourage housing development during the state and nationwide housing crunch has any impact on small towns like Halifax. The village does not have water or sewer infrastructure. Halifax does have zoning but no subdivision ordinance in place.

Some of the highest hazard areas associated with flooding are Route 112, Green River and Branch Roads which lie close along the rivers and streams. Areas of concern during flooding events are homes located along small brooks that are subject to flash flooding during quick heavy rain events. Branch Brook is a particular area of concern for quick rises during flooding events. Given the proximity of Branch Brook to West Halifax and the critical municipal buildings located there it is imperative that flooding concerns are mitigated. Any development goals for the village must be tempered with mitigation efforts for this area. Plan development participants noted no particular housing or built environment concerns related to natural hazards other than these municipal/critical structures.

Existing Land Use Map from the 2019 Halifax Town Plan



Proposed Land Use Map from 2019 Halifax Town Plan



Drinking Water and Sanitary Sewer

Halifax has no public drinking water supply or wastewater treatment. Wastewater treatment happens by way of individual septic systems and drinking water is provided by individual property owners with private wells. Development at scale could be achieved if a public water and/or wastewater system is pursued though the upfront cost of such systems make this prohibitively expensive absent major development pressures that the town does not currently see. PFAS/PFOA contamination at the closed town landfill is being monitored in a couple of nearby drinking water wells.

Transportation Network

Halifax is located off the beaten path, but does have two main roadways, Vermont Route 112 and Green River Road. The Town is located to the southeast of Wilmington, the western most economic center of the region, and the various ski areas and bedroom communities. To access the wider region residents of Halifax would need better access to Route 9, a major east-west corridor traversing southern Vermont or Route 91 an interstate highway traversing the entirety or eastern Vermont. Some small roads connect through other towns and were helpful during the transportation system emergency posed by Tropical Storm Irene, but they are challenging to navigate during mud season with sections remaining unpaved.

There are approximately 6 miles of Class 1, 16.8 miles of Class 2, and 48 miles of Class 3 roads in Halifax. Approximately 26 miles, or 35%, of the overall road mileage is hydrologically connected, which means it 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.

Emergency Services

The Emergency Management Director (EMD) coordinates emergency planning, preparedness and response for hazard events affecting the Town. The Fire Chief, Road Foreman, and Emergency Management Director are the primary information collectors and coordinate as required for Town response needs.

The EMD is an active role in Halifax and it is advised that the town set aside some continued funding to aid in emergency management planning in the future. Halifax Fire Company is an independent and volunteer company made up of about 25 volunteers, of whom 6-8 are also EMS certified. Halifax is a member of Tri-State Fire Mutual Aid Association and Deerfield Valley Mutual Aid Association, and Southwest New Hampshire Mutual Aid (primary). Local fundraising and private donations are the major source of funding supplemented by an annual appropriation by the Town. Rescue Inc and Deerfield Valley Rescue, provide rescue and EMS support for the town. The Town has a contract with Vermont State Police and the Windham County Sheriff. The nearest hospitals are in Greenfield, Brattleboro, and Bennington – depending on the need of the victim. Halifax has two emergency shelters Halifax Elementary School and the Fire Station. The elementary school serves 50-60 students and there is a crisis plan in place. Halifax is signed up for VTAlert which is an emergency messaging system that can be used to alert residents, visitors or specific groups within a community, of various emergency messaging and directions. This will greatly increase the towns capacity to provide both emergency updates and preparedness information to residents.

The Town is also aware of its vulnerable population by having an inventory list of those people. Halifax's Community Club has provided a monthly senior meal. In addition, Jacksonville, a neighboring Village, has Meals on Wheels which is another way of keeping track of people in need. The Deerfield Valley Lions Club and provide limited holiday food assistance for needy people. Throughout the process WRC staff were in contact with frontline service providers that could operate in the town. These service providers bring a wealth of knowledge of vulnerable populations in town, the best ways to engage and serve with these informal group's town wide. Unfortunately very few service providers do operate within Halifax exclusively.

Green Mountain Power is the only electrical provider for Halifax and Consolidated Communications provides land line phone service.

Power Outage Statistics¹

Green Mountain Power has provided outage data from 2018 - 2022 for this Plan update. Looking at the "Average Outage Duration" in 2018 as compared to 2022, 5.02 hours vs. 7.08 hours, respectively, those residents in Halifax experienced greater than average outage lengths in 2022 indicating perhaps that the types of storms have been changing over the years with snow becoming wetter, heavier and more likely to cause damage to power infrastructure.

TOWN NAME	YEAR	Customer Hours Out	Meters with Outages	Meters / Town	Avg. Outage Duration (CAIDI) (hours)	Outage Frequency (SAIFI)	Total Duration (SAIDI)(Hours)
Halifax	2022	34,125	4,823	671	7.08	7.19	50.86
Halifax	2021	10,261	4,137	671	2.48	6.17	15.29
Halifax	2020	22,357	7,060	671	3.17	10.52	33.32
Halifax	2019	12,867	2,751	671	4.68	4.1	19.18
Halifax	2018	47,865	9,540	671	5.02	14.22	71.33
	Annual Average 2018-2022	127,475	5,662	671	4.5	8.44	38

PLANNING PROCESS

This update process was done in a more expedited fashion as there was timing pressure due to a federal declaration request for rains on July 09, 2023. The Plan was expired at that point, and the update process and drafting had to be completed within about two weeks. Town residents who took part in the planning process for developing the Local Hazard Mitigation Plan for Halifax tend to be affiliated with more than one association for the town. In rural areas of Vermont, it is typical that people who are most interested in the safety, health and welfare of their community will participate on more than one board and may for example, hold the role of Fire Chief, or school teacher, or a small business owner, in addition to owning personal property in the town. Therefore, although the meeting may not have as many people in attendance as a more populated community would, those present at the meeting are representing not only a

variety of roles, but many roles that would be held by numerous individuals in a more populated area.

Documentation of the Plan Update Process

This Single Jurisdiction Hazard Mitigation Plan is an UPDATE to a Plan approved by the Federal Emergency Management Agency (FEMA) effective November 14, 2016 and expired November 13, 2021.

The Town began the plan update process in January 2023. Windham Regional Commission staff and members of the planning team met with a group of planning participants at a hybrid in-person/online public meeting, as well as having separate conversations with the numerous town officials. WRC staff attended the June 20th selectboard meeting to announce the project, engage with the selectboard and announce the publication of an online survey for the project. In total 18 participants filled out an online survey created for the plan update process or participated in a public meeting. The Hazard Mitigation Planning participants convened on July 20 to provide input into the plan update. WRC staff, the Emergency Management Director and other members of the planning team led the effort at the town level, directly inviting town officials, local business owners and members of the public. The general public was informed through advertisement on the town website, on a popular town level social media site called Front Porch Forum, and physical postings at the Town Hall and Elementary School. Each meeting lasted for a couple of hours. WRC staff also met separately with applicable public officials over the course of the update process including the Road Foremen, Tree Warden, Conservation Commissioners and the Fire Chief. Over the course of the meetings the group completed and discussed:

- **Update of the 2016 Halifax Local Hazard Mitigation Plan**
 - Purpose
 - Process
 - What are Hazards and Mitigation Actions
- **Hazard assessment included:**
 - Discussion of hazard events that have occurred since the last Plan
 - Virtual hazard assessment survey using Google Forms
 - Discussion of meeting participant survey results
 - Discussion of online public survey results
- **Brief review of expired Halifax Local Hazard Mitigation Plan**
 - Decision on what hazards the updated Plan will address
 - Marking up of town maps with local hazard notes, projects and areas of need
- **Mitigation Goals and Actions**
 - Review/edit 2016 Mitigation Goals
 - Brief review of the 2016 Mitigation Actions Table that the EMD/Town updated
 - Creation of an updated Mitigation Actions Table for the updated Plan
 - 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

- Overall resiliency concerns or ideas
- Review of other elements and address questions that weren't discussed

The following people were involved in the hazard mitigation planning process in one or more meetings or conversations:

- Pete Silverberg – Selectboard Chair
- Karen Christofferson – Selectboard member
- Edee Edwards – Selectboard Vice Chair/WRC Commissioner
- Michael Fournier – Road Foreman
- Stephan Chait – WRC Commissioner, Conservation Commission
- Paul Blais - Emergency Management Director
- Dennis Annear – Fire Chief
- Sue Kelly – Halifax Tree Warden
- Tristan Roberts – Selectboard member
- Michael McConnell – Windham Regional Commission, Plan Developer
- Laurel Copeland – Halifax Conservation Commission

WRC staff updated the plan to meet the current standards and guidelines of FEMA for hazard mitigation plans. The information from the public meeting, along with follow-up information gathered in conversations with Road Foreman Michael Fournier, Fire Chief Dennis Annear, Paul Blais the Emergency Management Director, and information provided by Pete Silverberg, Selectboard Chair were used in the update. The plan utilized local knowledge and the best available data on hazards and environmental characteristics. Plans, studies, reports and technical information utilized in this plan are cited throughout and listed in this section. Specific hazard citations of information sources are listed at the end of each hazard section.

The draft was presented for internal town review by WRC staff and the Planning Committee. Town personnel (including the local floodplain administrator, EMD and highway department), Planning Commission and Selectboard were all asked to provide internal comments. The internal town review period was from August 24 – September 14, 2023. 2 sets of comments were received. WRC staff then finalized the draft for public comment.

Input from Frontline Organizations, Neighboring Communities and the Public

The draft plan was put out for public comment on August 24, 2023. This was done by posting an electronic copy on the town website and having hard copies available at the Town Office. Flyers were posted at the town hall and elementary school advertising its availability for review and comment, and the comment period was noted at a Halifax Selectboard meeting.

To satisfy FEMA outreach requirements related to community lifelines, the planning team developed a list of representatives of businesses, schools, and other private organizations that sustain community lifelines, as well as non-profit organizations, including community-based organizations that work directly with or provide support to vulnerable populations. A reasonable attempt was made via email/phone to engage these organizations to review the draft Plan.

Organizations located within Halifax

- Halifax Fire Department – Volunteer organization servicing Halifax.
- Halifax Elementary School

Organizations outside of Halifax, providing services in Halifax

- Green Mountain Power – Electric Utility. Consulted via email on loss of power statistics and other resiliency projects planned for Halifax.
- MOOver – Provides bus, van, taxi and volunteer rides for residents needing transport.
- Deerfield Valley Community Partnership
- Deerfield Valley Food Pantry
- DV Fiber
- The Gathering Place
- Senior Solutions
- SE Vermont Community Action
- SeVEDS via Brattleboro Development Credit Corporation
- Vermont Department of Health
- Visiting Nurse and Hospice for Vermont & New Hampshire
- Whitingham Free Public Library
- Windham Disaster Animal Response Team (WinDART)
- Windham and Windsor Housing Trust
- Youth Services Inc
- Windham Solid Waste Management District

No comments were received from the public during the two-week comment period. The draft plan was simultaneously distributed to the adjacent towns of: Whitingham, Wilmington, Brattleboro, Guilford, and Marlboro, VT, Heath and Colrain in Massachusetts for comment via email. No comments were received back. The plan was finalized by WRC staff and submittal to Vermont Emergency Management (VEM). This submittal allows VEM to make suggested revisions on the draft, and allows for any revisions to be made before the final draft is submitted to the Federal Emergency Management Agency Region 1 (FEMA) for review.

Making the Halifax Hazard Mitigation Plan available for public comment included the following efforts:

- All of the meetings discussed in the above sections were advertised and open to the public including posting hard copy flyers and various digital forms of advertising.²
- Public survey about hazard concerns and mitigation action ideas was advertised on Front Porch Forum and the towns website for a several weeks to gather public input in advance of the public meeting.
- The Hazard Mitigation Planning participants convened on June 20th and July 20th 2023 for public meetings to provide input and insight into the plan update.
- WRC staff had follow-up calls or meetings with the Selectboard Chair, a Selectboard member, the Emergency Management Director, the Road Foreman and Fire Chief to gather details for the Plan.
- A draft of the Plan was posted from August 24 – September 14, 2023 on the town website for public comment.³
- Physical copies of the draft Plan were available for review in-person at the Town Office.

- Flyers were put up at the town office and elementary school for public comment on the draft.
- On June 22, 2023, an invitation was extended via email to neighboring towns and to community lifeline providers to provide a means and opportunity to review and comment on the draft Halifax Local Hazard Mitigation Plan.⁴ No comments were received. Inter-town and provider communication will repeat for future revisions of this Plan.

Data Sources

Information was gathered for the updated Halifax Local Hazard Mitigation Plan through a variety of sources listed below. This information was incorporated into the text throughout and used to update data points, charts and graphs. A summary of reviewed data sources is provided below and additional specific references are cited throughout this Plan.

- Local knowledge of the participating Halifax Planning Team and other relevant parties – community impacts, priorities, trends, and overall plan guidance
- Information from the most recent Local Hazard Mitigation Plan – past mitigation actions
- Floodready Vermont Community reports – NFIP participation data
- 2019 Halifax Town Plan – community profile information
- 2016-2023 Green Mountain Power Outage Data
- 2018 State of Vermont Hazard Mitigation Plan – hazard profile information and extent data
- National Oceanic and Atmospheric (NOAA) National Climatic Data Center’s Storm Events Database – event information for hazard profiles
- FEMA Disaster Declarations for Vermont
- VT ANR Atlas – location of ANR defined River Corridor and FEMA Special Flood Hazard Area
- FEMA Flood Insurance Rate Maps (effective 12/2/2015) - location of Special Flood Hazard Area
- U.S. Geological Survey National Water Information System- Stream Gage Data
- WRC Local Liaison Reports of Storm Damage – impacts
- FEMA – Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, 1/2023
- Green River Corridor Plan, 11/2014
- East Branch of the North River Corridor Plan, 12/2017
- Flood Ready Summary Report, 08/2023
- Halifax 2023 Local Emergency Management Plan
- Flood Ready Expanded Community Report, 08/2023

RISK ASSESSMENT

The risk assessment portion of a Hazard Mitigation Plan contributes to the decision-making process for allocating available resources to mitigation projects. 44 CFR Part 201.6(c)(2) of FEMA's mitigation planning regulations requires local municipalities to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Methodology

A **vulnerability analysis** for each community begins with an inventory of possible hazards and an assessment of the risk that they pose. These are the questions to be answered. What hazards can affect your community? How bad can it get? What is the likelihood of future events occurring? What areas of your town are most vulnerable to these hazards? How does climate change impact your town currently and what are you worried about for future impacts? Information collected from the core planning team went into this vulnerability assessment to identify the hazards the town feels most vulnerable to.

The following table is the scale used to rank each hazard that is analyzed:

Hazard Assessment Ranking Criteria	
	Frequency of Occurrence: Probability of a plausibly significant event
1	Unlikely: <1% probability of occurrence in the next 100 years
2	Occasionally: 1–10% probability of occurrence per year, or at least 1 chance in next 100 years
3	Likely: >10% but <75% probability per year, or at least 1 chance in next 10 years
4	Highly Likely: 100% probability in a year

Potential impact was considered and scored separately for impacts to infrastructure, life, economy and the environment. Additionally, seasonal patterns that may exist are considered, what areas are likely to be affected most, the probable duration of the hazard, the speed of onset (amount of warning time, considered with existing warning systems).

The combination of the frequency scores for each hazard and the impact ranking for each hazard related to infrastructure, life, economy and the environment, were together used determine the hazard ranking score for each hazard. A Google Form survey was completed between the two public meetings and the survey results are included below and in the appendix of this plan. These results were analyzed in real time with the planning participants at the second meeting. Results along with community input were used to determine which hazards the plan would address. The participants used the results to formulate their discussion, however, local knowledge and the will to act or not act did impact their choices on the chosen hazards to address.

Results

While all hazards were considered by the Hazard Mitigation Planning participants for inclusion in this plan, it is not feasible to study each in depth. For hazards that are not profiled in this plan, the reader is directed to the Vermont State Hazard Mitigation Plan. The rationale for not addressing all of the hazards is that Halifax has a low level of risk associated with them and/or the town does not have the capacity to mitigate for them at this time. This plan will only focus on the hazards that Planning Team has decided are pertinent to their community and they have

chosen to mitigate for at this time which are: Inundation Flooding, Snow and Ice, Invasive Species and Fluvial Erosion will be discussed in the flooding section. The below tables show the results of the hazard assessment:

Frequency of Hazard Occurrence: Ranking by scores	
	Totals
Extreme High Heat	3.18
Extreme Cold	3.18
Damaging High Winds	3.31
Drought	2.81
Earthquake	1.31
Fluvial Erosion	3.06
Infectious Disease Outbreak / Pandemic	2.68
Inundation Flooding	2.62
Invasive Plant or Insect Species	3.25
Landslide	2.31
Significant Hail Event	2.56
Significant Ice Storm	3.43
Significant Snow Event	3.68
Wildfire	2.31

The above frequency ranking table highlights in orange the hazards that the Town has chosen to address. As shown, the Town has not chosen to address all of the highest-ranking hazards.

Particular to snow, ice and cold, these are prevalent hazards that Halifax is very accustomed to due to the location of the Town, and indeed the Town relies on the cold and snow “hazards” as an economic driver connected with ski and snowmobile tourism. Given that the town feels comfortable dealing with hazards of this type there is still more that the town can do to address these hazards.

Hail, heat, and high winds scored somewhat high on the frequency ranking, indicating that these hazards may be rising in frequency over time and may become more pressing in terms of the ‘will to mitigate’ over time. At this point, however, these hazards are seen as rare enough that mitigation is not justified on a wide scale.

The table below shows the results of the same hazards when surveyed separately from frequency and in relation to their impacts to infrastructure, life, the economy and the natural environment. The chosen hazards are again highlighted in orange so that one can see clearly where they lie in the rankings. In this ranking, the chosen hazards are more of the top-ranking hazards for impact, with the exception of invasive species which plan participants thought to be an emerging issue in the region and Halifax. Of note in this table is that again, snow and ice rank high for impact, just as it did for frequency, but the impacts are accustomed to in Halifax. The plan participants did however discuss what more could be done to address these issues.

Also of interest is that inundation flooding scored higher in the rankings on impact than it did for frequency, and fluvial erosion scores much higher on the impact rankings than it did for frequency. The sense among plan participants was that the difference between inundation

flooding and fluvial erosion is not widely understood, and the more common feeling is that 'flooding' generally is seen as the issue, which in Vermont includes both fluvial erosion and inundation damage.

	Impact of Hazards				
Hazard	Infrastructure	Life	Economy	Environment	Totals
Extreme High Heat	1.9	2.3	2.2	2.4	2.2
Extreme Cold	2.1	2.5	2.1	2.1	2.2
Damaging High Winds	2.5	2.1	2.1	2.1	2.2
Drought	1.9	2	2.3	2.8	2.2
Earthquake	1.9	1.8	1.9	1.9	1.9
Fluvial Erosion	2.8	2.4	2.4	2.8	2.6
Infectious Disease Outbreak / Pandemic	1.9	2.3	2.6	1.9	2.2
Inundation Flooding	2.8	2.4	2.6	2.8	2.7
Invasive Plant or Insect Species	2.1	1.8	2.3	2.8	2.2
Landslide	2.1	1.9	2	2.3	2.1
Significant Hail Event	2.1	1.8	1.9	2.1	1.9
Significant Ice Storm	2.9	2.3	2.3	2.3	2.5
Significant Snow Event	2.5	2.2	2.3	2.1	2.3
Wildfire	2.3	2.4	2.4	2.6	2.4

Highlighted in blue are considered to be outlying impact scores. For wildfire, it scores high in the impact rankings while scoring lower on the frequency scale. These rankings are consistent with the state hazard mitigation plan and were confirmed by the Planning Team during the public process. Given that Halifax and Vermont as a whole are both extremely mountainous with a high level of tree cover, it is perhaps not surprising that wildfire scored high on the impact scale. On the frequency scale though it scores much lower as wildfire has not been shown to be a significant natural hazard in Vermont.

On a separate note, but again highlighted in blue in the above table are the rankings for wildfire, high heat, and drought. These hazards scored lower on the impact rankings, but they are hazards of wider concern in the emergency management community. The population is not yet feeling the impacts of these hazards frequently enough to be concerned about them. Any desire of emergency personnel to bring more public awareness and attention to these hazards may require public education around risk. Providing educational opportunities related to the above hazards is also a focus of the town and plan participants for the selected hazards of flooding, erosion and invasive species. The town may choose to mitigate these other hazards in the future as they are hazards of rising concern in Vermont. With the impacts climate change becoming more consistent and widespread covering these hazards in future hazard mitigation plans makes sense. For the remaining hazards the rationale for not addressing them is that the excluded hazards have lower levels of risk associated and lower probability of occurrence and/or level of impact.

The natural hazards addressed in the 2016 Halifax LHMP were Flooding/Fluvial Erosion/Power Outage.

Identifying and Profiling Hazards

The following sections include a narrative with a Description, Geographic Area of the Hazard, Impact, Extent, Probability, and discussion of Past Occurrences of five natural hazards affecting Halifax.

Flooding and Fluvial Erosion

Flooding Description

Flooding is the most widespread and destructive hazard in the United States. Flooding has also been the most common and costly hazard to impact Halifax. Flooding can occur anytime of the year as a result of heavy rains, thunderstorms, tropical storms, hurricanes or Nor'easters. 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. There is a 26 percent chance of experiencing a flood during the life of a 30-year mortgage compared to a 4 percent chance of a fire. Halifax has an NFIP compliant floodplain ordinance, which gives residents access to discount flood insurance and enables the Town to regulate development within the Special Flood Hazard Area (SFHA). SFHAs are subject to inundation by the 1% annual chance flood (100-year flood). Maps of these areas can be found at the Town Office or online at the FEMA Map Service Center.⁵

Impact

Halifax has a very hilly/mountainous topography and is quite beautiful and remote. Because of its topography, nearly all the roads in Halifax lie along waterways as these are the lower flatter areas of land in the town. Therefore, there are a lot of structures that also lie close to waterways. Despite the damage that flooding has caused in Halifax, there is not a lot of FEMA defined Special Flood Hazard Area (SFHA) in Halifax. This is due to the town's terrain. SFHA delineates areas of floodwater inundation. The terrain of Halifax leads to fast moving flood waters that don't have much opportunity to spread out into floodplains and slow their speeds. An example of this is shown in the photo above (Sumner Bridge), where one can see the moving floodwaters near the stream corridor and the still inundation floodwaters in the floodplain

⁵ <https://msc.fema.gov/portal>

along and outside the corridor (this area is not in the FEMA defined SFHA. The *River Corridor Plan for the Green River in Guilford and Halifax, VT*⁶ mentions this in reference to the Green River by saying “The Green River watershed is an extremely flashy watershed due to its steep headwaters and soils with poor infiltration. The National Flood Insurance Program (NFIP) study for the Green River does not cover the entire river corridor and is not a detailed study; therefore



Sumner Bridge, TS Irene 2011

inundation hazards appear to be underestimated in many locations.” There is not a lot of wide open flat floodplain in Halifax. Flooding therefore comes at high speeds and causes much erosive destruction in River Corridor. With the onset of climate change it is possible that Halifax could see more flooding events as the conditions under which flooding occurs are becoming more and more frequent. This can be seen in the rising frequency of winter flooding events with significant temperature changes leading

to rapid snow melt and potentially flash flooding. If temperatures continue to swing drastically then this type of flooding could continue to become a real problem even in the higher elevations where traditionally temperature changes are less impactful.

