Village of North Bennington Hazard Mitigation Plan

June 2022 Draft

North Bennington, Vermont

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Introduction

Purpose

Hazard mitigation actions are designed to reduce potential losses from natural hazards such as flooding, landslides, wildland fire, and similar events. Hazard mitigation plans identify, assess and prioritize those hazards and present actions that a community can undertake to reduce risks and damage from those natural hazards (Federal Emergency Management Agency 2013a).

This plan is intended to identify, describe and prioritize potential natural hazards that could affect the Village of North Bennington in Bennington County, Vermont and provide specific measures to reduce or avoid those effects. The Federal Emergency Management Agency (FEMA), within the U.S. Department of Homeland Security and the Vermont Emergency Management both advocate the implementation of hazard mitigation measures to save lives and property and reduce the financial and human costs of disasters.

This first part of this plan provides a profile of the village, demographics, and settlement patterns. The plan includes the planning process along with lists of members of the planning team and dates of meetings and public and agency review. The plan then analyzes the following hazards:

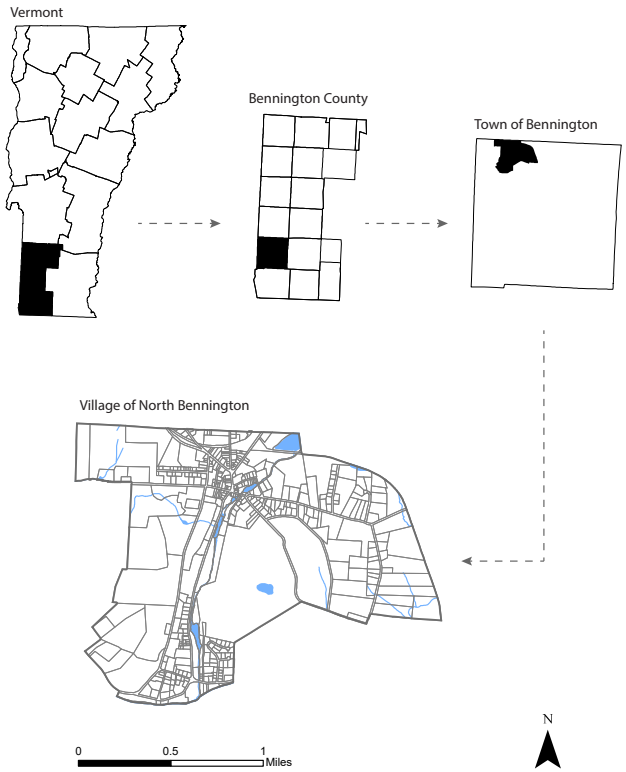
- Flooding and Fluvial Erosion
- Winter Storms
- High Wind Events
- Hail
- Temperature Extremes
- Drought
- Wildfire
- Landslide
- Earthquake
- Hazardous Materials Spill
- Infectious Disease Outbreak
- Invasive Species

After all hazards are described, the plan assesses the vulnerability and capabilities of the village, followed by mitigation goals and actions. Lastly, this plan describes how the plan will be maintained and updated.

Mitigation Goals

The village identified the following mitigation goals:

1. Reduce injury and loss of life resulting from natural disasters.
2. Reduce damage to public infrastructure, minimize disruption to the road network and maintain both normal and emergency access.
3. Establish and manage a program to proactively implement mitigation projects for roads, bridges, culverts and other municipal facilities to ensure that community infrastructure is not significantly damaged by natural hazard events.
4. Design and implement mitigation measures so as to minimize impacts to rivers, water bodies and other natural features, historic structures, and neighborhood character.
5. Increase the economic resiliency of North Bennington by reducing the economic impacts incurred by municipal, residential, agricultural and commercial establishments due to disasters.
6. Incorporate hazard mitigation planning into other community planning projects, such as the Village Plan, Capital Improvement Plan, and Local Emergency Management Plan.
7. Ensure that members of the general public continue to be part of the hazard mitigation planning process.



Map 1: Location of North Bennington (Source: North Bennington Village Plan 2018)

Implementation of the actions in this plan to achieve the above goals would also help achieve the statutory requirements of 24 V.S.A. Chapter 117 requirements including those to protect natural and cultural resources, provide affordable housing, support economic development and maintain a working landscape. These are also expressed in the Village Plan (North Bennington 2018).

Village Profile

Regional Context

The Village of North Bennington is located in the northwestern portion of the Town of Bennington in the southwestern part of Bennington County, Vermont (Map 1). The village is a separate municipality and is surrounded by the towns of Bennington and Shaftsbury. The major route through the village is VT Route 67/67A.

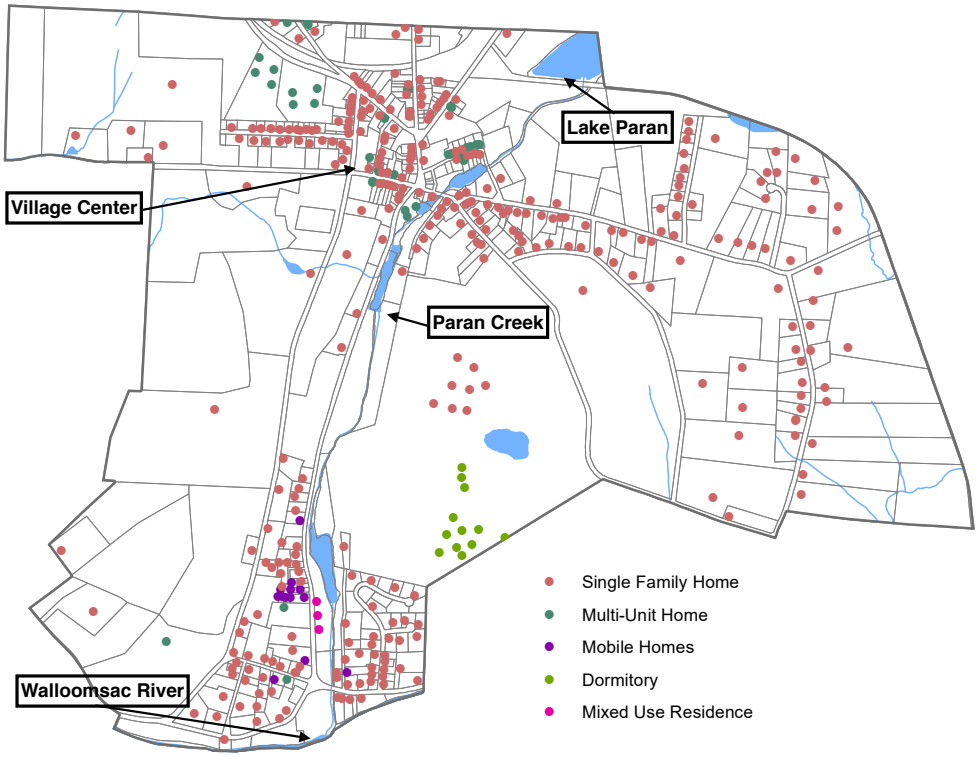
A railroad from New York passes through the northern end of the village on its way to Rutland. The track splits in the village with the southern track passing just south of Lake Paran to an area where rail cars are stored on the track. Approximately 20 rail cars are stored at a time. The rail cars are filled with propane and/or natural gas. Beyond this area, the track continues on to Bennington, but that portion of the track is no longer in use.

Figure 1: Railroad through North Bennington (Source: North Bennington Village Plan 2018)

Demography and Land Use

The population as of 2020 was 1,716 (U.S. Census Bureau 2020). The village population increased 4.4% from 2010. In North Bennington, 54% of housing units are owner-occupied, 38% are renter-occupied and 4% are seasonal (Bennington County Regional Commission 2015).

North Bennington occupies a total land area of 2.1 square miles, centered on Paran Creek, which bisects the village and flows from Lake Paran in the north, to the Walloomsac River at the



Map 2: Development in North Bennington (Source: North Bennington Village Plan 2018)

southern municipal boundary. The village center is located in the north-central part of the community along VT Route 67A (Water Street). Commercial development is limited to the area in and around the village center, and industrial development areas follow the low valley along Paran Creek. The eastern and western parts of the village consist of scattered residential development and patches of open fields and woodland areas among rolling hills. The highest density of housing exists around the village center and in the southern part of the village along and near VT Route 67A.

Table 1. Number of buildings by type
Source: Vermont Geoportal 2020 data

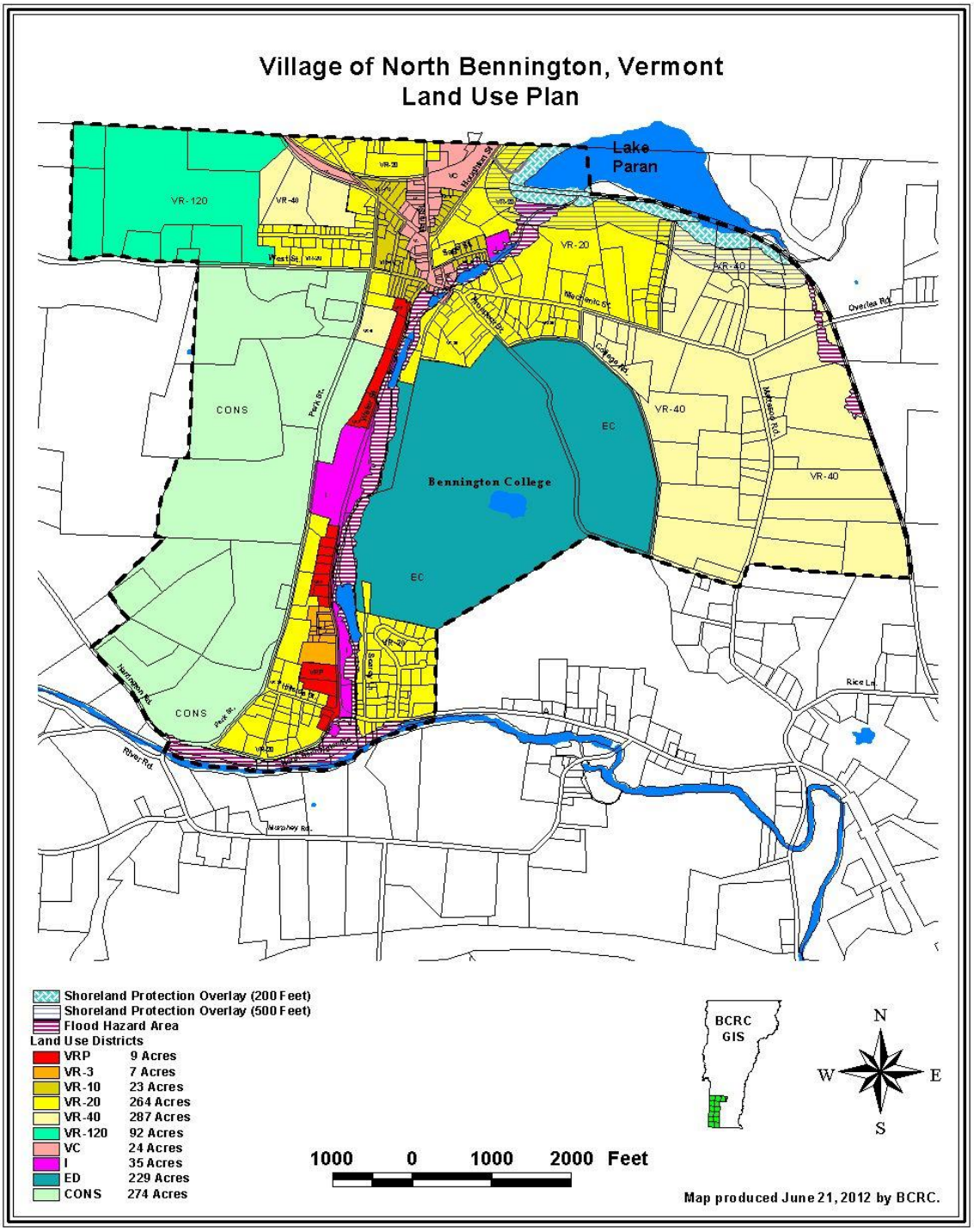
Type	Number of Buildings
Single-family Dwelling	324
Multi-family Dwelling	40
Mobile Home	13
Other Residential	1
Commercial	36
Industrial	2
College	29
House of Worship	5
School	3
Recreation	2
Fire Station	1
Library	1
Museum	1
Post Office	1
Public Gathering	1
Town Garage	1
Town Office	1
Other	18
Utility	7
Grand Total	487

Most land is at relatively low elevation and most areas have slopes of 0-10% with some areas along Water Street and around Lake Paran of >20%. Other than small drainage ways, surface water resources are limited to Paran Creek and its associated millponds and wetlands, Lake Paran and the Walloomsac River.

Economic and Cultural Resources

Economic resources are best summarized by the types of uses. The different uses by building type found in North Bennington are listed in Table 1. Map 3 shows the land use designations from the 2018 North Bennington Village Plan.

The village houses two markets, small professional offices, library, restaurants, small businesses, churches, an elementary school and private school, part of the Bennington College campus, and a post office. Part of the Bennington College campus is also located in Bennington. There are no large-scale commercial developments found in the village. Industrial businesses occupy buildings located along Water Street and Paran Creek, which was once used for power generation for manufacturing.

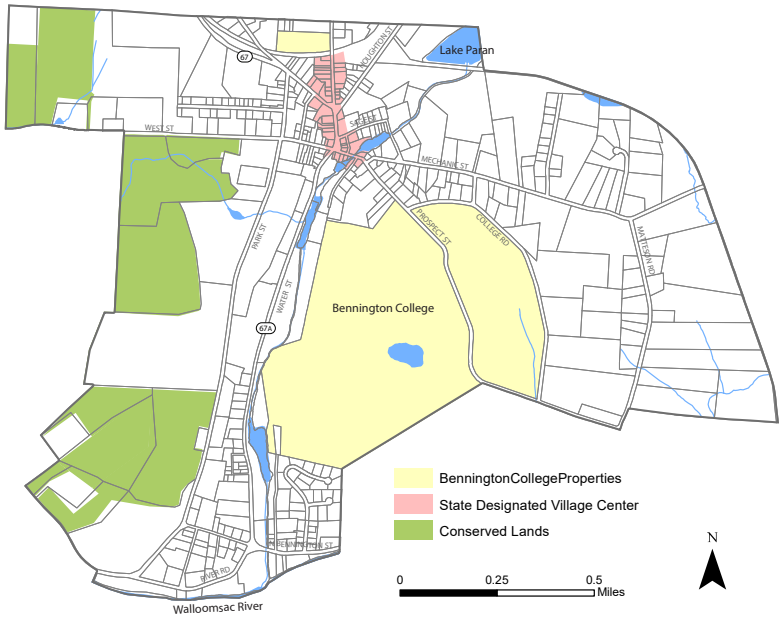


Map 3: Land Use Designations (Source: North Bennington Village Plan 2018)

Large commercial businesses, such as grocery stores and large retail stores are located in Bennington. The high school and middle school, as well as Southwestern Vermont Medical Center and supporting personal service businesses are all located in Bennington.

North Bennington contains a concentration of historic structures in the village center. This area forms a district that has been recognized by the Vermont Division for Historic Preservation

and included in the National Register of Historic Places. The village has adopted historic district design standards as a part of the municipal zoning bylaws, and has received Village Center Designation through the Vermont Agency of Commerce and Community Development, which provides incentives for historic preservation activities (Map 4).



Map 4: State Designated Village Center in North Bennington (Source: North Bennington Village Plan 2018)

Due to the relatively small tax base in the village, damage to larger local businesses would impact the tax collection and put a financial strain on the village. In addition, damage to infrastructure, such as a bridge or public building, would have a substantial impact on North Bennington's budget.

Critical Facilities

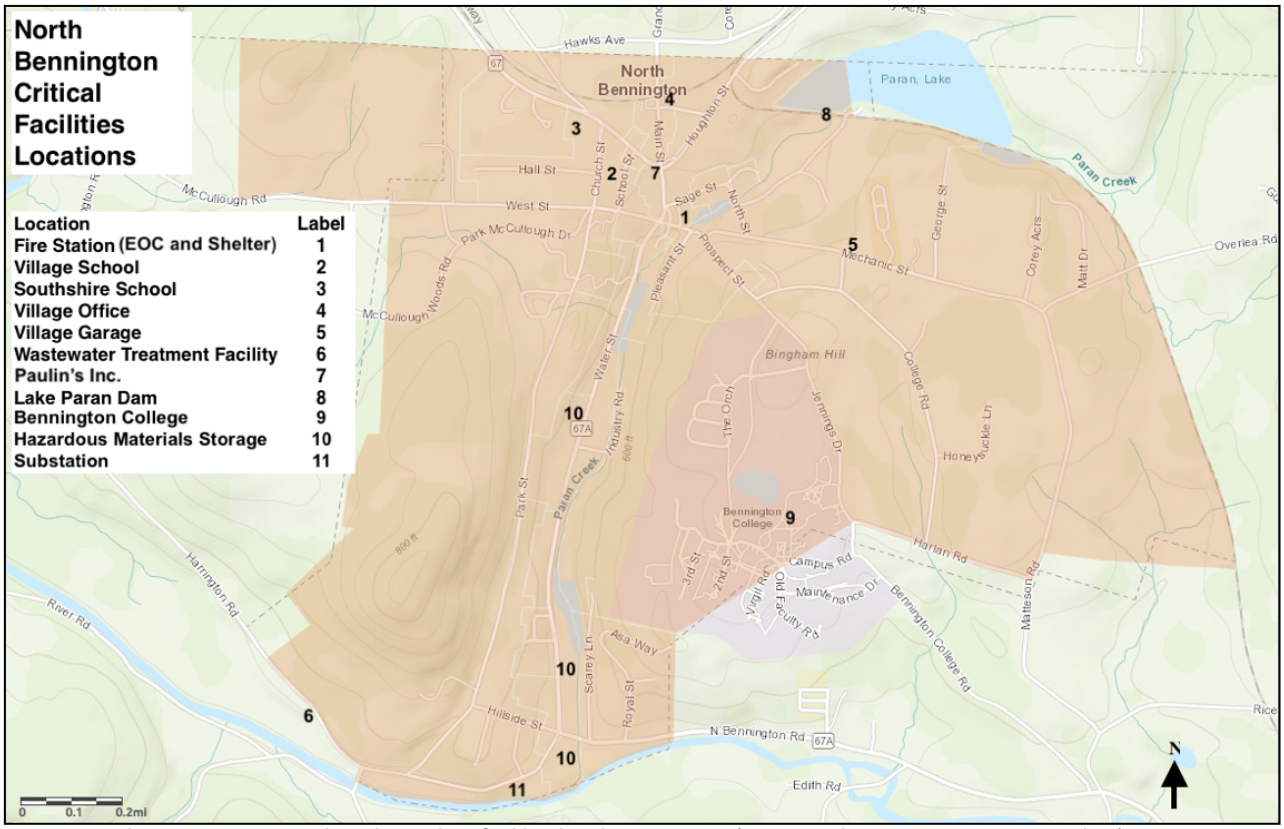
Table 2 lists and describes critical facilities, including the shelter and emergency operations center, hazardous materials storage facilities, and a substation. These are shown on Map 5. The transportation system also represents a set of critical facilities. North Bennington contains 9.662 miles of Town Highway (1.612 miles of Class 1, 0.08 miles of Class 2 and 7.97 miles of Class 3), and 0.465 miles of State Highway (Vermont Agency of Transportation 2018).

Table 2. North Bennington Critical Facilities
Source: North Bennington Planning Team, and 2021 Local Emergency Management Plan

Name	Description
North Bennington Fire Station	Fire Station, Emergency Operations Center, Emergency Shelter
North Bennington Village School	Education Facility, Emergency Shelter
Southshire School	Education Facility
North Bennington Village Office	Village Office, Emergency Operations Center
North Bennington Village Garage	Village Garage, Emergency Operations Center
Bennington Wastewater Treatment Facility (located in Bennington)	Water Treatment Facility
Paulin's Inc.	Hazardous Materials Storage Facility
Lake Paran Dam	Major dam
North Bennington Water Reservoir (located in Shaftsbury)	Public Water Supply
Public Water Supply (Basin Brook located in Shaftsbury)	Public Water System

The public water supply is a critical facility and most of North Bennington is served by a public water system from Basin Brook in Shaftsbury, about four miles northeast of the village

boundary. The water system also serves some parts of Shaftsbury. The water department has an agreement in place to receive a backup generator in case there is a prolonged power outage at the facility. The water department also maintains enough water storage to provide water to the community for two and a half days after an event.



Map 5: North Bennington Critical Facilities identified by the planning team (Sources: Planning Team, ArcGIS Online)

Properties not connected to the public water system rely on private wells. Both public water systems and private wells are vulnerable to contamination. If the public water system were contaminated, it would affect more people in the village, but private wells are more susceptible to contamination due to chemical spills. In addition, public water systems have routine water testing requirements they must follow, but there are no requirements for the testing of private residential wells. This means that a property could have contaminated water from their private well for an extended period of time without knowing it.

At the beginning of 2016, concerns were made regarding the groundwater in North Bennington at the former Chemfab property, which was a manufacturing business that produced Teflon-coating for fabrics. The Department of Environmental Conservation (DEC) was contacted to test five private wells in North Bennington. The private wells were analyzed for perfluorinated compounds as well as volatile organic compounds. Each of the five wells showed the presence of perfluorooctanic acid (PFOA) at concentrations above the Vermont Department of Health drinking water health advisory limits of 20 parts per trillion (ppt). PFOA was not found in the North Bennington public water source or system.

After the initial wells tested positive to PFOA, more wells were tested in North Bennington and Bennington. This was the first water contamination issue for North Bennington. Since these findings, efforts have been made to connect the properties with contaminated wells to the public water systems of North Bennington and Bennington.

Planning Process

Planning Team

This is the second stand-alone hazard mitigation plan for North Bennington. The previous plan was adopted in 2017 and prior to that, the village was also part of a multi-jurisdictional plan that expired in 2010. The members of the hazard mitigation planning team are listed in Table 3 below.

