

Waterbury, Vermont 2024 Local Hazard Mitigation Plan



Route 100 and US 2 at railroad trestle - December 2023

FEMA Approval Pending Adoption Date:

Municipal Adoption Date:

FEMA Formal Approval

Date:

1 INTRODUCTION

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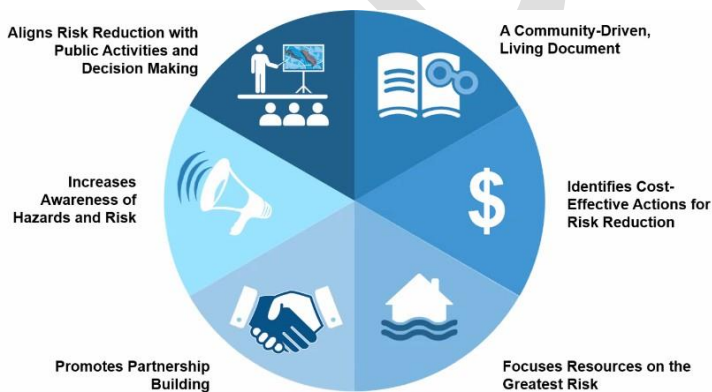
Mitigation planning provides an opportunity for local government to lessen the impact of the next natural disaster. The goal of this Plan is to advance and prioritize mitigation investment to reduce risks posed by natural hazards and to increase the Town of Waterbury’s resilience to damages from natural hazard impacts.

Hazard Mitigation is any sustained policy or action that reduces or eliminates long-term risk to people and property from the effects of natural hazards. FEMA and state agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This Plan recognizes that opportunities exist for communities to identify mitigation strategies and measures during all the other phases of Emergency Management - Preparedness, Response and Recovery. While the hazards can never be completely eliminated, it is possible to identify what the hazards are, where their impacts are most severe, and identify local actions and policies that can be implemented to reduce or eliminate the severity of the impacts.

2 PURPOSE

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

The benefits of mitigation planning include:



Source: FEMA LHMP Skill Share Workshop 2021

Furthermore, the Town seeks to be in accordance with

the strategies, goals, and objectives of the 2023 State Hazard Mitigation Plan.

3 COMMUNITY PROFILE

Land Use and Development Patterns

According to the 2018 Waterbury Town Plan, the town charter was granted in 1763. First surveyed in 1782 with first permanent colonial settler following a year later. Many water powered mills fed by the tributaries of the Winooski River fueled the early development of the town.

The town grew into a regional transportation and hub providing access along the Winooski River through the Green Mountains for both Rail and Interstate commerce and connectivity. This allowed the town to grow as a major connection and commerce point.



Waterbury, Vermont is a vibrant community encompassing Waterbury village, Colbyville, and Waterbury Center - located in the northwest corner of Washington County, in the heart of Vermont’s Green Mountains. The Winooski River Valley, several mountain ranges, and the gently rolling hills surrounding Waterbury offer a spectacular year-round setting. Waterbury sits just a 20-minute drive from Montpelier, 30 minutes from Burlington, and midway between the popular resort areas of Stowe and the Mad River Valley.

With a lively downtown, numerous tourist attractions, an emphasis on healthy living and family life, and a business-friendly economic climate, our community has become a regional hub. Waterbury is home to Darn Tough, Ben & Jerry’s and the Vermont State Office Complex.

With its small-town values, employment opportunities, and disaster recovery experience, Waterbury faced the challenge of rebuilding after the

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destruction wrought by Irene and continues to maintain its thoughtful approach to future development.

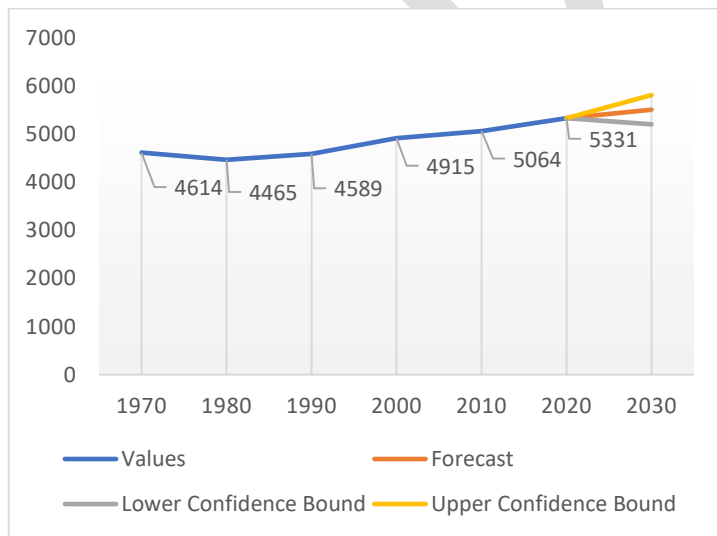
Land Features

Waterbury’s landscape is defined by the Green mountains, Thatcher Brook, Little River and the Winooski River. The Town is nestled between the Green Mountain Range and the Middlesex Range. The southern border of the town is the Winooski River. The lowest elevation of the Winooski River being ~340ft, the highest point being at 3,327 feet, on the side of Ricker Mountain with the summit being in neighboring Bolton.