Photos taken during and after TS Irene are shown throughout this report in addition to pictures from other, more recent storm events to give a perspective on this historic storm. The town was cut off for several days after that storm, and several weeks in the hardest hit remote areas. More about the erosive flood impacts will be discussed in the fluvial erosion section of this plan.

⁶ River Corridor Plan for the Green River in Guilford and Halifax, VT, prepared by Fitzgerald Environmental Associates, LLC, November 1, 2014

The photo on the right shows the TS Irene moving floodwaters in the village area, with the Fire Station shown in the photo. There is no FEMA defined SFHA in the village area. The River Corridor, along Branch Brook, does run through the village, though even the area shown in this photo is not in the mapped River Corridor. This is important to note because it shows that the maps are not absolute and therefore regulations are not perfect to restrict development in areas that can experience flooding hazards. As waterways shift, and development impacts waterways and floodwater movement, so to do the areas of flood hazard shift and change over time. The village area is susceptible to flooding, as shown by the below photo, and Halifax should keep that in mind when they are permitting any new development. The pictured area to the right is in neither the Special Flood Hazard nor the River Corridor, which goes to show that there are hazard areas that the town should be aware of without relying upon mapping.



This photo shows sheet flow flooding throughout the entire village area of West Halifax. TS Irene.

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. Some of the highest hazard areas associated with flash floods are the Green River corridor and areas adjacent to the east branch of the North River, including route 112. These areas have all seen damage in recent years with flooding and severe thunderstorms that have been a part of declared disasters. Green River Road is an important through route for the region and for Halifax, when Route 9 is cut off for through traffic, as it was during and after TS Irene. Other areas of concern during flooding events are homes located along small brooks throughout town that are subject to rise during quick flash flooding events such as along Branch Brook, Fowler Brook and Randall Brook.

Ice jam flooding is fairly common in the early springtime, generally around March. The heavy rainfall, combined with runoff from snowmelt due to the mild temperatures, results in flooding of rivers, streams and creeks. Halifax doesn't have mapped current or historic ice jams. However, sometimes ice jams will form on the west branch of the North River north of the village. These jams are monitored, but there has not been ice jam flooding that caused any damage to structures or infrastructure to date.

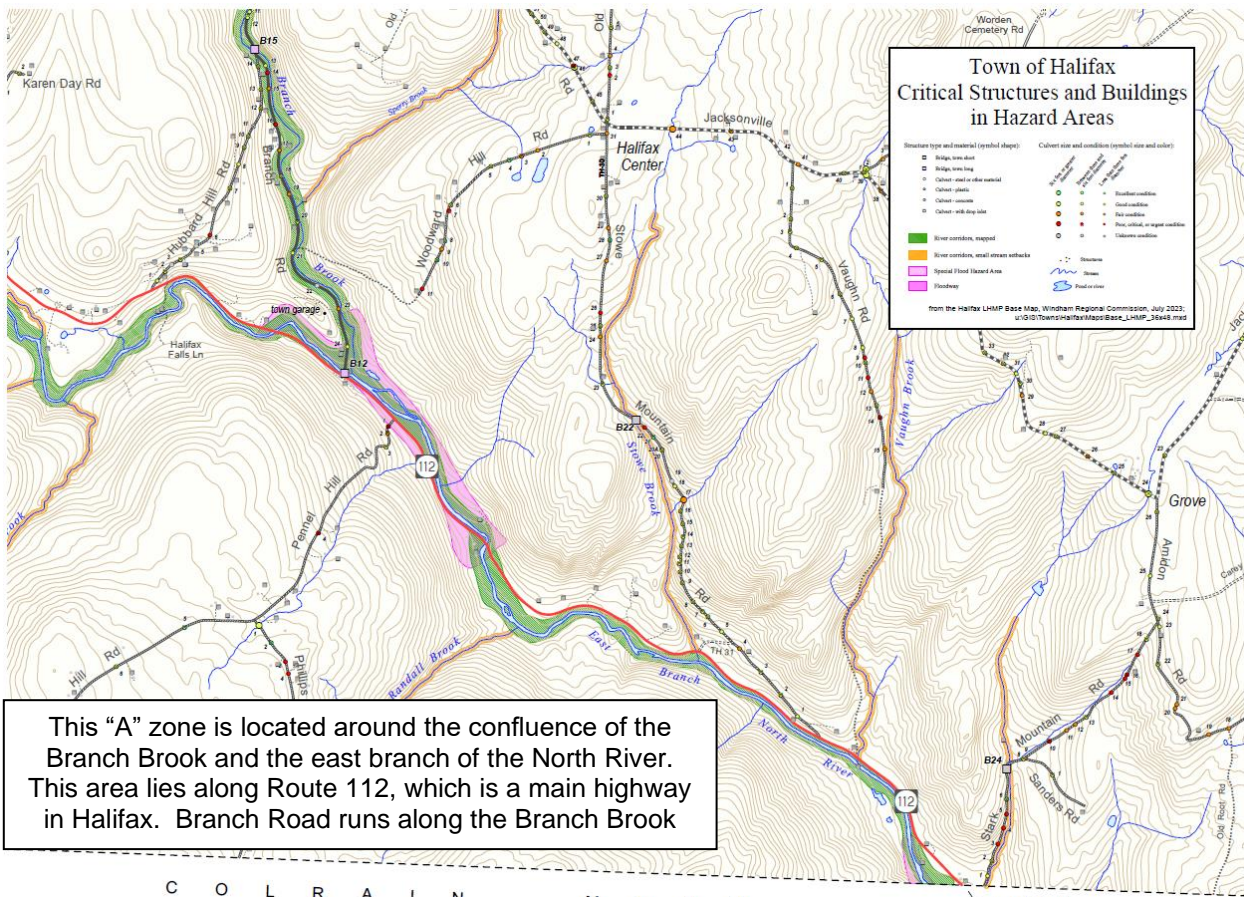
There has been flooding on Green River Road, where jams routinely form due to log buildups, and there would be damage if not for the town road crew monitoring and breaking up the jams when needed. Halifax is primarily concerned about the log jams that exist in some of the rivers and streams and pose a risk for flooding. Some of these jams remain in place for several years, and pose a risk if they break and let loose a lot of water and debris. The Road Foreman has received permission from Vermont ANR to cut some of the logs but leave them in the river. This will allow the water to flow more easily, while also preserving the ecological value of woody natural debris in the waterways. This remains an active mitigation effort that the town engages

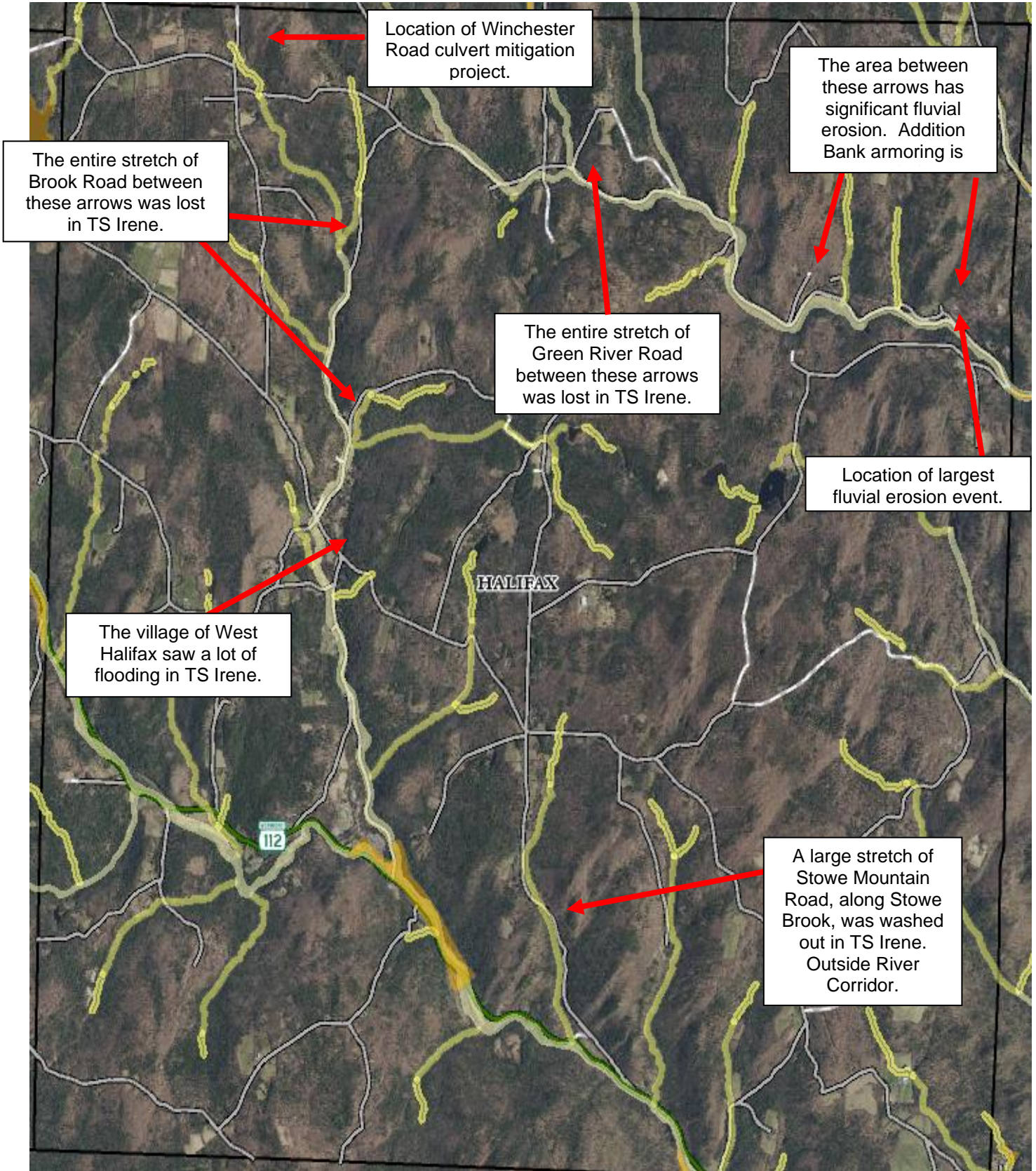
in yearly. Being able to cut these logs in warmer times, prevents problem ice jams from forming in the winter months.



Location / Special Flood Hazard Area and River Corridor Mapping

FEMA has mapped two “A” zones in Halifax, which are shown below. “A” zones are areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no base flood elevation or depths are shown. Generally, a proposed development project would need to do an H & H study to determine the base flood elevation and





floodway for a particular property or properties. These zones are the Special Flood Hazard Area

(SFHA) that FEMA has defined in Halifax. Properties within the SFHA, that have a mortgage, are required to purchase flood insurance. Parcels outside of the mapped area can still purchase insurance if they would like. Halifax's participation in the National Flood Insurance Program (NFIP) gives residents access to discount flood insurance through the NFIP. The Flood Hazard Summary Sheets on Flood Ready, Vermont's website, says there are 5 structures in the Special Flood Hazard Area and only 20% of these structures have flood insurance.⁷ As the below map shows, the Town Garage is partially located in the SFHA. The building is actually quite high up and has not been flooded to date.

This map is a snip showing the special flood hazard areas (SFHAs) that FEMA has designated in Halifax in orange. The floodplains shown are based on the FEMA Flood Insurance Rate Maps (FIRMs) available through the FEMA Map Service Center.⁸ The map effective date for the latest FIRMs for Windham County is 9/28/2007.

The map on the following page shows the River Corridors that Vermont Agency of Natural Resources (ANR) has mapped, as well as the SFHAs for the entire Town. River Corridors encompass an area around the present channel where fluvial erosion, channel evolution and down-valley meander migration are most likely to occur. The mapped river corridor includes this area and a 50-foot buffer on either side to allow for the recommended setback and zone of avoidance to protect the riparian/fluvial erosion hazard corridor. The ANR defined River Corridor also includes a 50-foot buffer on all streams shown on the Vermont Hydrologic dataset. The only mapped River Corridors are for streams with a watershed of two square miles or greater, so for unmapped streams one must assume the buffer. The below map shows the Special Flood Hazard Areas (SFHAs) in orange and the River Corridors in yellow, for the entire Town of Halifax. Of note is that there is not much SFHA but a lot of River corridor. These are also the main transportation thoroughways in Halifax. This can lead to road washouts and culvert issues during storm events.

mapped River Corridor extending long the Green River, Branch Brook and the North River.

Extent

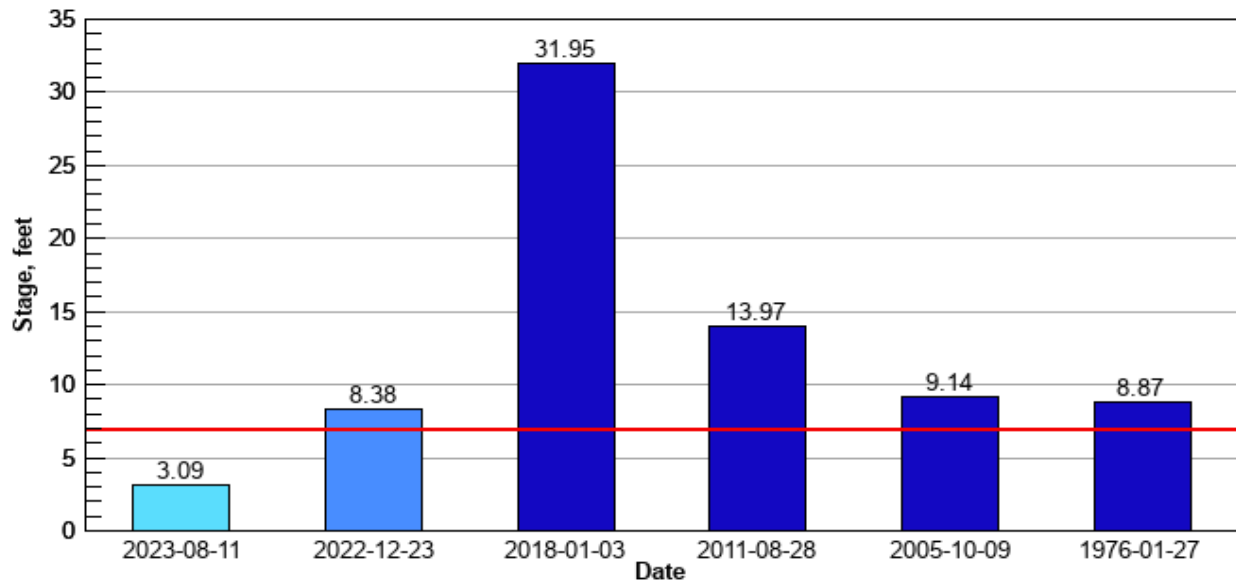
The highest recorded measurement at the nearest stream gauge to Halifax on the Green River was 31.95 feet, which was measured on January 3, 2018.⁹ In the previous 365 days from plan drafting the high-water mark at this stream gauge was 8.38 feet on December 23rd 2023.

⁷ Flood Hazard Summary Report for Halifax, accessed 08/2023
<https://anrweb.vt.gov/DEC/FoFReports/DisplayFloodHazardReport.aspx>

⁸ FEMA Map Service Center <https://msc.fema.gov/portal>

⁹ USGS Stream gauge 01170100 GREEN RIVER AT COLRAIN, MA
 <http://waterwatch.usgs.gov/?id=wwchart_ftc&site_no=01170100>

USGS 01170100 GREEN RIVER NEAR COLRAIN, MA



- Current Stage 3.09 feet on 2023-08-11 14:00:00 (provisional)
- Recent Maximum Stage (previous 365 days) 8.38 feet on 2022-12-23 (provisional)
- Highest Recorded Peak Stages at Current Datum
- National Weather Service Flood Stage 7 feet

Disaster Declarations for Windham County, VT 2015-2023

Disaster Number	Declaration Date	Declared Year	Incident Type	Declaration Title	Incident Begin Date	Incident End Date	Disaster Closeout Date
23070	7/10/2023	2023	Flood	FLOODING	7/9/2023		
23072	7/14/2023	2023	Flood	SEVERE STORMS, FLOODING, LANDSLIDES, AND MUDSLIDES	7/7/2023		
21103	9/29/2021	2021	Flood	SEVERE STORM AND FLOODING	7/29/2021	7/30/2021	
21085	8/22/2021	2021	Hurricane	TROPICAL STORM HENRI	8/22/2021		9/8/2021
20147	4/8/2020	2020	Biological	COVID-19 PANDEMIC	1/20/2020	5/11/2023	
20032	3/13/2020	2020	Biological	COVID-19	1/20/2020	5/11/2023	12/22/2022
18004	1/2/2018	2018	Severe Storm	SEVERE STORM AND FLOODING	10/29/2017	10/30/2017	
11258	11/8/2011	2012	Severe Storm	SEVERE STORMS AND FLOODING	5/20/2011	5/20/2011	1/14/2020
11208	9/1/2011	2011	Hurricane	TROPICAL STORM IRENE	8/27/2011	9/2/2011	
11198	8/29/2011	2011	Hurricane	HURRICANE IRENE	8/26/2011	9/2/2011	3/10/2014
9003	1/14/2009	2009	Severe Ice Storm	SEVERE WINTER STORM	12/11/2008	12/18/2008	10/15/2014
7816	5/4/2007	2007	Severe Storm	SEVERE STORMS AND FLOODING	4/15/2007	4/21/2007	3/13/2013
4103	9/23/2004	2004	Severe Storm	SEVERE STORMS AND FLOODING	8/12/2004	9/12/2004	1/4/2011
3098	9/12/2003	2003	Severe Storm	SEVERE STORMS AND FLOODING	7/21/2003	8/18/2003	1/4/2011
1033	4/10/2001	2001	Snowstorm	SNOW	3/5/2001	3/7/2001	2/28/2005
75	7/27/2000	2000	Severe Storm	SEVERE STORMS AND FLOODING	7/14/2000	7/18/2000	6/30/2008
99142	11/10/1999	2000	Severe Storm	TROPICAL STORM FLOYD	9/16/1999	9/21/1999	6/30/2008
96146	6/27/1996	1996	Flood	EXTREME RAINFALL AND FLOODING	6/12/1996	6/14/1996	2/23/2005
96033	2/13/1996	1996	Flood	ICE JAMS AND FLOODING	1/19/1996	2/2/1996	2/17/2005
76068	8/5/1976	1976	Flood	SEVERE STORMS, HIGH WINDS & FLOODING	8/5/1976	8/5/1976	4/16/1981
73068	7/6/1973	1973	Flood	SEVERE STORMS, FLOODING, & LANDSLIDES	7/6/1973	7/6/1973	11/12/1976
69040	8/30/1969	1969	Flood	SEVERE STORMS & FLOODING	8/30/1969	8/30/1969	5/26/1972

Detail on Specific Flooding Events that have Affected Halifax:

Past Occurrences

Since 1996, when National Climatic Data Center detailed records start, there have been 35 flood events in Windham County, Vermont. Halifax experiences routine spring flooding, but this is not always documented. There have been 21 Presidential Disaster Declarations in Windham County since 1953.

July 29, 2021 - Bands of moderate to heavy rainfall set up across areas southern Vermont during the afternoon and evening hours on Thursday, July 29, 2021 north of a warm front and area of low pressure. Between 2 and 5 inches of rain fell across most areas which resulted in several reports of flash flooding. This rainfall ended a very wet month of July in which most areas picked up between 12 and 18 inches of rain.

Nearly two dozen towns in southern Vermont were listed with either minor or major impact due to flooding, according to Vermont Emergency Management, with damage estimates ranging from less than \$10,000 to more than \$200,000 each. Numerous roads or culverts were closed or washed out. About 350 individuals were reported to be isolated individuals due to main road washouts around their home.

President Biden approved a formal request for a Major Disaster declaration for Bennington and Windham counties as a result of the storms. Over \$5 million in damages to public infrastructure was identified by Vermont officials, including costs to repair public roads and bridges as well as debris removal.

April 15-21, 2007 - Flash floods and inundation flooding over a period of several days - The Town of Halifax got 8 inches of snow in the morning of April 15, followed by 6-8 inches of rain. The snow caused a berm at the Town Offices holding in the rainwater which caused a lot of inundation flooding. Rain and snow caused damage to roads and utility lines across Windham County and Halifax. Across the state, nearly \$3.6 million was obligated as part of the FEMA Public Assistance Program. Halifax received approximately \$235,000 from FEMA for this event. While it is not normal for the town to receive this type of damage from severe flooding and thunderstorms on an annual basis, road washouts and culvert repairs from these associated events have ranged in the ballpark of \$200,000 to \$400,000.



Weir Road Bridge during TS Irene, 2011.
This bridge was completely washed out.

October 8, 2005 - On October 8 at daybreak, a nearly stationary cold front was over southwestern New England. The air over the northeastern United States was very moist.

Low pressure in the vicinity of the eastern Carolina states moved slowly north northeast along the cold front. Heavy rain fell over southern Vermont through the early morning hours of October 9. During this period, there was over 6 inches of rainfall in southern Vermont, triggering widespread flooding. Several evacuations of people from their homes occurred. Flooding from a beaver dam break on Perry Road caused 14 feet of erosion. Major added complications came from debris that washed with the water, plugging culverts and wreaking havoc near bridges. Halifax received \$225,000 as part of Vermont state assistance for non-declared disasters.

August 3, 2003 – A tropical air mass was in place over southern Vermont on August 3. With a strong disturbance over the Great Lakes adding weak lift to a very unstable atmosphere,

scattered showers and thunderstorms erupted during the afternoon hours. A slow-moving storm over Windham County produced doppler radar estimated rainfalls of 3 to 4 inches in about four hours' time. The torrential rains took a toll, washing out roads in the city of Londonderry. County Highway 121 was washed out in the Town of Windham. Massive flooding occurred in the city of Grafton at the base of Fire Pond and Hinkley Brook roads, where water, debris and mud washed those roads out. The raging debris knocked a house off its foundation and damaged several other ones. This was the same area affected by the infamous Flood of 96 which was even more severe. Heavy rains also washed away a small covered bridge in Grafton. FEMA Declaration DR – 1488 was associated with this event. Many roads were washed out and culverts needed replacing throughout Halifax.

September 17, 1999 - The remnants of Tropical Storm Floyd (DN99142) moved up the eastern seaboard on September 16 and during the early hours on September 17. The storm brought both high winds and heavy rainfall to Southern Vermont, which included a large swath of 3 to 6 inch amounts. Specific rainfall amounts included 2.91 inches in Bennington, 3.89 inches in Sunderland, 4.54 inches at Peru and 5.70 inches at Brattleboro. The rain produced significant flooding across the region, which proved destructive. Many smaller tributaries reached or exceeded bank full. Water from the Millbrook in Weathersfield washed away a portion of State Route 5. The World's Fair in Tunbridge was cancelled for the first time in many years. Winds from the passage of Floyd were estimated to have gusted to over 60 mph, especially over hill towns. The combination of the wind and very saturated ground, produce widespread downing of trees and power lines across much of Southern Vermont. A woman was injured on Tavern Hill in Putney, Windham County when a tree came crashing down on her Volvo, destroying the vehicle. Some trees fell on vehicles and houses. The rain and wind produced power outages across the region. As many as 2,000 people lost power in Southern Vermont.

June 19, 1998 - Thunderstorms with torrential downpours produced flash floods across parts of Windham County. Shoulders of routes 100 and 112 were washed out near Jacksonville and Halifax. Flooding also occurred in the Putney area and at Rawsonville. Several mountain roads were washed out throughout the County.