Table 3. Planning team members	
Name	Affiliation
Matt Patterson	Village Trustee
Norm Leblanc	Village Road Foreman
Ted Fela	Village Water Department
Ed Myers	North Bennington Fire Department

Public Involvement

North Bennington started the planning process in October of 2021 and appointed a planning team on November 9, 2021. All meetings were warned according to the Vermont Open Meetings Law, and dates are listed in Table 4.

Table 4. Dates of planning meetings and public and agency review	
Meeting	Dates
Village Trustees appoint planning team	November 9, 2021
Planning team and Trustees meeting	February 17, 2022
Planning team and Trustees meeting	April 12,2022
Planning team meeting	BCRC talked with each planning team member throughout the month of May 2022
First draft made available for public and agency review by the planning team	June 2022
Public meeting at the North Bennington Depot Building	
Trustees meeting and vote to send to the SHMO and FEMA, pending substantive comments	
Village Trustees adoption of FEMA approved plan	

- During the publicly warned November 2021 meeting, several village residents were present. They provided no comments.

- During the publicly warned February 2022 meeting, several village residents were present, there were no comments from the public. The Trustees and members of the planning team provided input about who the BCRC should contact to gather hazard information in the village. They also made suggestions about who to notify for upcoming meetings about the plan.
- During the publicly warned April 2022 meeting, several members of the public were present, but left before the plan was discussed. The Trustees provided several comments to questions the BCRC had.
- The planning team was unable to find a time to meet that worked for everyone. Therefore, each member of the planning team held individual meetings with the BCRC to discuss hazards, village capabilities, prioritize hazards, and to review the current and previous mitigation actions tables. No members of the public were present during these individual discussions.

The plan was posted on The Fund for North Bennington, Inc. website, where village information is posted, and on the Bennington County Regional Commission website. The plan was also sent to the Select Board Chairs of the surrounding towns of Bennington and Shaftsbury. Each were asked to share the plan with appropriate staff and officials. Comments were requested by email to Allison Strohl at the Bennington County Regional Commission at astrohl@bcrcvt.org by September 1, 2022. Once the comment period ended, the Trustees held a warned public meeting where they authorized sending the plan to Vermont Emergency Management for review. Following the review by Vermont Emergency Management, the Trustees adopted the plan, dated _____, at their _____ meeting.

Hazard Assessment

The following sections provide a detailed assessment of each of the hazards identified by the planning team, local knowledge, local and state plans, and data from various sources listed in the References section.

There have been numerous changes to the NOAA database in just the last few years. While NOAA data goes back to 1950, there was a dramatic change in 1996 in the way data were collected. The number of events recorded in years prior to 1996 is far fewer than from 1996 onward. Therefore, for the best reliable data, only data from 1996 onwards was used. In addition, the National Climate Data Center is now called the National Centers for Environmental Information. Both are referenced in this plan and refer to the same database.

Other sources of historical weather data have also been reviewed. The cooperative weather observers for Peru, Sunderland, and Pownal in Vermont have the most consistent long-term data, though some data was available from the North Adams, MA observer, and precipitation (rain) data was available from Bennington Morse State Airport Station. The only stream gauge for Bennington County is in Bennington near the New York border on the Walloomsac. Bennington College has a weather station (https://tempestwx.com/history/40688/year/2021/1/1). The station failed a few years ago and lost all past recorded weather data. The weather station was fixed in

2021, and data is available from February 2021 to now. The data should be included in the following plan updates when more data is available. There are no other weather stations that record or keep long-term data records in North Bennington.

The USGS high water marks for Irene were looked at (Medalie and Olson 2013). In North Bennington, they were located along portions of Paran Creek and the Walloomsac. However, the 2015 special flood hazard maps for potential flooding extent were mostly relied on.

Several studies on potential impacts of climate change were reviewed: the Intergovernmental Panel on Climate Change (Christensen et al 2013), the Vermont Agency of Natural Resources (Tetra Tech 2013), the University of Vermont (Galford et al 2021), the Global Climate Change Research Program (Horton et al 2014), and the U.S. Forest Service (Rustad 2012). The relationship between climate change and the frequency and extent of natural hazards is a developing science. Where information was available, it was described how climate change might affect specific hazards in the future.

Lastly, the probability, impact, and vulnerability for each hazard was based on the rating information in Table 19. This is the same assessment information used in the 2018 State Hazard Mitigation Plan.

Flooding and Fluvial Erosion

Flooding

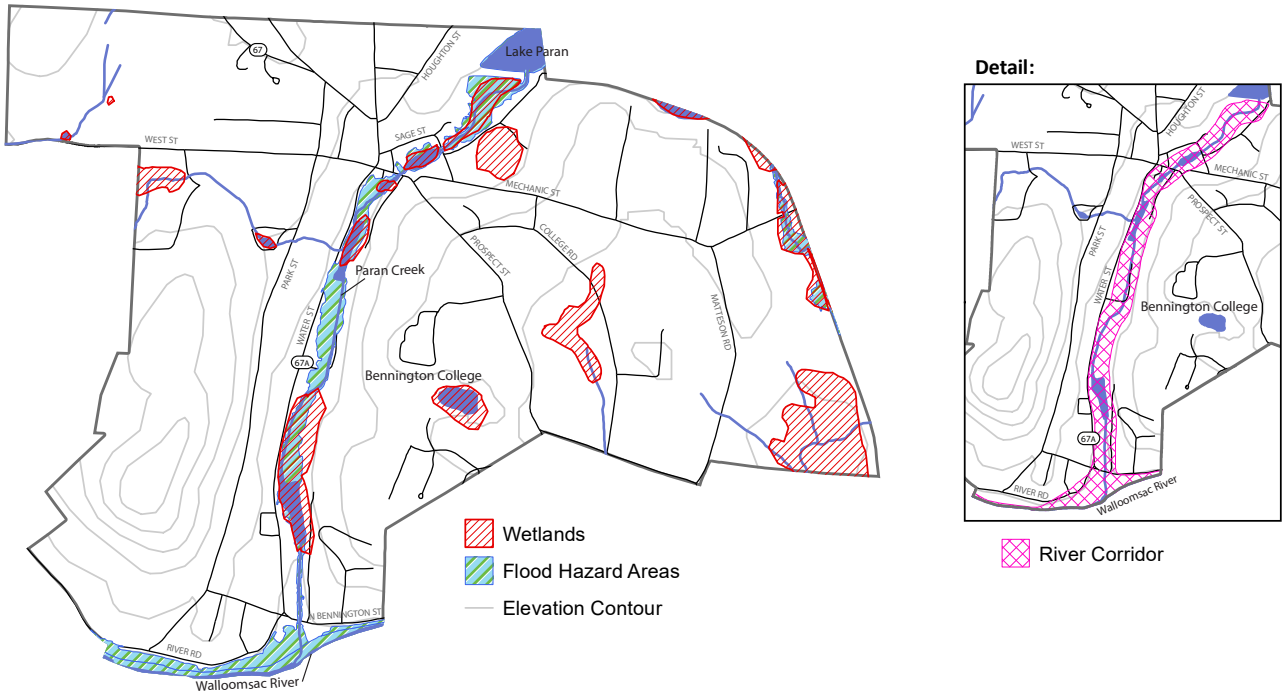
Flooding and associated fluvial erosion are the most frequent and damaging natural hazards in Vermont. The National Weather Service (2010) defines a flood as “any high flow, overflow, or inundations by water which causes or threatens damage.” A flash flood is …”a rapid and extreme flow of high water into a normally dry area, or a rapid water rise in a stream or creek above a predetermined flood level.” These are usually within six hours of some event, such as a thunderstorm, but may also occur during floods when rainfall intensity increases, thereby causing rapid rise in flow.

Floods may reach the following magnitude levels in one or more reaches, but not necessarily all. The NWS impact categories are:

- Minor Flooding - minimal or no property damage, but possibly some public threat.
- Moderate Flooding - some inundation of structures and roads near stream. Some evacuations of people and/or transfer of property to higher elevations.
- Major Flooding - extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.
- Record Flooding - flooding which equals or exceeds the highest stage or discharge observed at a given site during the period of record keeping.

Runoff from snowmelt in the spring, summer thunderstorms, and tropical storms and hurricanes can all result in flooding in North Bennington. Ice jam flooding can occur on Vermont rivers when substantial ice forms followed by several days of warmth, snowmelt, and any rainfall leading to ice breakup. As the ice breaks up on the rivers, chunks of ice form jams which cause localized flooding on main stem and tributary rivers. Ice jams are most prevalent during the January thaw (late January) and in March and April as spring approaches.

Flash floods can occur after spring melt of mountain snow, following large storms such as Tropical Storm Irene, or after significant thunderstorms. Digital flood zone maps (DFIRMs) became effective December 2, 2015 and were adopted by North Bennington. Map 6 shows the location of both flood hazard areas and river corridors.



Map 6: Flood Hazard Areas and River Corridors in North Bennington (Source: North Bennington Village Plan 2018)

Much of North Bennington's development is located along Paran Creek and in the village center, with eight buildings located in the flood hazard area. There has not been any new development in the flood hazard area in North Bennington since the 2017 Village of North Bennington Hazard Mitigation Plan. In addition, no new building development at all has occurred in the village since the previous plan.

Other changes have occurred in the village since the previous plan. An assisted living facility has been turned into a writer's retreat. The number of apartments along Water Street in the previous Chem Fab factory building has increased from about 70 units to 83 units. This building is located just outside the flood hazard area but is in the river corridor. The same owner of these apartments also owns the neighboring mill building that has been turned into housing for Bennington College. Approximately 70 students, including a few faculty members and staff, live in this housing called Paran Creek Apartments. This building spans Paran Creek and is located in the

flood hazard area. In addition, Bennington College has increased the number of students attending, many being remote attendees this year. Bennington College has plans to increase housing on campus, transitioning current faculty housing to student housing in 2023. With the increase in college housing located in the flood hazard area, the vulnerability to North Bennington has increased since the previous plan.

North Bennington has five dams. The Lake Paran dam was completed in 1851 and is owned by the State of Vermont Agency of Transportation. This dam, listed in the National Inventory of Dams, was last inspected in 2017 (U.S. Army Corps of Engineers 2020). According to the National Inventory of Dams, this dam is classified as having high hazard potential but is considered to be in fair condition. The dam is considered high hazard potential due to the high risk of downstream flooding of Paran Creek if the dam were to fail (Paran Creek Watershed Plan 2017). The Lake Paran dam does have an Emergency Action Plan developed by the dam owner.

South of the Lake Paran dam but on Paran Creek are four more dams. All of these dams are considered to be of low hazard potential, according to the Vermont Dam Inventory. The first is Whites Mill dam or Prospect Street dam, owned by the Village of North Bennington. The completion date and last inspection date are both unknown. Next is the Stark Mill dam, privately owned and built in 1918. The inspection date is unknown. Then there is the Cushman dam, owned by the National Hanger Company. The completion date and inspection date are unknown. The last dam located on Paran Creek, before reaching the Walloomsac River, is named Polygraphic and is privately owned. The completion date and the last inspection date are also both unknown. The only dam included in the National Inventory of Dams is the Lake Paran dam.

Fluvial Erosion

In Vermont, most rivers flow through relatively confined valleys, but still meander over time across the floodplain. The Vermont Hazard Mitigation Plan (2018) states that 75% of flood damages as measured in cost are due to erosion rather than inundation. River corridors provide an area within which a river can move across the landscape as it dissipates energy and transports and deposits sediments. Where rivers are constricted by bridges and other structures, or rip rap, the water moves at higher velocity, resulting in downcutting and collapse of the banks. This may undermine structures within the corridor.

Previous Occurrences

Ludlum (1996) describes numerous storm events that have affected Vermont since settlement, but the local impacts of these are difficult to trace. The 1927 flood was the largest recorded disaster in the history of the state. The state received over six inches of rain, with some areas receiving 8-9 inches. Following a rainy October, this storm occurred from November 2nd through the 4th causing extensive flooding. Two storms occurred in March of 1936. Heavy rains and snowmelt caused significant flooding. Two years later, the 1938 hurricane caused both flooding and extensive wind damage. The remnants of Hurricane Belle (August 9-10, 1976; DR-518) caused flooding damage in portions of Vermont.

In addition to these events, the Bennington Evening Banner, the local newspaper at the time, recorded three more flood events. The 1869 flood occurred after nearly 36 hours of violent rainfall and flooded downtown Bennington. A storm in 1948 caused downtown Bennington to flood and rendered the North Street and River Street bridges impassable. Lastly, the newspaper mentioned a storm in 1973 that claimed lives, caused property damage and flooded several communities in Vermont.

Table 5 shows a total of 60 flood events in Bennington County from 1996 to 2021, using NOAA data. These have been primarily minor and affected either specific streams, such as the Walloomsac and Batten Kill, or specific towns or villages.

Table 5. Total number of flood events by type and year for Bennington County
Source: National Oceanographic and Atmospheric Administration 2021

Year	Flash Flood	Flood	Total
1996	3	6	9
1997			
1998	1	3	4
1999	2		2
2000	4	1	5
2001			
2002	1		1
2003		2	2
2004	1	5	6
2005		5	5
2006			1
2007	1	1	2
2008			
2009	2		2
2010			
2011	3	3	6
2012			
2013	4		4
2014			
2015			
2016			
2017		1	1
2018		1	
2019		8	8
2020			
2021	2		2
Total	24	36	60

Hurricanes and tropical storms that form in tropical waters have historically affected New England but are relatively infrequent. Besides the 1938 storm, Tropical Storm Belle brought significant rains to Vermont in 1976 and Hurricane Gloria brought rain and wind damage in 1985. North Bennington has been subjected to two major tropical storms in the past twenty years. Hurricane Floyd was a Category 4 storm before hitting North Carolina, and then was reduced to a tropical storm when it reached southern New England. Tropical Storm Irene was the remnant of Hurricane Irene, which was a Category 1 hurricane. A category 1 storm has winds of 74-95 miles per hour and could damage roofs, down shallow-rooted trees and damage power lines (https://www.nhc.noaa.gov/aboutsshws.php).

The following describes 28 moderate and extreme events that have occurred since 1996, using the National Weather Service (2010) categories, which affected North Bennington or nearby areas. These events were described in the National Centers for Environmental Information records (2021). It should be noted that only the five events occurred in the winter, with all other events in the spring, summer or fall. Ice jam flooding also occurs in one instance discussed below.

January 19-20, 1996 (DR-1101 1/19 to 2/2 1996): An intense area of low pressure which was located over the Mid-Atlantic region on the morning of January 19 produced unseasonably warm temperatures, high dewpoints and strong winds. This resulted in rapid melting of 1 to 3 feet of snow. In addition to the rapid snowmelt 1 to 3 inches of rain fell as the system moved northeast

along the coast. This resulted in numerous road washouts and the flooding of several homes across the county. *Note that this was also categorized as a High Wind event.

April 24, 1996: Significant rains on the evening of April 23 resulted in flooding along the Walloomsac and Batten Kill Rivers. The Walloomsac River crested 1.5 feet over flood stage at North Bennington and the Batten Kill crested 1 foot over flood stage at Arlington. The flooding resulted in several road closures but much of the flooding was minor.

May 1, 1996: Heavy rain on the evening of April 30 caused the Walloomsac River to flood. Flooding occurred at Paper Mill Village in Bennington.

May 11-12, 1996: A low pressure system tracked across New York State and New England during May 10 and 11. On May 12 the system moved to the east coast and intensified, this prolonged the period of precipitation. Rainfall in excess of 2 inches fell during this period over much of western New England. This resulted in flooding along the Walloomsac River. The river crested 2.5 feet over flood stage. Route 67 in Bennington was flooded during the morning hours of May 12. A Cooperative Weather Observer in Pownal recorded 2.10 inches of rain on May 12.

December 2, 1996: Rainfall during the late fall season resulted in flooding across parts of Bennington County. The Walloomsac River flooded in North Bennington. Several homes were flooded along with Route 67A. The Batten Kill at Arlington flooded with several homes affected.

January 24, 1999: The combination of rain and very mild temperatures produced rapid snowmelt in southern Vermont. This runoff and ice jams triggered flooding on the upper Batten Kill near Arlington and on the Walloomsac River near Bennington. The Bennington Morse State Airport recorded 0.69 inches of rain and melted snow.

September 16-17, 1999 (DR-13079/16-21 1999): The remnants of Hurricane Floyd brought high winds and heavy rainfall (3-6 inches) to southern Vermont. Many smaller tributaries reached or exceeded bankfull. Estimated wind gusts exceeded 60 mph, especially over hill towns. Power outages occurred across southern Vermont. A Cooperative Weather Observer recorded 4.60 inches of rain in Pownal and 2.94 inches at Bennington Morse State Airport.

July 14-17, 2000 (DR- 1336 7/14-18 2000): Thunderstorms caused torrential rainfall with flash flooding washing out sections of roadways in northeast Bennington County and southern Bennington County. Route 7 was closed due to flooding and rockslides and 67 was closed due to flooding. Numerous other roads were closed, some even washed out. This rain produced enough runoff to cause the Batten Kill to exceed the 6-foot flood stage by about 1 foot at Arlington, a 47-year high. The swelled river flooded the Batten Kill Canoe Company and adjacent river property. Specific amounts included 3 inches at Bennington. Lightning from a thunderstorm struck a man while he was jogging in Bennington, injuring him. The Bennington Morse State Airport recorded 2.79 inches of rain.

May 28, 2002: Scattered thunderstorms developed along a quasi-stationary front on the afternoon of May 28. These storms were slow moving and contained torrential rainfall across southern

Vermont. Rainfall amounts reached around 3 inches in a couple of hours in Bennington County. The result was localized flash flooding in Pownal. Routes 346 and sections of Route 7 were flooded in Pownal.

March 29, 2003: An area of low pressure, moving along a slow-moving cold front on March 29 and 30, produced up to 2 inches of rainfall across extreme southern Vermont. The rain, combined with seasonably mild temperatures, melted much of the remaining snowpack across this area and produced a significant runoff. Both the Walloomsac and Batten Kill Rivers briefly went above flood stages in sections. The Walloomsac gage at Bennington crested at 8.19 feet, compared to the flood stage of 7.5 feet. The Batten Kill gage at Arlington crested at 6.3 feet, 0.3 feet above its flood stage.

July 21 to August 18, 2003 (DR-1488 7/21-8/18 2003): Severe storms and flooding affected Vermont including Bennington County. (Note: this event does not appear in the NOAA data). Both Bennington Morse State Airport and the Cooperative Weather Observer in Pownal recorded sporadic and sometimes large amounts of precipitation during this period.

March 31 to April 2, 2004: As much as 3 inches of rain fell between March 31 through April 2 across southern Vermont. This rain combined with the last of the snowmelt produced an excessive runoff of water. As a result, flooding took place in Bennington at the Paper Mill Village along the Walloomsac River.

May 25, 2004: The Walloomsac River exceeded its flood stage of 7.0 feet, cresting at 7.75 feet at the gage in Bennington.

September 18, 2004: The Walloomsac River exceeded its flood stage of 7.0 feet, cresting at 7.21 feet at the Bennington gage.

October 9, 2005: North Bennington Road at Bennington closed due to flooding.

November 30, 2005: The Walloomsac River had minor flooding at Bennington. The river crested at 8.51 feet.

January 18-19, 2006: High wind and 1 to 2 inches of rain fell across eastern New York and western New England. Flooding occurred on the Walloomsac River in Bennington on January 18 and January 19. Flood stage is 7.0 feet; the river crested at 8 feet.

April 16-17, 2007 (DR-1698 4/15-21 2007): An intense coastal storm spread heavy precipitation across southern Vermont, starting as a mixture of snow, sleet and rain which changed to all rain. Liquid equivalent precipitation totals ranged from 3 to 6 inches leading to minor flooding across portions of southern Vermont. A Cooperative Weather Observer recorded 2.20 inches of rain in Pownal and Bennington Morse State Airport recorded 1.41 inches from April 15 to 17.
June 15, 2009: Numerous thunderstorms developed across southern Vermont, many of which contained large quantities of hail. Some thunderstorms were slow moving and produced locally

very intense rainfall rates. This led to flash flooding in some areas. Cars were reported stalled in floodwaters in downtown Bennington due to flash flooding from heavy rainfall.

June 30, 2009: Torrential rain from thunderstorms produced flash flooding in Bennington. Several vehicles were disabled in high water on South Street in Bennington.
August 28-29, 2011 (DR-4022 8/27-29 2011): Tropical Storm Irene produced widespread flooding, and damaging winds across the region. Rainfall amounts averaged 4 to 8 inches and fell within a twelve-hour period. A Cooperative Weather Observer recorded 4.70 inches of rain in Pownal and Bennington Morse State Airport reported 4.23 inches of rain from August 27 to 28. In Bennington County, widespread flash flooding and associated damage was reported countywide, with many roads closed due to flooding and downed trees and power lines. Strong winds also occurred across southern Vermont, with frequent wind gusts of 35 to 55 mph, along with locally stronger wind gusts exceeding 60 mph. The combination of strong winds, and extremely saturated soil led to widespread long duration power outages. In Bennington County, approximately 5,000 customers were affected by power outages. Record flooding occurred on the Walloomsac River. The Walloomsac gage exceeded its seven-foot flood stage at 8:48 am EST on August 28th, its nine foot moderate flood stage at 9:50 am, its 11 foot major flood stage at 11:46 am, crested at a record 12.82 feet at 2:30 pm, and fell below flood stage at 5:32 am on August 29th. Route 9 was closed from Bennington to Brattleboro due to numerous reports of flooding. Portions of Route 9 remained closed after the floodwaters receded due to damage.

During Irene, the main water source to Bennington was cut off to the town for several days after a bridge collapsed in Woodford damaging the town water line. Many residents and businesses were without power. Storm drainage issues occurred along Northside Drive causing the flooding of several businesses. The wastewater treatment plant was operating near maximum load and couldn't have handled much more water.