Several extensive land areas are owned by the State including Mt. Mansfield State Forest, and C.C. Putnam State Forest.

Demographics and Growth Potential

The 2020 Decennial Census prepared by the U.S. Census Bureau shows an estimated population of 5,331 and 2,559 housing units. Over the last 40 years Waterbury has undergone slow and steady population growth.



Source: Census data with excel projection of expected growth

Between 2010 and 2020, the median age of Waterbury residents changed minimally by +0.9 to 42.8; almost matching the Vermont median age of 42.9. The portion of the population over 65 is 19.0%, compared to 20.6% in Vermont and 16% in the country. The population density of the Town is 111

people per square mile compared to an overall state density of 68.

Precipitation and Water Features

Average annual precipitation is 42 inches per year; with July being the wettest month. Average annual snowfall is 92.8 inches; with January being the snowiest month.

The Winooski River and its many tributaries (Graves Brook, Thatcher Brook, and the Little River) are a major water features in Waterbury.

The most significant water body in Waterbury is the Waterbury Reservoir. Waterbury Reservoir was created in 1935 with a total area of 850 acres and a maximum depth of 100ft. The reservoir was created by the construction of an 1,845 ft dam that stands 187 ft tall.

Drinking Water and Sanitary Sewer

Public drinking water is supplied by the Edward Farrar Utility District. The district serves a population of 1200 accounts throughout the town. The district has 12 wells that serve the overall system. They maintain ~9 miles of pipeline and have 150 hydrants. This system is a gravity fed system with most of the wells being on Sweet Road or Waterworks Road along the Waterbury/Stowe town line.

The Wastewater system

The Edward Farrar Utility District supplies wastewater services for 800 connections. This system has ~45,000 linear feet of gravity sewer lines with an additional ~4,000 feet of 12” forced main line. There are 4 pump stations, 34 North Main Street, 200 Lincoln Street, 546 River Road Ice Center, and 43 Grandview Heights. This system has 293 manholes and

Transportation

Waterbury is ±50 square miles in size with primary access via US Interstate 89, a north-south major arterial route, US Route 2, VT Route 100, served by the New England Central Railroad and the Amtrak Vermonter.

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The 2023 VTrans Town Highway data indicates that Waterbury has 55.63 municipal road miles: 1.49 Class 1; 7.94 miles of Class 2; 39.61 miles of Class 3; 6.59 miles of Class 4 (or functionally Class 4). Of the total municipal road miles, ~57% are paved and ~43% are gravel. In addition, there are 10.28 miles of State highway in Waterbury, and 7.998 of US interstate a for a total of ±67.3 traveled highways, including Class 4 roads.

According to the Town’s 2017 road erosion inventory, 46% of Waterbury’s Road mileage is hydrologically connected - meaning it is within 100-feet of a water resource (i.e., stream, wetland, lake, or pond). Proximity to water resources can make these sections of road more vulnerable to flooding and fluvial erosion. These sections must be up to the standards created for the Municipal Roads General Permit program with a requirement of 7.5% of non-compliant segments being upgraded per year.

According to the Town’s 2023 bridge inventory, Waterbury has a total of 7 municipal bridges - 1 short structures (6’-20’ length) and 6 long structures (>20’ length). The town’s 6 long structures are inspected every two years by VTrans through the Town Highway Bridge Program.

Waterbury has a total of 311 culverts in the municipal road right-of-way; all were inventoried in 2018 by the Central Vermont Regional Planning Commission. Several culverts were listed in critical or poor condition and ideally been considered for replacement and/or upgrade in accordance with Town Road and Bridge Standards. The local road network is maintained by the municipal highway department, whose garage is located on Guptil Road.

Electric Utility Distribution System

Electric service to approximately 2,300 Structures with electricity provided by Green Mountain Power. Average annual outage statistics between 2017 and 2019 are summarized in Table 1.

Table 1: Power Outage Summary

Average Annual (2017-2019)	
Avg # outages per year less than 24 hours	60
Number of outage greater than 24 hrs.	19

The above data was from Department of Public Service created for review of energy burdened communities.

There were 19 power outages that lasted longer than 24 hours between 2017 and 2019 and 180 between 1 and 24 hours. This negatively effects the town in life safety and economics. When combined with a storm event or extreme heat or cold, long power outages can be dangerous.