In 1996, Between Saturday morning July 13 and Sunday morning July 14 rainfall from three to five inches was common across southern Vermont resulting in significant damage and a Presidential Declaration of Emergency. Flooding occurred throughout New England causing millions of dollars in damage. The remnants of Hurricane Bertha (DN96146) tracked from the Mid-Atlantic region northeast to Quebec, Canada. Several roads and streams were flooded throughout the region, including low-land flooding along the Hoosic River in Bennington County. Scattered power outages also occurred over the area, when strong winds downed water-laden tree branches onto wires.

During 1976, flooding occurred throughout New England, as result of Hurricane Belle (DN73068), causing millions of dollars in damage.

In 1973 there was an extreme rainfall event from June 28-30 that affected all areas of Vermont except the northwest section. Rainfall amounts as much as 6 inches in 24 hours in some locations. This was the largest rain event since the 1927 flood. Highway damage was extensive in the south-central, southeastern, and northeastern areas of the State. The town of Ludlow on the Black River was seriously damaged. Three persons were killed in the 1973 flood,

and damage was estimated at \$64 million. Sizable crop loss was reported, and damage to State highways was estimated to be \$10 million. The entire State was declared a disaster area.¹⁰

The Vermont Flood of 1927 was the deadliest flooding event in the history of the State; eighty-four people were killed with over \$28 million in property damage. The Spring Floods of 1938, which had an effect on all of New England, caused \$113 million in damage, killed 24 people and made 77,000 people homeless. During this flood alone, the main street of Hooksett, New Hampshire was 18 to 20 feet underwater.

Probability

Flooding is highly likely, as determined by the number of past events and the local knowledge of the Hazard Mitigation Planning Committee. There are events every year, especially during spring snow melt and late summer rains. Snow is melting earlier and storms are getting more intense as a result of climate change. In some cases what usually would have fallen as snow is now rain or ice. This trend is likely to get worse as the impacts of climate change are felt more and more. Furthermore, temperature fluctuations in winter can cause mass snow melt and flooding. This will be the case for both the Green and North Rivers in Halifax as well as the many smaller streams and brooks.

Sources used

Local town knowledge and records, VT ANR online mapping, FEMA FIRM maps, US ACE's CRREL Ice Jam mapping tool, USGS stream gauge data, Northeast Regional Climate Center data, FEMA.gov data visualization tool for declared disasters, National Climatic Data Center storm event database data for Windham County.¹¹

Fluvial Erosion

Fluvial Erosion Description & Impact

Much of the destruction from flooding in Halifax, and in Vermont generally, is due to fluvial erosion rather than inundation, which is the type of flooding targeted in FEMA mapping. Halifax is particularly vulnerable to fluvial erosion due to the road network, infrastructure and development is within the river corridor. Fluvial erosion is the destruction of river banks caused by the movement of rivers and streams, when stream power overcomes resistance of bed and bank material. 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.

Gravity and water power are the forces driving fluvial erosion. Factors that allow the force of gravity to overcome the resistance of earth material to erosion include: saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, removal of trees and other vegetation and earthquake shaking. 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. Associated issues in Halifax are related to road cutting and bank erosion for the most part, areas where roads have been built between steep slopes on one

¹⁰ USGS "Vermont Floods and Droughts" information page <http://md.water.usgs.gov/publications/wsp-2375/vt/>. Accessed 08/2023.

¹¹ < <http://www.ncdc.noaa.gov/stormevents/>> accessed 07/2023

side of the road, and slopes to a river or brook on the opposite side. Existing homes are dotted on the landscape along these roads which have existed for 200 years or more, so cannot be easily closed or relocated.

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 within and along what are called River Corridors. River Corridor mapping was released by the Vermont Agency of Natural Resources in early December 2014; small stream mapping was released in January 2016. This mapping delineates fluvial erosion hazard areas and includes a 50-foot buffer beyond those designated areas. For small streams, a 50-foot buffer from top-of-bank on either side of the waterway constitutes the River Corridor. This mapping can assist municipalities in developing bylaws and effective mitigation strategies to regulate development within fluvial erosion hazard zones. Halifax does currently have a fluvial erosion bylaw.



Though not taken in Halifax, 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.

Bends in the river are prone to movement as part of natural river processes, and their movements can be even more dramatic when manmade impacts and development upstream impinges on these natural stabilizing forces. The interaction of the natural and unnaturally dramatic forces of river movement, combined with the stationary location of the closely located roads is what leads to road damages during heavy weather events. Property owners outside of the FEMA floodplain can purchase flood insurance at a lesser expense, and it still covers damages resulting from fluvial erosion in events that damage multiple properties.

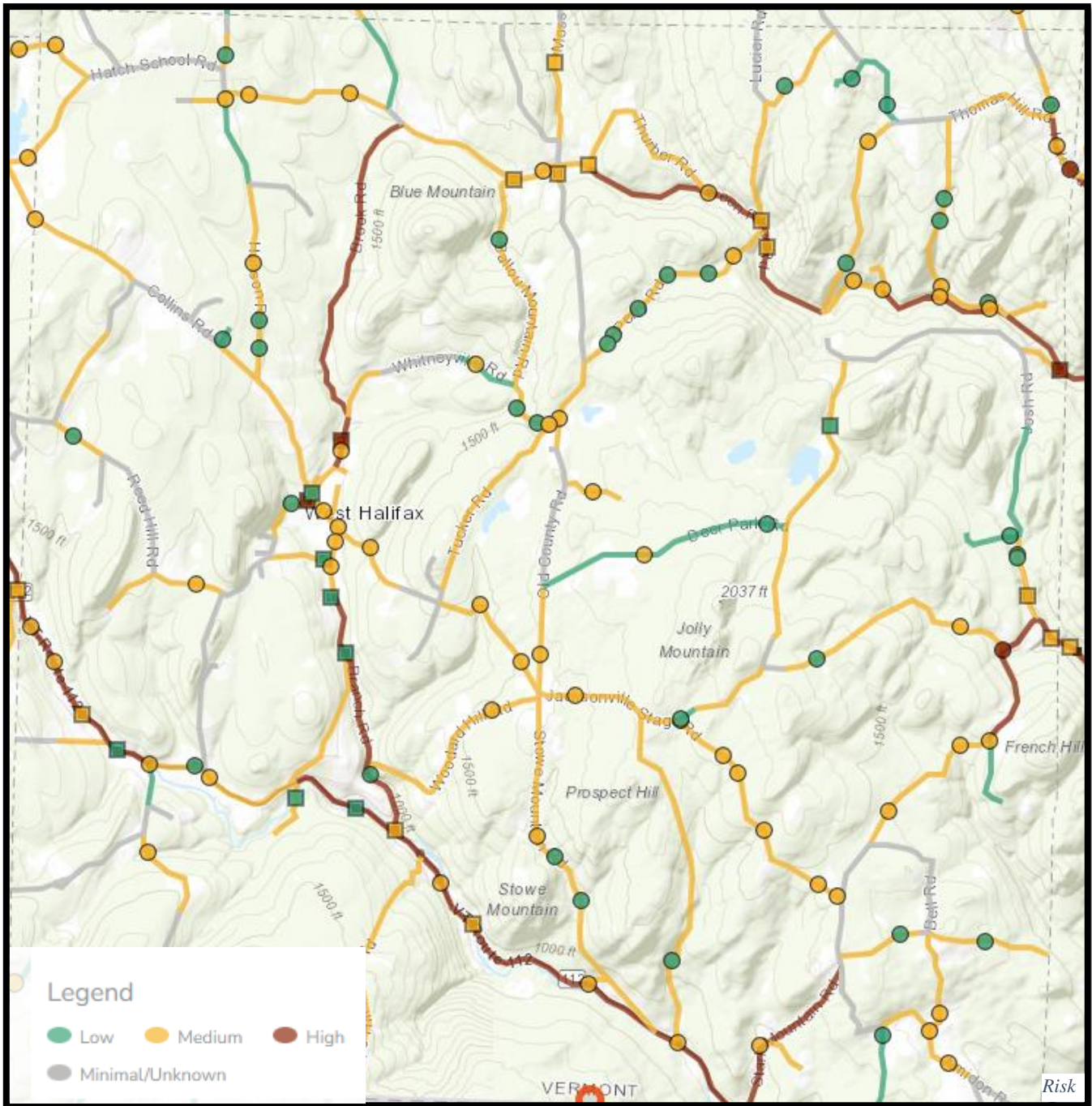
VTrans Highway Flood Vulnerability and Risk Mapping

As part of the scope of work for the Transportation Resilience Planning Tool, the Vermont Department of Transportation has developed metrics to quantify the flood vulnerability and risk of bridges, culverts, and road embankments throughout the state.¹² 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

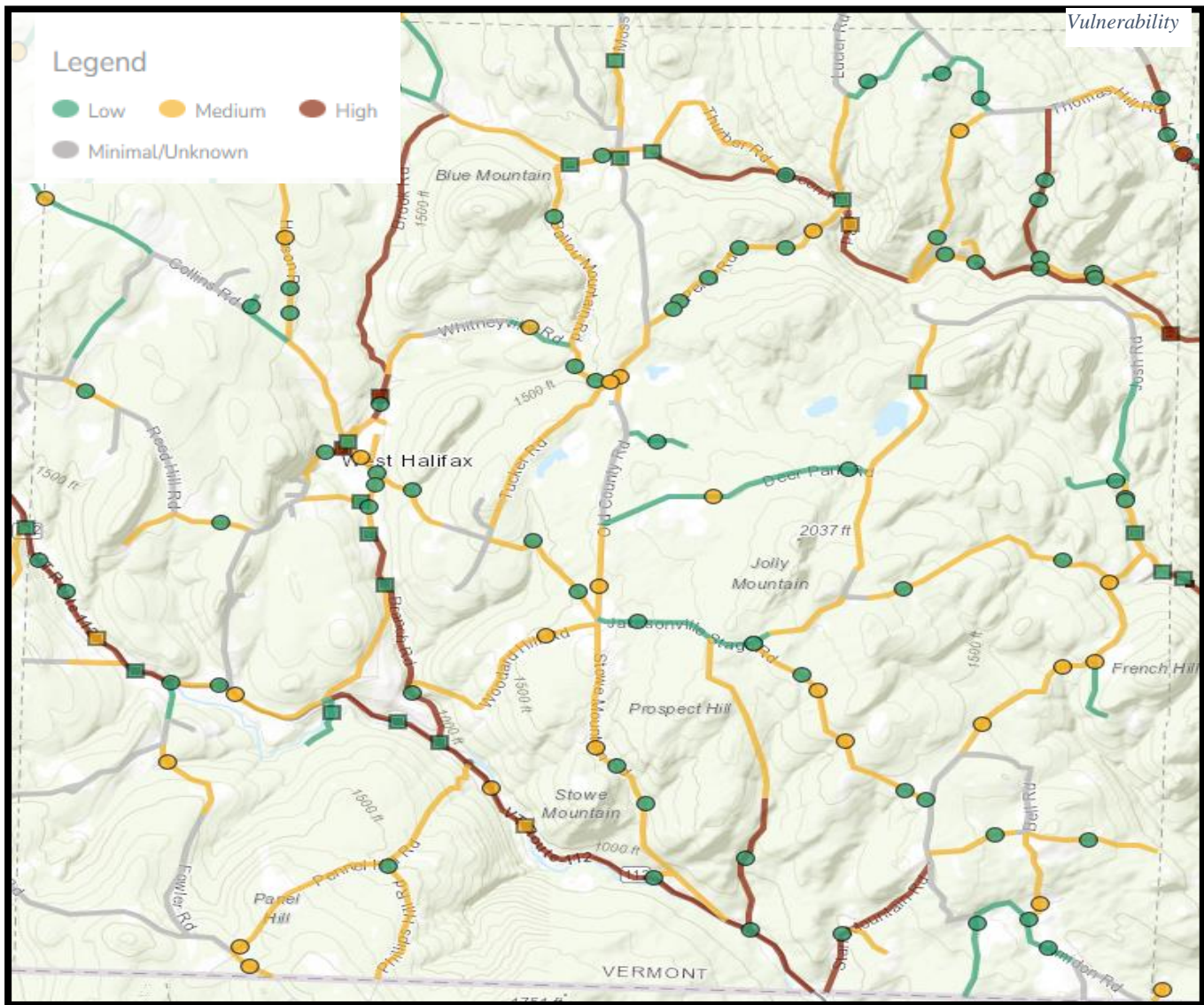
¹² VTrans Statewide Highway Flood Vulnerability and Risk Website: <https://vtrans.vermont.gov/planning/transportation-resilience/statewide>

This analysis provides an estimate that can be used for hazard mitigation planning, supporting emergency preparedness, and for capital programming. The analysis was done for three different categories: vulnerability, criticality, and flood risk.



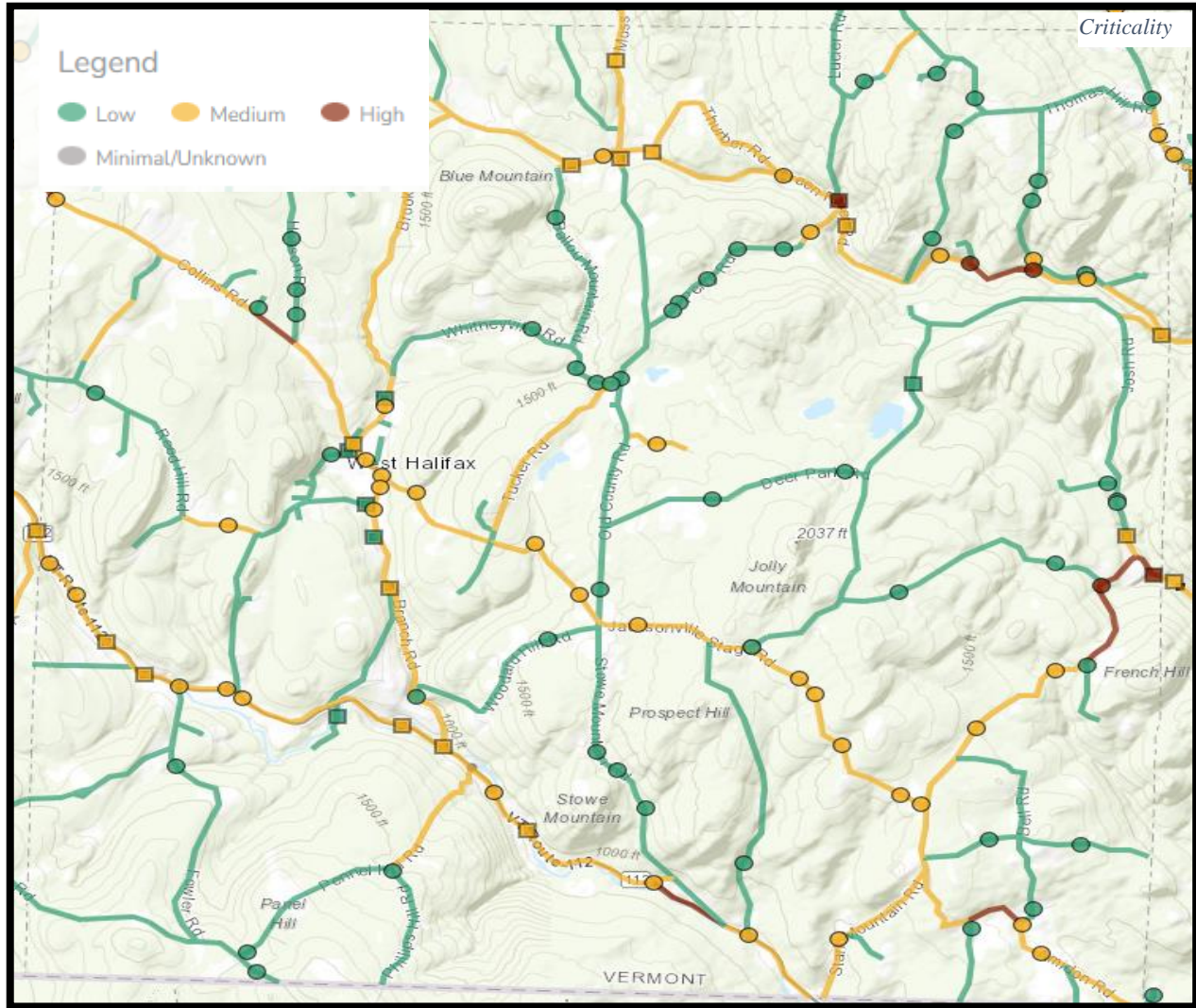
The Risk map shown here provides an analysis of the probability of inundation, erosion, or deposition and the potential severity of the damage to infrastructure or structure. The map identifies sections of Route 112, Branch Road and Green River Road, as being high risk road segments. The following structures are identified as high risk: bridge on Weir Road off of Branch

Road; bridge on Reed Hill Road west of the village, a bridge on Green River Road on the border of Guilford as well as a bridge on Jacksonville Stage Road (see maroon squares on the map above).



The vulnerability map shown above provide an analysis of the general level of vulnerability to natural hazards of road segments or structure in the network related to general travel and emergency services accessibility. The vulnerability map shows the same bridges being highly vulnerable to flooding and/or erosion damage. Most of Route 112, Branch Road and the majority of Green River Road are rated as highly vulnerable to flooding, erosion.

Seven road segments are deemed highly critical within Halifax and two bridges (101308001613081 & Jacksonville Stage Road Bridge) ranks highly critical for general travel and emergency service access.



Extent

The extent of a flood event can vary from a minor event due to a typical rain event or could be a major event as a result of rapid snow melt in spring, rain on frozen ground, or as a result of a tropical depression or storm. The extent of flooding is such that brooks may breach their banks and flow onto land and down roads.

The largest area of fluvial erosion in Halifax is pictured to the right. It lies off of Green River Road on private land. It is about 200 feet long and 300 feet high. Totalling approximately 1.4 acres lost. There are numerous instances of lesser fluvial erosion occurring along the Green River as well as the East Branch of the North River.



This area in Halifax on the Green River has the worst fluvial erosion in town.

Probability of Fluvial Erosion

Flooding and fluvial erosion are both highly likely in the future, as determined by the number of past events and the local knowledge of the Hazard Mitigation Planning Team. There are events every year, including 2023, especially during spring snow melt and late summer season rains. In recent years temperature fluctuations in the winter months have

led to flooding and fluvial erosion from snow melt. This impact can be tied to climate change as by the snow that would normally stay on the ground until spring time is melting earlier. There are even times during the winter months where rising temperatures have led to massive snow melt which can lead to flash floods, inundation flooding, ice jams and fluvial erosion. Flash flooding is a locally probable event, with flash floods typically occurring in summer months. Higher-elevation drainage areas and streams are particularly susceptible to flash floods, which plan participants noted are more common. Floods are becoming more frequent and storms are getting stronger with climate change. This is leading to more frequent flood events that cause damages in the region in times of the year where residents would not normally experience flooding or fluvial erosion damage.

Fluvial erosion is highly likely and exists in Halifax, especially due to the damage caused by TS Irene in 2011, where fluvial erosion hazard flooding de-stabilized many steep-sloped areas and washed-out riparian zones next to roads and streams. Fluvial erosion is directly associated with flooding and large-scale rain events and spring snow melt. With areas of high elevation drainage, Halifax is subject to flash flood events that erode stream banks and adjacent areas. There are events every year, especially during spring snow melt and late summer season rains.

Sources used

Local knowledge of areas of concern and impacts, information in 2016 Halifax LHMP, National Oceanic and Atmospheric Climatic Database, Communications with Vermont Emergency Management, Discussions and emails with Halifax Emergency Management Director and Road Foreman in June and July 2023, additional sources are directly cited through this document. East Branch of North River Corridor Plan (2017) and Green River Corridor Plan (2014).

Geographic Area of Hazard/Location/Occurrence of Fluvial Erosion



This photo shows the close proximity of Green River Road to Green River. There is extensive bank armoring in this section put in after TS Irene.

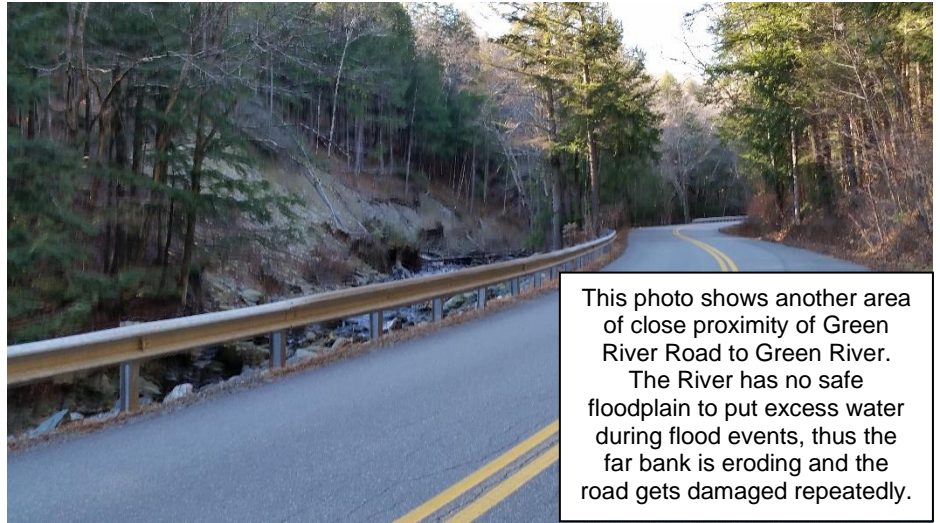
In some instances, stabilization/mitigation projects in Halifax have helped. In other areas throughout Halifax, issues remain. Many of the fluvial erosion issues are on private land, and require the consent of the land owner to mitigate the hazard. Former EMD John LaFlamme, 'A lot of Halifax's vulnerability is not under their control to mitigate.' The river

Corridor mapping (included in this plan) shows the ANR defined River Corridors, which are likely to have fluvial erosion present or in the future. The map also points out some of the issues discussed in the text of particular problem spots. There are numerous areas in Halifax with fluvial erosion risks to both infrastructure and buildings (see flooding maps). Many of the road risks have cut off residences during past events, such as TS Irene or the heavy rainstorms in 2021, 2022 or 2023. About 20 Halifax residents were stranded for 1-2 and some even 3 weeks after TS Irene; they were along the Green River and roads that offshoot from Green River, such as Perry Road, Fowler Road, and Deer Park.

The *River Corridor Plan for the Green River in Guilford and Halifax, VT*¹³ describes the River this way "...The Green River channel is still adjusting its width, depth, and planform to the following historical and ongoing impacts: 1) aggradation of sediment in the valleys due to European settlement and deforestation that occurred during the 1700's and 1800's; 2) channel straightening, dredging, and corridor encroachment associated with adjacent roads, agriculture, and other land uses; 3) significant floods in recent years such as those in October of 2005 and Tropical Storm Irene in August of 2011" (pg. 71 of the *Green River Corridor Plan*).

¹³ River Corridor Plan for the Green River in Guilford and Halifax, VT, prepared by Fitzgerald Environmental Associates, LLC, August 2023

The Green River in Halifax has “extensive armoring and encroachment along Green River Road. The steeper and more confined reaches in Halifax transport large volumes of sediment and have little opportunity to spill on to floodplains and dissipate energy. As a result, these reaches convey large volumes of water and sediment downstream. These high energy reaches caused catastrophic damage to roads and bridges during TS Irene in locations where embankment armoring failed or at bridges/culverts that were undersized or obstructed by debris.”



This photo shows another area of close proximity of Green River Road to Green River. The River has no safe floodplain to put excess water during flood events, thus the far bank is eroding and the road gets damaged repeatedly.