In North Bennington, a log jam occurred on Paran Creek, just south of the Water Street/North Bennington Road bridge. This caused water to back up quickly and threatened flooding of the buildings along Water Street. The log jam was cleared before the increase in water caused any damage.

September 7, 2011: Large amounts of moisture from the remnants of Tropical Storm Lee interacted with a frontal system producing heavy rainfall with total rainfall amounts ranging from 3 to 7 inches led to widespread minor to moderate flooding across southern Vermont. A Cooperative Weather Observer in Pownal recorded 6.70 inches of rain between September 5 and 9, and Bennington Morse State Airport recorded 3.49 inches from September 4 to 8. Minor flooding occurred on the Walloomsac River at Bennington. The Walloomsac gage exceeded its 7-foot flood stage at 11:48 am on September 7, crested at 8.57 feet at 2:15 pm (moderate flood stage is nine feet), and fell below flood stage at 5:54 pm on September 7.

May 22, 2013: Heavy rainfall from showers and thunderstorms reportedly caused flash flooding along Route 67A in North Bennington. Law enforcement reported that the road was temporarily closed due to flooding. The Bennington Morse State Airport recorded 3.43 inches of rain from May 21 to 22, and a Cooperative Weather Observer in Pownal observed 3.70 inches of rain.

May 29, 2013: Flash flooding was reported as a result of heavy rainfall from thunderstorms in Bennington on North Branch Street. South Street (Route 7) was also reported to be closed due to flooding on the roadway.

June 2, 2013: Showers and thunderstorms developed across the region. These thunderstorms were aided by very strong winds aloft and a few storms became severe across southern Vermont, producing large hail and wind damage. The thunderstorms also produced very heavy rainfall, which caused flash flooding within Bennington. Amateur radio operators reported that 8 to 10 inches of water was flowing across streets in downtown Bennington.

July 1, 2017: Thunderstorms occurring across the region resulted in torrential rainfall in portions of southern Vermont. The airport at Bennington recorded 3.47 inches of rain in four hours during the evening. This rainfall resulted in river flooding along the Walloomsac, including Paper Mill Village in Bennington. The storm also produced a microburst in Bennington County with maximum wind speeds of an estimated 100 mph.

January 19-20, 2019: Melting of snow along with rain and ice jams caused flooding across the county including the Walloomsac.

July 14, 2021: A line of strong to severe thunderstorms resulted in a few wind damage reports and flash flooding in southern Vermont. Heavy rain led to several buildings being flooded in Bennington on South Street. Multiple trees and wires were reported down around Shaftsbury.

Extent and Location

The primary damages from past events have been from flooding and fluvial erosion with secondary damage from wind. The village joined the National Flood Insurance Program (NFIP) in July 7, 2011. There are four flood insurance policies in effect. There have been no NFIP-designated repetitive losses within North Bennington.

During Tropical Storm Irene, flooding occurred along the banks of the Walloomsac, though there was little property damage. Prior to Tropical Storm Irene, Paran Creek flooded Water Street when material collected at the Cushman dam. However, the planning team could not identify any flooding or erosion issues along Paran Creek in recent years. Erosion along Paran Creek seems to be minimal due to substantial vegetation along the banks. However, various residential buildings, the North Bennington Fire Department, and businesses and industrial buildings along Water Street are located within the special flood hazard area and the river corridor.

After Tropical Storm Irene, there were six high water marks located and mapped in North Bennington by the USGS. Four were located along Paran Creek and two along the Walloomsac (Medalie and Olson 2013). Three were located within the flood hazard area and three were located slightly outside but not enough to be noteworthy. In other words, the FEMA DFIRMs appear to be accurate because flooding was, for the most part, in line with the flood hazard area.

In addition to the above events, the Peru, Pownal, and Sunderland Cooperative Observers recorded precipitation. Table 6 shows those months by year where that value exceeded the 90th percentile, which varies by site and month. Several events of that magnitude have occurred where flooding was not recorded in NOAA records or local knowledge, but this does provide additional information on potential flooding extent.

Table 6. Months where rainfall exceeded the 90th percentile (precipitation totals, in inches, in parentheses) of monthly precipitation at the Peru, Pownal, and Sunderland Cooperative Observer Stations from 1990 to 2013

	Sunderland	Pownal	Peru
Month	Year	Year	Year
January	1990, 1998, 1999 (5.98”)	1996, 1998, 1999 (4.29”)	1990, 1999 (5.79”)
February	2002, 2008, 2011 (3.58”)	1990, 2008 (3.53”)	2000, 2002, 2008 (4.93”)
March	2001, 2007, 2008 (5.35”)	1999, 2001, 2007 (4.42”)	2001, 2008 (6.15”)
April	1993, 1996, 2002, 2007, 2011 (4.74”)	1990, 1993, 1996 (4.76”)	1996, 2007 (5.95”)
May	1990, 2000, 2006 (6.31”)	1990, 2013 (6.50”)	1990, 2012 (7.70”)
June	1998, 2002, 2006 (7.67”)	1998, 2000, 2002, 2013 (7.27”)	1998, 2006, 2011, 2013 (8.94”)
July	1996, 2004, 2008 (6.87”)	2004, 2010 (6.34”)	1996, 2000, 2013 (7.41)”
August	1990, 2003, 2011 (7.38”)	1990, 1991, 2003, 2011 (7.24”)	1990, 2003, 2011 (8.65”)
September	1999, 2003, 2011 (5.75”)	1999, 2004, 2011 (6.13”)	1999, 2003, 2011 (7.13”)
October	2005, 2007, 2010 (7.05”)	1995, 2003, 2010 (5.46”)	1995, 2005, 2006, 2010 (8.30”)
November	2002, 2004, 2005 (5.28”)	2005 (5.36”)	2002 (6.37”)
December	1996, 2003, 2008 (6.42”)	1990, 2003, 2011 (4.62”)	1996 (7.18”)

The average annual precipitation in Vermont has increased 6.71 inches since 1960. This trend is predicted to continue so that Vermont streams will have higher flows and possibly experience more frequent and greater flooding events (Galford et al 2021).

Special Flood Hazard Areas: these are areas mapped by FEMA and using the LIDAR derived zones that were adopted in late 2015. Figure 2 below shows the parts of a typical floodplain.

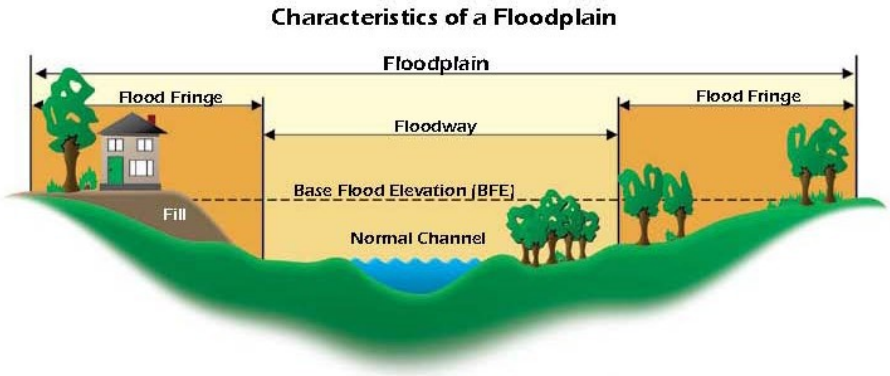


Figure 2: Typical Floodplain

River Corridors: River corridors (Figure 3) have been mapped by the Vermont Agency of Natural Resources using geospatial data and modified by VT ANR river scientists using available field data. The data were used to calculate the "meander belt width" or area within which a river would move across the valley. As rivers shift their location both vertically and horizontally, erosion of adjacent lands can occur and threaten properties that may be outside of special flood hazard areas (Vermont River Management Program 2010).

The maps developed by VT ANR show the potential extent of fluvial erosion in North Bennington. This is the only information available that shows the amount of fluvial erosion that could occur. Therefore, these maps provide the best data to determine extent of fluvial erosion.

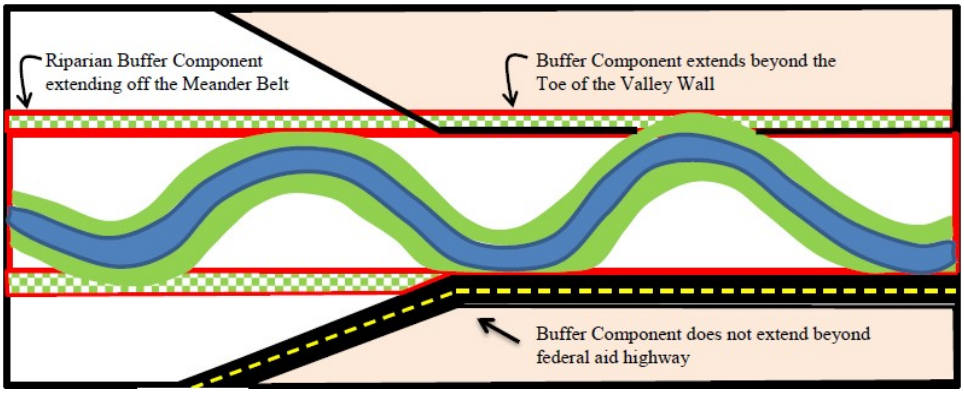


Figure 3: River Corridors

Probability, Impact, and Vulnerability

A moderate or major flood event occurring in or near North Bennington in any given year is highly likely, with >75% probability in a year.

Table 7 tallies the number of structures by type within the river corridor and special flood hazard area. As shown in Table 7, there are 8 structures in the special flood hazard area and 42 in the river corridor recently mapped by VT ANR. Therefore, the potential proportion damaged within the village from severe flooding would range from 1-10% with injuries of 1-10%. Most services recover in less than seven days, though help for specific property owners may take significantly longer.

Table 7. Structures in flood zones and river corridors in North Bennington, VT
Source: Vermont Open Geodata Portal

Site Type	A Zone	AE Zone	Lake Paran Inundation	River Corridor	50-foot Corridor	Grand Total
Single Family Dwelling	1		17	23	1	42
Multi-Family Dwelling	3		6	4		13
Mobile Home			1	1		2
Commercial W/Residence			3	3		6
Commercial			10	6		16
Industrial	1		1	1		3

Table 7. Structures in flood zones and river corridors in North Bennington, VT Source: Vermont Open Geodata Portal						
Site Type	A Zone	AE Zone	Lake Paran Inundation	River Corridor	50-foot Corridor	Grand Total
Fire Station	1		1	1		3
Day Care Facility			1			1
Library			1			1
Utility		2	2	2		6
Other			2	2		4
Grand Total	6	2	45	43	1	97

Winter Storms

Description

Winter storms are frequent in Vermont. Winter storms may consist of heavy snow, mixed precipitation, or ice storms and all may be accompanied by strong winds. Potential damages can include power outages, traffic accidents, and isolation of some areas. For example, the October 4, 1987 storm stranded travelers in the area and knocked out power for several days. The "Blizzard of ’93," one of the worst storms on record, virtually shut down Vermont on the weekend of March 13-14, forcing the closure of roads and airports. Snowfall amounts ranged from 10 to 28 inches across the state.

Table 8. Total number of winter storm events by type and year for Bennington County Source: National Centers for Environmental Information 2021						
Year	Blizzard	Heavy Snow	Ice Storm	Winter Storm	Winter Weather	Totals
1996		5		2		7
1997		1		7	2	10
1998				2	1	3
1999				4		4
2000		1		6		7
2001				6		6
2002				5		5
2003				5		5
2004				2		2
2005	1	3		2		6
2006						
2007		3	1	6	4	14
2008		4	1	1	11	17
2009		3		1	10	14
2010		3		1	2	6
2011				5	5	10
2012				4	2	6
2013		2		1	4	7
2014		2		4		6

Table 8. Total number of winter storm events by type and year for Bennington County Source: National Centers for Environmental Information 2021						
Year	Blizzard	Heavy Snow	Ice Storm	Winter Storm	Winter Weather	Totals
2015		2			6	8
2016		1			5	6
2017	1	3		1	7	12
2018		2		5	4	11
2019		1		5	4	10
2020		1		2	8	11
2021		1		4	5	10
Totals	2	38	2	81	80	203

In rare cases, the weight of snow may collapse roofs and cause other structural damage. Wind accompanying snowstorms can increase the effect of the snow damages. In addition to snow, ice storms occur when the lower levels of the atmosphere and/or ground are at or below freezing, and rain is falling through warmer air aloft. The precipitation freezes upon contact with the ground, objects on the ground, trees and power lines.

Previous Occurrences

Table 8 summarizes the 203 winter storm events that have occurred in Bennington County since 1996. As can be seen, a high number of events occurred in 1997, 2007, 2008, 2009, 2011, 2017, 2018, 2019, 2020, and 2021. Using NOAA data, we categorized the extent of each storm with storms ranked as “High” if they produced more than twelve inches of snow or were categorized by NOAA as producing heavy or record snows or blizzards or significant icing. The Blizzard of 1993 was categorized as “Extreme.” NOAA also reports numerous storms producing one to over three feet of snow in the Green Mountains, but these were not listed as they did not affect major population centers. The following is a summary of significant events.

<u>January 2 to 3, 1996 Heavy Snow</u>: A major winter storm developed over the Gulf coast states on January 2 and tracked northeast along the eastern seaboard during January 3. Heavy snow fell across southern Vermont with the average snowfall ranging from 10 to 12 inches.

<u>November 26, 1996 Winter Storm</u>: Over Bennington and Windham Counties, snow and heavy freezing rain downed trees and power lines and caused numerous accidents. Across southern Vermont, approximately 10,000 customers lost power.

<u>December 7 to 8, 1996 Winter Storm</u>: Heavy wet snow fell across southern Vermont resulting in 20,000 customers losing power. Shaftsbury recorded 12 inches of snow and 11 inches was recorded in Pownal. Downed trees caused road closures, and some were without power for several days. A Cooperative Weather Observer in Pownal recorded 14.5 inches of snow during this event.

<u>March 31 to April 1, 1997 Winter Storm</u>: A nor’easter formed bringing rain that changed to snow with totals of 12 inches in Shaftsbury. The wet snow caused power outages and road closures.

December 29 to 30, 1997 Winter Storm: Wet snow and strong winds combined to down trees and power lines causing scattered power outages. Route 7 was closed for several hours to clear debris. In Bennington, a 60-foot by 30-foot section of a cinema roof was peeled off by gusting winds. Strong winds ripped the metal skirting off several mobile homes at the Willows Mobile Home Park. Snowfall totals generally ranged from 5 to 10 inches across Bennington and Windham Counties.

January 14 to 15, 1999 Winter Storm: Heavy snow fell across eastern New York and southern New England with 5 inches reported by a Cooperative Weather Observer in Pownal. The storm was accompanied by extremely cold conditions with reported temperatures of -9 F.

December 30 to 31, 2000 Winter Storm: A general swath of 6 to 12 inches of snow fell across the region with locally higher amounts across the hills. Specific amounts included 13 inches in Pownal, and 8 inches in Bennington.

February 5 to 6, 2001 Winter Storm: A swath of heavy snowfall accumulating of a foot or more fell across southern Vermont. In Bennington County, specific accumulations included 12 inches in Bennington and 14 inches in Pownal.

March 5 to 6, 2001 Winter Storm: An extended period of moderate to heavy snow resulted in 26 inches of snow in Pownal. This was one of the largest snowfalls in southern Vermont since the Blizzard of 93.

January 6 to 7, 2002 Winter Storm: Two storm systems managed to produce a swath of snow in excess of a foot across southern Vermont. In Pownal, 15 inches of snow fell.

December 6 to 8, 2003 Winter Storm: The first major snowstorm of the winter resulted in 20.5 inches of snow reported in Pownal.

January 15 to 16, 2007 Ice Storm: Freezing rain and sleet resulted in widespread downed trees and power lines with accompanying widespread power outages. Significant icing, with ice accretions of ½ inch up to 1 inch, occurred from the freezing rain.

February 14, 2007 Heavy Snow: Snowfall in excess of two feet across portions of Bennington County resulted in closed schools and businesses. Strong winds created near blizzard conditions during parts of the event.

April 15 to 16, 2007 Winter Storm: Heavy, wet snow, ranging from 8 to 12 inches, downed trees and power lines causing widespread outages.

December 16 to 17, 2007 Winter Storm: Snow, heavy at times, mixed with sleet Sunday afternoon and evening. Total snow and sleet accumulations ranged from 10 to 14 inches, with 14 inches reported at Woodford. The combination of strong winds, and the extra weight of heavy wet snow on tree limbs also downed trees and power lines in portions of Bennington County during Sunday.

The heavy snow and sleet resulted in numerous school and business closings Monday morning, and also created treacherous travel conditions for the morning commute.

February 12 to 13, 2008 Winter Storm: Snow accumulated 4 to 7 inches and was accompanied by freezing rain with ¼ to ⅓ of an inch of ice.

December 11 to 12, 2008 Ice Storm: Rainfall in rates of ¼ to ⅓ of an inch per hour fell creating ice accumulations of ½ to ¾ of an inch. Snow and sleet mixed in some areas. An estimated 15,000 customers lost power and businesses and schools were shut for several days. Very cold temperatures followed the storm. Numerous warming shelters were setup to assist those who were without power and heat.

January 1 to 3, 2010 Heavy Snow: A strong storm brought 10 inches to over two feet of snow across Bennington and Windham counties. Over this three-day period, a Cooperative Weather Observer reported 13 inches of snow.

February 23 to 24, 2010 Heavy Snow: Heavy snow totaling one to two feet fell across southern Vermont with highest amounts at elevations above 1500 feet. A Cooperative Weather Observer in Pownal reported 9.7 inches of snow on February 24.

February 26 to 27, 2010 Heavy Snow: Just after the storm described above, a second storm brought one to two feet in higher elevations with lesser amounts below 1000 feet in elevation. A Cooperative Weather Observer in Pownal reported 13.4 inches of snow from February 25 to 27.

December 26 to 27, 2010 Winter Storm: Heavy snow falling at rates of 1 to 3 inches per hour resulted in one to two feet of snow. Winds were strong and gusted to 35-45 mph. A Cooperative Weather Observer in Pownal reported 20 inches of snow on December 27.

January 12, 2011 Winter Storm: A strong storm resulted in 14 inches to three feet of snow falling at rates of 3 to 6 inches per hour. A Cooperative Weather Observer in Pownal reported 20.6 inches of snow from January 12 to 13.

February 1 to 2, 2011 Winter Storm: Snowfall was generally 10 to 18 inches but ranged to 25 inches in some areas.

February 25, 2011 Winter Storm: Snow fell at rates of 1 to 2 inches per hour with totals of 12 to 17 inches across southern Vermont.

October 29 to 30, 2011 Winter Storm: While not yet winter and with trees with much of their foliage still on, 5 to 14 inches fell across Bennington County. Trees and power lines came down due to the weight of the wet snow. A Cooperative Weather Observer in Pownal reported 9.3 inches of snow on October 30.

December 14 to 15, 2013 Heavy Snow: Snow fell at rates in excess of 1 inch per hour over much of the region and snow rates locally were as high as up to 3 inches per hour at times. In addition,

gusty southeast winds occurred during the late night hours, with a few gusts of 40-55 mph. The highest snowfall amounts occurred across the higher peaks of the southern Green Mountains, with up to 18 inches occurring in Woodford.

February 13 to 14, 2014 Winter Storm: Snow fell at rates of up to 3 inches per hour. Over the two days of the storm, 8 to 21 inches fell in southern Vermont. At times, winds gusted to 40 mph as the storm left the area.

November 26 to 27, 2014 Winter Storm: An early storm affected southern Vermont over the Thanksgiving period with 8 to 15 inches of total snow accumulation.

February 2, 2015 Heavy Snow: Most areas received 9 to 15 inches, although some areas within the high terrain of the southern Green Mountain saw up to 19 inches.

February 7 to 10, 2015 Heavy Snow: Snow amounts between one and two feet, with the highest amounts across the high terrain of the southern Green Mountains.

March 14 to 16, 2017 Blizzard: Extremely heavy snow and blizzard conditions with snow fall rates of 1 to 4 inches per hour resulted in 18 inches of snow. High winds resulted in near zero visibility. Most impacts occurred on March 14, but snow continued for several days.

January 3 to 4, 2018 Heavy Snow: Snowfall fell at rates of 1 to 3 inches per hour accumulating to 7 to 15 inches. The storm was followed by high winds of 30 to 40 mph and extreme windchill conditions.

February 4, 2018 Heavy Snow: Heavy snow resulted in totals of 5 to 14 inches in southern Vermont.

March 13 to 15, 2018 Winter Storm: A long duration snow, with observed rates of 1 to 3 inches per hour resulted in one to two feet of snow with higher amounts at higher elevations.

February 12 to 13, 2019 Winter Storm: Snow changing to sleet and freezing rain resulted in closing and delays including power outages due to accompanying high winds.

December 1 to 3, 2019 Heavy Snow: Snow accumulated to 18 to 28 inches in eastern New York and southern Vermont. Many schools were closed for several days.

December 16 to 17, 2020 Heavy Snow: Snowfall rates of up to 3 to 6 inches per hour were observed with total snowfall in southern portions of Bennington and Windham Counties of 15 to 25 inches.

February 1 to 2, 2021 Winter Storm: Moderate to heavy snow fell, with snowfall rates of 1 inch per hour at times. Storm totals ranged from 7 to 17 inches.

Extent and Location

The National Centers for Environmental Information publishes climate normal, or averages, for various stations. The Sunderland station was the closest station with this snowfall data (https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&station=USC00438160). The data covers a 30-year period from 1991-2021. The average snowfall for this period was 75.2 inches for Sunderland. December, January, February and March are the primary months for snowfall. Extreme snowfall events for one, two, and three day events have ranged from 12 to over 20 inches (NOAA/National Climate Data Center Cooperative Weather Observer reports). The skill of road crews in Vermont means that only the heaviest snowstorms (>12 inches) or ice storms affect the populations.