Public Safety

Fire protection is provided by the Waterbury Fire Department, an all-volunteer organization. The Fire Department is a member of the Capital Fire Mutual Aid Association. Law enforcement is provided by the Vermont State Police resident trooper program with 2 troopers being involved. The nearest hospital is the Central Vermont Medical Center. Ambulance services are provided by Waterbury ambulance service.

Emergency Management

Per the Town’s Local Emergency Management Plan, the Town Manager serves as Emergency Management Coordinator and Fire Chief serves as Local Emergency Management Director. They work with others in town to keep the LEMP up to date and coordinate with nearby towns and regional emergency planning efforts.

4 PLANNING PROCESS

Plan Developers

The Town assembled a Hazard Mitigation Planning Team to participate in updating the Plan. Team members included: Selectboard member (local EMD), Emergency Management Coordinator, representative of the Planning Commission, and Friends of the Mad River staff.

The Central Vermont Regional Planning Commission (CVRPC) assisted the Town with this Plan update. FEMA Building Resilient Infrastructure and Communities (BRIC) funds supported this process.

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Plan Development Process

The 2024 Local Hazard Mitigation Plan is an update to the 2018 single jurisdiction mitigation plan. A summary of the process taken to develop the 2023 update is provided in **Table 2**.

Table 2: Plan Development Process

Nov 9, 2023: Kick-off meeting. Discussed what an LHMP is; benefits of hazard mitigation planning; current plan status; planning process; outreach strategy; and plan sections. Planning Team working meetings were not open to the public.

Jan/Feb 2024: To notify the Whole Community* of the plan update, the Town posted physical and online notices. Physical notices were posted at the Town Office, Waterbury Post Office, and Waterbury Center Post Office. Online notices were posted on the Town website (<https://www.waterburyvt.com/>), Town Facebook page, and Front Porch Forum.

*Whole Community stakeholders include: 1) local and regional agencies involved in hazard mitigation; 2) entities with authority to regulate development; 3) neighboring towns; 4) representatives of business, schools/academia, and other private organizations that sustain community lifelines; and 5) representatives of nonprofit organizations that work directly with or provide support to vulnerable populations.

CVRPC posted online notices on the CVRPC website (centralvtplanning.org). CVRPC also direct emailed notice to 1) officials (Selectboard and Planning Commission chairs, Town Managers and Clerks, Emergency Management Directors) in neighboring towns of Duxbury, Bolton, Stowe, Middlesex, Moretown, and 2) Key Partners (Friend of the Winooski, Winooski Natural Resources Conservation District, Harwood Unified School District, Winooski Basin CWSP, VDH Regional Emergency Preparedness Specialist, VTrans District 6 Projects Manager, Central VT Floodplain Manager). Notice included CVRPC contact for information on planning process and opportunities for public input – see **Appendix C**.

April 11, 2024: Planning Team working meeting – confirmed plan purpose (Section 2) and completed community profile (Section 3). Completed hazard risk assessment (Section 5).

May 2024: To solicit input from the Whole Community, the Town utilized a survey (see **Appendix D**) and hosted an in-person Community Workshop on May 2. The Town provided notice of the survey and workshop by posting physical notices at the Waterbury Municipal Office, Waterbury Post Office, and Waterbury Center Post Office, and online notices on the Town website, Town Facebook page, and Front Porch Forum.

In addition to these physical and online methods, the Town also published notices for the May Workshop in the online newspaper of local circulation – Waterbury roundabout.

CVRPC posted online notices on the CVRPC website of the opportunities to provide input on where each hazard might impact the Town; assets most likely to be affected; and preferred types of mitigation actions (Sections 5 and 6). CVRPC also direct emailed notice of the survey and to local officials in neighboring towns and Key Partners – see **Appendix C**.

June 3, 2024: Selectboard meeting – reviewed mitigation actions in a public meeting to determine actions for town implementation.

5 HAZARD IDENTIFICATION AND RISK ASSESSMENT

Local Vulnerabilities and Risk Assessment

One of the most significant changes from the 2017 Plan is the way hazards are assessed. To be consistent with

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the approach to hazard assessment in the 2018 State Hazard Mitigation Plan, the Hazard Mitigation Planning Team conducted an initial analysis of known natural hazard events* to determine their probability of occurring in the future (high probability events are **orange** in Table 4).

The Team then ranked the impacts associated with the natural hazard events based on 1) probability of occurrence and 2) potential impact to people, infrastructure, the environment, and local economy.

This assessment considered the effects of future conditions, like climate change, on the type, location, and range of intensities of identified hazards.

Table 4: Community Hazard Risk Assessment

*This plan defines a natural hazard as a source of harm or difficulty created by a meteorological, environmental, or geological event.
 FEMA Local Mitigation Planning Handbook, May 2023

The ranking results are presented in Table 4 and reflect the following **highest risk hazard impacts** that the Town believes they are most vulnerable to:



Floods associated with thunder and/or winter storms and ice jams.