Return Frequency	Discharge (cfs)			
	¹ North River (Shattuckville, MA)	¹ Deerfield River (Charlemont, MA)	¹ Green River (Colrain, MA)	² East Branch North River at M02 (Halifax, VT)
Drainage Area (mi²)	88	361	116	35
Data Period	1939-2015	1913-2015	1967-2015	None
2 year	4,870	11,800	2,440	1,340
5 year	8,430	18,900	3,860	2,090
10 year	11,600	24,700	5,070	2,660
25 year	16,900	33,400	6,490	3,500
50 year	21,800	40,900	8,620	4,230
100 year	27,700	49,400	10,600	5,000
200 year	34,800		12,800	5,860
500 year	46,500	73,800	16,400	7,150

The *River Corridor Plan* describes the overall recommendations for the Green River in Halifax this way:

- Limited floodplain protection opportunities exist in Halifax, and therefore those few opportunities identified in this plan are very important for the protection of nearby infrastructure and downstream areas.
- Extensive roadway reconstruction following Tropical Storm Irene left the river prone to bed erosion and bank instability on the opposite bank. While there may not be a feasible way to address these issues, there are opportunities to further “naturalize” the banks along the road through the redevelopment of vegetated slopes overlying the riprap armor.

- The ongoing bed and bank erosion along the heavily armored stretches of Green River Road should be monitoring closely in the near term, and especially following subsequent floods. If the river bed continues to incise (i.e., cut down), the embankments could be at risk of failure. Channel bed armoring may be required in some areas to prevent these failures.

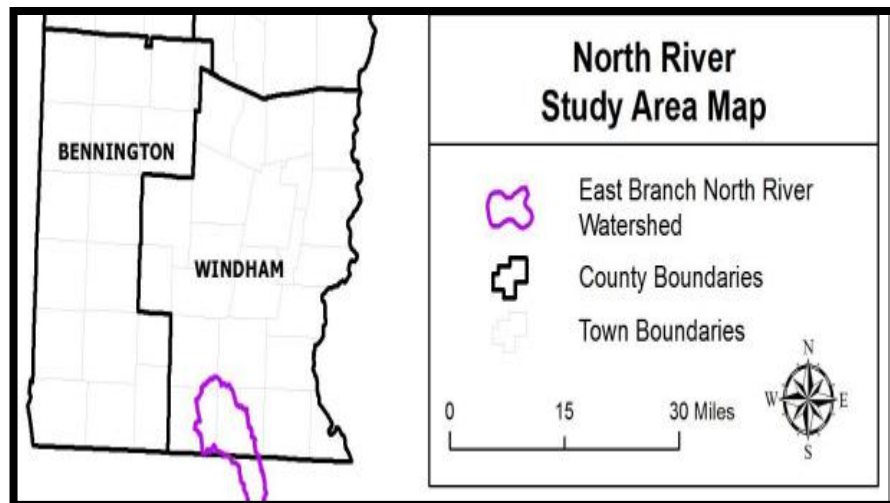
The river Corridor mapping (included in this plan) shows the ANR defined River Corridors, which are likely to have fluvial erosion. The map also points out some of the issues discussed in the text of particular problem spots. Mitigation projects on private land require the consent of the land owner to complete. Potential mitigation actions included in this plan are shown in the mitigation action section of this plan.



Largest area of fluvial erosion in Halifax is along the Green River. Photo was taken after TS Irene in 2011.

NORTH RIVER CORRIDOR PLAN

In 2016, the Windham Regional Commission (WRC) and the Vermont Department of Environmental Conservation (VTDEC) identified the East Branch of the North River and its tributaries Branch Brook and Hager Brook in southern Vermont for assessment of fluvial geomorphic and aquatic habitat conditions. Flooding and erosion damage sustained during Tropical Storm Irene (TSI) in the Towns of Halifax and Whitingham led to the selection of these tributaries for further study. Infrastructure along the river and tributaries was severely impacted by



flooding and erosion, and therefore the plan will serve to help the town better understand existing flood vulnerabilities, and plan for future improvements with flood risks in mind.

Snow and Ice

Description and Impact

The Region has a long history of severe winter storms and blizzards and usually experiences at least one or two Nor'easters or other significant winter storms each year with varying degrees of severity. There have been 118 winter/ice storm or extreme cold events in Windham County since 1996.¹⁴ A typical event begins as a low-pressure system that moves up the Atlantic Coast, into the Canadian Maritimes, dumping heavy snow across parts of Vermont. Snowfall accumulations are generally three to six inches in the valleys and 6 to 12 inches in the mountains. Winter storms and ice storms can cause power lines to fail, damage trees and impede access to homes and businesses. Halifax is at risk as higher elevation areas usually experience the most severity with winter weather. Halifax has higher than average elevation in relation to other Windham County towns. This combined with steep slopes and a development pattern historically favoring areas next to area streams or rivers and significant snow and ice storms could have a substantial impact not only on occurrence, but also when the snow or ice melts.

Heavy wet snows of early fall and late spring, as well as ice storms, often result in loss of electric power, leaving people without adequate heating capability. Another threat from winter storms is downed trees, resulting in power failures, impassable roads or driveways and potentially ice dams. An ice storm crossed the region in December of 2023 causing widespread downed trees and power outages in Windham and Bennington Counties. The total cost of damages across the region surpassed the one-million-dollar threshold triggering a Presidential Disaster Declaration. During the large snow event in March 2023, Halifax did not get hit particularly hard compared to lower elevation towns because the snow was heavier at the lower elevations. Still, many in Halifax were without power for several days, and road and driveway clearing took multiple days due to the sheer volume of snow. Halifax got hit hard in 2008 as well with lengthy power outages and tree damage. Damage across the region consisted of roads being due to downed trees and utility lines. Thousands lost power for varying lengths of time and several shelters were opened in Bennington County.

The primary concerns with winter weather events are power failure, damage to roofs, trees and power lines, and dangerous or impossible travel conditions.

Extended power outages are a concern of the town. Power failure is a common event in areas of Halifax and a condition as a result of high winds and/or heavy snow and ice that can occur anywhere in town. Power failures are typically the result of power lines damaged by storm events. During ice storms the higher elevation locations in town as well as areas of concentrated development are most susceptible to power failures. Power failures may also result from disruptions in the New England or national power grid, as indicated by the widespread power outages in 2003. Dead or dying trees in close proximity to power lines pose a particular threat to power lines when ice loads are added.

¹⁴ National Climatic Data Center, 1996-2023 storm events database <http://www.ncdc.noaa.gov/stormevents>

Significant snow or ice storm impacts are heightened by the many miles of unpaved roads in Halifax. These unpaved roads make plowing, sanding and general or emergency travel hazardous during storm events. Transportation and other infrastructure on or along unpaved roads has a higher than average potential for damage during storm events.

Extent

The severity or magnitude of winter storms to occur in southeast Vermont can range from moderate to very severe. The southeastern region of VT typically receives over 60 inches of snowfall per year, and most Vermonters are prepared to handle large amounts of snowfall. Halifax experiences significant snow storms every year but according to the town they are manageable. The top-ranking snow event in Windham County was 41" measured over 3 days in Whitingham on 3/05/1947¹⁵.

Probability

The Planning Team in Halifax deems snow/ice storms to be highly likely in any given year. Every winter there is at least one weather related incident where people in town will lose power for a few days. Climate change is causing snow to be warmer and thus heavier, leading to an increase in heavy wet snow events in the region. Halifax's elevation protects it somewhat from this impact, according to town officials, but this trend may eventually impact even higher elevations. Extreme snow and/or ice events are rare, but climate changes cause more extremes in general and this is seen with extreme events being a yearly concern.

Past Occurrences

The Region has a long history of severe winter storms and blizzards and usually experiences at least one or two Nor'easters each year with varying degrees of severity. There have been three winter storms in recent history in Windham County that were Disaster Declarations:

- Snowstorm (EM - 1087495) – March 13-15, 2023
- Severe Ice/Winter Storm (9003) – 12/11/2008-12/18/2008
- Snowstorm (1033) - 3/5/2001-3/7/2001

The following detail events listed in the National Climatic Data Center for all ice storms on record for Windham County for records dating back to 1996:

March 13-15, 2023 - A powerful Nor'Easter resulted in widespread heavy wet snow and gusty winds across southern Vermont March 13-March 15, 2023. Anywhere from 15 to 30 inches of snow with locally higher amounts in excess of 30 inches fell over the southern Greens. A few locations in the southern Greens topped 40 inches. Numerous downed trees and powerlines resulted in widespread power outages. Some locations were without power for at least 1 or 2 days. Several warming stations opened to assist those without power. Overall, this event led to the closing of many school districts, and resulted in chain up laws and bans of empty tractor trailers and/or tandems on some area interstates. A State of Emergency was issued for several jurisdictions as a result of the storm. Key Impacts: Power Outages, School Closures, Car Accidents, Travel Restrictions.

February 3, 2022 - A prolonged winter storm began on Thursday, February 3 and continued into Friday, February 4. Precipitation began as rain on February 3. Colder air gradually pushed

¹⁵ NOAA Snowfall Extremes, gathered 8/23 <https://www.ncei.noaa.gov/access/monitoring/snowfall-extremes/VT/3>

southward into the overnight and early morning hours of February 4 resulting in a changeover to a wintry mix of sleet, freezing rain and snow. Most locations picked up 1 to 2 inches of liquid equivalent precipitation from this event with the majority of it falling as one or multiple types of frozen precipitation. Precipitation ended during the afternoon hours on February 4. Flat ice accumulations ranged from 0.10 to nearly 0.50 of an inch across both Bennington and Windham counties. Bennington County received a greater amount of snow and sleet (3 to 5 inches) compared to Windham County (2 inches or less). This event left thousands of residents without power in both Bennington and Windham counties due to downed trees and power lines and caused many schools to close on Friday, February 4. State offices opened two hours late. A couple of vehicle accidents were also noted. Key impacts: travel delays, vehicle accidents, school closures, tree and wire damage, power outages.

February 1, 2021 - Moderate to heavy snow developed to the northwest of a slow-moving coastal low on February 1st. The snow was light initially during the morning and afternoon hours of the 1st, but an area of heavy snow expanded northwestward during evening, with snowfall rates of one inch per hour observed at times. The snow moved north of the region by the morning of the 2nd. Storm totals ranged from 7 to 17 inches. The snow prompted numerous school closures and delays. Key impacts: transportation delays, school closures.

December 16, 2020 - An area of low pressure tracked northward off the East Coast toward New York City on Wednesday, December 16, then eastward to just off Cape Cod on Thursday, December 17. As a result, cold enough air north of this low led to moderate to heavy snowfall across all of eastern New York and western New England. Snow advanced northward into southern Vermont during the evening and overnight hours on Wednesday, December 16. Snow reached its peak intensity during the overnight hours before gradually winding down during the midday hours on Thursday, December 17. Bands of heavy snow occurred with snowfall rates of 1 to 2 inches per hour reported at times. An exceptionally strong band of snow sat over northern portions of Bennington and Windham counties for several hours during the morning of the 17th producing snowfall rates of 3 to 6 inches per hour. Snowfall totals generally ranged from 15 to 25 inches across southern portions of Bennington and Windham counties with 24 to 40 inches across the north. Key impacts: transportation delays, traffic accidents, school closures.

January 9, 2019 - A mix of rain and freezing rain developed in the early morning hours of January 9th ahead of an occluded front. The mixed precipitation quickly changed to snow over the higher terrain as the front passed and cold air was drawn into southern Vermont. Upslope snow continued over higher elevations through the day and into the night before ending on the morning of the 10th. Accumulating snow occurred mainly above 1500 feet elevation in Bennington and western Windham Counties where totals of 6 to 18 inches were observed.

January 4, 2018 - A deep upper level trough swept across the southern US and turned northeastward offshore of the east coast from the morning of January 3 through the morning of January 4, 2018. The interaction between the cold upper trough and the relatively warmer Atlantic waters resulted in tremendous intensification of a surface low pressure system that tracked from around Miami, FL to just offshore of Cape Cod on January 3 and 4. A good deal of moisture wrapped into this system and was lifted across much of the East Coast, resulting in a broad area of moderate to heavy snowfall. A heavy band of snow impacted southern Vermont from the late morning through the afternoon hours of January 4, resulting in snowfall rates up to 3 per hour and total snowfall amounts mainly in the 7-to-15-inch range. Gusty northerly winds occurred with this system as well, with gusts of 30 to 45 mph recorded. The winds and falling snow contributed to reduced visibility and blowing and drifting of snow. The snowfall tapered off

in the evening of January 4. As the system pulled away, brutally cold Arctic air rushed southward into Vermont, resulting in an extended period of extremely cold conditions from January 5 through January 7. The coldest wind chills occurred during the mornings of January 6 and 7, when frigid air combined with westerly winds gusting to 30 to 40 mph resulted in widespread wind chills as low as 20 to 40 degrees below zero. High temperatures on January 6 were mainly in the single digits above and below zero. Many warming shelters were opened across the state as a result of the cold weather.

February 12, 2017 - Two low pressure systems approached the northeastern US on Sunday, February 12, with snowfall breaking out over the local area around sunrise. The snow was heavy at times during the morning and early afternoon, with accumulation rates of 1 to locally 2 inches per hour at times. The snow was wet and dense and readily clung to trees. The snowfall diminished Sunday evening, except over the higher terrain areas of the Greens, where accumulating snowfall persisted through the night and into Monday before diminishing Monday afternoon. In total, 7 to 12 inches of snowfall occurred through most of the local area, with up to 20 over the higher terrain of the Green Mountains.

February 9, 2017 - A low pressure system formed over the Tennessee Valley late on February 8. As this system tracked northeastward, it quickly strengthened, spreading moderate to heavy snow to the north of its track. This system became a full-fledged Nor'easter as it emerged offshore and tracked just off the tip of Long Island. Storm total snowfall of 8 to 14 inches was observed from the wee hours through the early afternoon hours of February 9.

November 20, 2016 - A strong frontal boundary crossed the region during the early morning hours on Sunday, November 20th. Precipitation initially begins as rain or a mix of rain and snow, but quickly transitioned over to just snow as colder air quickly worked its way into the region. Although precipitation only lasted a few hours across valley areas, the snowfall continued through the entire day on Sunday November 20th and into the day on Monday November 21st across the higher elevations of the southern Green Mountains, as the persistent westerly flow caused upslope flow. While valley areas only saw a few inches of snowfall, the highest elevations around Woodford saw up to 26 inches. As a result of the snowfall, travel was severely hampered across the high terrain. In addition, the snowfall combined with gusty winds caused some power outages across southern Vermont as well.

Invasive Species: Plants and Insects

Invasive plant species are a region-wide hazard and 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 health**¹⁶.

Burningbush (*Euonymus alatus*), an invasive shrub often planted in local yards, has its seeds carried by birds to nearby woods, where they grow well in those undisturbed areas, crowding out native plants. The homeowner with them in their yard may not realize this spread is happening.

Keep in mind that “exotic” may be hard to define. For example, Black locust (*Robinia*

¹⁶ (USDA) https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/technical/ecoscience/invasive/?cid=nrcs142p2_011124

pseudoacacia) is native to the US, mainly in and near the Ohio River Valley, but it is not native to Vermont. It was brought here by settlers who planted it mainly to use for fence posts. It spreads rapidly to undisturbed woods, so it is considered invasive in Vermont.

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 which serve as avenues 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.

Heavy travel corridors like Route 112 and Green River Road in Halifax are also highways for the spread of invasives. Waterways and riparian areas are also corridors that invasives can overtake and spread along. In Halifax, where the roadways tend to follow rivers and streams closely, invasive plants could be particularly troublesome. This situation is likely to be exacerbated with the impacts of climate change. As our region gets warmer, more wet or dry depending on the season and native plant and animal species that are accustomed to certain growing conditions will be further crowded out as these conditions begin to differ more and more from the species optimal growing conditions.

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

Common name	Latin name	Locations	Threats	Control
Japanese Knotweed	<i>Fallopia japonica</i>	Banks rivers and many brooks	Can grow through asphalt, into basements, and block trails; more likely to wash out than natives	Mowing (endless), repeated cutting & digging (3-10 years),
Asiatic (Oriental) bittersweet	<i>Celastrus orbiculatus</i>	Roadsides, other disturbed areas	Can cover utility poles, buildings, trees; displaces natives	Excavation including roots
common and glossy (European) buckthorn	<i>Rhamnus cathartica</i> & <i>R. frangula</i>	Clearcuts, woodland edges	Prevents regrowth of native trees	Excavation including roots

Japanese & Common barberry	<i>Berberis thunbergii</i> & <i>B. vulgaris</i>	Planted shrub, escapes to woods	Increases deer mice which harbor deer ticks with Lyme disease	Excavation including roots
Burningbush	<i>Euonymus alatus</i>	Planted as ornamental, birds spread seeds to woods	Displaces native shrubs	Excavation including roots
Amur, Morrow's, Tartarian, and Bell's honeysuckle	<i>Lonicera mackii</i> , <i>morrowii</i> , <i>tatarica</i> , <i>x bella</i>	Planted as ornamental, birds spread seeds to woods	Displaces native shrubs	Excavation including roots

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. 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. This will be particularly important because most of the land in Halifax is privately owned. As such the homeowner is responsible for stopping the spread of invasives and there are minimal ways the town can impact this.

Invasive vines can cover utility poles and make servicing the lines, transformers, and junction boxes on them very difficult.

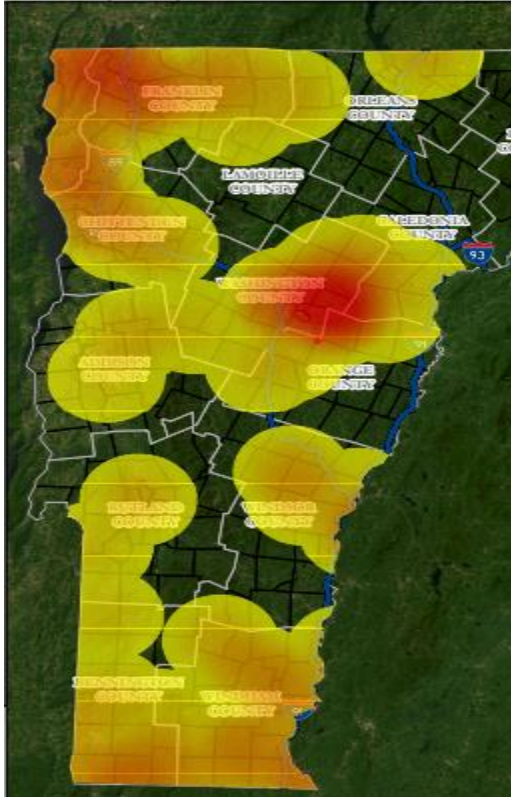
Preventing the spread of invasive plants is something that everyone can assist with. The first step is to not plant non-native plants on your property and to remove invasives that exist. Additionally, it is important that when soil is disturbed, to plant native cover before invasives have a chance to 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 insects. Mowing roadsides from the north to the south can also help prevent the migration of invasive seeds on-site¹⁷.

VTinvasives.org is a great resource for towns interested in engaging in activities around invasives, including using their template to develop a custom invasive species plan for your town. The idea is to continue to create as much awareness as you can so residents know who to call when they see things. The sooner an outbreak is found, the better the chances of containment. Bio-controls are being worked out currently but aren't yet a solution. Insect pests are often found first by concerned citizens, members of the Conservation Commission, arborists and foresters.

¹⁷ Vermont Fish and Wildlife Department: Wildlife Action Plan. Developed 11/22/05. Accessed 3/2/15. http://www.vtfishandwildlife.com/library/reports_and_documents/vermonts_wildlife_action_plan/_/_report/7_appendix/k_invasive_exotic_and_pest_species.pdf

Top Invasive Forest Pests and their Impacts

Non-native invasive species cause irreversible impacts on tree health, forest composition, and biodiversity. Three non-native insects which currently threaten Vermont are the emerald ash borer (EAB), Asian longhorned beetle (ALB) and hemlock woolly adelgid (HWA). Hemlock woolly adelgid is currently present throughout the state, including Halifax. Initially discovered in Orange County in February 2018, Emerald ash borer (EAB) has spread quickly and as of this writing been determined the in-orange areas on the below map and was confirmed in Halifax in 2023. Asian longhorned beetle are within fifty miles of Vermont's border. Over half of the trees in Vermont are host species of one of these three invasive insects.¹⁸



Emerald ash borer (shown above)

Emerald ash borer (EAB), *Agrilus planipennis*, is an exotic beetle that was discovered in southeastern Michigan near Detroit in the summer of 2002. The larvae feed in the cambium between the bark and wood, producing S-shaped galleries that girdle and kill branches and trees. Emerald ash borer probably arrived in the United States on solid wood packing material carried in cargo ships or airplanes originating in its native Asia. It first came into Detroit and killed off all the ash trees in the city, which had been planted after the city's elm trees had been killed by Dutch elm disease. The United States Department of Agriculture Animal and Plant Health Inspection Service (APHIS) does inspections at ports and terminals, but only inspects about 7% of materials coming into the US. Emerald ash borer has spread rapidly in the United States, killing millions of trees. EAB has been confirmed in other towns within the Windham Region, including Halifax. Carefully planning and managing the movement of infested or potentially infested material will slow the spread and provide greater protection for uninfested forests. EAB is currently present in 33 states (most recently in Maine).

Map provided by VTinvasives.org and current as of 8/11/2023.

White ash is one of the ten most common tree species in Vermont, so this insect will have a major impact in Vermont. EAB only feeds on Ash trees, but that is 7% of Vermont's tree species. EAB can travel faster than Asian longhorned beetle. 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.

¹⁸ vtinvasives.org (accessed 2/20/15)

Signs and Symptoms: Symptoms and signs include D-shaped adult exit holes, bark splitting, serpentine frass-filled (sawdust-like waste) feeding galleries, wood pecker feeding, crown dieback, and epicormic shoots (whips growing off the trunk and branches). Many of these symptoms and signs are similar to other insects and diseases of ash.



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

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.¹⁹

A native ground-nesting wasp, *Cerceris fumipennis*, is providing a handy solution to the EAB detection problem. This wasp will prey on the adult emerald ash borers (as well as related native beetles) and carry them, paralyzed, back to its burrow. The paralyzed beetle is then stored underground as food for the wasp's larva.

Hemlock woolly adelgid

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.

The HWA first arrived in the southeast U.S. and spread to the northeast through the Long Island Sound. 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. Making its presence in Halifax likely. It is now found in approximately 14-15 Windham Towns, including Halifax HWA is moving south to north in lower elevations first, and is mostly throughout southern Vermont at this point. Dead or dying

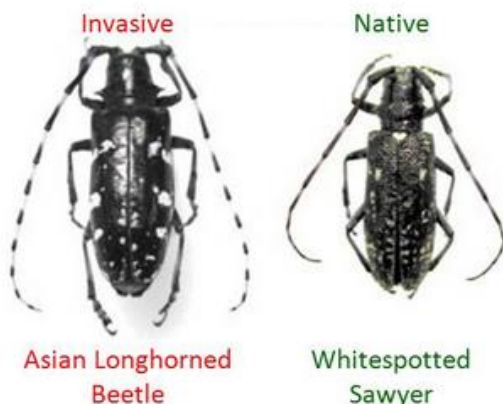
¹⁹ University of New Hampshire Cooperative Extension – Blonding on Ash trees information sheet. <http://extension.unh.edu/resources/files/Resource004103_Rep5824.pdf> Accessed 3/2/15.

hemlocks are a sadly regular sight in the region. It was first found at the SIT campus in 2010 and is now found throughout the town of Brattleboro.