Increasing temperatures that are predicted to occur will likely reduce total winter snowfall. If precipitation falls as rain in the winter, river flows will be higher due to the lower evapotranspiration in the winter. Freezing rain may become more frequent, with resulting impacts to the transportation and power systems (Galford et al 2021).

Probability, Impact and Vulnerability

A moderate or greater snowstorm occurring in or near North Bennington in any given year is highly likely, with a >75% probability in a year. These are large-scale events, though local impacts may vary greatly. Power lines and roads are most vulnerable, with traffic accidents the most likely to create injuries. Power outages could be short term (a few hours) or last seven or more days. Some roads may remain impassable for long periods as well.

High Wind Events

Description

High wind events can occur during tropical storms and hurricanes, winter storms and frontal passages. Thunderstorms can produce damaging winds, hail and heavy rainfall, the latter potentially producing flash floods. NOAA recorded 108 thunderstorms with damaging winds in Bennington County since 1996.

Tornadoes are formed in the same conditions as severe thunderstorms. Intense, but generally localized damage can result from the intense winds. The primary period for tornado activity in New England is mid-summer (Zielinski and Keim 2003). Tornadoes will generally follow valleys in the northeast and dissipate in steep terrain. NOAA recorded three tornadoes in Bennington County since 1990.

Previous Occurrences

Table 9 summarizes the total number of significant wind events including thunderstorms, strong winds, and tornadoes from 1996 to 2021. The 1998 tornado registered F2 on the Fujita

damage scale. The 2002 tornado in Bennington County registered F1 while the 2003 tornado was an F0 to F1 (National Centers for Environmental Information 2021). The Fujita scale is based on damage intensity. According to NOAA, an F0 tornado has winds of 40-72 mph and could damage chimneys, branches, and down shallow rooted trees. An F1 tornado has winds of 73-112 mph and could damage roofs, push mobile homes off foundations or overturn them, and blow cars off of roads. An F2 tornado has winds of 113-157 mph and could tear off roofs, destroy mobile homes, uproot or snap large trees, and light objects could become projectiles (https://www.weather.gov/oun/efscale).

Table 9. Summary of significant wind events in Bennington County
Source: National Centers for Environmental Information 2021

Year	High Wind	Strong Wind	Thunderstorm Wind	Tornado	Funnel Cloud	Totals
1996	5					5
1997	2	2	6			10
1998	1		8	1		10
1999	2		4			6
2000	1		1			2
2001			3			3
2002	1		3	1		5
2003	1			1		2
2004						
2005	1		3			4
2006	6		4			10
2007	3		6			9
2008		3	5			8
2009	2		1			3
2010	5		3		1	9
2011	1		8			9
2012	2		3			5
2013			6			6
2014			3			3
2015			2			2
2016		1	7			8
2017	4	3	5			12
2018	2	5	7			14
2019	1	9	3			13
2020		4	9			13
2021	1	4	8			13
Totals	41	31	108	3	1	184

Wind speed data is available for only a few wind events due to the lack of weather stations. National Centers for Environmental Information data (2021) rarely included estimates of wind speed. Generally, wind speeds of greater than 55 miles per hour are considered damaging (National Oceanographic and Atmospheric Administration 2006). Events that occurred in or near North Bennington are described below.

February 24 to 25, 1996 High Wind: Damaging winds downed many trees across southern Vermont and produced scattered power outages.

March 19 to 20, 1996 High Wind: Damaging winds downed three utility poles north of Bennington on Route 7. In Shaftsbury, trees fell on two homes and there were numerous reports of trees and wires down.
December 1, 1996 High Wind: In Bennington and Pownal, wind downed numerous trees and power lines.

May 31, 1998 Thunderstorm Winds and Tornado: Strong thunderstorms generated an F2 tornado in New York, which became an F1 after crossing into Vermont. The tornado followed Route 67 through North Bennington and south Shaftsbury.

September 7, 1998 Thunderstorm Wind: A derecho downed trees in Woodford.

July 6, 1999 Thunderstorm Wind: Destructive thunderstorm winds brought down trees and power lines in Pownal and Stamford.

August 13, 1999 Thunderstorm Wind: A storm knocked down numerous trees and wires in Bennington. Downed trees blocked various roadways. A downed tree gashed a hole in the roof of a house on Gore Road in Bennington. A tree also fell on a Ford Explorer bringing considerable damage to the vehicle.

September 16 to 18, 1999 (DR-13079/16-21 1999): Remnants of Hurricane Floyd (see flooding and flash flooding) brought winds gusting to over 60 mph and downed trees and power lines in southern Vermont.

November 2, 1999 High Wind: Localized high wind gusts occurred in the Green Mountains during the evening hours. A wind gust of 66 mph was recorded at Bennington Morse State Airport.

August 3, 2000 Thunderstorm Wind: A severe thunderstorm blew numerous trees down in Bennington.

December 12, 2000 High Wind: Strong winds downed trees and power lines across Bennington County.

August 9, 2001 Thunderstorm Wind: Scattered severe weather caused trees to be blown down in Bennington as well as in Arlington.

June 5, 2002 Thunderstorm Winds and Tornado: Thunderstorms originating in New York produced an F1 tornado that touched down in Woodford Hollow. Tornado winds were estimated between 125 and 150 mph. Non-tornadic thunderstorm winds blew some trees down in Pownal. Lightning struck a home in North Bennington causing a very small fire with minimal damage to the structure of the house.

July 21, 2003 Tornado: A supercell, that originated in the Mid-Hudson Valley of New York and producing a long-lived significant tornado, spawned a second twister which touched down in Pownal. The twister cut a swath longer than 25 miles and up 150 yards wide. After touching down in Pownal, the tornado moved northeast into Bennington, then continued into the Green Mountain State Forest in western Windham County where it caused significant forest damage. Most of the destruction was to trees. There was also some structural damages in Bennington County. A tree collapsed onto a house. Another massive pine slammed into a 100-year-old house's roof in Pownal. A steakhouse in Bennington suffered damage that closed it for a couple of days, including shattered windows and water damage due to an open roof. An awning had been blown from the deck of the structure, all the way across Route 7A. The owner was slammed against a wall while venturing outside on the open deck but received no injuries. During the height of the storm, power was knocked out to over 2,000 customers in southern Vermont.

February 17, 2006 Thunderstorm Wind: A wind gust of 66 mph was measured during a thunderstorm at Bennington Morse State Airport.

May 30, 2006 Thunderstorm Wind: A thunderstorm blew down trees in Bennington late in the afternoon.

October 29, 2006 High Wind: Strong winds, some reaching 60 mph, blew from the evening of October 28 through parts of October 29.

December 1, 2006 High Wind: A measured wind gust of 58 mph was recorded at Bennington Morse State Airport. Trees were reported down in Shaftsbury due to thunderstorm winds.

March 2, 2007 High Wind: High winds were recorded, along with snow and freezing rain. Winds at Bennington Morse State Airport reached 59 mph.

July 15, 2007 Thunderstorm Wind: Wires were reported down in Shaftsbury due to strong thunderstorm winds.

August 3, 2007 Thunderstorm Wind: Numerous showers and strong thunderstorms developed across eastern New York and western New England. Some thunderstorms became severe during this time period. Numerous trees and wires were reported down in Bennington.

August 25, 2007 Thunderstorm Wind: Scattered strong to severe thunderstorms developed across eastern New York and western New England. Trees and wires were reported down in North Bennington due to strong thunderstorm winds.

December 16, 2007 High Wind: A snowstorm brought 8 to 14 inches of snow along with strong winds that combined to down trees and powerlines. A tree reportedly fell on a trailer located on Chapel Road, in Bennington. This occurred due to the combination of high winds and the accumulation of heavy wet snow on tree branches. In addition, several thousand power outages were reported throughout Bennington County on Sunday afternoon, also due to the combination of high winds and heavy snowfall.

May 31, 2008 Thunderstorm Wind: Trees and wires were reported down in Bennington as a result of strong thunderstorm winds.

June 30, 2009 Thunderstorm Wind: A wind gust of 59 mph was recorded at Bennington Morse State Airport.

December 9, 2009 High Wind: Power outages were reported due to high winds across Bennington County affecting the towns of Bennington, Pownal, Shaftsbury, Sunderland, Sandgate, Manchester and Dorset. A measured wind gust of 59 mph was recorded at Bennington Morse State Airport.

June 5, 2010 Thunderstorm Wind: Trees and limbs were reported down in Bennington due to strong thunderstorm winds.

July 17, 2010 Funnel Cloud: A funnel cloud was reported on Route 279 in Bennington.

August 22, 2010 High Wind: Strong winds formed during passage of a cold front. Downed trees and wires were reported in Arlington, Bennington, Shaftsbury and Sunderland.

September 30 to October 1, 2010 High Wind: A low pressure system and remnants of Tropical Storm Nicole offshore created winds gusting to over 55 mph with power outages reported. Eighty-two power outages were reported across Bennington County due to high winds.

December 1, 2010 High Wind: Strong wind gusts downed trees and power lines resulting in power outages. Generally, 1½ to 3 inches of rain fell across the area resulting in some urban and small stream flooding. Trees and power lines were reported down in various locations around Bennington due to strong and gusty winds. Some downed trees were blocking roads.

April 26, 2011 High Wind: Trees and wires were reported down due to high winds along East Road in Bennington.

May 26, 2011 Thunderstorm Wind: Trees were reported down on Cedar Hill Road in Pownal due to strong thunderstorm winds. Trees were also reported down on Hidden Valley Road and a tree was reported down on a house on Jackson Cross Road in Pownal. Hundreds of branches were reported down on roads throughout the Bennington area due to strong thunderstorm winds.

June 9, 2011 Thunderstorm Wind: A pre-frontal trough formed a line of severe thunderstorms that moved across eastern New York and southern Vermont.

August 21, 2011 Thunderstorm Wind: There were two distinct rounds of strong to severe thunderstorms which created damaging winds. Trees were reported down in Bennington, and on Route 9 just east of Bennington, due to strong thunderstorm winds.

August 28-29, 2011 (DR-4022 8/27-29 2011): Along with flooding described above, Tropical Storm Irene brought 35-55 mph winds with gusts exceeding 60 mph resulting in downed trees and powerlines.

September 4, 2011 Thunderstorm Wind: A wind gust of 64 mph was measured at Bennington Morse State Airport. Trees were reported down in Bennington due to strong thunderstorm winds.

September 8, 2012 Thunderstorm Wind: Multiple trees and wires were reported down due to thunderstorm winds in Bennington.

October 29 to 30, 2012 High Wind: Superstorm Sandy brought strong winds of 40-60 mph, with a gust of 41 mph recorded at Bennington Morse State Airport. The highest wind gust in southern Vermont occurred in Woodford, where a wind gust of 58 mph was reported.

December 21, 2012 High Wind: A tree was reported down in Bennington due to high winds.

June 2, 2013 Thunderstorm Wind: Showers and thunderstorms developed across the region aided by very strong winds. A few storms became severe, producing large hail and wind damage. The thunderstorms also produced very heavy rainfall, which caused flash flooding in Bennington. Multiple trees were reported down and one tree fell on two parked trucks as a result of the thunderstorm winds.

June 23, 2015 Thunderstorm Wind: Trees were reported down in Bennington due to thunderstorm winds.

July 1, 2015 Thunderstorm Wind: A large tree was downed in Bennington as a result of thunderstorm winds.

January 10, 2017 High Wind: Wind gusts of 40-60 mph were observed across the area resulting in many downed trees, power poles, and power lines. Some power outages occurred.

May 5, 2017 High Wind: Strong easterly winds of up to 68 mph were observed for 1-2 hours by a trained spotter. The winds caused numerous trees and wires down, resulting in power outages and road closures.

May 18, 2017 Thunderstorm Wind: Wires were reported down from thunderstorm winds.

August 22, 2017 Thunderstorm Wind: Strong to severe thunderstorms developed and prompted a Severe Thunderstorm Watch in western New England. Multiple trees were downed in southern Vermont due to thunderstorm winds. A large tree branch was reported down in Bennington.

October 30, 2017 High Wind: Thousands of power outages were reported, along with trees down, large tree limbs, and wires down across southern Vermont.

February 24-25, 2019 High Wind: Gusts in excess of 50 mph were common across the area which caused numerous power outages and downed trees. A tree fell onto a home in Bennington.

October 16-17, 2019 Strong Wind: Several trees were down on Route 7 between Bennington and Pownal.

October 7, 2020 Thunderstorm Wind: A line of thunderstorms caused widespread damage: damaged trees, downed trees and powerlines. About 21,000 lost power across southern Vermont. This event was classified as a serial derecho based on the 320-mile-long damage swath and distribution of significant wind gusts of 75 mph and above.

March 1, 2021 High Wind: Wind gusts were recorded from 40-60 mph. Trees and powerlines were downed, and power outages were reported. A 58 mph wind gust was recorded near Old Bennington.

June 30, 2021 Thunderstorm Wind: Several trees and wires were reported down in Shaftsbury.

July 14, 2021 Thunderstorm Wind: A line of strong to severe thunderstorms resulted in a few wind damage reports in Shaftsbury, with multiple trees and wires down around the town.

September 8, 2021 Thunderstorm Wind: Wires were reported down in North Bennington.

September 15, 2021 Thunderstorm Wind: Trees reported down in Shaftsbury.

December 11, 2021 Strong Wind: Widespread wind gusts were between 40-55 mph. Downed wires were reported near Shaftsbury.

Extent and Location

Damaging winds, including the previous occurrences described above, are those exceeding 55 miles per hour (National Oceanographic and Atmospheric Administration 2006 and undated). During a May 2017 event, winds were measured at 68 mph in southern Vermont. Another event, occurring in October 2020, winds gusts were recorded in excess of 75 mph. Higher winds were likely created during the three tornadoes. High wind events can strike anywhere. Where storms are funneled up the valleys, damage can be significant, but most likely less than 10% of structures would be affected. Again, power outages could last up to seven or more days.

Probability, Impact and Vulnerability

Wind events causing moderate or greater damage occur almost every other year in Bennington County, and can range from localized events from thunderstorms to wide ranging events from larger storms. The primary vulnerability would be power outages from downed trees and lines. A moderate or greater damage wind storm occurring in or near North Bennington in any given year is likely, with a >10% to <75% probability per year.

Hail

Descriptions

Hail is frozen precipitation that forms in severe thunderstorms. Hailstones can range in size from ¼ inch (about the size of a pea) to over 4 inches (grapefruit sized), though most hail is in the smaller categories of less than 1.5 inches. The strong up and downdrafts within thunderstorms push to freeze and down to collect water and this repeated cycle results in accumulation of ice until gravity pulls the hailstone to Earth.

Previous Occurrences

The National Centers for Environmental Information has 30 reports of hail storms in Bennington County between 1996 and 2021, all associated with thunderstorms. The following were within North Bennington or nearby towns.

May 31, 1998 Thunderstorm Winds and Tornado and Hail: Strong thunderstorms generated an F2 tornado in New York, which became an F1 after crossing into Vermont. The tornado followed Route 67 through North Bennington and south Shaftsbury. Hail was reported in Shaftsbury.

July 18, 2000 Hail: Hail was reported in Bennington.

June 27, 2002 Hail: In North Bennington, 1 inch hail was reported.

August 3, 2007 Hail: Ping pong ball sized hail was reported in Shaftsbury.

June 24, 2008 Hail: Quarter size hail was reported near Pownal during a thunderstorm.

June 15, 2009 Hail: Quarter size hail was measured at Bennington Morse State Airport during a thunderstorm. In addition, nickel to quarter size hail was also reported in Bennington.

July 7, 2009 Hail: Penny size hail was reported in Bennington during a thunderstorm.

July 17, 2010 Hail: Quarter size hail was reported during a thunderstorm in Bennington.

July 21, 2010 Hail: Quarter size hail was reported during a thunderstorm in Bennington.

June 1, 2011 Hail: Multiple reports of large hail were reported during a thunderstorm in Shaftsbury: hail stones of 3.25 inches and 2.75 inches in diameter were measured; hail the size of a golf ball was reported; hail sizes of greater than one inch in diameter were common; reports of greater than baseball size hail, 3 inches, was reported; and quarter size hail was reported near Bennington during this thunderstorm.

June 2, 2013 Hail: Quarter size hail was reported during a thunderstorm in Bennington.

Extent and Location

Hail can cover wide areas and has the potential for damaging crops, automobiles or glass within structures, as well as causing injury. Generally, however, hail storms affect relatively small areas as they form in thunderstorms, which are localized. Storms with the largest hail stones near North Bennington were in Shaftsbury in 2007 and 2011. Ping pong size hail was reported in 2007, and multiple large size hail, from golf ball size to greater than 3 inches, was reported in 2011.

Probability, Impact and Vulnerability

Hail storms are generally local, affecting subareas within the village, though a group of thunderstorms can cause hail in multiple locations over a wide area. The possibility of hail occurring in or near North Bennington in any given year is likely, >10% to <75% probability per year. The potential vulnerability would be localized with damage to structures or automobiles, though there could also be damage to vegetation. In general, these impacts would be localized.

Temperature Extremes

Descriptions

Temperature extremes entail periods of either excessive heat or extreme cold. Excessive heat is generally defined as periods when the normal high temperature is exceeded by 10 degrees. In the summer, this would equal approximately 90 degrees in North Bennington (Table 10). Excessive heat is recorded at other times but does not have the health consequences of summer periods. In addition, the heat index, which factors in the high relative humidity levels of summer, is also a factor. However, relative humidity is not recorded at area weather stations, so the history of heat index can't be calculated.

Extreme cold is not well defined. For those involved in outdoor activities, extreme cold, accompanied by wind, is when exposed skin would be subject to frostbite. However, for periods of power outages that might accompany winter storms, extreme cold could be thought of as when temperatures fall below freezing as that would not only affect personal health and the health of household animals, but could result in pipes freezing, and the loss of water supplies and perishables.

Table 10. Pownal normal temperatures for 1991 to 2021
Source: National Centers for Environmental Information: https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&station=USC00436500

Month	Max Temperature (^{0}F)	Min Temperature (^{0}F)	Average Temperature (^{0}F)
January	30.6	11.9	21.2
February	33.1	13.4	23.3
March	41.8	21.6	31.7
April	56.0	32.9	44.4

Table 10. Pownal normal temperatures for 1991 to 2021 Source: National Centers for Environmental Information: https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&station=USC00436500			
Month	Max Temperature (^{0}F)	Min Temperature (^{0}F)	Average Temperature (^{0}F)
May	68.2	43.3	55.8
June	75.4	52.1	63.8
July	80.5	57.0	68.7
August	78.2	55.3	66.8
September	71.8	48.5	60.1
October	59.2	38.6	48.9
November	46.7	28.8	37.7
December	36.3	20.1	28.2
Annual	56.5	35.3	45.9

Past Occurrences

The station normal report for the Cooperative Weather Observer in Pownal indicates an average of less than 1 day per year when the maximum temperature would equal 90 degrees, 40 days when the maximum temperature would be less than 32 degrees, and 160 days when the minimum temperature would be less than 32 degrees.

Extent and Location

Extreme temperature is a widespread phenomenon. The populations affected could be small if one is considering outdoor workers or large for the entire village in a power outage. The highest recorded temperature from the Pownal Cooperative Weather Observer was 97 degrees on July 6, 2010 and July 18, 2012. The coldest recorded temperature from the Pownal Cooperative Weather Observer was -26 degrees on January 27, 1994.

Average temperatures in Vermont have risen 2.7 degrees since 1941 with an increase of 1.5 degrees since 1990. Winter temperatures have risen more than summer temperatures. But if these trends continue, the number of days above 90 degrees will likely increase and minimum temperatures also increase (Galford et al 2021).

Probability, Impact and Vulnerability

Extreme heat is relatively rare with occurrences of approximately less than one day per year. Extreme cold, here defined as less than freezing temperature, is a frequent occurrence in Vermont. Impacts of either type of event could be widespread, and vulnerability is dependent on the populations exposed. Extreme heat affecting North Bennington in any given year is likely, with >10% to <75% probability per year. Extreme cold is highly likely, with a >75% probability each year.

Drought

Description

There are several types and definitions of drought: meteorological, climatological, atmospheric, agricultural, and hydrological. The latter is based on stream flow and groundwater availability and is probably most important from a natural hazard assessment perspective. Reductions in precipitation over long enough periods, particularly during the growing season when plants take up moisture, can result in hydrologic drought.

Table 11. Years and number of months when the PHDI indicated severe or extreme droughts from 1895 to 2018
Source: National Climate Data Center. Source: ftp://ftpncdd.noaa.gov/pub/data/cirs/climdiv/ (Richard Heims, personal communication)

Year	Extreme	Severe
1907		1
1908	2	1
1909	1	2
1910		2
1911	5	4
1912		2
1913		5
1914		5
1915	3	1
1921		2
1922		1
1930		1
1931		1
1941		5
1942		2
1949		1
1953		2
1957		1
1959		1
1963		3
1964	1	6
1965	8	1
1995		2
1999		1
2001	2	1
2002	1	1
2016		1
Total	23 months; 8 years	59 months; 27 years

Past Occurrences

The Palmer Hydrologic Drought Index (PHDI) is an indicator of potential surface and groundwater availability based on climatic conditions. The categories of drought include moderate drought, severe drought, and extreme drought. Table 11 shows periods when the index showed severe and extreme droughts using data from 1985 to 2018. No drought conditions were recorded from 2003 through 2015 or since 2016. Members of the planning team reported that some wells were low in 2015, which did have some months with moderate drought conditions. But only minor drought conditions have been observed since 2015, and with little impact to the village.

Extent and Location

The National Climate Data Center calculates this index back to 1895. Since then, severe droughts occurred in 27 years or 22% while extreme drought occurred in 8 years or 6%. Severe and extreme droughts have been of short duration, except occurrences in the early 1960s. Mild to moderate droughts have been more frequent. Severe and extreme droughts are likely to affect those properties with shallow wells.