Whole stands of hemlock trees and 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 fungi and disease, may result in their mortality. Another pest, Hemlock elongate scale was found recently for the first time in Guilford, Vernon and Brattleboro.

Asian longhorned beetle²⁰

The Asian longhorned beetle (ALB), *Anoplophora glabripennis*, is an invasive insect that feeds on certain species of hardwood trees, eventually killing them. Also known as the Starry Sky or Sky Beetle, the ALB is native to eastern Japan, and Korea. It was brought to the US, to New York City first, in packing material from Asia. ALB attacks a variety of native hardwood species, including maple, birch, elm, poplar, horse chestnut and willow. ALB prefers maples and does not like trees in the oak family. Upon hatching, the larvae tunnel through the heartwood of a host tree until fully grown. They then burrow out of the trunk as adult beetles. This process weakens the wood, making it prone to breakage, and can cause tree health to decline. Outbreaks of this beetle pose a severe threat to even perfectly healthy trees in both forests and urban or suburban landscapes. The beetle has caused tens of thousands of trees to be destroyed in Illinois, Massachusetts, New Jersey, New York and Ohio. Trees that aren't destroyed by people trying to prevent the spread are usually killed by the pest within a couple years. About half of Vermont's trees are susceptible to Asian longhorned beetle. This insect will have a major impact if it becomes established in Vermont.



Signs and Symptoms of Infestation: Oval to round wounds on the bark where the females have chewed out a site to deposit their eggs. Round emergence holes in the trunks and branches of trees. Piles of coarse sawdust at the base of trees.

The closest area to the Windham region that has the pest is Worcester County, Massachusetts in 2008. And they have an active quarantine and public notification campaign about the pest.²¹ They are having to destroy every host tree, infected or not, and will be replanting trees from the oak's genus. Boston had a small outbreak which they believe was caught in time. New York and Ohio also have

quarantines in affect in their boundaries to prevent the spread. ALB has not been detected in upstate NY or in NH. It is difficult to spot infected trees from the ground, so inspectors need to

²⁰ <http://www.maine.gov/dacf/php/caps/ALB/ALBdamagepics.shtml>

²¹ <https://vtinvasives.org/invasive/asian-longhorned-beetle> Accessed 8/09/23.

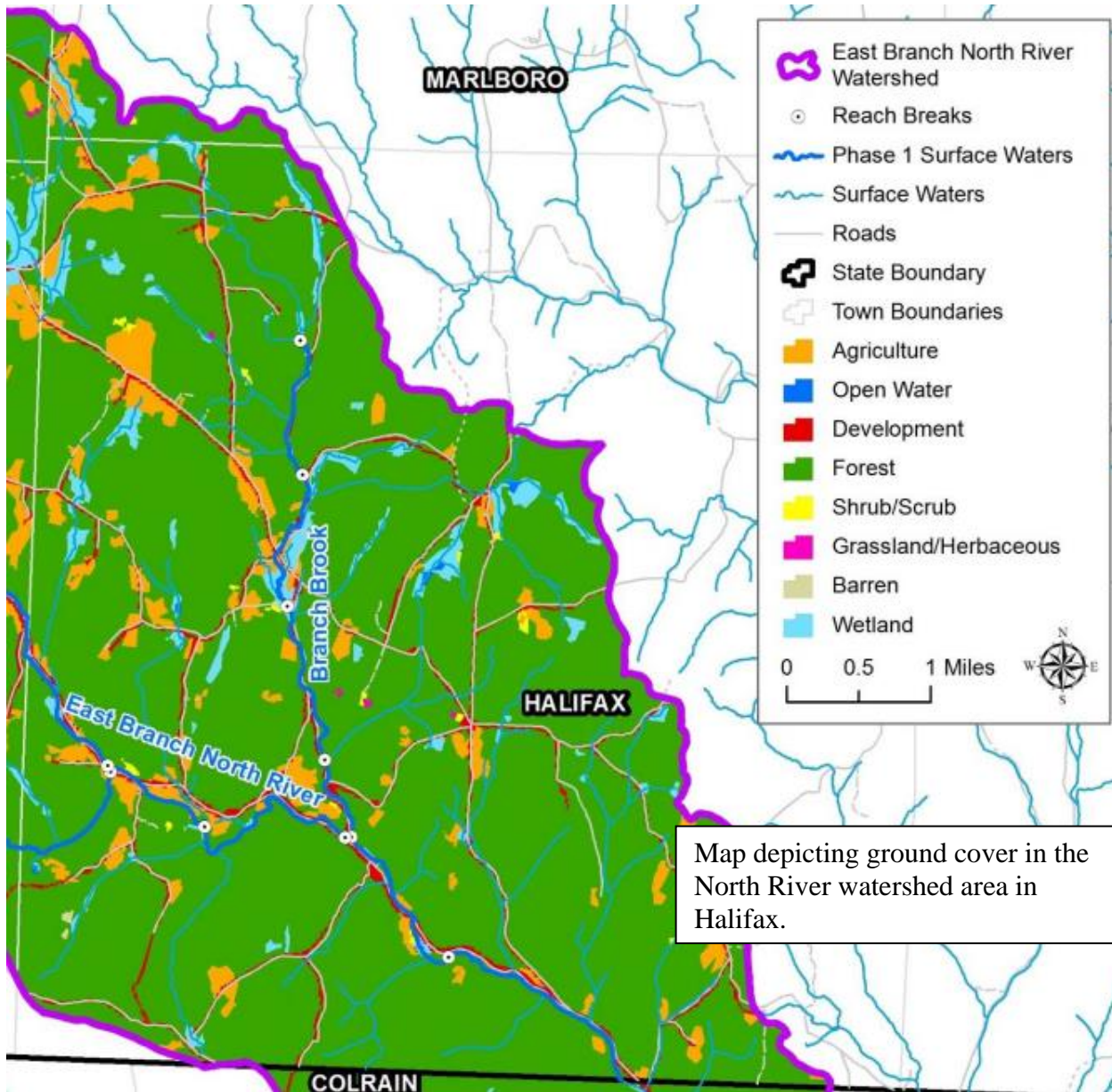
climb trees. To treat wood for transport it needs to be heated to at least 160 degrees for longer than 75 minutes.

Invasive Species Impact

The impacts of invasive species have ripple effects that go on and on. Hemlock is a foundational tree species, and when it goes away invasive plant species tend to take over, causing wildlife habitat and water quality to decrease. Deer use hemlock stands to winter over in because of the cover a healthy tree provides, so there could be a detrimental impact to the deer population, and hunting, caused by the loss of hemlock. Hemlocks provide shade to waterways, so their loss could mean warmer streams and lower water quality, potentially impacting aquatic life. The hemlock isn't a comparatively very valuable wood product, but it is used for logging and wood products, so there are economic threats to its loss. The large deer population is causing the loss of new trees to regenerate the forest hardwoods, thereby leaving vulnerability for invasives to come in.

Ash logs are more valuable than hemlock logs, but the bigger concern with the loss of ash is the cascading ecological impacts. There are over 40 arthropod obligate species that are threatened by the loss of ash trees (they depend on ash for their survival), and ripple effects of the loss of these arthropods and the interrelationships aren't fully known at this point. Ash is a valuable tree for wood products and logging, so the economic impacts could be severe. Also important are, the costs to towns for removing dead or dying trees, and the aesthetic and community open space impacts caused by their loss. Ash trees are about 12% of the forest cover in Vermont, and there are pockets of lots of ash in Halifax. Halifax has completed an ash tree survey, to know where vulnerable trees are located. They have not completed an invasive species preparedness plan. Interested private citizens can obtain purple traps for assistance with early detection of EAB on their property to aid in these mitigation efforts.

The loss of maple trees to ALB, could mean a devastation to the maple industry, a major industry in Vermont, including in Halifax. A lot of people sugar in Halifax, not all commercial, but it is a big activity in Halifax and the surrounding towns. Economic impacts could be great. Sap can't be used once a maple is treated with insecticide, and the lag time before it can be used again is unknown. Fall foliage tourism is a big draw for visitors to Vermont and this would be big loss of "leaf peepers" who are a big drive of the economy for the area.



Probability

As mentioned earlier in this section, emerald ash borer and hemlock wooly adelgid are currently known to be present in the state of Vermont. Asian longhorned beetle has been found within fifty miles of Vermont's border. Halifax's EAB infestation is newly discovered while HWA has been confirmed in Halifax and other towns in the Windham region. Additionally, certain invasive plant species are present in every town in the region. With the impacts of climate change being felt all around us there are invasive species, both plant and insect, that will be present in Vermont that are not current here. Asian Longhorn Beetle (ALB) is one such species that could make an appearance in Halifax in the future. A warming climate and seasonal precipitation swings could make southern Vermont more attractive to invasives depending on their optimal growth conditions. These same factors could make it more difficult for native species to flourish in Vermont.

Extent

Over half of the trees in Vermont are host species of one of these three main pests, so the potential impact is great. EAB only feeds on Ash trees, which are 7% of Vermont's tree species and a strong component of beech/birch forest stands. Southeastern Vermont has primarily white ash and green ash, while black ash is less common here, they are found more so to the north. Green ash is common in urban environments because they are good shade trees and do well in an urban setting. Newfane is an example of a town in the Windham region that has planted a lot of green ash trees, so they are particularly vulnerable to EAB.

Ash planted on roadside rights of way have the highest potential for infestation of EAB. There is the potential for hundreds of dead Ash trees along roadways throughout the state and near extinction of Ash trees, creating a potentially hazardous situation when cutting them down. The current mortality rate is 99.8% of trees infected with EAB. Conversely, not cutting the dead trees down could lead to other potentially hazardous situations like ice jams, downed powerlines and blocked roadways. Green Mountain Power expects EAB to severely impact their grid over time, so they are proactively removing vulnerable Ash trees near their power lines in confirmed affected areas. Areas that haven't been confirmed must contract for tree removal for trees they are concerned with.

Being proactive is key for stopping, or curtailing, the spread when pests are detected. An inventory of roadside ash trees is a good thing for towns to do; Halifax has completed an Ash Tree Inventory. Training road crews to identify threats and who to alert of outbreaks is also a good idea and is included in the Mitigation Action Table. It is the hope of the Tree Warden and Conservation Commission to map the results of the Ash Tree Inventory. This will allow removal of infected trees with greater efficiency. With a 5-person road crew and little to no money available to hire removal contractors' efficiency in operations is critical for Halifax. The town, to date, has yet to complete an EAB preparedness plan. Numerous towns (including Brattleboro) in Vermont have developed EAB preparedness plans. By completing a preparedness plan for applicable invasive species will get the community on the same page as to community needs and goals as they relate to the identified invasives. Ash trees can be treated to prevent EAB, and weighing the cost of proactive treatment versus removal of dead trees and replacement is something a community should consider. This effort can be aided or directed with a preparedness plan.

There are EAB insecticides that are registered for use in VT and they are fairly effective at protecting trees, but they have to be applied to each tree individually so this isn't practical to protect all ash trees in a forest environment, but is a good option for an urban tree canopy. Halifax town officials may consider conducting an Ash tree survey and treatment of ash trees on town properties or within town owned rights of ways. Trees have to be retreated every one to two years because of the insect's life cycle. Treating all ash trees as described could prove to costly or outside the capacity of the town. ALB eradication is to cut and chip all the trees that are infested. There is another insecticide that works for ALB, but it is only effective if the tree is treated before the larvae burrow too deeply into the wood beyond the tree's vascular system. The ALB larvae spend a lot of time in the interior wood, out of the vessel system of the tree so they aren't exposed to the insecticide.

The worst example of the potential impact of ALB infestation in the region. is Worcester County, Massachusetts. This problem has been going on since 2008, although upon detection it was well established, as much as 15 years went by before it was discovered. The Massachusetts ALB Cooperative has confirmed a regulated area of 110 square miles, which

has been expanded over time from the original 17 square miles considered infested. This area is under strict regulation by order of the Commonwealth of Massachusetts, no one can cut, move, harvest, carry, transport or ship firewood, green lumber and other material within or outside of the affected area unless authorized. These are significant restrictions, so the impact of ALB detection should be taken very seriously as it affects numerous hardwood species.

ALB can be eradicated when discovered early. It is usually found in industrial settings, because it usually arrives in pallets from an Asian shipment. ALB is now being moved around through human activities, especially through the movement of firewood. It is easier to detect ALB than EAB because the ALB is larger.

Invasive plants are a threat to the ecology and economy of Halifax. Long-standing and spreading forest threats in the Windham Region are glossy buckthorn, purple loosestrife, Japanese barberry, multi-flora rose, Japanese knotweed, cow parsley, and garlic mustard, and Asiatic bittersweet. There are more and more invasive plants moving up along roadways and waterways from lowland areas. All threaten forest regeneration, and multi-flora rose and Asiatic bittersweet can destroy mature trees. Smaller invasive plants such as garlic mustard, purple loosestrife, and goutweed present a threat to native herbaceous plants. The health threat posed by Japanese barberry should be noted: According to Jeffrey Ward, Chief Scientist at the Connecticut Agricultural Experiment Station, a forest infested with Japanese barberry harbors an average of 120 black-legged ticks per acre while a forest without barberry harbors an average of only 10 black-legged ticks per acre. Black-legged ticks are known to transmit the causal agents of several diseases, including Lyme disease. Flooding events like TS Irene and the recent 2023 flooding spread a lot of invasive plants around the region through the transport of seed material from various sources. Logging, and particularly clear cutting, create areas that are particularly susceptible to invasives. Logging is a frequent occurrence in Halifax as a large percentage of the town is in the Current Use program. Logging is recognized as an important industry in Halifax and statewide.

VTinvasives.org is a great resource for towns interested in engaging in activities around invasives, including using their template to develop a custom invasive species plan for your town.²² The idea is to continue to create as much awareness as you can so residents know who to call when they see things. The sooner an outbreak is found, the better the chances of containment. Bio-controls are being worked out currently but aren't yet a solution. Insect pests are often found first by concerned citizens, arborists and foresters. Halifax tree warden, Sue Kelly has been instrumental in the documentation of species present in Halifax as well as providing insight into current and potential future mitigation actions. Halifax does currently have a Conservation Commission and one person on the Conservation Commission is a trained first detector.

Past Occurrences: Invasive species cannot be categorized or filed into "events" These pests are a part of everyday life and are present in Halifax.

Other Sources Used

Phone call with Halifax Tree Warden Sue Kelly on 8/9/2023(drsuekelly@gmail.com); Phone call with Conservation Commission member Stephan Chaite (stephan599@verizon.net); Email from State Hazard Mitigation Planner Caroline Paske on 8/8/23;

²² < <http://www.vtinvasives.org/tree-pests/community-preparedness>>

HAZARDS NOT ADDRESSED IN THIS PLAN

Wind: The planning team participants rated high winds to be a hazard that does not pose a risk to Halifax. While the planning team participants rated high winds higher on the frequency scale but low on impact to the community overall. This is consistent with the SHMP.

Heat & Cold: While heat and cold can be an issue in Halifax the low overall hazard score from the survey indicated that these hazards need not be covered in great detail. There was discussion that these hazards be included in any mailers or informational bulletins that the town may send out in the future. This is consistent with the SHMP.

Drought, Landslide, Wildfire, Earthquake, hail, infectious disease: These hazards were not addressed due to perceived lack of risk to the hazards. While some of these hazards ranked in the top four for one of frequency or impacts, generally they all rated low on these scales. It was discussed in the July 20, 2023 meeting that the extremely low likelihood of these hazards occurring in Halifax made it impractical to cover them in detail. This is consistent with the SHMP.

ASSESSING VULNERABILITY

Structures in the SFHA or River Corridor

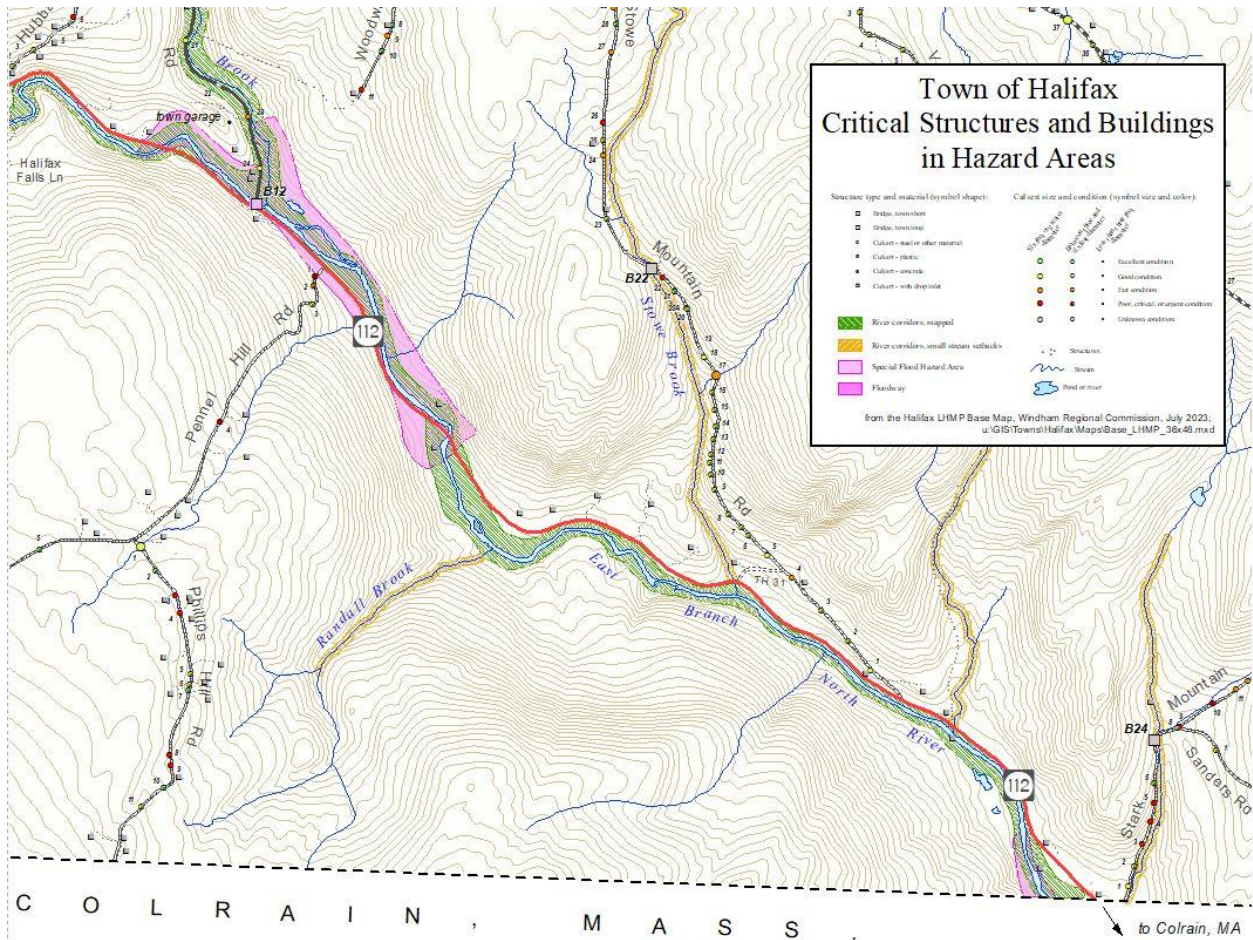
There are approximately 5 buildings within FEMA-designated Special Flood Hazard Areas (SFHAs).²³ The map on the following page shows structures (red and orange dots on map) that are located in the SFHA. The 5 are all in the larger SFHA, near the intersection of Route 112 and Branch Road. These structures are particularly vulnerable to flooding and fluvial erosion hazards described in this plan.

Properties within SFHAs, that have a mortgage, are required to purchase flood insurance. Halifax's participation in the National Flood Insurance Program (NFIP) gives residents access to discount flood insurance through the National Flood Insurance Program. Flood insurance can still be purchased privately; however, it is more expensive. Development in SFHAs must meet additional construction standards as outlined in Halifax's floodplain regulations, which is part of their zoning ordinance and was adopted in March 2012. Halifax joined the NFIP in 2012. There is only one active flood insurance policy through the NFIP in effect in Halifax per the FEMA NFIP Insurance Report, 2018.

There are thirty-six (36) structures in the River Corridor in Halifax. This is about 6% of the total number of structures in Halifax.²⁴ Adding River Corridor regulations to the floodplain bylaw in the town zoning would impact substantial improvements/replacements of these structures, as well as any new development in the River Corridor.

²³ 2023 Flood Hazard Summary Sheet for Halifax

²⁴ There are currently 594 structures in Halifax.



Critical Facilities

Below is a list of the most critical structures in Halifax and they are all shown on the map, as well. Two or <1% of the total critical or public structures in Halifax are within the SFHA. Critical facilities are considered vulnerable to any and all natural hazards facing the community and would be prioritized for restoration and mitigation in the event of any damage or outage.

- Town Office, West Halifax Village
- Fire Company, West Halifax Village
- Elementary School, West Halifax Village
- Town Garage, Branch Road near Hwy 112 intersection
- Post Office

Repetitive Loss Structures

According to Vermont Emergency Management, Halifax has 0 repetitive loss claims.²⁵ The latest records also indicates that there are no (0) active NFIP policies in Halifax. A repetitive loss structure is an NFIP-insured structure that has had at least 2 paid flood losses of more than

²⁵ Email communication with Caroline Paske of Vermont Emergency Management, dated 08/08/2023.

\$1,000 each in any 10-year period since 1978.²⁶ Severe repetitive loss (SRL) structures are NFIP-insured buildings that, on the basis of paid flood losses since 1978, meet either of the loss criteria described in the SRL section. SRL properties with policy effective dates of January 1, 2007 and later will be afforded coverage (new business or renewal) only through the NFIP Servicing Agent's Special Direct Facility (SDF) so that they can be considered for possible mitigation activities. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

Participation in and Compliance with the National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) is a voluntary program organized by FEMA that includes participation from 20,000 communities nationwide and 247 Vermont towns and cities. Combined with floodplain mapping and floodplain management at the municipal level, the NFIP participation makes affordable flood insurance available to all homeowners, renters, and businesses, regardless of whether they are located in a floodplain.

The NFIP was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that: 1) require any new residential construction within the 100-year floodplain to have the lowest floor, including the basement, elevated above the 100-year flood elevation; 2) allow non-residential structures to be elevated or dry flood proofed (the flood proofing must be certified by a registered professional engineer or architect); 3) require anchoring of manufactured homes in flood prone areas. The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed.

In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the purchase of flood insurance as a condition of any federally regulated, supervised or insured loan on any construction or building within the 100-year floodplain. In 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act to reduce subsidies for structures built before the NFIP was instituted (called pre-FIRM structures). Over 50 percent of Vermont's NFIP policies are pre-FIRM, which means that flood insurance premiums for many will increase over the ensuing years.

While the NFIP floodplain management criteria are administered by states and communities through their floodplain management regulations, FEMA's role is to provide technical assistance

²⁶ <https://www.fema.gov/national-flood-insurance-program/definitions>

and to monitor communities for compliance with the minimum NFIP criteria. Halifax joined the NFIP on November 1, 2012 and is a member in good standing (CID 500281). The latest floodplain ordinance was adopted 2013 and has been adopted into the zoning ordinance. The latest Flood Insurance Rate Maps (FIRMs)(50025C0490E) and Flood Insurance Study (FIS) referred to in the development of this plan have an effective date of September 28, 2007.

The Town works with the elected officials, Windham Regional Commission, the state and FEMA to correct any compliance issues and prevent further NFIP compliance issues through continuous communications, training and education.

The latest record indicates that there is one flood insurance policy holders in Halifax.²⁷ There have been no NFIP claims filed in Halifax since joining the NFIP.²⁸ Halifax may want to do public outreach to encourage the purchase of flood insurance for people in the SFHA, River Corridor and the FEMA 500-year floodplain (Zone X on the FIRMs). Flood insurance is reasonably priced in these areas, and covers damage from fluvial erosion, as well as inundation flooding. Nearly 20% of flood insurance claims nationally are for flood damage to buildings located outside the SFHA. It should be noted that flood insurance does cover flooding damage resulting from dam failure and fluvial erosion.

The Zoning Administrator reviews all development permit applications to determine if the property and/or building is located in any floodplain boundaries, meets all minimum development standards and otherwise abides by the towns Flood Regulations. If so, the Administrator reviews the application to ensure that all relevant regulations are proposed to be adhered to and does any needed inspections before working with the Zoning Board or issuing a permit.

If a structure within the SFHA is to be substantially improved then a Conditional Use Permit (CUP) is required.

The Flood Regulations of Halifax define “substantial improvement” as “any reconstruction, rehabilitation, addition, or other improvement of a structure after the date of adoption of this bylaw, the cost of which, over three years, or over the period of a common plan of development, cumulatively equals or exceeds 50 percent of the market value of the structure before the “start of construction” of the improvement. This term includes structures which have incurred “substantial damage”, regardless of the actual repair work performed. The term does not, however, include either: (a) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specification which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or (b) Any alteration of a “historic structure”, provided that the alteration will not preclude the structure’s continued designation as a “historic structure”.”

They define “Substantial Damage” as “damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged conditions would equal or exceed 50 percent of the market value of the structure before the damage occurred.”

²⁷ Expanded Community Report for Halifax, accessed August 8, 2023.

<https://anrweb.vermont.gov/DEC/FoFReports/SSRSReportViewer.aspx?RepName=ExpandedCommunityReport&Municipality=Halifax>

²⁸ NFIP Insurance Report, accessed August 9, 2023.

https://floodready.vermont.gov/sites/floodready/files/documents/cisrpt_NFIP%206.26.18.PDF

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. The town administers the NFIP minimum requirements related to substantial damage and substantial improvement thresholds.

The Town works with the elected officials, Windham Regional Commission, the state and FEMA to correct and prevent NFIP compliance issues through continuous communications, training and education. The NFIP is administered locally by the Zoning Administrator, who also fulfills the role of Floodplain Administrator.

MITIGATION STRATEGY

Local Hazard Mitigation Goals for this Plan

The below Hazard Mitigation Goals, which were contained in the prior 2016 Halifax Local Hazard Mitigation Plan, were reviewed by the planning participants as part of the Plan update process. The participants felt that the overall goals outlined here remain the town's overall hazard mitigation goals with some room for improvements. The planning participants discussed resiliency as a concept that should be included in the town goals. A new mitigation goal discussed for inclusion relating to overall resiliency efforts to protect our built environment and the fifth bullet has been changed to include resiliency planning integration into other town plans and documents.

- 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.
- Enhance the resilience of our built environment – our communities, infrastructure, buildings, and cultural assets.
- Encourage hazard mitigation/resiliency planning be incorporated into other community planning projects, such as but not limited to the Town Plan, and the Local Emergency Management Plan.
- Ensure that members of the general public continue to be part of the hazard mitigation planning process.
- Maintain capital reserve funds and capital funds to restore essential services after hazard events.

Other Planning Document Policies and Recommendations that Support Mitigation

The Halifax Town Plan was most recently updated in 2019. That planning effort has led to the inclusion of numerous polices that either directly or indirectly impact mitigation and

preparedness for natural hazard events. Other planning documents that support hazard mitigation activities in Halifax are the Green River and East Branch of the North River Corridor Plans. These plans and the implementation policies included are at the end of this section.

2019 Town Plan Policies that Support Mitigation

Land Use - Flood Hazard Area Policies

1. It is the policy of the town to foster the protection and restoration of river corridors, floodplains, wetlands, and upland forested areas that attenuate and moderate flooding and fluvial erosion.
2. It is the policy of the town to protect floodplains, river corridors, land adjacent to streams, wetlands, and upland forests through adoption and administration of flood hazard area regulations governing development in designated Special Flood Hazard Areas and River Corridors, in order to reduce the risk of flood damage to infrastructure, improved property, people, and the environment.
3. New development in identified flood hazard, fluvial erosion, and river corridor protection areas should be avoided. If new development is to be built in such areas, it should not exacerbate flooding and fluvial erosion.
4. The protection and restoration of stream geomorphic equilibrium, floodplains and upland forested areas that
6. Reserve flood hazard areas for agriculture, recreation, or other purposes, which do not significantly impair the land's ability to handle floodwaters.
7. Deny any development within a flood hazard area that restricts or diverts the flow of floodwaters.
8. Ensure the health, safety and welfare of the public during flooding by discouraging all construction within flood hazard areas.
9. Ensure that any property improvements within or in close proximity to a designated flood hazard area are in full compliance with the duly adopted zoning and flood hazard bylaws.
10. Work with the Agency of Natural Resources and the Windham Regional Commission to conduct stream geomorphic assessments, determine what areas are at risk of fluvial erosion, and develop fluvial erosion hazard maps. This information shall form the basis for the establishment of a fluvial erosion hazard zone and related bylaw amendments. 28
11. The Halifax Zoning Administrator shall refer all zoning applications involving the use of flood hazard areas to the Agency of Natural Resources as required under Chapter 117, 24 V.S.A., for review prior to issuing a zoning permit.

Surface Water Policies

1. Ensure that the natural course, condition, and function of watercourses and stream banks not be changed permanently except for necessary crossings by adequate bridges or culverts engineered and designed to minimize the impact on streams.
2. Require that undisturbed vegetation buffers be maintained along the banks of surface waters.
5. Require that Significant Wetlands as identified on the National Wetlands Inventory Maps be protected from development by maintaining an undisturbed, naturally vegetated buffer strip around the wetland edge sufficient to ensure the integrity of the wetland.
7. Require that every effort be made to utilize natural drainages. Deny the rerouting or enclosure of small upland streams and swales in culverts.
10. Ensure that drainage pathways created to protect maintained roadways from erosion do not result in emptying stormwater and silt directly into waterways.

Natural Area Policies

1. Encourage the acquisition of significant natural areas by either gift or purchase.
2. Prevent any development that dredges, fills, drains, floods or otherwise alters any wetland.
3. Encourage the maintenance of all the natural areas identified above and allow public access to all natural areas where appropriate.
4. Require that an adequate vegetated buffer strip be maintained between any development and a natural area.
5. Protect any identified rare, threatened or endangered plant or animal species and Significant Natural Communities.

Emergency Management Policies

1. Require that all new public and private roads and driveways are properly constructed so that they do not contribute to the damage of Town roads from run-off. Driveway permits are required.
2. Encourage the improving of existing roads, and design culverts and bridges to carry a 100-year flood event without damage.
3. Encourage the updating and improvement of emergency evacuation plans including the Local Emergency Management Plan filed annually with the Windham Regional Commission by town officials and the Emergency Management Director.

Fire and Police Protection Policies

1. Provide the facilities and effective equipment for police and fire protection that is within the financial capabilities of the Town.
2. Require that all development be designed and sited so as to minimize the risks of fire and to maximize the fire department's ability to combat fires. Necessary common fire protection features, such as fire ponds and/or dry or charged hydrants, should be installed where practicable by developers and subdividers to ensure public safety.
3. Encourage that smoke detectors be installed in all residential units and commercial establishments.
4. Require that proposals for development include a statement of immediate and long-term impact on police and fire protection services and identify measures to be taken to minimize any additional burden.

Groundwater Policies

6. Require soil and erosion control best management practices during and after construction.
8. Require that road salt storage areas be sited outside the 100-year flood hazard area; the Class 1 or Class II groundwater zones; SPAs and WHPAs; and other areas designated by the Town as important groundwater protection areas and shoreland areas of surface waters.

Communication Tower Policies

2. Communications towers shall preserve the character and appearance of the Town while allowing adequate wireless telecommunications services to be developed.

Cell Phone / Internet Broadband Policies

1. Facilitate bringing broadband and cell phone services to all residents and businesses that wish to have the services.
2. Strengthen town-wide communications through town website expansion and improvements.
3. Educate the community in the use of these devices.

Energy Resources Policies

1. Explore ways to assist area residents and business owners to understand how they can effectively reduce and recycle waste, conserve energy resources and implement alternative energy resources. Encourage the use of on-site or locally obtainable renewable energy resources such as hydroelectric, solar, wood, biomass, and wind as long as such use is consistent with policies of the Town Plan.

Transportation Policies

1. Require that paving a gravel road only take place when there is a definite need for paving that serves the public interest.

4. Coordinate planned road improvements along Route 112 between the Town and Agency of Transportation to ensure adequate road capacities without damage to the rural character or environment of Halifax.

5. Ensure that improvements to roads and the construction of new roads are carried out in strict conformance with adopted Road and Bridge Standards.

Past and Ongoing Mitigation and Maintenance Efforts

Below is an update on prior identified hazard mitigation projects that were listed in the 2016 Halifax LHMP. The planning participants reviewed these actions and provided an update to WRC throughout the Plan update process. Current status is shown in the chart by color. Gray indicates projects that have been completed, green shows projects whose status are known and orange are projects that are either ongoing or partially complete and prioritization changes are called out where applicable.

Changes Since the 2016 Plan

As described in the Town Profile section of this Plan, the Town experienced a slight population decline between 2000 and 2020, and very little new development.

Action	Information in Hazard Mitigation Plan			
	Responsible Party	Timeframe for Completion	Funding Source	Project Priority
Promote VTAAlert sign-up amongst residents and second home owners	EMD	Start Summer 2015 / Complete mid-2016	State funded; town budget	High
Formalize mutual aid/shared services/ equipment sharing agreements with adjacent towns. Having these agreements would save time and effort following disasters when support is needed.	Selectboard / Road Foreman	Started Summer 2015 / Complete by the end of 2016	Town budget	High

Cut trees that obstruct water flow in the Green River and have potential to cause jams. This will now be done every year, with permission from ANR.	Road Crew	First time this was done was Fall 2015. Yearly program.	Town budget	High
New bridge at Sumner Road and Branch Road	Road Foreman	Start and finish Summer 2017	Vtrans Structures grant	High
Green River Bank armoring to create a more permanent fix and stop the annual need for maintenance to protect this section of road.	Road Foreman	Start and Finish Summer 2016	Town budget or grant funding	High
Add fluvial erosion regulations to floodplain bylaw in zoning ordinance	WRC and Planning Commission	Began Summer 2015 / complete March 2016	Town budget / WRC dues	High
Training of Zoning Administrator in floodplain administration	Zoning / Floodplain Administrator / WRC / VT ANR	Ongoing; First training held Fall 2015	Town budget	High
Winchester Road Culvert upgrade	Road Foreman	Start and finish 2017 or 2018	Vtrans grant	Medium
Culvert upgrade on Hatch School Road	Road Foreman	Start and finish Summer 2019	VTrans Structures grant / Town budget	Medium
Stark Mountain Road culvert upgrade	Road Foreman	Start and complete 2017 - Summer to Fall	Town budget, unless grant can be found	Low
Hubbard Hill Road culvert upgrade	Road Foreman	Start and finish 2016	Town budget	Low
New bridge at Branch Road and Route 112	Road Foreman	Hydraulic study by 2017; Start and finish construction Summer 2018	VTrans Structures grant / Town budget	Low

Halifax has made some progress in completing the mitigation projects identified in the 2016 Plan and that is discussed in the Implementation section of this Plan. The town has carried over a few mitigation actions from 2016 that were incomplete and still relevant. They have also identified new priorities based on events, such as significant flooding events and longer power outages, discovered presence of invasive species in town and changes in how significant winter weather impacts the town and its operations that were experienced during the time between the last plan and this updated plan. In the current iteration of the LHMP the planning team and interested residents decided to add Snow & Ice and Invasive Species.

There are ongoing efforts in town that serve to either mitigate for hazards, assist with readiness of town to deal with a hazard, or both. Those efforts are listed here:

1. Leaf removal, tree trimming and culvert/ditch cleaning are maintenance activities done by the road crew. If ditches are being eroded, the crew may also stone or grass line them.
2. The town manages a local emergency operations center (EOC) during disasters:
 - Primary: Halifax Fire Station, 118 Branch Rd. Halifax, VT

- Alternate: Halifax Town Office, 246 Branch Rd. Halifax, VT
3. Halifax is a member in good standing of the National Flood Insurance Program. The floodplain ordinance is kept compliant and the town maintains SFHA maps at the town office.
 4. Provide opportunity for residents to learn about and sign up for VTAlerts, a platform that the state uses to keep residents up to date on hazard information.
 5. The town is also party to several mutual aid agreements and would like to pursue shared service agreements in the future where appropriate.

Identification of Mitigation Actions

The Halifax Hazard Mitigation Planning participants combined with interviews and phone calls with critical town staff and officials identified the following hazard mitigation activities based on an evaluation of hazard event vulnerability and risk.

Actions were prioritized by the plan participants and WRC staff. Most of these are new actions so any shifts in prioritization came out through the plan development process. The following criteria were used in establishing project priorities. The ranking of these criteria is largely based on the best available information and best judgment as many projects are not fully scoped out at this time. Prioritization was done during the meetings for the plan development in discussions among participants and guided by WRC's Emergency Planner as well as interviews and phone calls with relevant town officials or subject matter experts.

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures or structures critical to town operations?
- Can the action be implemented quickly?
- Is the action socially acceptable?
- Is the action technically feasible?
- Is the action administratively possible?
- Is the action politically acceptable?
- Is the action legal?
- Does the action offer reasonable benefits compared to its cost of implementation?
- Is the action environmentally sound?

Mitigation Categories

After assessing the status and relevancy of the mitigation actions from the previous plan, the Hazard Mitigation Planning Team began developing a new list of mitigation actions. To develop a new list of mitigation actions, the Hazard Mitigation Planning Team reviewed the list of strategies in the Town Plan, previous LHMP and other relevant town documents including River Corridor Plans and Conservation Commission newsletters. They also considered the four mitigation action categories as defined by FEMA.

1. Local Plans and Regulations
2. Structure and Infrastructure Projects
3. Natural Systems Protection
4. Education and Awareness Programs

The below table, taken from the Local Mitigation Planning Handbook, clearly defines each of these mitigation types and provides examples for each.

Mitigation Action	Description of Category	Examples of Mitigation Actions
<p style="text-align: center;">1</p> <p>Local Plans and Regulations</p>	<p>These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.</p>	<ul style="list-style-type: none"> • Comprehensive plans • Land use ordinances • Building codes and enforcement • Capital improvement programs • Open space preservation • Stormwater management regulations and master plans
<p style="text-align: center;">2</p> <p>Structure and Infrastructure Projects</p>	<p>These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure.</p> <p>This type of action also involves projects to construct manmade structures to reduce the impact of hazards.</p>	<ul style="list-style-type: none"> • Acquisitions and elevations of structures in flood prone areas • Utility undergrounding • Structural retrofits. • Floodwalls and retaining walls • Detention and retention structures • Culverts • Safe rooms
<p style="text-align: center;">3</p> <p>Natural Systems Protection</p>	<p>These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.</p>	<ul style="list-style-type: none"> • Sediment and erosion control • Stream corridor restoration • Forest management • Conservation easements
<p style="text-align: center;">4</p> <p>Education and Awareness Programs</p>	<p>These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public is more likely to lead to direct actions.</p>	<ul style="list-style-type: none"> • Radio or television spots • Websites with maps and information • Real estate disclosure • Mailings to residents in hazard-prone areas. • StormReady • Firewise Communities

Cost-Benefit Analysis

As part of public engagement and Halifax staff discussions, there was a rough cost/benefit analysis done for each action listed in the table and those results are shown in the table. The below cost and benefits tables address the priorities for the mitigation strategies that are stated in the Mitigation Actions Table. This was how the mitigation actions were assessed by the Hazard Mitigation Planning Team. Priority was assessed somewhat independently of cost/benefit and was based more on the need of each action and availability of funding, versus what the action costs and benefits.

At the time of applying for FEMA's PDM-C, FMA or HMGP grant programs, each project listed below will undergo full benefit-cost analysis (BCA) methodology, version 5.1 or higher to maximize savings. Whenever possible, Wilmington will utilize 406 mitigation funding.

Cost Estimates

High	= >\$100,000
Medium	= \$25,000 – 100,000
Low	= < \$25,000

Benefit Estimates

High	Public Safety
Medium	Infrastructure/ Functionality
Low	Aesthetics/ General Maintenance

Mitigation Actions Identified by the Hazard Mitigation Planning participants

	HAZARD(S) ADDRESSED	Issue Detail	ACTION	RESPONSIBLE ENTITY	Start/End Dates	POTENTIAL FUNDING	Mitigation/Preparedness	PRIORITY	Cost/Benefit	Notes
1	All	Communications with residents during storm events is an problem. By encouraging VAlert residents can get up to date storm information and make better, more informed decisions	Promote VAlert sign-up amongst residents and second home owners	EMD/Town Staff	2023-2028	State funded; town budget	Preparedness	High	low/high	
2	All	Being a rural town, Halifax needs to work with neighboring towns to provide efficient and effective solutions.	Formalize mutual aid/shared services/ equipment sharing agreements with adjacent towns. Having these agreements would save time and effort following disasters when support is needed.	Selectboard / Road Foreman	2023-2028	Town budget	Preparedness	High	low/high	
3	All	Communications with residents during storm events is an problem. By encouraging VAlert residents can get up to date storm information and make better, more informed decisions	Send information to residents on state preparedness/mitigation programs	EMD/Town Staff	2023-2028	Town Budget/Grants	Preparedness	Low	low/high	
4	All	Information is a key element in decision making for towns and residents alike. By sending residents the most current hazard information they can be better prepared for the next storm event.	Send information regarding hazards impacting Halifax and ways for residents to be better prepared	EMD/Town Staff	2023-2028	Town Budget/Grants	Preparedness	Low	low/high	
5	Flooding/Fluvial Erosion	Ice Jams can be very destructive and costly for towns. By eliminating the most ideal conditions for ice jams to form the town can lower the chance of damage from this hazard type.	Cut trees that obstruct water flow in the Green River and have potential to cause jams. This will now be done every year, with permission from ANR.	Road Crew	2023-2028	Town budget	Mitigation	High		Done Once
7	Flooding/Fluvial Erosion	Preparedness activities can have a huge impact during storm events. Properly training and equipping the Zoning Administrator will lower overall risks in town by not allowed development in flood hazard areas.	Training of Zoning Administrator in floodplain administration	Zoning / Floodplain Administrator / WRC / VT ANR	Yearly/As Needed	Town budget	Preparedness	High	low/med	

8	Flooding/Fluvial Erosion	Properly sized culverts are critical pieces of infrastructure during storm events to carry water away from flood prone areas efficiently.	Stark Mountain Road culvert upgrade	Road Foreman		Town budget, unless grant can be found	Mitigation	Low		Upper Section Complete
9	Flooding/Fluvial Erosion	Properly sized culverts are critical pieces of infrastructure during storm events to carry water away from flood prone areas efficiently.	Hubbard Hill Road culvert upgrade	Road Foreman		Town budget	Mitigation	Low		
10	Flooding/Fluvial Erosion	Properly sized culverts are critical pieces of infrastructure during storm events to carry water away from flood prone areas efficiently.	New bridge at Branch Road and Route 112	Selectboard		VTrans Structures grant / Town budget	Mitigation	Low		
11	Flooding/Fluvial Erosion	Properly sized culverts are critical pieces of infrastructure during storm events to carry water away from flood prone areas efficiently.	Upgrade culverts as necessary through the towns culvert inventory	Road Foreman		VTrans Structures grant / Town budget	Mitigation	High	Variaed	Action includes multiple projects and or locations
12	Flooding/Fluvial Erosion	Maintaining good standing in this programs offers lower rates for flood insurance and allows the town to recoup additional funding after storm events.	Maintain the towns good standing within the NFIP.	EMD/WRC	Ongoing	Town Budget	Preparedness	High	low/low	
13	Flooding/Fluvial Erosion	Properly maintained culverts and bridges can have implications during storm events as improperly maintained infrastructure is more prone to damage from storms.	Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	Road Crew/Private Contractors	Yearly/As Needed	Town Budget	Preparedness	High	Varied	
14	Snow and Ice	Power outages are a concern in Halifax with some residents out of power and cut off for weeks during TS Irene	Work with Utility Companies to protect utility infrastructure	Selectboard/WRC	Ongoing	Town Budget/Grants	Mitigation	low	Varied	
15	Flooding/Fluvial Erosion/Snow and Ice	Some residents were out of power and cut off for weeks during TS Irene. Knowing where to find residents that are more vulnerable to these hazards is the first step in assisting during storm events.	Assist Vulnerable Populations	Selectboard/WRC	Ongoing	Grants	Preparedness	High	low/high	
16	Flooding/Fluvial Erosion/Snow & Ice	Keeping both primary and alternate shelters stocked and in good repair is essential during a storm event.	Ensure town emergency shelter & all other critical buildings are well stocked and in good repair	EMD/Selectboard	Ongoing/Yearly	Town Budget/Grants	Preparedness	High	low/high	
17	Flooding/Fluvial Erosion/Snow & Ice	Dirt roads turn into mud and are very difficult to maintain efficiently.	Where appropriate pave town roadways with hard, easy to plow surfaces	Selectboard/Road Crew	Ongoing	Grants/Vtrans	Mitigation	low	high/med	

	Flooding/Fluvial Erosion	There are many privately owned bridges in Halifax	Identify and assess privately owned bridges with cooperation of property owners	EMD/Selectboard	0-5 years	Grants	Preparedness	Low	Low/low	
18	Invasive Species	Road Crew members are out along roadways all day and are the most likely to spot invasives on a daily basis.	Train road crew members on Invasive Plant/Insect identification	Tree Warden	Yearly/As Needed	Town budget, unless grant can be found	Preparedness	low	low/low	
19	Invasive Species	Residents should be able to recognize common invasives including EAB.	Training/Education for community members to recognize Emerald Ash Borer	Conservation Commission/Tree Warden	As needed	Grant from ANR	Preparedness	low	low/low	
20	Invasive Species	Having invasive species plans for public lands and ROW will aid the town in managing the spread of invasives.	Prepare invasive species management plans for publicly owned lands and rights of way in Halifax	Conservation Commission	0-5 years	Grants	Preparedness	low	med/med	Action includes multiple projects and or locations
21	Flooding/Fluvial Erosion + Snow/Ice	Properly equipping the road crew to maintain the towns roadways is crucial. During a storm event the road crew will be more effective and impactful with the right equipment	Provide additional equipment to the road crew to properly and safely maintain town roads	Selectboard / Road Foreman	ongoing	Grants/Vtrans/Town Budget	Preparedness	low	high/med	
22	Invasive Species	Mapping this data will aid in the towns efforts to combat the spread of various invasive pests.	Map the data compiled in the Ash Tree Inventory	Conservation Commission	0-1 years	ANR Grant	Preparedness	med	low/low	
23	Invasive Species	It is important for town residents to know about programs available to them in order to combat the spread of invasives.	Inform residents of state/federal mitigation programs related to invasive species.	Conservation Committee/Tree Warden	0-1 years	Town Budget	Preparedness	med	low/low	
24	Flooding/Fluvial Erosion	Implementing these plans should have a long term impact of the town, its finances and overall safety of residents.	Implement both the Geen River and East Branch of the North River Corridor Plan	Selectboard/Road Crew	Ongoing	FEMA Grants/Town Budget	Mitigation	high	Varied	Action includes multiple projects and or locations
25	Flooding/Fluvial Erosion + Snow/Ice	Some roads or bridges should be considered for winter closure or even possible permanent closure / reclassification should storm repair expenses exceed the actual usage and perceived public good of the highway	Create/rebuild road prioritization plan	Selectboard	2-5 years		Mitigation			

Implementation of Mitigation Actions / Capabilities

Barriers to Implementation:

1. Financial constraints of town budget
2. Limited staff at town level
3. Small population means limited tax base
4. Large number of second homes
5. Village of West Halifax is susceptible to flooding
6. Green River Road, one of the main roads in town, is entirely within the River Corridor. Many other roads in Halifax are also in the River Corridor. Many of the roads in Halifax are also steep.
7. Floodplain Administrator needs training
8. Poor town wide communication infrastructure

Capabilities to build upon for implementation:

1. Town cohesion and social capital
2. Active Selectboard
3. Active Planning Commission
4. Five part-time town employee positions, engaged employees
5. Five full-time Road Crew employees
6. Dedicated EMD to carry out projects.
7. Windham Regional Commission assistance when needed
8. Floodplain ordinance in place

Recognizing that there is no place that doesn't have barriers to overcome in project implementation, Halifax is in a decent position overall. There are committed volunteers and staff who make this town function well. They are invested and plan to remain in the area. Halifax does not have a lot of businesses, but they do have some tourist attractions and more potential ones on the horizon. Halifax is not struggling financially, though they have a limited real estate tax base because they have a small population. Halifax is a fair distance from major towns and amenities. This lends to a "do it yourself" mentality that serves Halifax positively. Their remote location could increase vulnerability during a major event, or conversely it could protect Halifax.