Probability, Impact and Vulnerability

Table 12 below shows categories from the U.S. Drought Monitor for Vermont. From about 2018 to more recently, much of southwestern Vermont, including North Bennington, had been under the D0 category (Abnormally dry). The planning team had not observed the types of conditions listed in Table 12 for that category, though they may have occurred at times and in scattered locations. Currently (April 2022) the U.S. Drought Monitor shows no drought conditions.

A severe or extreme drought occurring in or near North Bennington in any given year is likely, with >10% to <75% probability per year. Except for long-term drought, most wells should supply sufficient water, though structures with shallow wells are most likely to be affected. Drought may affect the potential for wildfire, which is discussed below. Increasing temperatures or changes in precipitation patterns due to climate change may affect the frequency, length and degree of drought.

Table 12. Potential impacts of drought in Vermont
Source: United States Drought Monitor – Vermont, Available via https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?VT

Category	Impact
D0	Crop growth is stunted; planting is delayed
	Fire danger is elevated; spring fire season starts early
	Lawns brown early; gardens begin to wilt
	Surface water levels decline
D1	Irrigation use increases; hay and grain yields are lower than normal
	Honey production declines
	Wildfires and ground fires increase
	Trees and landscaping are stressed; fish are stressed
	Voluntary water conservation is requested; reservoir and lake levels are below normal capacity
D2	Specialty crops are impacted in both yield and fruit size
	Producers begin feeding cattle; hay prices are high
	Warnings are issued on outdoor burns; air quality is poor
	Golf courses conserve water
	Trees are brittle and susceptible to insects
	Fish kills occur; wildlife move to farms for food
	Water quality is poor; groundwater is declining; irrigation ponds are dry; outdoor water restrictions are implemented
D3	Crop loss is widespread; Christmas tree farms are stressed; dairy farmers are struggling financially
	Well drillers and bulk water haulers see increased business
	Water recreation and hunting are modified; wildlife disease outbreak is observed
	Extremely reduced flow to ceased flow of water is observed; river temperatures are warm; wells are running dry; people are digging more and deeper wells
D4	Vermont has had little or no experience in D4 so no impacts have been recorded at that level in the Drought Impact Reporter

Based on well data from the Vermont Center for Geographic Information, there are a total of 29 wells located in North Bennington. Of the wells observed in North Bennington, 3 of them have depths of less than 100 feet. There are no public water supply wells located in North Bennington.

The village's water source comes from Basin Brook in Shaftsbury. North Bennington has control of the water station, owns the land where the station is located and the water rights for Basin Brook. The water pipe travels through downtown Shaftsbury then out to North Bennington.

Weather related damage to the public water supply would most likely be from flooding, a high wind event or tornado. The damage could cause a blockage in the system, or the storage tank could get damaged. If a blockage occurred, the water supply could be shut down for some time. If there were damage to the holding tank, a temporary tank would need to be installed, which could take days. There is not a secondary spring for drinking water for North Bennington. However, there are backup wells that are used when the main system is compromised.

During Irene, the reservoir intake became blocked with rocks and mud and needed to be cleared. The water department had to change the source of water to the backup wells and it took several days to clear the intake and restore flow from Basin Brook. The planning team believes shutting the system down due to natural causes is unlikely because of the site of water system components. In addition, closure due to contamination through human-made causes would be quickly detected by existing instrumentation. Depending on the cause of the contamination, village response would be to inform the public to boil their water or to use bottled water.

Wildfire

Description

Wildfire or wildland fire is any unplanned fire affecting open lands including forests, grasslands or other features. The potential for wildland fire is dependent on fuel types, which vary with vegetation, topography, and weather. Fire intensity measured by the amount of energy released in a fire and exhibited by the length of flames and rates of spread dictate the degree of wildland fire hazard and methods of control. Table 13 shows how wildfires can be categorized based on size.

Table 13. Wildland fire size classes
Source: National Wildfire Coordinating Group 2011

Magnitude (Size)	Description	Probability
Class A	< ¼ acre	High
Class B	¼ to 10 acres	High
Class C	10 to 100 acres	Moderate
Class D	100 to 300 acres	Low
Class E	300 to 1000 acres	Very low
Class F	1000 to 5000 acres	Very low
Class G	>5000 acres	Very low

In Vermont, forests tend to be dominated by northern hardwood species such as sugar maple (*Acer saccharum*), birch (*Betula* spp.), white pine (*Pinus strobus*), and hemlock (*Tsuga canadensis*). These species tend to create relatively low flammability fire, so that surface fires have low intensity and rates of spread, thereby limiting fire hazard (Anderson 1982). Most of the land area in North Bennington is covered by broadleaf litter fuels that exhibit fires of low intensity and slow rates of spread (U.S. Forest Service 2010).

In both forested and open settings, structures may be threatened by even small wildfires. These wildland-urban interface areas are the most likely areas where resources will be needed to suppress wildland fire and to reduce potential hazards.

Fire behavior is most extreme during periods when the relative humidity is low, generally less than 35-45%. These conditions are most prevalent in the spring, following snowmelt, between March and late May or early June. After that, vegetation becomes increasingly green, and the resulting moisture in the live vegetation (fuel) reduces flammability significantly. Precipitation and evapotranspiration increase ambient relative humidity levels so that fires in the summer are generally rare and limited in size.

Fall again brings drying fuels and weather conditions increasing fire hazard. However, relative humidity levels increase after dark, and shorter days also limit the amount of time for fuels to dry and intense, fast moving fires to occur (North Central Research Station 2005).

North Bennington likely has some structures within the “wildland urban interface,” which represents areas where structures are directly adjacent to wildland fuels (Federal Register 2001). These areas have not been mapped.

Past Occurrences

According to records from the Vermont Department of Forests, Parks and Recreation, from 1992 to 2018, 193 wildfires occurred in Bennington County, 43 occurred within Bennington, which includes North Bennington and Old Bennington. From 2018 to 2021, there have been no reported wildfires in North Bennington, Bennington, or Old Bennington.

The North Bennington Annual Reports from 2008 to 2015 show that there were 23 brush fires within the village boundary during this time. Annual Reports from 2016 to 2020 report that the North Bennington Fire Department responded to 8 brush fires during this time.

Extent and Location

Of the 43 fires from the Vermont Department of Forests, Parks and Recreation records, 11 were Class A, 31 were Class B and 1 was Class C. The largest fire was 21 acres, but it is unknown whether this fire occurred in North Bennington, Bennington or Old Bennington. Brush fires are more common than forest fires in North Bennington, as there are more open fields and fewer forests.

Probability, Impact and Vulnerability

The fire return interval in forested areas in Vermont is generally greater than 100 years, meaning that the natural return interval is relatively long. This return interval is shorter for areas dominated by herbaceous vegetation in the fields within valleys. Brush fires occurring in North Bennington in any given year is highly likely, with a >75% probability in a year, but these are most likely to be small.

The area's deciduous and coniferous forests create litter that is relatively low in flammability so that wildfires have relatively low intensity and rates of spread. The main hazard is for wildland fire fighters working in steep terrain. The natural fire return intervals in most forests in Vermont are greater than 50 years (Malamud et al 2005) though fires can be more frequent in old fields. Recurrence is likely related to precipitation rather than the buildup of fuels, so drought recurrence is already factored into these interval estimates. Therefore, the potential for large fires is very limited due to the fuel characteristics and the relatively urbanized land cover of North Bennington.

Earthquake

Description

Vermont has no active faults but has experienced minor earthquakes. The U.S. Geological Survey predicts a two percent probability of an earthquake causing considerable damage in Vermont sometime in the next 50 years (Springston and Gale 1998).

Past Occurrences

Data from the Weston Observatory at Boston College (Northeast Earthquake Maps and Catalog 2015) was used to identify earthquakes occurring within 100 miles of North Bennington from January 1990 to February 2014. No earthquakes occurred in either North Bennington or Bennington County during that period. Figure 4 plots the number of earthquakes by year by magnitude. Updated data from this source was unavailable. However, data from the New England Seismic Network (NESN) shows that 23 earthquakes occurred in Vermont from February 2014 (where the Weston Observatory data

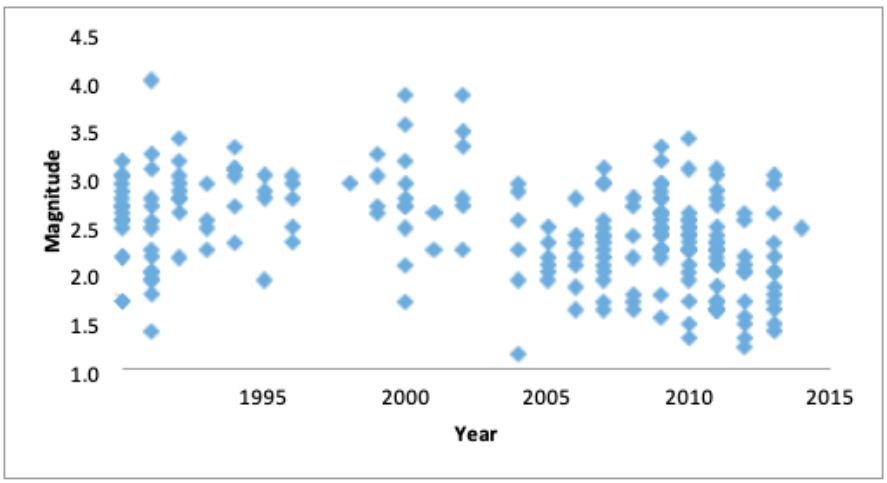


Figure 4: Plot of earthquakes and magnitude for occurrences within 100 miles of North Bennington, VT (Source: Northeast Earthquake Maps and Catalog 2015)

ended) to December 2021. None of these earthquakes were in North Bennington, but one was reported to be near Manchester, VT, approximately 20 miles north of the village. This earthquake occurred in 2017 and had a
magnitude of 1.1.

Table 14. Earthquake Magnitude and intensity scale descriptions
Source: https://www.usgs.gov/media/images/modified-mercalli-intensity-mmi-scale-assigns-intensities

Magnitude	Modified Mercalli Intensity	Description
1.0-3.0	I	**I.** Not felt except by a very few under especially favorable conditions.
3.0-3.9	II-III	**II.** Felt only by a few persons at rest, especially on upper floors of buildings. **III.** Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
4.0-4.9	IV-V	**IV.** Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. **V.** Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0-5.9	VI-VII	**VI.** Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. **VII.** Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0-6.9	VII-IX	**VII.** Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. **VIII.** Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. **IX.** Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	VIII or higher	**VIII.** Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. **IX.** Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. **X.** Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. **XI.** Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. **XII.** Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Table 15. Earthquakes in Vermont Source: Vermont Geological Survey (Ebel et al 1995) http://www.anr.state.vt.us/dec/geo/EBEL.htm consisting of excerpts from: A Report on the Seismic Vulnerability of the State of Vermont by John E. Ebel, Richard Bedell and Alfredo Urzua, a 98 page report submitted to Vermont Emergency Management Agency in July, 1995.			
Location	Date	Magnitude	Mercalli Intensity
Swanton	July 6, 1943	4.1	Felt by nearly everyone; many awakened with some dishes and windows broken and unstable objects overturned
Brandon	March 31, 1953	4.0	Felt indoors by many, but by few outdoors. Sensation would
Middlebury	April 10, 1962	4.1	Felt by nearly everyone; many awakened with some dishes and windows broken and unstable objects overturned

Extent and Location

Table 15 shows earthquakes that have occurred in Vermont based on the 1995 report. Those occurring within 100 miles have ranged in magnitude from barely registered to 3.9, with most in the range of 0.5 to 3.0 (Figure 4). No damage was recorded in any of these in Bennington. In 2003, the Vermont Geological Survey completed simulations using FEMA HAZUS software of potential damage within Bennington County from a 500-year recurrence earthquake centered in Middlebury, VT, Tamworth, NH and Goodnow, NY. The results indicated minimal damage and injury from any of these events in Bennington (Kim 2003).

Probability, Impact and Vulnerability

Based on the 2003 HAZUS analyses and that there has not been an earthquake on record in North Bennington, an earthquake occurring with a magnitude large enough to cause substantial damage in the area is unlikely, with a <1% probability per year. However, earthquake prediction science is very limited.

Landslide

Description

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide movement include saturation by water, steepening of slopes by erosion or construction, and alternate freezing or thawing. Table 16 shows how landslides can be categorized.

Table 16. Landslide and debris flow types Source: U.S. Geological Survey 2006		
Magnitude	Description	Probability
Localized	Falls: abrupt movements of rocks and boulders, generally on steep slopes.	Low to moderate.
Topples	Topples: movements involving some forward rotation as material moves downhill.	Low to moderate.
Flows	A range of land movement generally involving a mass of loose soil, rock, organic matter, air and water moving downhill rapidly and possibly covering a wide area. One form called creep involves slow movement of material and is often recognizable by trees growing so as to remain vertical while bent near the ground as they grow to keep up with the slow material flow.	Highly variable but can be fairly common.

Past Occurrences

No landslides have been reported in North Bennington. None were reported during Tropical Storm Irene and none have been reported from previous or subsequent large-scale weather events. No rockfall areas were identified by the Vermont Agency of Transportation (Eliason and Springston 2007).

Extent and Location

Using a protocol developed for the Vermont Geological Survey (Clift and Springston 2012; Dale 2015) there is very little landslide potential in North Bennington. Areas of moderate potential were identified along the hillsides that follow Paran Creek to the Walloomsac and bordering Lake Paran. There is an area on Water Street where a retaining wall was falling in, which is highlighted in Map 8. The issue has been resolved but the planning team requested it remain in the plan as it may become an issue again.

Probability, Impact and Vulnerability

A landslide occurring in North Bennington in any given year is unlikely, with a <1% probability per year. Additionally, the potential impact and vulnerability if a landslide were to occur, are both

Invasive Species

Descriptions

Invasive species are organisms that are not native to a geographic area and which can or do cause economic or environmental harm. Invasive species are characterized by organisms that spread rapidly, can displace native species, and have few or no predators to keep their populations in check.

At the same time, they have characteristics that may reduce the value and use of natural resources. For example, bush honeysuckle can become a dominant shrub in some forests reducing the potential for tree regeneration. Japanese knotweed colonizes stream banks, and does not hold soil well, leading to increased streambank erosion. Bush honeysuckle can become a dominant shrub in some forests, reducing the potential for tree regeneration (Vermont Invasives 2021).

Vermont has two invasive species lists: Class A species are on the Federal Noxious Weed List but are not known to occur in Vermont. These are listed in 7 C.F.R. 360.200, a section of the Code of Federal Regulations. Class B species are known to occur in the state and are considered a threat (Table 17).

Table 17. Designated Class B noxious weeds in Vermont
Source: Vermont Agency of Agriculture, Food and Markets: https://agriculture.vermont.gov/public-health-agricultural-resource-management-division/plant-health-and-pest-management/plant-0
Those with a * have been identified in Bennington County. Source: Early Detection and Mapping System http://www.eddmaps.org/tools/query/
Those marked with an (A) are also on the aquatic invasive species list (Table 18)

Scientific Name	Common Name
*Acer ginnala**	Amur maple
*Acer platanoides**	Norway maple
*Aegopodium podagraria**	Bishop's goutweed or goutweed
Ailanthus altissima	Tree of heaven
*Alliaria petiolata**	Garlic mustard
*Berberis thunbergii**	Japanese barberry
*Berberis vulgaris**	Common barberry
Butomus umbellatus (A)	Flowering rush
*Celastrus orbiculatus**	Oriental bittersweet
*Euonymus alatus**	Burning bush
*Fallopia japonica**	Japanese knotweed
Hydrocharis morsus-ranae (A)	Frogbit
*Iris pseudacorus** (A)	Yellow flag iris
Lonicera japonica	Japanese honeysuckle
Lonicera maackii	Amur honeysuckle
*Lonicera morrowii**	Morrow honeysuckle
*Lonicera tatarica**	Tartarian honeysuckle
*Lonicera x bella**	Bell honeysuckle
*Lythrum salicaria** (A)	Purple loosestrife
*Myriophyllum spicatum** (A)	Eurasian watermilfoil
Najas minor	European naiad
Nymphoides peltata (A)	Yellow floating heart
*Phragmites australis** (A)	Common reed
Potamogeton crispus (A)	Curly leaf pondweed
*Rhamnus cathartica**	Common buckthorn
*Rhamnus frangula**	Glossy buckthorn
*Trapa natans** (A)	Water chestnut
Vincetoxicum nigrum	Black swallow-wort

Table 18 shows aquatic invasive species listed by the Agency of Natural Resources.

Table 18. Aquatic invasive species in Vermont Source: Watershed Management Division, Department of Environmental Conservation: http://dec.vermont.gov/watershed/lakes-ponds/aquatic-invasives/gallery	
Scientific Name	Common Name
Dreissena polymorpha	Zebra mussel
Alosa pseudoharengus	Alewife
Orconectes rusticus	Rusty crayfish
Bythotrephes longimanus	Spiny Waterflea
Corbicula fluminea	Asian clam
Didymosphenia geminata	Didymo
Nitellopsis obtusa	Starry Stoneword
Myriophyllum heterophyllum	Variable-leaved Watermilfoil

In addition to the species listed above, the following should be considered invasive species: Wild parsnip (*Pastinaca sativa*) which is abundant along roadsides in North Bennington and many areas in Bennington County, and can cause skin burns when chemicals in the plant transfer to exposed skin, then interacts with the sun. This can cause harm to those who work on or along roads or utility rights of way. Cow parsnip or wild chervil (*Anthriscus sylvestris*) also dominate roadways and can invade meadows. Reed canary grass (*Phalaris arundinacea*) can invade wetlands and crowd out native plants and has been observes in Bennington County.

Figure 5: Common Barberry (Source: VT Invasives)

The bush honeysuckles (*Lonicera* spp.) have also been observed along roadsides. It is likely that buckthorn (*Rhamnus cathartica*) and barberry (*Berberis thunbergii*) have invaded forests and wetland edges and that Japanese knotweed (*Fallopia japonica*) has invaded stream banks and other disturbed areas. Japanese knotweed has been mentioned by the planning team as being an issue in the village. Japanese and Common barberry (*Berberis thunbergii* and *Berberis vulgaris*) promote Lyme disease by harboring high populations of mice, one of the hosts of deer ticks. Recently didymo (*Didymosphenia geminate*) was determined to be native, but this status may change.

Figure 6: Japanese Barberry (Source: VT Invasives)

Other invasives mentioned by the planning team that have been issues in the village are garlic mustard (*Alliaria petiolate)* and hogweed (*Heracleum mantegazzianum*). There has been an effort to mitigate garlic mustard around Lake Paran. There are also efforts to mitigate bush honeysuckles in the village.

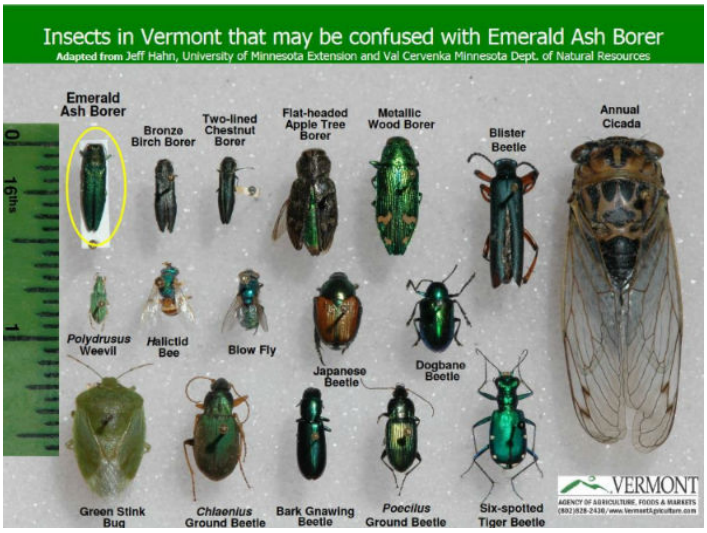


Figure 7: Emerald Ash Borer compared to lookalikes (Source: VT Invasives)

Past Occurrences

Invasive species are present and represent a continuous hazard that will vary with their abundance and their impacts on structures and infrastructure.

Extent and Location

The extent of invasive plants in North Bennington and in Bennington County has not been fully mapped.

Insects and pathogens have the potential for dramatically altering the composition and structure of forests as well as affecting trees in settled areas. Hemlock wooly adelgid (*Adelges tsugae*) has dramatically reduced hemlock trees south of Vermont and has been found in Pownal. The emerald ash borer (*Agrilus planipennis*) is also a significant threat to forests as it kills all ash species.