The town looks to and works closely with the Windham Regional Commission. They look to the Regional Plan policies for guidance on land use decisions which influence their town plan policies and goals. The town works closely with VT Department of Environmental Conservation Agency of Natural Resources and the Army Corps of Engineers when mitigating any work in streams or rivers. Additionally, the town adopts the latest VTrans Road Standards for road/culvert/bridge improvement projects.

With the support of these Agencies and the Commission, Halifax is capable of carrying out all of the mitigation actions outlined in this plan.

Existing Planning Mechanisms / Integration

The following policies, programs and activities related to hazard mitigation are currently in place and/or being implemented in the Town of Halifax. The Hazard Mitigation Planning participants analyzed these programs for their effectiveness and noted improvements needed. Halifax uses all of the tools listed below to help plan for current and future activities with the town. For example: the Local Emergency Management Plan has a contact list that is used for response

purposes in the case of a hazard event, and is updated every year after Town Meeting. Town Road and Bridge Standards are followed by the town and Halifax is in the midst of updating their culvert inventory. In the development of this plan, the latest readopted 2019 Town Plan was used.

As Halifax goes through the update process for the planning mechanisms outlined in the table below, they will look to the Hazard Mitigation Plan's Table of Actions and Risk and Vulnerability Assessments to help guide land use district decisions, and guide goals and policies for those districts. At Town Meeting every March, policies and action items in the Town Plan are reviewed and integrated into hazard mitigation as needed. The Local Emergency Management Plan contact list is updated after Town Meeting each year, including updates to vulnerable geographic locations, as well as locations of vulnerable populations. Updates to each of the planning mechanisms outlined in the table below are handled by the identified responsible party in the table. There is no timeframe for updating the below referenced plans and regulations to better incorporate hazard mitigation, 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 a future town plan update to ensure that emergency preparedness and mitigation planning efforts are included in the Town Plan, with particular attention to including the projects in the Mitigation Actions Table. This will assist with ensuring that this plan is utilized and project follow-through occurs.

Halifax will update the Town Plan according to the towns internal schedule based on a March 2027 expiration date to address flood resiliency and to incorporate other town goals. The hazard mitigation plan will be considered and incorporated as appropriate. The floodplain ordinance should be updated to include a Fluvial Erosion Hazard bylaw, a goal of this LHMP. The LEMP is updated yearly and was updated last in 2022. Other mitigation/emergency planning related documents and their status are outlined in the below table:

Plans and Studies

This local hazard mitigation plan will be integrated into the various documents shown below as these documents are updated. Groups such as the Planning Commission (Town Plan), Conservation Commission (Invasive Species Area Plans), and the School Board (School Emergency Response Plan) are responsible for updating the corresponding plans. It is, however up to the EMD and selectboard to distribute this LHMP update to the various boards and commissions both in and outside of the town.

Capability	Description	Improvement Opportunity
<i>Town Plan</i>	Plan for coordinated town-wide planning for land use, municipal facilities, etc.	Town Plan was adopted in 2019. Integration of the Local Hazard Mitigation Plan should occur with updates of the Town Plan.
<i>Local Hazard Mitigation Plan (LHMP)</i>	Plan that identifies hazards in community and proposes actions to reduce or eliminate risk to people, property, and the natural environment.	Integrate new corridor plans into document
<i>Stormwater Plan</i>	Plan that identifies stormwater improvements for municipal roads.	Town received a General Permit to discharge stormwater from municipal roads
<i>Local Emergency Management Plan (LEMP)</i>	Municipal procedures for emergency response.	Already updated yearly.
<i>Invasive Species Management Plan</i>	Plan that provides guidance on effective management of invasive species.	This has not been done and should be completed. EAB is confirmed within Halifax.
<i>Culvert Inventory</i>	An inventory of the size, material, condition and location of culverts. Updated annually by Public Works Department.	None identified. Culvert Inventory last updated in 2018.
<i>School Emergency Response Protocol</i>	School procedures for emergency response	Outside towns scope to alter response plan.
<i>Flood Hazard Area Regulations</i>	Regulates development in FEMA identified SFHAs	Already implemented
<i>Ash Tree Inventory</i>	Identifies ash trees within Halifax	Not mapped. Would be more effective if mapped clearly.
<i>National Flood Insurance Program (NFIP)</i>	Provides ability for residents to acquire flood insurance	Further training for Floodplain Administrator recommended

Administrative Capacity and Capability

Capability	Description	Improvement Opportunity
<i>Emergency Management Director</i>	Prepares plans and procedures for responding to natural disasters other emergencies and leads response efforts.	Could form Emergency Planning Committee
<i>Planning Commission</i>	Municipal body responsible for planning for the community, including maintaining the town	Already performs assigned tasks.

	plan, zoning bylaws, and subdivision regulations.	
<i>Zoning Board of Adjustment</i>	Municipal body responsible for evaluating and deciding on proposed development.	Already performs assigned tasks.
<i>Zoning Administrator</i>	Administrative officer responsible for administering zoning bylaws. Also serves as the Floodplain Administrator.	Further training for Floodplain Administrator recommended
<i>Tree Warden</i>	Responsible for trees on public property, including town properties, schools, and within public right-of-way.	Already performs assigned tasks.
<i>Selectboard</i>	Legislative body of the town for all purposes required by the state.	Already performs assigned tasks. Could create and overall plan update schedule.
<i>Mutual Aid Agreements – Emergency Services</i>	Agreement for regional coordinated emergency services.	In place and effective.
<i>Mutual Aid Agreements – Public Works</i>	Agreement for regional coordinated emergency highway maintenance services.	Recommended to formalize agreements with adjacent towns if warranted.
<i>VEM Training</i>	Training provided by state to ensure emergency responders are adequately prepared to respond to emergency incidents.	Identified as an action item in LHMP
<i>Highway Department</i>	Municipal department responsible for overseeing all aspects of municipal road network, including maintenance and construction.	Limited capacity and already overworked.
<i>Town Clerk & Treasurer</i>	Responsible for receiving and recording town archives, recording deeds, filing vital statistics information, running treasury.	Part time position.

Financial Resources

Capability	Description	Improvement Opportunity
<i>Town Budget</i>	Annual municipal operating budget, approved at Town Meeting	Small tax base. Increases would have little impact.
<i>Taxing Authority</i>	Ability to assess and collect property taxes.	Small tax base. Increases would have little impact.
<i>State/Federal Funding</i>	State and federal grants or loans available through FEMA or other agencies.	Must apply and most are competitive.

Zoning and Regulations

Capability	Description	Improvement Opportunity
<i>National Flood Insurance Program (NFIP)</i>	Provides ability for residents to acquire flood insurance.	Further training for Floodplain Administrator recommended
<i>Zoning</i>	Regulates the development and division of land, standards for site access and utilities	Periodically review for content. Create schedule for updates
<i>Building codes</i>	No building codes in place.	No building codes in place.

<i>Road Standards</i>	Design and construction standards for roads and drainage systems.	State road and bridge standards adopted.
<i>Wetland Protections</i>	Protection of environment, water resources, wildlife, biota. Protected by 1990 Vermont Wetland Rules	Outside the towns scope to alter or change state law.
<i>River Corridor Plans</i>	Regulates development in River Corridors as identified by Vermont ANR.	There are only two rivers in town. They both have corridor plans already

Outreach and Education

Capability	Description	Improvement Opportunity
<i>Town Website</i>	Municipal website providing relevant information to residents and businesses about public meetings, resources, etc.	Provide additional information on emergency management and preparedness on town website.

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 before Town Meeting Day at a Selectboard meeting along 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 that can help mitigate future hazardous events; e.g., bridge and culvert replacements, road replacements and grading, as well as buying out any repetitive loss structures that may be in the Special Flood Hazard Area, and revise the plan as needed. In addition to tracking process 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. 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 and Evaluation 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 a thorough 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 2 ½ 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^[1]:

1. The Emergency Management Director (EMD) will gather a team to serve as a Hazard Mitigation Planning Committee ('Committee'). Members should include such roles as: 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 Committee through the update process. This update process 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.
 - Progress in implementation of plan actions and goals.
 - Incorporation of new mitigation 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.
 - 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 Plan 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.
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 by the to VEM and FEMA. FEMA will issue notice of 'final approval' and set the date that an

updated LHMP needs to be final approved by 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 Committee should occur in regards to the LHMP and 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 Committee. The Report should note whether the Plan needs to be amended. If the committee determines that NO modification of the plan is needed, then the report is distributed to local communities. If the Committee determines that modification of the plan IS needed, then the Committee 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 stated 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 Committee 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 bulletin board, Town website, at the Readsboro General store notice board, the Post Office notice board, and in the Deerfield Valley News.

This Plan is a tool to promote hazard mitigation discussions with the goal of improving promoting action to increase the overall resiliency of Readsboro.

- Seeking participation from key players in addition to general public interest:
 - Select board
 - Planning Commission
 - Public Works
 - School
 - Fire & Rescue
 - Emergency Mgt/ 911 Coordinator
 - Town Administrator
- Post the hazard mitigation plan on the town website
- Selectboard will review past hazard mitigation committee members and consider whether new members should be added. Representatives of local businesses, nonprofits, academia, etc. should especially be considered.
- Notify the public of committee meetings through town bulletin board, website, newspaper, Facebook, Community Hall newsletter, Front Porch Forum, etc.

APPENDIX

1. Adoption Certificate
2. Responses to Google Form Natural Hazard Assessment (16 responses)
3. Flood events from NOAA Storm Events Database that have caused financial loss in Windham County.
4. Email sent to adjacent towns for public comment on the public meeting, draft plan
5. Email sent to frontline organizations for public meeting and draft plan
6. Flyer advertising availability of Draft Hazard Mitigation Plan for public comment
7. Email sent TBD to town staff and Hazard Mitigation Planning Committee for review of the draft
8. June 20, 2023 Meeting Minutes
9. July 20, 2023 Meeting agenda
10. Meeting flyer that was posted around town advertising public comment period
11. Website advertisement for public comment on the draft plan, posted 10/16/23 – 10/30/23

1. Certificate of Adoption

Town of Halifax, VT
Selectboard

A Resolution Adopting the Town of Halifax Local Hazard Mitigation Plan

WHEREAS, the Town of Halifax, 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 Halifax, VT Local Hazard Mitigation Plan analyzes natural hazards and assesses risks within the community; and

WHEREAS, the Town of Halifax, VT 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 Halifax, 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 Halifax, VT will follow the Plan Maintenance Process outlined in this plan to assure that the plan stays up to date and compliant; and

NOW, THEREFORE BE IT RESOLVED that the Town of Halifax, VT adopts the *2023 Town of Halifax Local Hazard Mitigation Plan*. While content related to the Town of Halifax may require revisions to meet the plan approval requirements, changes occurring after adoption will not require the Town of Halifax 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 ____ in favor and ____ against, and ____ abstaining, this ____ day of _____, _____.
month, year date

Selectboard

Peter Silverberg, Chair

Edee Edwards, Vice Chair

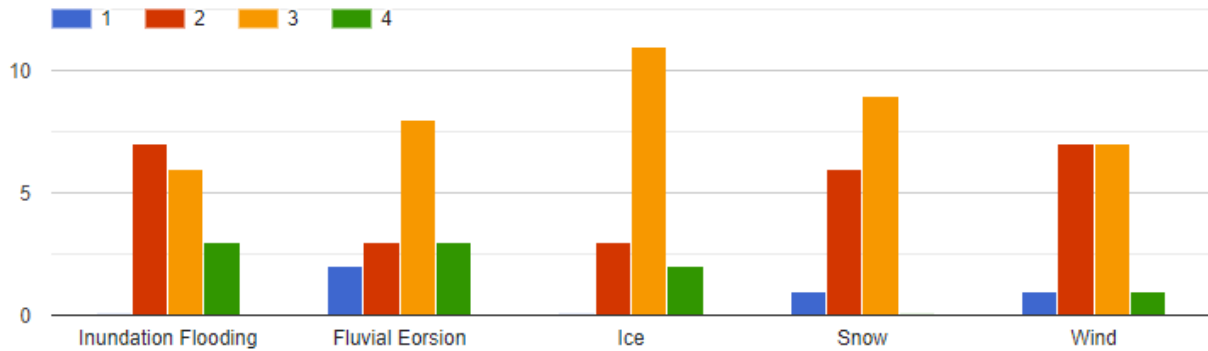
ATTEST

Alison Crossley, Selectboard Administrative Assistant

2. Responses to Google Form Natural Hazard Assessment

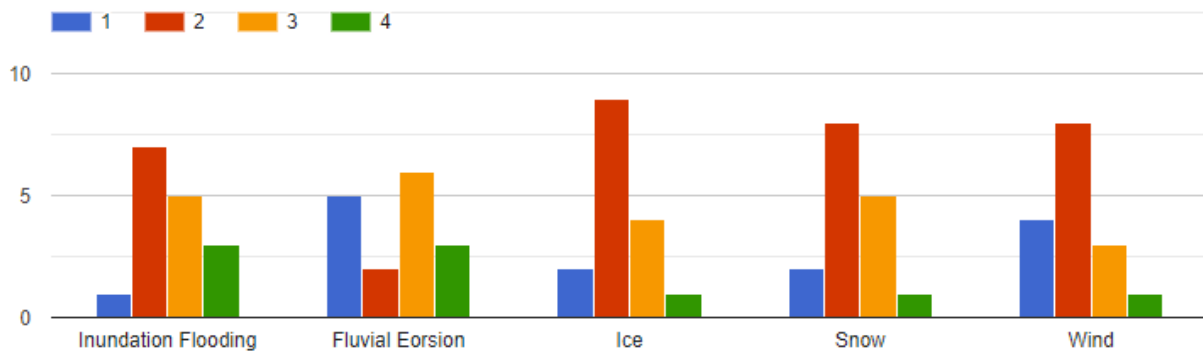
Potential Impact to Infrastructure

[Copy](#)



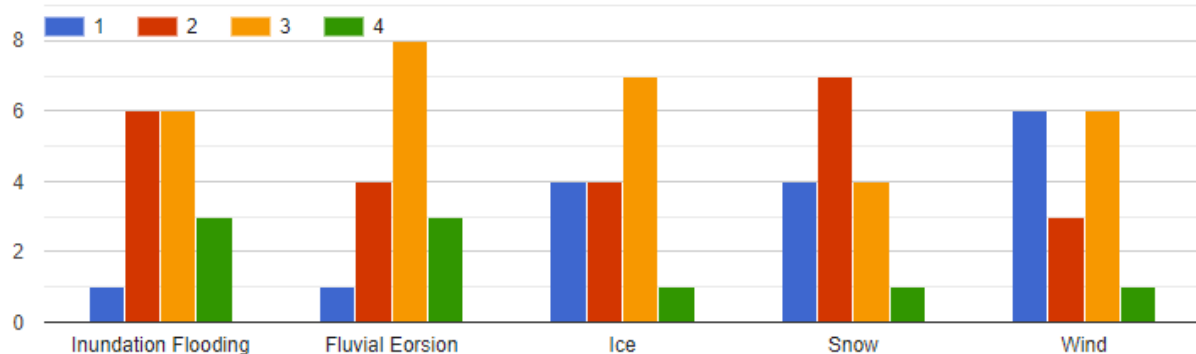
Potential Impact to Economy

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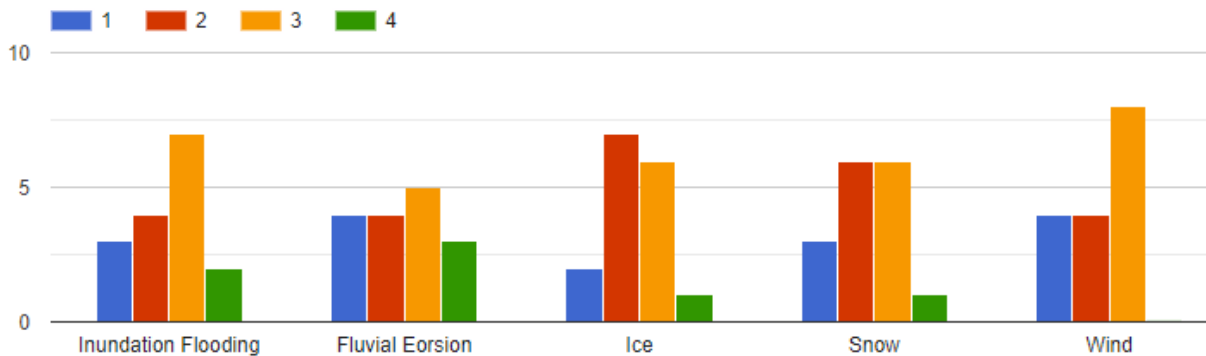
Potential Impact to Environment

[Copy](#)



Potential Impact to Life

Copy



3. Flood events from NOAA Storm Events Database that have caused financial loss in Windham County.

VOLUME 74 NO. 21 USPS 063-406 1987 WEDNESDAY, APRIL 1, 1987 BRATTLEBORO, VERMONT 26 PAGES 30 CENTS

Flooding rains down on valley

Homes evacuated as rivers rise

By CHRISTOPHER ROWLAND

Heavy rains Tuesday caused the Whitestone Brook to swell up and spill over its banks in several West Brattleboro locations, forcing the evacuation of several trailers at the Mountain Home Park and sending sand-bag crosses to the area.

The National Weather Service in Connecticut reported that the Connecticut River in southern Vermont was observed at 26.7 feet Tuesday night with the flood stage at 28 feet. The spokesman said the river is expected to crest at 33 feet this afternoon.

Power outages were reported throughout Windham County and in New Hampshire as strong winds combined with the rains. About 5,000 customers lost power in New Hampshire's Cheshire County, officials said.

Brattleboro fire crews sandwiched at Malross Terrace off Western Avenue in an attempt to block rushing waters from occupying the West Brattleboro development.

Along the western end of Marlboro Road, the water swept across fields and into the street.

Fields behind the Fitness Barn, the Country Kitchen restaurant and the Brattleboro West shopping center were flooded. Across the brook, water flowed past and under several mobile homes at the Mountain Home Park.

The farmers' market near the Greenway Bridge on Western Avenue was under water.

Brooks and streams were running full all over Windham County and much of the state. A flood warning issued by the National Weather Service remained in effect until 8 p.m. and a Connecticut River flood alert was in effect until this morning.

At one point, the water in Whitestone Brook was crashing into the Meadowbrook Road bridge. However, the waters began to subside at about 5 p.m. and the integrity of the bridge was not threatened, officials said.

"We'll be with it just as long as we have to," Brattleboro Fire Chief T. Howard Mattison said of the efforts to battle the floodwaters. The worst of the flooding had subsided by early Tuesday evening, Mattison said.

Fire crews were standing by in case the brook resumed its rise, Mattison said.

"If we get more heavy rain, we'll be back out again," Mattison said.

The rain combined with strong winds caused numerous power outages throughout the county and in Hinsdale, N.H., electric company officials reported.

"There's some pretty big water problems over here," said Richard Lamberts of the New Hampshire Public Service Co.

Power was knocked out from Hanalei to the Connecticut River, Lamberts said, affecting at least 1,000 customers alone.

David Miller of Central Vermont Public Service said power was out at times in West Dummerston, Guilford, Wardboro and along Arden Hill Road in Brattleboro.

High winds that blew over water-laden branches caused the outages, Miller said.

Green Mountain Power spokesman David Christock said electricity out in Rockingham, Westminster West and Dummerston Center. Power was off in parts of Putney early Tuesday morning.

"It doesn't sound too good right now, listening to the seamer," Christock said. "If it keeps raining and blowing like it has been, we're going to be in for a night."

Officials said the mobile homes at

See FLOOD, Page 24

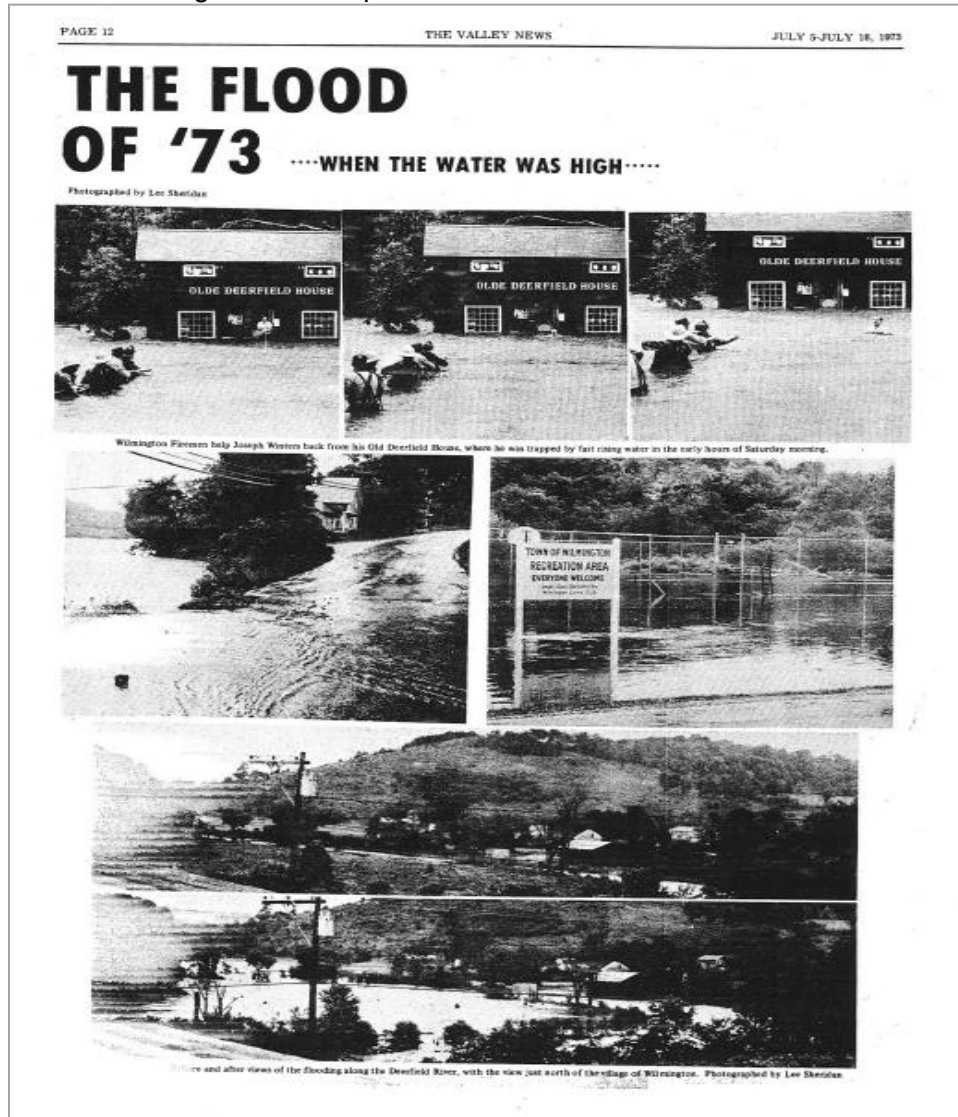
HIGH WATER — Sections of Windham were under water like much of the county Tuesday. Above, the south side of Route 9 along the Deerfield River was evacuated by late afternoon. During the day and into the evening, the town's police and highway departments were out continuously responding to related complaints and taking protective action.