A study was completed that surveyed ash trees in North Bennington for the potential impact of the emerald ash borer (Quant 2016). Map 7 shows the number of ash trees along road segments by category. Borers are often dispersed through the movement of firewood. The emerald ash borer was recently found in Stamford and Pownal. Unfortunately, once the emerald ash borer is established, it cannot be eradicated and most ash trees die in 3-5 years (Vermont Department of Forests, Parks, & Recreation 2021). This will result

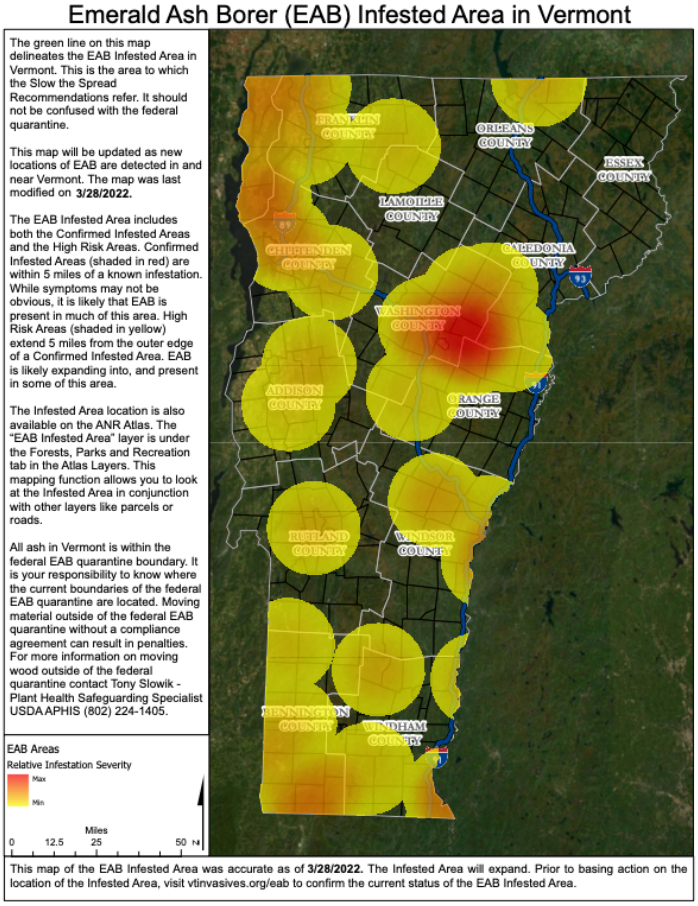


Figure 8: EAB Infested Areas (Source: VT Invasives)

in a large number of trees that need to come down, creating a loss of canopy and large expense for municipalities.

In addition to the above insects, there are other insects and pathogens that are affecting Vermont forests. These may constitute an emerging hazard (Schultz et al 2015). Climate change may increase the abundance and ranges of forest pest species such as hemlock wooly adelgid and invasive species currently found in more southerly locations (Rustad 2012).

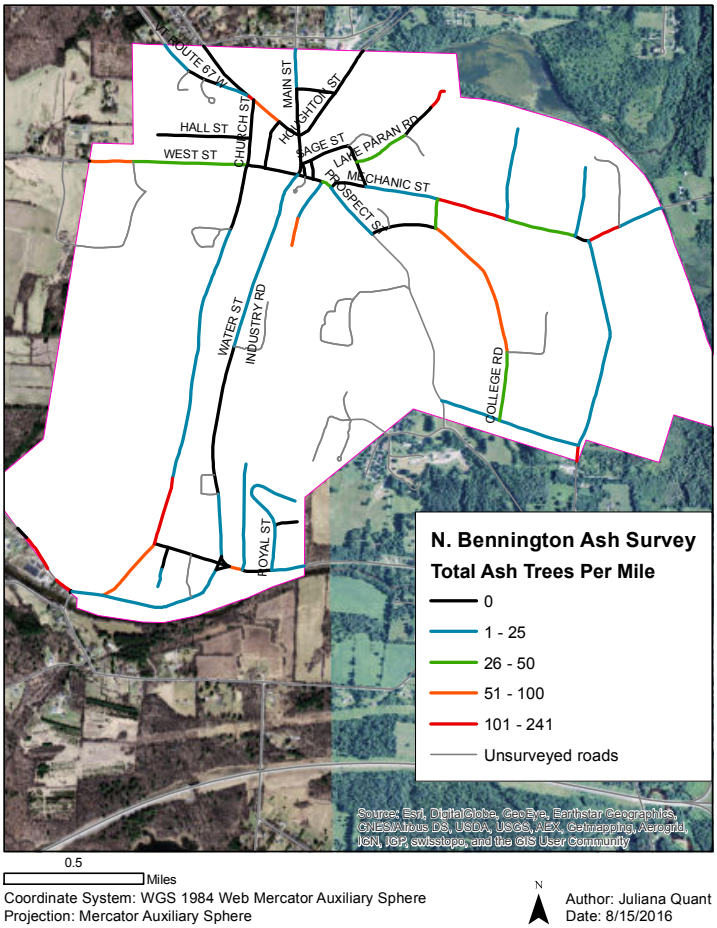
Probability, Impact and Vulnerability

The likelihood of increased abundance of invasive species in North Bennington is highly likely, with >75% probability in a year. Potential impacts to forested areas are very high. Invasive insects that can cause tree death, particularly the emerald ash borer, could result in road closures, power outages and property damage.

Increases in the abundance of invasive plant species could limit regeneration of native trees and shrubs and affect the long-term integrity of the forests (Vermont Department of Forests, Parks and Recreation 2010; Vermont Invasives 2021).

The ash tree survey found that there were 277 ash trees observed within the village right-of way (i.e. 25 feet from the center line of the road), with 81 greater than 12 inches in diameter. The highest counts of ashes were on Park Street, College Road, Mechanic Street, and Harrington Road. The highest concentrations of ashes were on Harrington Road, Overlea Road, Fishing Access Road, and College Road, with the highest concentration of large ashes on Fishing Access Road. Map 7 shows where the ash trees were observed. The emerald ash borer poses a great threat to

North Bennington Ash Survey



Map 7: Ash trees observed in North Bennington (Source: Summary of ash surveys (Fraxinus spp.): Manchester Village and North Bennington, VT.) Please note that the boundary used for this map is incorrect.

these ash trees, potentially creating a large expense to the village to remove the trees before they become a hazard to utility lines, roads, and buildings (Quant 2016).

Hazardous Material Spill

Descriptions

Hazardous wastes are materials that are flammable, corrosive, toxic, or labeled with warning or caution labels. These materials are used in industry, in the home, or on farms and are transported regularly.

Past Occurrences

Vermont Agency of Resources maintains a hazardous materials spills list. North Bennington is combined with Bennington and Old Bennington. Reviewing the list indicates that there were 34 spills from 1990 to 2015. From 2016 to 2021, there have been 9 spills reported in North Bennington. According to the recently retired North Bennington Fire Chief, the village has, at most, three small hazardous materials spills per year.

Extent and Location

All of the spills affected small sites or areas. The main highways that would be affected by a spill in North Bennington would be VT Route 67A and 67. These roads are the main arteries through the village, so a spill could affect many properties and travelers.

One particular concern in any hazardous materials spill would be the impact on water resources. If an incident occurred along VT Route 67A/Water Street, Paran Creek and the Walloomsac River could be affected due to the proximity of the road to the creek and river.

Hazardous roads and intersections have been identified by the Vermont Agency of Transportation, the planning team, and village trustees. The road with the most accidents from 2016 to 2021, according to the VTrans Public Crash Data Query Tool (http://apps.vtrans.vermont.gov/CrashPublicQueryTool/#), was Route 67A/Water Street/Main Street, with 25 accidents. This road had the most accidents in the previous Hazard Mitigation Plan as well. The intersection with the most accidents was Bank Street at Main Street in the village center, with six accidents. This intersection had the most accidents in the previous plan also. The intersection of Route 67A/Main Street at Sage Street and Lincoln Square had three accidents during this period. Bank Street at White Creek Road was showing multiple accidents in the previous plan, but there does not seem to be many in the recent time period.

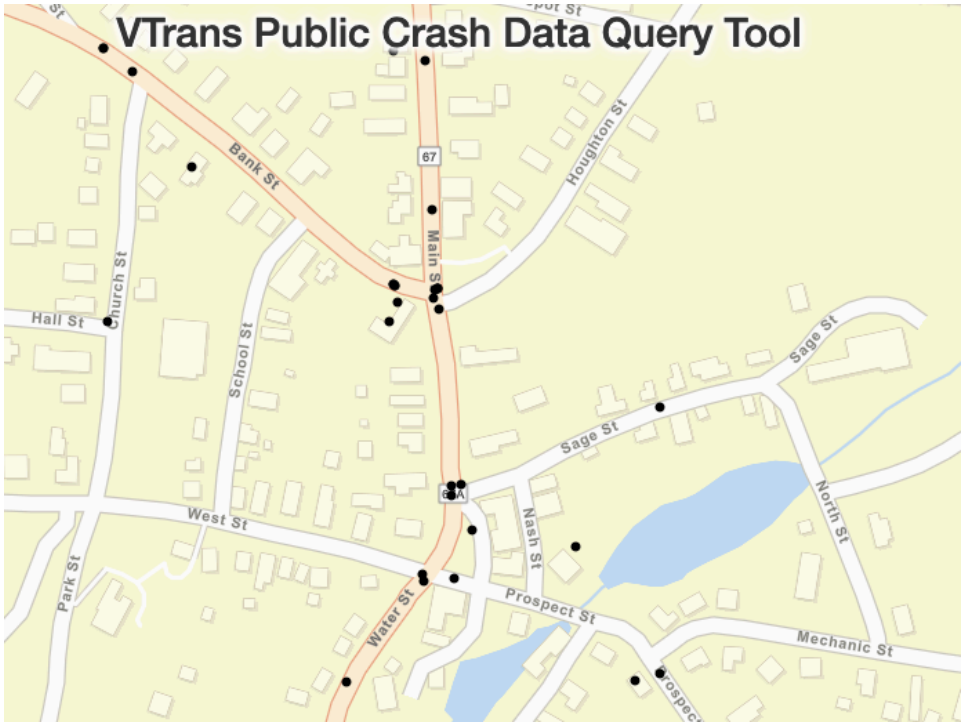


Figure 9: High Crash Locations from 2016 to 2021 (Source: VTrans Public Crash Data Query)

In the previous plan, the intersection at Bank Street and Main Street was identified as a problem area due to truck drivers not using the (then new) mountable curb and instead swinging out into the lane of oncoming traffic. According to the planning team and village trustees, this is no longer an issue. The planning team also previously identified the road curve where River Road and Hillside Street intersect with Route 67A/Water Street/North Bennington Road as having limited visibility and causing issues. The current planning team and village trustees did not feel this was a current issue anymore, as the visibility has been increased in recent years. However, they did identify Scarey Lane (very close to that intersection) as being an issue. Drivers are only allowed to turn right from Scarey Lane onto Route 67A/North Bennington Road due to the low visibility from drivers coming around the curve where Water Street turns into North Bennington Road (Route 67A) but there are many that don't abide by the road sign and turn left, causing multiple accidents or near accidents. According to the VTrans Public Crash Data Query Tool, there have been four accidents around Scarey Lane from 2016 to 2021.

Roads with average grades greater than 10% also present hazards, particularly when roads are wet or during winter storms. The planning team identified two roads with steep grades in North Bennington: Prospect Street and Royal Street.

Probability, Impact and Vulnerability

Hazardous materials spills occur more than annually, though typically affect small areas. North Bennington has a moderate amount of truck traffic, which can increase the possibility of a spill. Many areas are vulnerable due to the proximity of surface and groundwater resources to roads. Local roads carry materials that could spill and harm aquatic resources as well as individual wells. The North Bennington Fire Department has the ability to respond to small hazardous materials spills. The Bennington Fire Department Hazardous Materials Response Team or the State Hazardous Materials Response Team is called to assist for larger incidents.

As mentioned in the beginning of this plan, there is a rail line that travels through North Bennington. The most common substance transported on the rail line is limestone slurry, which is not considered a hazardous material. There is a limited amount of caustic material, in the form of detergent, also transported, but not enough to be a concern of the village. The concern is of the natural gas and/or propane that is stored in tanks on train cars on the track to the east of the village.

The overall likelihood of a hazardous materials spill occurring in North Bennington is likely, with a >10% to <75% probability per year. Injuries, except in the case of direct injuries from a traffic accident, are likely low. However, the long-term impacts of a spill could be extensive if aquatic resources and/or water supplies were affected.

Infectious Disease Outbreak

Descriptions

Infectious diseases are caused by bacterial infections, viruses, fungi, and other organisms that can spread through the human population. Two of the most well-known infectious diseases currently occurring are COVID-19 and Lyme disease. Until COVID-19, Lyme disease had been the most prevalent infectious disease in Bennington County. Lyme Disease is very common in this region, as well as other tick-born illnesses.

Past Occurrences

COVID-19 is currently affecting the entire world. As of April 20, 2022, there have been 120,847 cases in Vermont with 626 deaths (Vermont Department of Health Daily Update: https://www.healthvermont.gov/covid-19/current-activity/case-dashboard). For much of the past two years that COVID-19 has been spreading, people have been required to wear face masks and physically distance themselves from others to reduce transmission. As a result, businesses were disrupted with some closing, schools were closed for prolonged periods with students learning remotely, and many workers switched to working remotely. The United States and Vermont has gone through several case surges over the past two years where transmission in communities was increased. Several vaccines have been developed and distributed throughout the world. Currently in the United States, anyone age 5 and over can receive a COVID-19 vaccine. The vaccine process is ongoing with booster shots available to many.

Lyme disease, carried by and transmitted by ticks is widespread in Vermont and New England. The symptoms can range from minor to very severe and is a clear threat to anyone in the region. In addition to Lyme disease, ticks in the region can carry multiple diseases and infect people with anaplasmosis and babesiosis as well.

Figure 10 shows the diseases and conditions tracked by the Vermont Department of Health. The 2021 counts for Anaplasma phagocytophilum and Pertussis seem lower than expected and the Vermont Department of Health will be looking into these numbers to make sure they are

accurate. Therefore, the numbers for these two diseases are considered preliminary and could change (Patsy Kelso, Vermont Department of Health, personal communication).

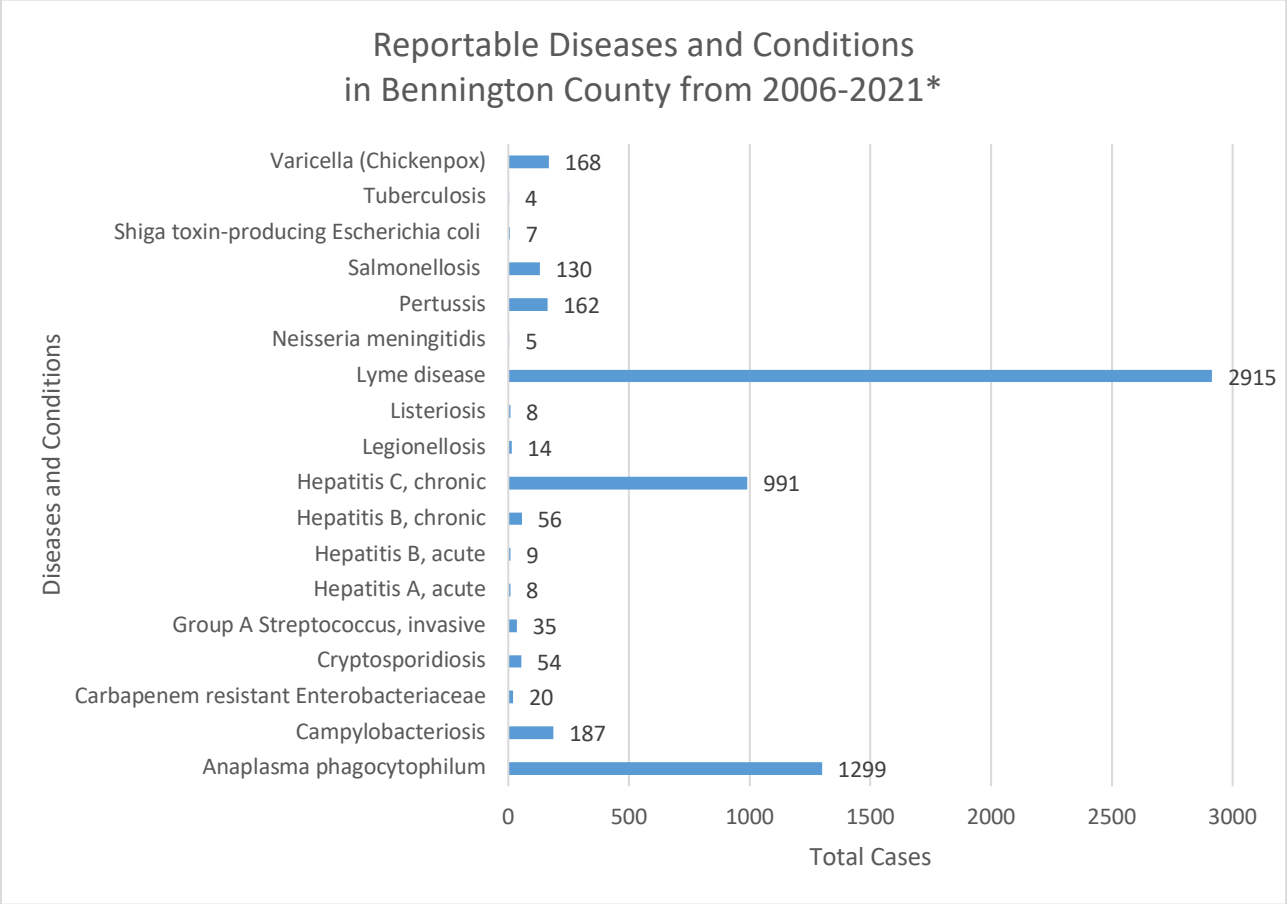


Figure 10: Reportable Diseases and Conditions in Bennington County from 2006 to 2021 (Source: VT Department of Health)*
**2021 data is preliminary and subject to change.*

Extent and Location

In general, individuals and families are most affected by infectious diseases, but schools and businesses could be affected as well, as seen with COVID-19.

Probability, Impact and Vulnerability

COVID-19 has affected North Bennington, the region, state, country, and world. It is highly likely that this infectious disease will continue to occur in North Bennington, with a >75% probability per year.

Lyme disease, and other tickborne diseases will continue to affect residents and those using recreational trails, and visiting natural and forested areas. It is highly likely that Lyme disease will continue to occur in North Bennington, with a >75% probability per year.

Many of the carriers of infectious disease, such as ticks and mosquitoes, may be exacerbated by climate change and lead to an increased abundance of invasive species (Vermont Hazard Mitigation Plan 2018). Invasive plant species have been known to increase tick populations in certain areas, such as along roadways and in forests. In addition, forest segments that are broken up and separated from lager forested areas promote the increase in certain animal populations that are main carriers of ticks. Promoting healthy forest practices can help keep the animal and tick populations at more balanced levels.

Vulnerability Assessment

Prioritization of Hazards

Table 19. Vulnerability assessment factors (Vermont Hazard Mitigation Plan 2018)
Frequency of Occurrence: Probability
1 = Unlikely <1% probability of occurrence per year
2 = Occasionally 1–10% probability of occurrence per year, or at least one chance in next 100 years
3 = Likely >10% but <75% probability per year, at least 1 chance in next 10 years
4 = Highly Likely >75% probability in a year
Potential Impact: Severity and extent of damage and disruption
1 = Negligible Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries
2 = Minor Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries
3 = Moderate Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities
4 = Major Severe property damage on a metropolitan or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

The hazard assessment information was used to prioritize hazards using criteria from the Vermont Hazard Mitigation Plan and is described in Table 19.

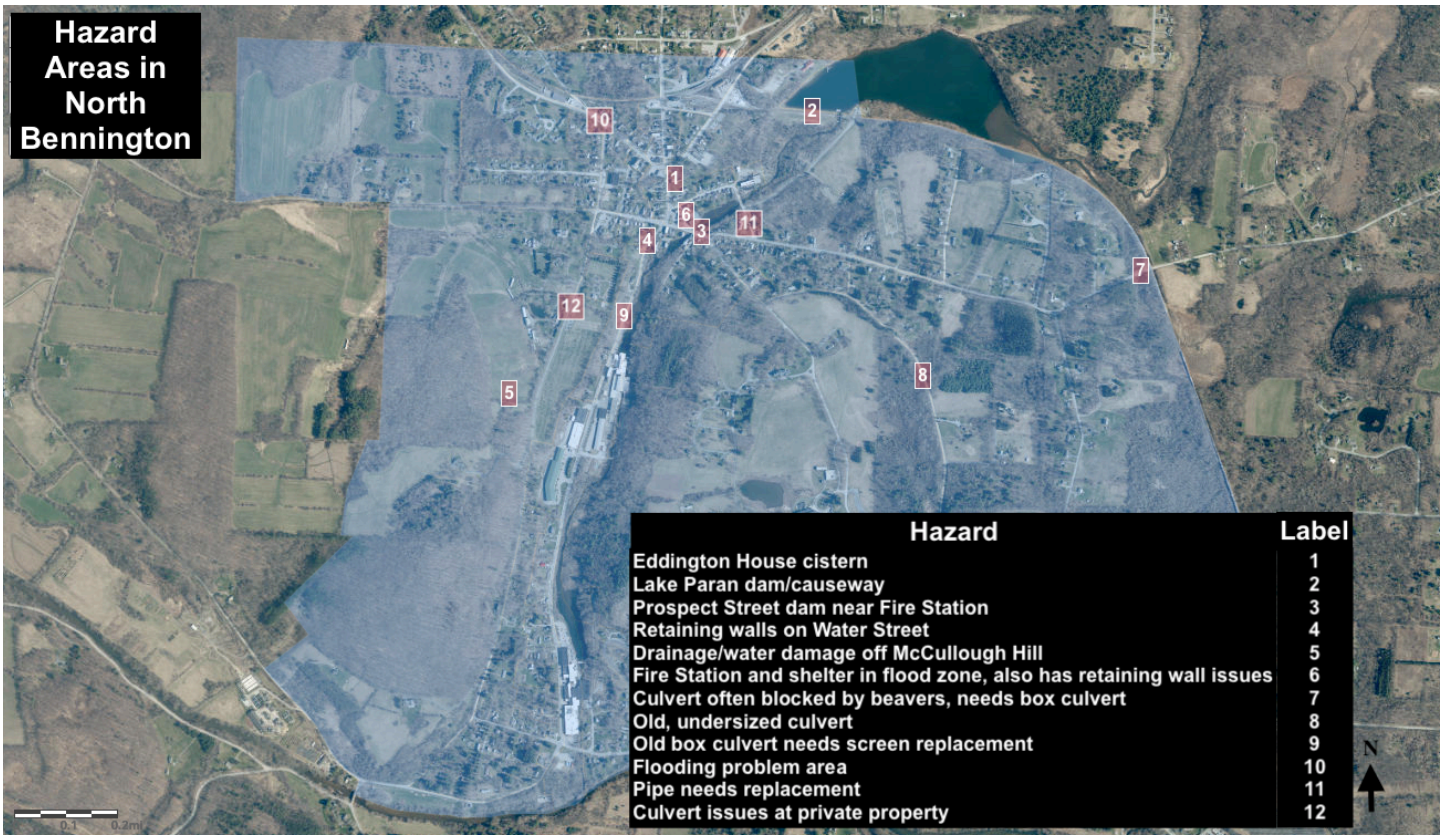
List of Priority Hazards

Table 20. Prioritization of hazards				
Hazard	Number of Events	Frequency of Occurrence	Potential Impacts	Total Score
Floods and Flash Floods	60 events from 1996 to 2021	4	3	7
Winter Storms	203 events from 1996 to 2021	4	3	7
High Wind Events	184 events from 1996 to 2021	3	3	6
Hail	30 events from 1996 to 2021	3	1	4
Temperature Extremes	Annual >90 F: 1 day on average annual maximum <32 F: 40 days annual minimum < 32 F: 160 days	3-4	2	5-6
Drought	Severe droughts have occurred in 27 years from 1895 to 2021	3	2	5
Wildfire	43 events from 1992 through 2021	4	1	5
Earthquake	No events	1	1	2
Landslide	No records causing damage	1	1	2
Invasive Species	Ongoing	4	3	7
Hazardous Materials Spills	43 events from 1990 to 2021	3	3	6
Infectious Disease Outbreak	Ongoing	4	4	8

The planning team assessed each of the hazards thoroughly then scored the hazards based on the criteria in Table 19 to determine which hazards would need mitigation actions. Table 20 shows the results of the scoring, with Floods and Flash Floods, Winter Storms, High Wind Events, Temperature Extremes, Hazardous Materials Spills, Invasive Species, and Infectious Disease Outbreak ranking highest. The Temperature Extremes score was borderline, but the planning team decided to include this hazard for mitigation actions. In the previous plan Drought and Water Supply were also selected to have mitigation actions. However, with new data and new vulnerability assessment criteria, Drought was not selected. The section on Water Supply was not included in this plan as the issue with contamination has been addressed.

Table 21. Hazard areas identified by the planning team
Eddington House cistern
Lake Paran dam/causeway
Prospect Street dam near Fire Station
Retaining walls on Water Street – potential slide
Drainage/water damage off McCullough Hill over Park Street and down Water Street
Fire Station and shelter in flood zone, also has retaining wall issues
Culvert often blocked by beavers, needs box culvert
Old, undersized culvert
Old box culvert needs screen replacement – if blocked, will flood Route 67A
Flooding problem area – roadside needs reshaping
Pipe needs to be replaced
Culvert issues at private property on Park Street

Map 8 is a composite map showing areas identified by the planning team as vulnerable to flooding, steep grades, and areas needing major culvert upgrades. Other priority hazards were not mapped either as adequate surveys have not been completed, or they could affect the entire village. Table 21 lists the hazard areas, shown on Map 8.



Map 8: Identified hazard areas in North Bennington by the Planning Team (Source: Planning Team, ArcGIS Online)

Mitigation Measures

Implementation of the actions in this plan to achieve mitigation goals identified by the planning team would also help achieve the statutory requirements of 24 V.S.A. Chapter 117 requirements, including those to protect natural and cultural resources, provide affordable housing, support economic development, and maintain a working landscape.

The following sections review plans already established that support hazard mitigation planning activities, as well as previous hazard mitigation plans, for North Bennington. Priorities for this 2022 plan are largely the same as for the previous plan, as the population and development of the village have remained mostly the same. There have been more storms, but nothing more severe than before. However, the village has seen the impacts from infectious disease since the previous plan. Priorities for hazard mitigation planning reflect the new data and lived experiences collected as part of this plan update.

Past Hazard Mitigation Plans

2005 Hazard Mitigation Plan

North Bennington was one of 13 jurisdictions in Bennington County that adopted a multi-jurisdictional hazard mitigation plan in 2005. In that plan, North Bennington identified flood, structure fire and dam failure as their worst threats. This hazard mitigation plan, and the previous plan, address flooding and dams. However, structure fire was not included in the previous plan or this plan, as it instead focuses more on natural threats and hazards.

2017 Hazard Mitigation Plan

In 2017, North Bennington adopted a stand-alone plan that assessed and developed mitigation measures for all natural hazards. Actions from that plan and the status of those actions can be found in Appendix I. The vulnerability assessment in this plan has been updated to reflect the percentages used in the 2018 Vermont Hazard Mitigation Plan. Additionally, Geographic Area Affected and Warning Time were not included in the vulnerability assessment this time around, as it also was not included in the state plan. Therefore, the prioritization of hazards scoring has identified Temperature Extremes and Wildfires as a higher priority. Hazardous Materials Spills has been removed as a priority due to the change in percentage for the rating of Frequency of Occurrence.

A change mentioned in this plan that was not occurring during the development of the previous plan, is that college students are now living in housing units in a previous established building located in the flood hazard zone, though there is no new development in the flood hazard zone. This is discussed in the flooding section. Another change involved hazardous roads previously identified. The hazardous roads have been addressed, though there is a new road causing issues in the village. Crash data also shows some changes in problem areas, showing less

issues at one intersection and more at another. Both of these areas are listed in the hazardous materials spills section.

Lastly, the previous plan had a section on Water Supply due to the (then) recent findings of PFOA in many residential wells in North Bennington and Bennington. Some of the information has been moved to the section that discusses the North Bennington water system as a critical facility. The rest has been removed as the contamination issue has been mostly resolved by connecting contaminated properties to public water systems.

Village Plan

The North Bennington Village Plan (North Bennington 2018) includes several objectives that support hazard mitigation. These objectives focus on flood hazard areas, hazard preparedness, shoreline protection, and stormwater management.

The Flood Resilience section of the plan addresses the potential of flooding and erosion hazards, mentions that climate change is increasing extreme weather occurrences, and supports mitigation efforts to increase preparedness of emergency response and the village's capacity for recovery. The plan also lists several steps for effective flood resilience: assessing hazards, reducing risks, preparing for an emergency, and insuring residual risk. Flood hazard areas and river corridors are discussed and a table showing the structures in each zone is included. The previous hazard mitigation plan is mentioned and discusses some aspects of that plan as well.

The plan also explains that the village has adopted land use regulations to control development in hazard-prone areas and mentions that the hazard mitigation plan further reduces risk by prioritizing specific mitigation actions, and by expanding access to FEMA mitigation funds. The plan includes information about the Local Emergency Operations Plan (now the Local Emergency Management Plan) and mentions that the village is a part of the National Flood Insurance Program (NFIP) since 2011, making flood insurance available to all residents. Lastly, the Flood Resilience section discusses the Emergency Relief and Assistance Fund and where the village stands within that program. At the time, the village was eligible for the largest ERAF amount, having all the current requirements completed.

In addition to the Flood Resilience section, the plan states that development in the floodplain area must be very carefully planned to avoid flood damage and water pollution, and any development in any floodplain areas must meet state standards for development in flood prone areas and should preserve a natural vegetated buffer along the stream bank. By controlling the type of development and the nature of construction in the flood hazard areas, the village seeks to protect public health and safety and protect the community against the costs associated with flood damage. The plan also incorporates the benefits provided by wetlands, which includes flood and stormwater control, maintenance of surface and ground water quality, open space and aesthetic appreciation, fish and wildlife habitat, and sources of nutrients for freshwater food chains.

The plan also discusses the Shoreline Protection Overlay District that extends 500 feet inland from the shore of Lake Paran. The district is intended to provide a safety zone to avoid flood damage, preserve aesthetic qualities, protect public waters from pollution, protect spawning grounds and wildlife habitat, and prevent erosion. Any use involving the disposal or storage of hazardous materials is prohibited in the district, and land within 200 feet of the lake shoreline is to be kept in its natural condition.

Lastly, stormwater management is discussed. Roadside ditches and natural drainage courses provide stormwater drainage in many locations but the plan states that drainage structures should be installed as part of roadway or other improvement projects to prevent flooding and to avoid direct discharges of contaminated waters to surface waters. The plan mentions that recent improvements have been made along West Street.

Village Bylaws

The North Bennington Zoning Bylaws, adopted in 2013, are still the most current. The bylaws ensure that proposed uses do not adversely affect surface or subsurface water resources, including floodplains, wetlands, streams, ponds, and groundwater. Stormwater management must comply with state standards, and not lead to adverse impacts on the municipal drainage system, surface or groundwater, or any other property in the area. The bylaws also prohibit fill in the floodway.

For structures and development, base flood elevation and floodway data is used to determine that the lowest floor (including basement) of residential buildings is elevated to be one foot or more above the base flood elevation and the floodway be kept free of obstructions. Encroachments or development above grade and below the elevation of the floodway is prohibited. No existing building in the floodway may be enlarged to create a greater encroachment on the floodway.

The Development Review Board determines that all development is: reasonably safe from flooding; designed and anchored to prevent flotation, collapse, or lateral movement of the structure; constructed of materials and utility equipment that are resistant to flood damage; constructed using methods and practices that will minimize flood damage; consistent with the need to minimize flood damage; and designed so that public utilities and facilities, such as sewer, gas, electrical, and water systems, are located, elevated, and constructed to minimize or eliminate flood damage.

The Development Review Board also makes sure that: electrical, heating, ventilation, plumbing, and air conditioning equipment, and other service facilities are designed and/or located so as to prevent water from entering or accumulating within components during conditions of flooding; adequate drainage is provided so as to reduce exposure to flood hazards; the lowest floor (including basement) of any substantially improved non-residential buildings and other structures, shall be elevated or flood-proofed to at least one foot above the 100-year flood level, or be designed with floodproofing measures; structures be substantially improved in Zones A, A1-

30, AE, and AH, and shall be located such a that the lowest floor is at least one foot above base flood elevation, which must be documented in as-built condition with a FEMA Elevation Certificate; enclosures below grade on all sides (including below grade crawlspaces and basements) are prohibited except for certain uses identified in the bylaws.

Lastly, new or replacement water supply systems, and/or sanitary sewage systems, are designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters, and that on-site disposal systems are located so as to avoid impairment of them or contamination from them during flooding.

Other Plans

North Bennington annually updates their Local Emergency Management Plan. This plan lists points of contacts to be used during hazardous weather events or other emergencies, positions and duties, emergency operations center staff members and locations, local resources, typed resources, public information and warning locations, vulnerable populations and vulnerable locations, and shelters. This plan is reviewed and/or readopted annually. The last plan was adopted on April 27, 2021.

Developed a Paran Creek Watershed Plan in 2017 that was developed to improve the water quality and habitat of all water bodies in the Paran Creek Watershed. The current status and health of the watershed, and identification of potential improvements and active management practices were discussed in this plan.

North Bennington is also participating in a Stormwater Master Plan that is set to begin in the summer of 2022.

State and Regional Plans and Programs

Vermont Hazard Mitigation Plan (2018)

The Vermont Hazard Mitigation Plan (2018) identified a series of hazards shown in Table 22 below along with those we considered in this plan. The planning team used the state plan as a starting point and local knowledge to create a more specific set of hazards that they addressed. Table 22 shows how the North Bennington plan tracks the state plan.

Table 22. Comparison of hazards considered in the 2018 Vermont Hazard Mitigation Plan vs. the Village of North Bennington Hazard Mitigation Plan

2018 VT Hazard Mitigation Plan	Village Hazard Mitigation Plan
Hazards	**Natural Hazards**
Drought	Drought
Earthquake	Earthquake
Inundation Flooding and Fluvial Erosion	Flooding and Fluvial Erosion

Table 22. Comparison of hazards considered in the 2018 Vermont Hazard Mitigation Plan vs. the Village of North Bennington Hazard Mitigation Plan	
2018 VT Hazard Mitigation Plan	Village Hazard Mitigation Plan
Hail	Hail
Wind	High Wind Events
Hurricane/Tropical Storm	Addressed in High Wind Events and Flooding and Fluvial Erosion sections
Infectious Disease	Infectious Disease Outbreak
Invasive Species	Invasive Species
Landslides	Landslide
Severe Thunderstorm	Addressed in High Winds and Flooding and Fluvial Erosion sections
Snowstorm and Ice Storm	Winter Storms
Extreme Heat	Temperature Extremes
Extreme Cold	Temperature Extremes
Wildfire	Wildfire

Bennington County Regional Plan (adopted March 19, 2015, amended with the Regional Energy Plan March 23, 2017)

The Bennington County Regional Plan (Bennington County Regional Commission 2015) lists the following policies and actions supporting hazard mitigation including several policy recommendations emphasizing protecting natural resources, maintaining village and urban centers, and avoiding development on sensitive lands including areas of steep slopes and wetlands along with the protection of surface and groundwater resources and forested lands. The regional plan also includes a flood resilience section, which is required by Vermont statutes describing potential hazards from flooding and fluvial erosion. The section encourages avoiding development in flood hazard areas, reconstruction of bridges and culverts that impede flows, undisturbed buffer areas along streams to provide for lateral movement and attenuation of overland flow, participation in the National Flood Insurance Program, updating of flood bylaws, adoption of up-to-date road and bridge standards and participation in the community rating system.

Vermont Agency of Natural Resources

The Vermont Agency of Natural Resources (VT ANR) has worked with North Bennington and other communities to adopt updated flood and river corridor regulations. VT ANR also has mapped river corridors and can regulate activities within those that are not subject to review by municipalities. VT ANR also reviews municipal permit applications for development within the special flood hazard area, permit applications for stream alterations, regulated activities within wetlands, and permits for transporting hazardous materials.

Act 250

The Act 250 program provides a public, quasi-judicial process for reviewing and managing the environmental, social, and fiscal consequences of major subdivisions and developments in

Vermont. During Act 250 proceedings, agencies and the public can offer comments on such proposed developments.

Village Capabilities

North Bennington is located entirely within the Town of Bennington but is a separate municipal entity. The village has a Board of Trustees, Planning Commission, Zoning Administrator, Development Review Board, Water Department, Water Board, Tree Committee, Highway Department, and Fire Department.

The Board of Trustees has four members. The trustees appoint members to the other boards and commissions, adopts the Village Plan and Bylaws, proposes the budgets, and approves expenses. The Planning Commission has five members with the primary purpose of reviewing and updating the Zoning Bylaws and the Village Plan on an ongoing basis to ensure that they are current and in conformity with the Vermont Statutes and Regulations. There is one Zoning Administrator for the village. This individual is tasked with issuing zoning permits. The Development Review Board, consisting of four members, reviews site plans, subdivisions, variances, conditional uses and the appeals of the Zoning Administrator.

The Water Board, consisting of five members, handles preventative maintenance, monitors the use of water being treated at the filtration plant, organizes required water testing and handles billing. The Water Board has the responsibility to provide a safe source of water for drinking and other uses to the village. The board maintains and monitors safe and secure sources of water including two reservoirs, the filtration plant and water lines to residents of Shaftsbury and North Bennington. The Tree Committee enhances the beauty of the village by planting and maintaining trees in public spaces and the public right-of-way, while also looking for hazardous trees in the village that need to be removed.

The Highway Department, consisting of two full-time employees plus part-time staff as needed, maintains roads, bridges, culverts, catch basins, ditches and sidewalks, repairs damaged areas and monitors any sensitive road infrastructure in the village. The Highway Department has developed strong collaborative relationships with the highway departments of Shaftsbury and Bennington. The three highway departments share equipment and staff as needed during times of high demand or an emergency. This has strengthened North Bennington's capacity to address needs during and after storms. The North Bennington Fire Department consists of 35 volunteer fire fighters. All are volunteers and on-call. The fire department has two pump trucks, one brush truck and one cold water rescue trailer. The North Bennington Fire Department is also a part of the Bennington County Mutual Aid Association for fire response. The Fire Department is also the primary emergency operations center (EOC) location and the village emergency shelter. The Village Garage is the secondary EOC location. The Village School is the secondary emergency shelter.

Other emergency services located in Bennington but are near the village include the Bennington Rescue Squad, Southwestern Vermont Medical Center, Bennington Police Department

which patrols North Bennington through contracted services, Bennington County Sheriff's Department, and three fire departments. The Vermont Department of Health and VTrans have local offices in Bennington. The regional shelter for Bennington County is Mount Anthony Union Middle School and is located in Bennington as well. Shaftsbury has a fire department and houses a Vermont State Police barracks.

North Bennington has all requirements completed to receive the highest Emergency Relief and Assistance Fund amount. The village has adopted the most current Road and Bridge Standards, has an updated Local Emergency Management Plan, they are a part of the National Flood Insurance Program, have a current Hazard Mitigation Plan, and have (interim) River Corridor Protection measures in place.

Table 23 summarizes other important village capabilities. Areas needing improvement and suggestions to maintain or enhance those capabilities are also included.

Table 23. Capabilities of the Village of North Bennington			
Plans/Policies/Ordinances	Description/Responsible Agent	Effectiveness	Improvements Needed/Suggestions
Village Plan	-Planning Commission -Emergency Management Director -Village Trustees (approval of Village Plan)	-Effective -2018 update includes flood resiliency information	-None
Local Emergency Management Plan (LEMP)	-Emergency Management Director -Village Trustees (approval of plan)	-Effective -Annually updated	-None -Continue to keep updated
Flood Hazard Area Regulations in Zoning Bylaws	-Planning Commission -Development Review Board -Zoning Administrator (permitting) -Village Trustees (approval of bylaws)	-Effective -Adopted new flood hazard area regulations in 2013	-None -Continue to monitor FEMA regulations and new local flood hazards
Zoning Bylaws	-Planning Commission -Development Review Board -Zoning Administrator (permitting) -Village Trustees (approval of bylaws)	-Effective	-None -Continue to monitor regulations and maintain training of volunteer board members to ensure effective permitting
Soil and Water Resources/Streams and Water Courses/Protection of Shoreland/Water Resources	-Planning Commission -Zoning Administrator (permitting) -Village Trustees (approval of bylaws)	-Effective -Shoreline Protection Overlay District	-None -Continue to review regulations and training of volunteer board members to ensure effective permitting
Water System	-Water Board -Village Trustees	-Effective	-None -Continue to comply with regulations. Consider identifying a secondary source for water supply
Wastewater Treatment Facility	-Village Trustees -Bennington Select Board -Bennington Water Resources - Superintendent	-Effective	-Establish a policy and procedure with Bennington for enabling new connections in North Bennington -Identify where new stormwater drainage structures are needed

Table 23. Capabilities of the Village of North Bennington			
Plans/Policies/Ordinances	Description/Responsible Agent	Effectiveness	Improvements Needed/Suggestions
Road Maintenance Programs and Standards	-Road Foreman -Village Trustees	-Effective -Village has adopted most recent VTrans Road and Bridge Standards	-Make sure culverts in flood areas are updated when needed
School Emergency Response	-North Bennington Graded School -Southshire Community School -Bennington College -Emergency Management Director -Fire Chief -Bennington Police Chief	-Effectiveness varies from school to school -Needs some improvements	-Update and review school emergency plans -Schools should conduct onsite training with Police and Fire Departments
Vulnerable Populations	-Emergency Management Director	-Effective -Vulnerable populations listed in LEMP	-Maintain current training for emergency personnel on responding to vulnerable populations
Mutual Aid Agreements – Emergency Services	-The Village Fire Department has Mutual Aid Agreements with North Hoosick and White Creek Fire Departments, and is part of Bennington County Mutual Aid -Local Dispatch is through the Bennington Police Department	-Effective	-Maintain the Mutual Aid Agreements
Mutual Aid Agreements – Road Crews	-Road Foreman -Village Trustees	-Not established	-It would be beneficial to have formalized agreements for the sharing of equipment and services between towns after hazardous weather events
Maintenance Programs – Bridge and Culvert Inventory	-Road Foreman	-Effective -Completed recently	-Maintain current bridge and culvert inventory

Mitigation Actions

There are four categories of mitigation actions (table 24) that need to be identified for the priority hazards selected in table 20. Table 25 lists the mitigation actions identified by the planning team and are listed by the type of hazard they address.

The actions were ranked as high, medium, or low priority to the village. High priority actions have a significant benefit to the community and significantly reduce the risk or vulnerability. Medium priority actions moderately benefit the community and moderately reduce the risk or vulnerability. Low priority actions minorly benefit the community and minorly reduce the risk or vulnerability. The feasibility of mitigation actions is also taken into consideration by identifying if each action has political or community support, is consistent with state policies, has a funding source, and is technically or logistically feasible. Some actions will be implemented by North Bennington and others by state agencies.

Table 24. Types of Mitigation Actions

Mitigation Action Categories	Description of Category	Example of Actions
Local Plans and Regulations	These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.	Comprehensive plans, land use ordinances, building codes, capital improvement programs, open space preservation, stormwater management, municipal plans, and master plans.
Structure and Infrastructure Projects	These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure.	Acquisitions and elevations of structures in flood prone areas, undergrounding utilities, structural retrofits, floodwalls and retaining walls, detention and retention structures, culvert and bridge upgrades.
Natural Systems Protection	These actions minimize damage and losses and also preserve or restore the functions of natural systems.	Sediment and erosion control, stream corridor restoration, forest and land management, and conservation easements.
Education and Awareness Programs	These actions inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.	Websites with information and maps, trainings and meetings, and information to residents on potential hazards in the community.