By Christopher Rowland

1987 – Major flooding. NCDC detailed storm data only goes back to 1996.

During 1976, flooding occurred throughout New England, as result of Hurricane Belle, causing millions of dollars in damage in VT.

In 1973 there was an extreme rainfall event from June 28-30 that affected all areas of Vermont except the northwest section. Rainfall amounts as much as 6 inches in 24 hours in some locations. This was the largest rain event since the 1927 flood. Highway damage was extensive in the south-central, southeastern, and northeastern areas of the State. Three persons were killed in the 1973 flood, and damage was estimated at \$64 million. Sizable crop loss was reported, and damage to State highways was estimated to be \$10 million. The entire State was declared a disaster area.²⁹ After this event, there was extensive dredging, berming and windrowing in an attempt to control channel location and reduce future flood impacts.



The Spring Floods of 1938, which had an effect on all of New England, caused \$113 million in damage, killed 24 people and made 77,000 people homeless. During this flood alone, the main street of Hooksett, New Hampshire was 18 to 20 feet underwater. There was over 11 feet of flood water in the Wilmington Town Hall filling the basement and damaging the Town Clerk's office and records.

²⁹ USGS "Vermont Floods and Droughts" information page <http://md.water.usgs.gov/publications/wsp-2375/vt/>. Accessed 4/3/15.

The Vermont Flood of 1927 was the deadliest flooding event in the history of the State; eighty-four people were killed with over \$28 million in property damage.

1977 on 1927 Flood

World Return

1-1
71-4103
VV
NOV 3 1977
VT 05303

1977 NOV 3 SATURDAY, NOVEMBER 3, 1977 16 PAGES PLUS 8-PAGE INSERT & 12-PAGE TABLED IN 1977

50 Years Ago This Week

The Flood of 1927 Overwhelmed Vermont

By WILSON PAGE
This week is the 50th anniversary of the arrival of a new winter, the great flood of Nov. 2, 3 and 4, 1927. It was so wet when a rain-soaked Vermont, future drought, set quarts in the White House, the dark forest, forest, and the newspapers were filled with the excitement of the Treaty of Versailles and the 1920s in government.

In Swanton, the behavior was filled with the news of the burning of the Central Congregational Church on Oct. 27. It also carried the incongruously featuring Maurice Markov, "most star of great opera," sporting LUCKY STRIP cigarettes. New automobiles were introduced for sale at about \$200, and motor

trucks from foreign plants were a novelty from page leaders. "Five Big World Acts," including "hot comedy, singing, talking, dancing and grand dancing," were listed at the Auditorium to the old town Ballou Park Street. Incidentally, the feature like that week was "The World of the Superstar." The Larkins Theater also offered vaudeville and the 1920s latest news. In Island Park, a football game was scheduled for Saturday, Nov. 4, between Swanton High School and Rutland High School. That game was never played. The flood of 1927 reduced Island Park's storage by half. Its contents are still visible in the Connecticut River at the corner end of the bridge in Montpelier, Vt.

In 1927, the latest had several buildings, including the Casino, which were being damaged... but no drinking or gambling in that time of prohibition. In Wednesday, Nov. 2, the Bulletin reported that the weather was a remarkable 71 degrees. The weekend November day is 69 years.

"Nature never smiled more sadly on good little Vermont than she did during the autumn of 1927," according to a contemporary book titled, "The Floods—A Gathering of Reports and Pictures Which Tell Their Story Dramatically of the Great November Flood in Vermont," by Lester S. Johnson of White River.

Johnson wrote that the spring and summer of 1927 provided, with more than ample rain for good crops. The fall was brilliant and unusually warm, quite with more than enough rain. In October, the average rainfall was 4.84 inches, whereas normal rainfall for that month is 2.49 inches, according to Johnson's account.



GREAT FLOOD of 1927 washed away most of Island Park in the Connecticut River, leaving the Casino, street, in damaged and in use later one hour. When the waters receded, signs were erected warning fishermen not to "venture on the riverbank."



ROAD TO ISLAND PARK — The floodwaters of early November 1927 passed over the road in Island Park and washed most of it away.

"The weather prediction for the Nov. 3 list of the Bulletin carried a clear warning of a "typical disturbance over Virginia and the Carolina" that would "move northwest with increasing intensity."

"The rainfall was estimated at an astounding 3.86 inches in some portions area of Vermont, and at 4.84 inches in Swanton and a 34-hour period. Thus the already full brooks, streams and rivers began to rise over their banks. The night of Nov. 3-4 was full of turbulence and steady rainfalls for Vermonters. Other New England states

suffered damage, but none so cruelly as Vermont, according to all accounts. The central portion of the state was the worst hit, where entire villages were isolated by wrecked bridges, washed out roads, and uprooted houses.

The FLOODING was chaotic, for most telephone lines were down, and traffic was chaotic, many tractors were sent on landback to assess damage in remote places. Inferred deaths were reportedly reported in Myerhill near in Folley was reported to have "lost of about during the flood. 'Miss Lucy' he' dropped dead of fright in Rutland "marble worker was in his death Spiby Bridge in Center Water out."

Lt. Gen. J. Rufus Sizer
See FLOOD, Part

4. Email sent to adjacent towns for comment and input during the planning process

 Mike McConnell <mgm@windhamregional.org>
To
Bcc: 'adminasst@colrain-ma.gov'; 'bos@townofheath.org'; 'townadmin@guilfordvt.gov'; 'Sue Fillion'; 'marlboroselectboard@gmail.com'; 'stucker@wilmingtonvt.us'; 'Gig Zboray'

 Reply  Reply All  Forward  ...

Mon 6/26/2023 10:35 AM

 You forwarded this message on 6/26/2023 11:28 AM.

 Meeting Flyer.pdf
119 KB

 Organization Outreach Letter.pdf
163 KB

Hello,

As a town that borders Halifax, Vermont we are required by FEMA to send information about ways to become involved in the planning process for the currently underway Local Hazard Mitigation Plan Update.

Attached you will find a meeting flyer for the next public meeting on Thursday July 20, 2023 and a the letter that we have sent to outside organizations that might have an interest in Halifax hazard mitigation planning.

I would encourage you to send in comments via email or complete the survey.

https://docs.google.com/forms/d/e/1FAIpQLSc-7lhGEgBf4-2ejDxmTvSi5EwMxu-esnpEdMxjr3Vhxg04yQ/viewform?usp=sf_link


There will be other opportunities to be involved in this process. Once a draft plan has been created it will be sent back out for comments from you all, other involved organizations, residents and the general public.





If you have any other questions or would like more information about the process please let me know.

Thanks,
Mike


Mike McConnell
Senior Planner
Windham Regional Commission
193 Main Street, Suite 505
Brattleboro, VT 05301
Phone: (802) 257-4547 Ext 110
www.windhamregional.org

5. Email sent to frontline organizations for comment and input on the planning process

 Mike McConnell <mgm@windhamregional.org>
To
Bcc: 'info@dvcp.org'; 'contact@deerfieldvalleyfoodpantry.org'; 'Halifax@dvfiber.net'; 'mlewis@gatheringplacevt.org'; 'info@moover.com'; 'info@seniorsolutionsvt.org'; 'sevca@sevca.org'; 'mstaloff@bdcc.com'; 'ahs.vdhbrattleboro@vermont.gov'; 'aknox@vnhcare.org'; **+5 others**

 Reply  Reply All  Forward  ...

Thu 6/22/2023 1:31 PM

 Organization Outreach Letter.pdf
163 KB

Hello,

The Town of Halifax, Vermont is updating their Local Hazard Mitigation Plan and is in the public comment phase of the project. Being affiliated with an organization that may conduct business or have clients that reside in Halifax, we would like an appropriate staff member to fill out an online survey relating to natural hazards and their impact on the town, it's residents, the economy and infrastructure.

Attached is a letter outlining the project and how to becoming involved including a link to the above survey.

There is a meeting scheduled for July 20, 2023 at 5:30pm that would be great to attend for anyone having an interest in Halifax. At this meeting (Halifax town offices) we will discuss the survey and potential mitigation actions that the town could take as a result of this planning effort.

There will be opportunities throughout the process to become involved and provide comments on plan drafts. If you would like to be taken off the contact list for this project, please let me know.

Thanks,
Mike

Mike McConnell
Senior Planner
Windham Regional Commission
193 Main Street, Suite 505
Brattleboro, VT 05301
Phone: (802) 257-4547 Ext 110
www.windhamregional.org

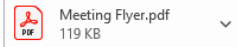


Mike McConnell <mgm@windhamregional.org>
To 'Zoe.Neaderland@vermont.gov'

Reply Reply All Forward ...

Tue 6/27/2023 10:46 AM

Follow up. Completed on Tuesday, June 27, 2023.



Zoe,

I am contacting you because I am working on an update to the Halifax Hazard Mitigation Plan. I wanted to Make sure VTrans was aware and given the opportunity to comment or otherwise provide input.

I understand that Vtrans might not regularly comment on plans of these nature but since the majority of the roads in Halifax are unpaved and many are adjacent or near a waterbody of some sort it seemed prudent to share.

You are under no obligation to comment or be involved but I have included a link to a survey we have put out and the flyer for a meeting we are having on Thursday July 20, 2023 at 5:30pm at the Halifax town office.

[https://docs.google.com/forms/d/e/1FAIpQLSc-7lhGEgBf4-2ejDxmTvSi5EwMxu-esnpEdMxjr3Vhxg04yQ/viewform?usp=sf link](https://docs.google.com/forms/d/e/1FAIpQLSc-7lhGEgBf4-2ejDxmTvSi5EwMxu-esnpEdMxjr3Vhxg04yQ/viewform?usp=sf_link)

If you have any questions or need more information please let me know.

Thanks,
Mike

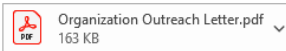
Mike McConnell
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Brattleboro, VT 05301
Phone: (802) 257-4547 Ext 110
www.windhamregional.org



Mike McConnell <mgm@windhamregional.org>
To 'Marie.Caduto@vermont.gov'

Reply Reply All Forward ...

Mon 6/26/2023 11:33 AM



Marie,

I got your contact info from my colleague Margo Ghia and I was hoping for some guidance. As part of new FEMA regulations we are required to give opportunities to local/regional organizations so that they may participate in the process.

I'm not sure if you are the correct person to comment hazard mitigation plans but we figured you would be a good start. Any assistance would be very helpful!

Thanks,
Mike

Mike McConnell
Senior Planner
Windham Regional Commission
193 Main Street, Suite 505
Brattleboro, VT 05301
Phone: (802) 257-4547 Ext 110
www.windhamregional.org

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

Halifax Local Hazard Mitigation Plan

Public Comment Period

The draft Halifax Local Hazard Mitigation Plan is now available for public review on the town website: www.halifaxvt.com

Hard copies of the plan are available at the Town Hall located at 246 Branch Road

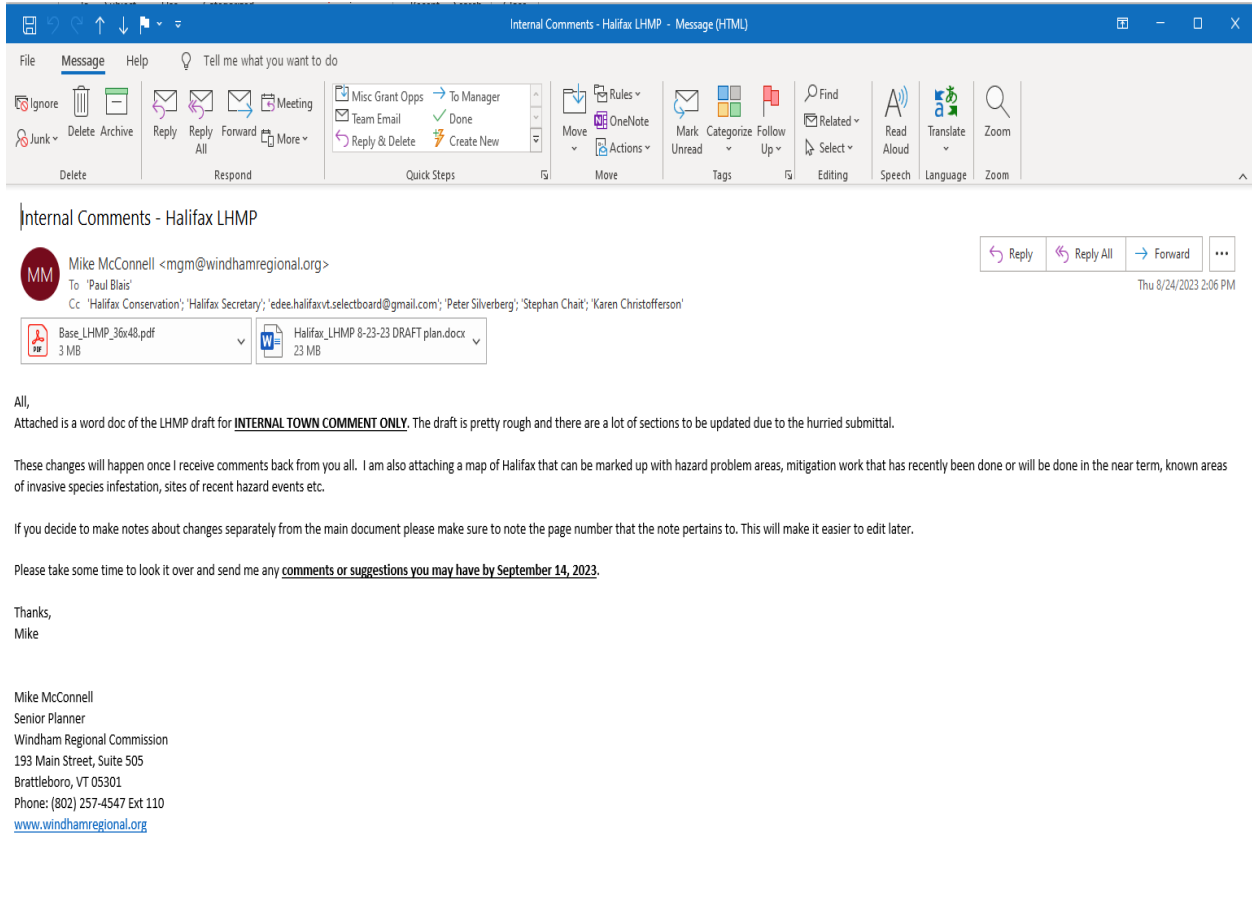


The plan will be available for public comment until October 30, 2023

Anyone who would like to comment on the plan should contact Mike McConnell at the Windham Regional Commission at mgm@windhamregional.org or at 802-257-4547 ext: 110.

We encourage your review and participation!

7. Email sent TBD to town staff and Hazard Mitigation Planning Committee for review of the draft



Internal Comments - Halifax LHMP - Message (HTML)

File Message Help Tell me what you want to do

Ignore Delete Archive Reply Reply Forward Meeting
All All More

Misc Grant Opps → To Manager
Team Email ✓ Done
Reply & Delete Create New

Move OneNote Actions


Mark Unread Categorize Follow Up

Find Related Select

Read Aloud Translate Zoom

Delete Respond Quick Steps Move Tags Editing Speech Language Zoom

Internal Comments - Halifax LHMP

 Mike McConnell <mgm@windhamregional.org>
To: 'Paul Blais'
Cc: 'Halifax Conservation'; 'Halifax Secretary'; 'edee.halifaxvt.selectboard@gmail.com'; 'Peter Silverberg'; 'Stephan Chait'; 'Karen Christofferson'

Base_LHMP_36v48.pdf 3 MB
Halifax_LHMP 8-23-23 DRAFT plan.docx 23 MB

Thu 8/24/2023 2:06 PM

Reply Reply All Forward

All,
Attached is a word doc of the LHMP draft for **INTERNAL TOWN COMMENT ONLY**. The draft is pretty rough and there are a lot of sections to be updated due to the hurried submittal.

These changes will happen once I receive comments back from you all. I am also attaching a map of Halifax that can be marked up with hazard problem areas, mitigation work that has recently been done or will be done in the near term, known areas of invasive species infestation, sites of recent hazard events etc.

If you decide to make notes about changes separately from the main document please make sure to note the page number that the note pertains to. This will make it easier to edit later.

Please take some time to look it over and send me any **comments or suggestions you may have by September 14, 2023**.

Thanks,
Mike

Mike McConnell
Senior Planner
Windham Regional Commission
193 Main Street, Suite 505
Brattleboro, VT 05301
Phone: (802) 257-4547 Ext 110
www.windhamregional.org

8. June 20, 2023 Meeting agenda

OFFICE OF THE SELECTBOARD

TOWN OF HALIFAX, VERMONT

REGULAR MEETING MINUTES

June 20, 2023

6:00 PM AT THE HALIFAX TOWN OFFICE

CALL TO ORDER

6:00pm Pete Silverberg called the meeting to order at 6:01pm on May 16th, 2023. Selectboard members present were Pete Silverberg, Edee Edwards, Patrick McAllister, and Karen Christofferson. Others present in person or remotely were Nikki Walling, Mike McConnell, Andrea Rand, Gary Rand, David Jones, Stephan Chait, Laurel Copeland, Doug & Marilou Parkhurst and Alison Crossley.

CHANGES AND ADDITIONS TO THE AGENDA –

Edee:

- Add Mike McConnell and Nikki Walling (GMP) to New Business
- Add Planning Special Mtg for June 28th

Moved Edee/2nd Pete – 4-0 approved.

APPROVAL PREVIOUS MEETING MINUTES

- June 5th Selectboard Special Meeting Minutes
- June 6th Selectboard Regular Meeting Minutes
 - Patrick Moved/Edee Seconded – 4-0 approved.

OLD BUSINESS

- Discussion of landfill tour and long-term plan for monitoring (Pete)
 - Pete distributed Preliminary Plan for Town Landfill Monitoring – note as preliminary draft but it has not been discussed by the board
 - Pete, Edee and Karen did a site visit on June 17th
 - Halifax Secretary circulated most current inspection report (Dated June 15, 2023)
 - Halifax Secretary will post to town website.
- Highway orders signature delegation of authority:
 - Discussed highway orders signature delegation of authority.
 - Edee suggested that it be ensured that SB be provided with a copy of the highway orders signed by a single delegated SB member
 - Karen asked about audit/control implications and how the process can be improved to address and support accounting controls
 - Alison suggested possibility of scanning orders rather than making additional paper copies to send out to entire board for review.

- Patrick moved to appoint Peter Silverberg, per 24 VSA Section 1623, to approve and sign orders for the Highway Department until the first meeting of the Selectboard following the next Town Meeting
 - Patrick moved/Edee 2nd, Pete abstained = approved 3-0
 - Patrick will discuss process with Town Treasurer
- ARPA Funding Next Steps
 - Noted new windows for Town Office have been installed.
 - This is a discussion for both ARPA funding and town BDCC
 - Alison will reach out to residents to conform to CAPP form so that SB can review options on equal basis and will let Selectboard know when complete to schedule a special meeting to review.
- Auditor appointment status update:
 - Patrick noted that the paper ad didn't result in candidate
 - Patrick reached out to write-ins One person declined; others have not responded
 - Patrick requests that the SB think about anyone who might be interested and ask that they step forward
 - No experience or credentials required.
 - Need people who can work with SB, Finance Committee
 - Discussion noted if SB can't get one person to do the job then we are required to hire someone
 - Posting the vacancy according to statute is not a concern due to discussion with VCLT
 - Action plan: SB to ask for candidates and put them in touch with Alison who can bring them into the process.
- Planning Special Mtg for June 28th
 - Discuss creating position descriptions (not performance) in public as a starting point for the next board and new appointment of Road Commissioner as the time to make formal changes.
 - Edee Moved/Pete Seconded/Passed 4-0.

NEW BUSINESS

- (6:06pm) Mike McConnell (Windham Regional):
 - Shared presentation Halifax Local Hazard Mitigation Plan (Need Copy)
 - Next mtg July 20, 2024
 - Last done in 2016 (None of the board was here at the time) Mike will share copy after the meeting
 - Update to position Halifax for Funding and recovery should it ever be needed
 - Mike McConnell and Paul Blais have been working together.
 - Focus of Hazard Mitigation Plan is to protect against Natural Hazards
 - Edee asked if Biological hazards (like Pandemic) would be considered
 - Yes – though it may not be as relevant to FEMA funding
 - We are in the Draft Development part of the process now
 - Internal Town Comment (working with Paul now)
 - July 20, 2023 meeting for Public Input on new mitigation actions(We will need this room)
 - Public comment in early fall
 - Submit draft to Vermont Emergency Management (November)
 - Edee noted Nikki in audience – would be helpful to have an understanding of where the power goes down the most often. Mike will be reaching out to GMP

- Mike would like offline contact regarding citizen's groups, vulnerable populations in the town so they can be aware of plan and provide comment
- Pete asked about other less obvious natural hazards (Mike shared a printout – example fire)
- Mike is posting the survey link and would like it posted to our town website (Alison action and also Edee with Front Porch Forum)


9. July 20, 2023 Meeting flyer

HALIFAX HAZARD MITIGATION PLAN – PUBLIC MEETING

- **Meeting Details**
 Thursday, July 20.
 Location: **Halifax Town Office Meeting Room**
 Time: **5:30 – 7:00pm**

- Hazard Mitigation Planning helps protect the town and its residents from Natural Hazards (ie: Flood, Wildfire etc.)
- Recommended projects could include:
 - Culvert replace/upgrade
 - Zoning changes
 - Floodplain Protection Bylaws
 - Streambank plantings

- **GET INVOLVED!**
 Fill out our online survey at www.halifaxvt.com
 Come to our next meeting
 Send in a comment – mgm@windhamregional.org



11. Website advertisement for public comment on the draft plan, posted 10/16/23 – 10/30/23