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
All Hazards	Education and Awareness	Provide a "be prepared" section on the village website with links to information for residents	-Trustees	2023-2025	-General fund	High
All Hazards	Education and Awareness	Encourage vulnerable residents to sign up with the Citizens Assistance Registry for Emergencies (CARE) at https://e911.vermont.gov/care	-Emergency Management Director (EMD)	2023-2025	-General Fund	Medium
All Hazards	Local Plans and Regulations	Maintain a current Local Emergency Management Plan	-EMD	Update annually	-General fund	High
All Hazards	Local Plans and Regulations	Encourage proper construction techniques and use of appropriate materials to address hazards, particularly flooding, winter storms, wind events, earthquakes, landslides and wildfire	-Planning Commission -Zoning Administrator	Ongoing	-General fund	High
All Hazards	Local Plans and Regulations	Integrate this hazard mitigation plan into the Village Plan	-Trustees -Planning Commission	Completed for current Village Plan – update when updating plan	-General fund	High
All Hazards	Education and Awareness	Identify and develop methods to communicate with populations vulnerable to potential hazards, particularly extreme temperatures and infectious diseases, but also those in need of assistance for evacuation and/or sheltering	-EMD	2023-2025	-General fund	High

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
All Hazards	Local Plans and Regulations	Assess need for driveway standards to assure adequate emergency access particularly access in winter storms, floods, and wildfire protection	-Planning Commission	2023-2025	-General fund	High
All Hazards	Structure and Infrastructure Projects	Acquire a generator to provide backup power for the water filtration plant	-Trustees -Water Board	2023-2028 (subject to funding availability)	-General fund	Medium
All Hazards	Structure and Infrastructure Projects	Acquire a generator for the Highway Garage	-Trustees -Highway Department	2023-2028 (subject to funding availability)	-General fund	Medium
Floods and Flash Floods	Education and Awareness	Educate owners on importance of securing propane tanks and other items that could float or blow away in storms	-Zoning Administrator	2023-2025	-General fund	Medium
Floods and Flash Floods	Local Plans and Regulations	Maintain current flood resiliency section, including sections addressing the protection of surface waters, land adjacent to streams, wetlands and water bodies, upland forests and other lands necessary to provide flood resiliency into the Village Plan, as required by Vermont statutes	-Planning Commission -BCRC	Completed for current Village Plan – update when updating plan	-General fund -Municipal Planning Grant	High
Floods and Flash Floods	Local Plans and Regulations	Develop a watershed planning team with other municipalities within the watershed to coordinate planning and other actions to protect the river and promote flood resilience	-Planning Commission -BCRC	2023-2028	-General fund -Watershed Grant from VT ANR	Medium

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
Floods and Flash Floods	Local Plans and Regulations	Maintain updated flood hazard and river corridor protection zone bylaws	-Development Review Board -Zoning Administrator	Completed for current bylaws – update when updating bylaws	-General fund	High
Floods and Flash Floods	Local Plans and Regulations	Participate in the Community Rating System to help reduce flood insurance premiums for residents and businesses	-Trustees	2023-2026	-General fund	High
Floods and Flash Floods	Local Plans and Regulations	Encourage appropriate stormwater and erosion control measures in new developments	-Development Review Board	2023-2028 (ongoing)	-General fund	High
Floods and Flash Floods	Local Plans and Regulations	Maintain current Vermont Town Road and Bridge Standards	-Trustees	Completed with current standards – update when new standards are available	-General fund	High
Floods and Flash Floods	Local Plans and Regulations	Inventory roads for stormwater mapping as part of the Vermont Stormwater program	-Highway Department -BCRC	2023-2028	-VT Better Roads -General fund	High
Floods and Flash Floods	Local Plans and Regulations	Complete village-wide stormwater management plan in accordance with the Vermont Stormwater Manual	-Planning Commission	Set to begin summer 2022	-VT Better Roads -General fund	High

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
Floods and Flash Floods	Local Plans and Regulations	Map stormwater system	-Vermont DEC	2023-2026	-State funding	High
Floods and Flash Floods	Local Plans and Regulations	Update culvert inventory	-Highway Department -BCRC	Completed – maintain current inventory	-General fund -VT Better Roads funding	High
Floods and Flash Floods	Natural Systems Protection	Identify possible acquisition of wetlands and special flood hazard areas to assure natural systems protection	-Conservation Commission -Planning Commission -BCRC	2023-2026	-General fund -Municipal Planning Grant	Medium
Floods and Flash Floods	Natural Systems Protection	Complete inventory of road network to assess whether road segments connected to surface waters through ditches, culverts or other drainage structures meet the new stormwater standards currently under development by the DEC Municipal Roads Program	-Highway Department	2023-2026	-General fund -VT Better Roads	High
Floods and Flash Floods	Natural Systems Protection	Develop a long-term plan to bring all sections of connected roads to revised standards as part of the municipal general permit	-Highway Department	2023-2026	General fund -VT Better Roads	High

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
Floods and Flash Floods	Natural Systems Protection	Implement stormwater control projects and green infrastructure practices to reduce flows and sediment	-Highway Department -Bennington County Conservation District	2023-2028	-General fund -State funding -State hazard mitigation funding programs (FRCF, BRIC, FMA, HMGP)	High
Floods and Flash Floods	Structure and Infrastructure Projects	Relocate the North Bennington Fire Department building to a location outside of the special flood hazard area	-Fire Department	2023-2028 (subject to funding availability)	-State hazard mitigation funding programs (FRCF, BRIC, FMA, HMGP) -State funding -General fund	High
Floods and Flash Floods	Structure and Infrastructure Projects	Road crew should regularly survey culverts for blockages including photographs and records of damages and costs	-Highway Department	Ongoing	-Highway fund	High
Floods and Flash Floods	Structure and Infrastructure Projects	Identify and replace culverts and bridges that do not meet current Vermont Town Road and Bridge Standards	-Highway Department	Ongoing	-Highway fund -State of Vermont -AOT -State hazard mitigation funding programs (FRCF, BRIC, FMA, HMGP)	High
Floods and Flash Floods	Structure and Infrastructure Projects	Reach out to dam owners and encourage them to get dams inspected	-Trustees	2023-2025	-General fund	Medium

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
Winter Storms	Education and Awareness	Provide educational materials on sheltering in place and preparation for winter storms, including long-term power outages	-EMD	2023-2025	General fund	Medium
Winter Storms	Education and Awareness	Provide materials for residents on methods to protect property from wind events	-EMD -Zoning Administrator	2023-2025	-General fund	Medium
Winter Storms	Local Plans and Regulations	Maintain agreements with adjacent towns for sharing of highway equipment	-Trustees -Highway Department	2023-2026	-General fund	High
Winter Storms	Structure and Infrastructure Projects	Place utilities underground for critical facilities	-Trustees	2023-2028	-State hazard mitigation funding programs (FRCF, BRIC, FMA, HMGP) -General fund	Medium
High Wind Events	Local Plans and Regulations	Require boats, propane tanks and other items stored outdoors to be secured	-Planning Commission -Zoning Administrator	2023-2025	-General fund	High
High Wind Events	Local Plans and Regulations	Encourage appropriate plantings to avoid future damage from downed trees	-Tree Committee	2023-2026	-General fund	Medium

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
High Wind Events	Structure and Infrastructure Projects	Retrofit existing buildings to withstand high winds including protection of power lines and other utilities	-Trustees -Private property owners	2023-2028	-State hazard mitigation funding programs (FRCF, BRIC, FMA, HMGP)	Medium
High Wind Event	Local Plans and Regulations	Conduct a tree survey for large dead trees	-Tree Committee	2023-2026	-General fund	Medium
High Wind Event	Structure and Infrastructure Projects	Work with Green Mountain Power to prioritize vegetation clearing along vulnerable lines	-GMP -Highway Department	2023-2028	-Utility company	Medium
Temperature Extremes	Education and Awareness	Provide information to community about how to prepare for extreme temperatures and notifying them about where the warming/cooling shelter is located, and how to see if it is open	-EMD -Trustees	2023-2025	-General fund	High
Temperature Extremes	Education and Awareness	Organize outreach to vulnerable populations about where the warming/cooling shelter is located, and how to see if it is open	-EMD -Trustees	2023-2025	-General fund	High
Invasive Species	Local Plans and Regulations	Monitor extent of invasive species, particularly forest invasive species such as Emerald Ash Borer	-Tree Committee	Ongoing	-General fund	Medium

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
Invasive Species	Local Plans and Regulations	Complete surveys for ash trees vulnerable to Emerald Ash Borer	-BCRC -Bennington County Conservation District	Ongoing	-State hazard mitigation funding programs (FRCF, BRIC, FMA, HMGP) -VT Department of Forests, Parks, and Recreation	Medium
Invasive Species	Local Plans and Regulations	Survey for invasive species (e.g., Japanese knotweed) to identify potential problem areas	-Conservation Commission	Ongoing	-VT Department of Forests, Parks, and Recreation	Medium
Invasive Species	Local Plans and Regulations	Encourage use of native species in plantings for commercial and residential development	-Development Review Board	2023-2028	-General fund	Medium
Invasive Species	Education and Awareness	Provide outreach materials for landowners on using native plants and controlling invasive species	-Bennington County Conservation District	2023-2028	-General fund -VT Department of Forests, Parks, and Recreation	High
Hazardous Materials Spill	Structure and Infrastructure Projects	Work with VT AOT to identify and mitigate high accident intersections and road segments	-VT AOT	Ongoing	-State AOT funds	High

Table 25. Mitigation Actions						
Hazard	Action Category	Action	Responsible Party	Time Frame	Funding Source(s)	Priority
Infectious Disease Outbreak	Education and Awareness	Provide educational materials on infectious diseases	-EMD	2023-2028	-General fund -VT Department of Health	High
Infectious Disease Outbreak	Local Plans and Regulations	Monitor disease occurrences and potential outbreaks, partnering with the VT Department of Health	-EMD -VT Department of Health	Ongoing	-VT Department of Health	Medium

Plan Maintenance

Annual Monitoring

The plan will remain available on the Bennington County Regional Commission (BCRC) website under the tab for North Bennington. This will make the plan accessible to all officials and the public. When other plans are updated, the Hazard Mitigation Plan will be integrated into those planning efforts when appropriate.

The Village Trustees intend to involve the public in the implantation, review, and update of this plan. Tracking of actions will take place during the annual budgeting process, when funds are allocated for various programs in the village, including capital improvements.

Plan Evaluation

The North Bennington Village Trustees will be responsible for serving as or creating a planning team for evaluating and updating the plan.

The effectiveness of the plan will be determined by whether or not actions listed in Table 25 are implemented. Therefore, the Trustees should annually evaluate the plan to assess if the goals and actions are being achieved.

a) Prior to town meeting in March, the planning team lead (assigned by the Trustees) and Emergency Management Director will review each of the actions in Table 25 to determine their status. Status categories are: completed, in progress, scheduled, no progress.
b) The evaluation will be presented to the Trustees at a public meeting to allow for a discussion on progress in implementing the actions and possibly applying for funding, or to address program and budgeting priorities.

If requested, the Bennington County Regional Commission will provide advice and assistance on the plan evaluation.

Plan Update

Toward the end of the five-year period covered by this plan, the Trustees and planning team will initiate a review of the plan by:

a. Updating the descriptions and analyses of events using new information since completion of the 2022 draft.
b. Identification of any new buildings or infrastructure or changes in critical facilities.
c. Estimation of potential probability and extent of hazards based on any new information since completion of the 2022 plan.

d. Review of completed hazard mitigation projects.
e. Identification of new projects and actions given the revised hazard evaluation.
f. Review of any changes in priorities since adoption of the 2022 plan.
g. Revision of the assessment of risks and vulnerability from identified hazards.
h. Development and use of criteria to assess the potential benefits and costs of identified actions for use in prioritizing those actions.
i. Integration of the updated plan into the North Bennington Village Plan and other plans and programs.

The planning team will hold open meetings to solicit opinions and to identify issues and concerns from members of the public and stakeholders. The planning team and the Village Trustees will update the Hazard Mitigation Plan or hire a consultant or the Bennington County Regional Commission (BCRC) to complete the plan update. The draft plan will be made available to the public, sent to the State Hazard Mitigation Officer (SHMO), and sent to neighboring towns and organizations for review and input. The revised plan will be submitted for review by the SHMO a second time. Once all questions and comments have been addressed, the SHMO will send the plan to FEMA. Following approval by FEMA, the Village Trustees will adopt the completed plan.

Should a declared disaster occur, North Bennington may undertake special review of this plan and the appropriate updates made. After Action Reports, reviews, and debriefings should be integrated into the update process. The plan should also be updated to reflect the findings of any other studies completed, such as the Stormwater Master Plan, culvert and bridge studies, river corridor plans, and other studies.

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Appendix I. Mitigation Actions from the 2017 North Bennington Hazard Mitigation Plan

Hazard	Type	Action	Responsible Party	Time Frame	Status (complete, carried to 2022 plan, deleted)	Priority
All Hazards	Education and Awareness	Provide a "be prepared" section of the village website with links to information for residents	-Trustees	2018-2019	Carried over	High
All Hazards	Local Plans and Regulations	Maintain a current Local Emergency Operations Plan	-EMD	2018-2023 (ongoing)	Completed and carried over	High
All Hazards	Local Plans and Regulations	Encourage proper construction techniques and use of appropriate materials to address hazards, particularly flooding, winter storms, wind events, earthquakes, landslides and wildfire	-Planning Commission -Zoning Administrator	2018-2019	Carried over	High
All Hazards	Local Plans and Regulations	Integrate this hazard mitigation plan into the Village Plan, the Local Emergency Operations Plan and budgeting and capital improvements plan	-Trustees -Planning Commission -Zoning Administrator	2018-2023 (ongoing)	Completed	Medium to High
All Hazards	Education and Awareness	Identify and develop methods to communicate with populations vulnerable to potential hazards, particularly drought, extreme temperatures and infectious diseases, but also those in need of assistance for evacuation and/or sheltering	-EMD	2018-2019	Carried over	High
All Hazards	Local Plans and Regulations	Assess need for driveway standards to assure adequate emergency access particularly to assure adequate access in winter storms, floods and for wildfire protection	-Planning Commission	2018-2019	Carried over	High
All Hazards	Structure and Infrastructure Projects	Acquire a generator to provide backup power for the village's water filtration plant	-Trustees -Water Board	2018-2019	Carried over	Medium to High
All Hazards	Structure and Infrastructure Projects	Acquire a generator for the Highway Garage	-Trustees -Highway Department	2018-2019	Carried over	Medium
Floods and Flash Floods	Education and Awareness	Educate owners on importance of securing propane tanks and other items that could float or blow away in storms	-Zoning Administrator	2018-2019	Carried over	Medium

Appendix I. Mitigation Actions from the 2017 North Bennington Hazard Mitigation Plan

Hazard	Type	Action	Responsible Party	Time Frame	Status (complete, carried to 2022 plan, deleted)	Priority
Floods and Flash Floods	Local Plans and Regulations	Develop and incorporate flood resiliency section, including sections addressing the protection of surface waters, land adjacent to streams, wetlands and water bodies, upland forests and other lands necessary to provide flood resiliency into the North Bennington Village Plan as required by Vermont statutes	-Planning Commission -BCRC	2018-2019	Completed	Medium to High
Floods and Flash Floods	Local Plans and Regulations	Develop a watershed planning team with other municipalities within the watershed to coordinate planning and other actions to protect the river and promote flood resilience	-Planning Commission -BCRC	2018-2022	Carried over	Medium
Floods and Flash Floods	Local Plans and Regulations	Adopt and enforce updated flood hazard and river corridor protection zone bylaws	-Development Review Board -Zoning Administrator	2018-2019	Completed	High
Floods and Flash Floods	Local Plans and Regulations	Participate in the Community Rating System to help reduce flood insurance premiums for residents and businesses	-Trustees	2018-2020	Carried over	High
Floods and Flash Floods	Local Plans and Regulations	Encourage appropriate stormwater and erosion control measures in new developments	-Development Review Board	2018-2023 (ongoing)	Ongoing and carried over	High
Floods and Flash Floods	Local Plans and Regulations	Adopt the latest Vermont Town Road and Bridge Standards and revisions as necessary	-Trustees	2018-2023 (as standards are updated)	Completed	High
Floods and Flash Floods	Local Plans and Regulations	Inventory roads for stormwater mapping as part of the Vermont Stormwater program	-Highway Department -BCRC	2018-2021	Carried over	High
Floods and Flash Floods	Local Plans and Regulations	Complete village-wide stormwater management plan in accordance with the Vermont Stormwater Manual	-Planning Commission	2018-2021	Starting summer 2022 and carried over	High
Floods and Flash Floods	Local Plans and Regulations	Map stormwater system	-Vermont DEC	2018-2020	Carried over	High
Floods and Flash Floods	Local Plans and Regulations	Update culvert inventory	-Highway Department; BCRC	2018-2019	Completed	Medium

Appendix I. Mitigation Actions from the 2017 North Bennington Hazard Mitigation Plan

Hazard	Type	Action	Responsible Party	Time Frame	Status (complete, carried to 2022 plan, deleted)	Priority
Floods and Flash Floods	Natural Systems Protection	Identify possible acquisition of wetlands and special flood hazard areas to assure natural systems protection	-Conservation Commission -Planning Commission -BCRC	2019-2022	Carried over	Medium
Floods and Flash Floods	Natural Systems Protection	Complete inventory of road network to assess whether road segments connected to surface waters through ditches, culverts or other drainage structures meet the new stormwater standards currently under development by the DEC Municipal Roads Program	-Highway Department	2018-2019	Carried over	High
Floods and Flash Floods	Natural Systems Protection	Develop a long-term plan to bring all sections of connected roads to revised standards as part of the municipal general permit.	-Highway Department	2018-2020	Carried over	High
Floods and Flash Floods	Natural Systems Protection	Implement stormwater control projects and green infrastructure practices to reduce flows and sediment	-Highway Department -Bennington County Conservation District	2019-2022 and beyond	Carried over	High
Floods and Flash Floods	Structure and Infrastructure Projects	Relocate the North Bennington Fire Department building to a location outside of the special flood hazard area	-Fire Department	2018-2022	Carried over	High
Floods and Flash Floods	Structure and Infrastructure Projects	Road crew should regularly survey culverts for blockages including photographs and records of damages and costs	-Highway Department	2018-2022 (ongoing)	Ongoing and carried over	High
Floods and Flash Floods	Structure and Infrastructure Projects	Identify and replace culverts and bridges that do not meet current Vermont Town Road and Bridge Standards	-Highway Department	2018-2023 (ongoing)	Ongoing and carried over	High
Floods and Flash Floods	Structure and Infrastructure Projects	Reach out to dam owners and encourage them to get dams inspected	-Trustees	2018-2020	Carried over	Medium to High
Winter Storms	Education and Awareness	Provide educational materials on sheltering in place and preparation for winter storms, including long-term power outages	-EMD	2018-2020	Carried over	High

Appendix I. Mitigation Actions from the 2017 North Bennington Hazard Mitigation Plan

Hazard	Type	Action	Responsible Party	Time Frame	Status (complete, carried to 2022 plan, deleted)	Priority
Winter Storms	Education and Awareness	Provide materials for residents on methods to protect property from wind events	-EMD -Zoning Administrator	2018-2020	Carried over	High
Winter Storms	Local Plans and Regulations	Maintain agreements with adjacent towns for sharing of highway equipment	-Trustees -Highway Department	2018-2023 (ongoing)	Carried over	High
Winter Storms	Structure and Infrastructure Projects	Place utilities underground for critical facilities	-Trustees	2018-2023	Carried over	Medium
High Wind Events	Local Plans and Regulations	Require boats, propane tanks and other items stored outdoors to be secured	-Planning Commission -Zoning Administrator	2018-2019	Carried over	High
High Wind Events	Local Plans and Regulations	Encourage appropriate plantings to avoid future damage from downed trees	-Tree Committee	2018-2019	Carried over	Medium
High Wind Events	Structure and Infrastructure Projects	Retrofit existing buildings to withstand high winds including protection of power lines and other utilities	-Trustees -Private property owners	2018-2023 (ongoing)	Carried over	Medium
High Wind Event	Local Planning and Regulations	Conduct a tree survey for large dead trees	-Tree Committee	2018-2019	Carried over	Medium
Drought	Local Planning and Regulations	Monitor drought conditions	-EMD	2018-2022 (ongoing)	Deleted	Medium
Drought	Education and Awareness	Provide educational materials on dealing with drought	-EMD	2018-2020	Deleted	Medium
Drought	Local Plans and Regulations	Incorporate planning for droughts in the local emergency operations plan	-EMD	2018-2019	Deleted	Medium
Hazardous Materials Spill	Structure and Infrastructure Projects	Work with VT AOT to identify and mitigate high accident intersections and road segments	-VT AOT	2018-2021	Ongoing	Medium to High
Water Supply	Natural Systems Protection	Inquire into the need of purchasing more land around the public water source to protect the water source from future development	-Trustees	2018-2023	Deleted	Medium to High
Water Supply	Local Plans and Regulations	Inquire into the feasibility of a secondary public water source	-Trustees	2018-2023	Deleted	Medium

Appendix I. Mitigation Actions from the 2017 North Bennington Hazard Mitigation Plan

Hazard	Type	Action	Responsible Party	Time Frame	Status (complete, carried to 2022 plan, deleted)	Priority
Infectious Disease Outbreak	Education and Awareness	Provide educational materials in printed form and on the village web site on potential infectious diseases	-EMD	2018-2021	Carried over	High
Invasive Species	Local Plans and Regulations	Monitor extent of invasive species, particularly forest invasive species such as Emerald Ash Borer	-Tree committee	2018-2022 (ongoing)	Ongoing	Medium
Invasive Species	Local Plans and Regulations	Complete surveys for ash trees vulnerable to Emerald Ash Borer	-BCRC -Bennington County Conservation District	2018-2020	Ongoing	Medium
Invasive Species	Local Plans and Regulations	Survey for invasive species (e.g., Japanese knotweed) along streams to identify potential erosion areas	-Conservation Commission	2018-2020	Ongoing	Medium
Invasive Species	Local Plans and Regulations	Encourage use of native species in plantings for commercial and residential development	-Development Review Board	2018-2023 (ongoing)	Carried over	Medium
Invasive Species	Education and Awareness	Provide outreach materials for landowners on using native plants and controlling invasive species	-Bennington County Conservation District	2018-2019	Carried over	High