Extreme cold, snow, and ice associated with severe winter storms.

Each of the **highest risk hazard impacts** are profiled in this section. Lower risk hazard impacts do not justify mitigation due to a low probability of occurrence and/or low impact and are not profiled in this Plan. See the State Hazard Mitigation Plan for information on the lower risk hazards.

2024 Hazard Mitigation Plan - Hazard Assessment							
Hazard Impacts	Probabilit	Potential Impact					Score*:
		Infrastructur	Life	Economy	Environmen	Average:	
Fluvial Erosion	4	4	3.5	3.5	3	3.5	14
Inundation Flooding	4	4	3.5	3.5	2.5	3.375	13.55
Ice	2.5	2	1.5	2	1.5	1.75	4.375
Snow	3.5	2.5	2	2.5	2	2.25	7.88
Wind	4	3	2	2.5	2.5	2.5	10
Heat	3.5	1.5	3	2	2	2.125	7.43
Cold	3.5	1.5	3	2	2	2.125	7.43
Drought	2	1.5	1.5	2	2.5	1.875	3.75
Landslides	2	2	2	1	1.5	1.625	3.25
Wildfire	1.5	1	2	1.5	2	1.625	2.44
Dam Failure	2.5	2.5	4	4	3	3.375	8.44
Invasive Species	1.5	1	1	1	1	1.0	1.5
Infectious Disease Outbreak	3	2.5	3.5	3	2.5	2.875	8.625
Ice Jam Flooding	3	2	2	3	3	2.5	7.5

*Score = Probability x Average Potential Impact

Other hazards removed from list

- Earthquakes-minimal risk in region
- Hail- most damages in region come from associated strong wind (severe storm)

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*Score = Probability x Average Potential Impact

	Frequency of Occurrence: Probability of a plausibly significant event	Potential Impact: Severity and extent of damage and disruption to population, property, environment, and the economy
1	Unlikely: <1% probability of occurrence per year	Negligible: isolated occurrences of minor property and environmental damage, potential for minor injuries, no to minimal economic disruption
2	Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years	Minor: isolated occurrences of moderate to severe property and environmental damage, potential for injuries, minor economic disruption
3	Likely: >10% but <75% probability per year, at least 1 chance in next 10 years	Moderate: severe property and environmental damage on a community scale, injuries or fatalities, short-term economic impact
4	Highly Likely: >75% probability in a year	Major: severe property and environmental damage on a community or regional scale, - multiple injuries or fatalities, significant economic impact

IMPACT DEFINITIONS

INFRASTRUCTURE IMPACTS: (Effects on Roads, Bridges, Structures, Homes)

- 1 – Minor: Localized/Isolated impacts to Infrastructure (Temporary loss of use)
- 2 – Moderate: Neighborhood level impacts (1-2-day loss of use)
- 3 – Severe: Community-wide impacts (2-5-day Loss of use)
- 4 – Disastrous: Regional losses of roads, bridges, homes (Extensive replacement/rebuild)

LIFE SAFETY ISSUES: (Health and Welfare of Population)

- 1 – Minor scrapes/injuries
- 2 – Occasional Hospitalization required due to injuries
- 3 – Multiple hospitalizations required and/or fatality
- 4 – Community-wide hospitalizations and/or fatalities

ECONOMIC IMPACTS: (Direct recovery costs to municipality and residents)

- 1 – < \$10,000 in damages (Can generally be handled within budget or via insurance)
- 2 – \$10,000-\$100,000 (May require assistance for the uninsured or large impact on local budget)
- 3 – \$100,000-\$1,000,000 (Requests of assistance/FEMA eligible)
- 4 – > \$1,000,000- (All resources used, Possible National Guard use)

ENVIRONMENTAL IMPACTS: (Effects to municipal operations and environment)

- 1 – Negligible: Short term impacts, low clean-up costs for spills
- 2 – Minor: Moderate clean-up costs, temporary redirection of municipal resources
- 3 – Moderate: Extended redirection of local resources/ impacts to normal operations, high clean-up costs
- 4 – Major: Long-term recovery efforts (could take years for full recovery or permanent loss of use)

Highest Risk Hazard Profiles



Floods can damage or destroy property; disable utilities; destroy or make impassable roads and bridges; destroy crops and agricultural lands; cause disruption to emergency services; and result in fatalities.

People may be stranded in their homes for a time without power, heat, or communication or they may be unable to reach their homes. Long-term collateral dangers include the outbreak of disease, loss of livestock, broken sewer lines or wash out of septic and wastewater systems causing water supply pollution, downed power lines, loss of fuel storage tanks, fires, and release of hazardous materials.

As noted in the 2023 State Hazard Mitigation Plan and 2021 Vermont Climate Assessment, the most common recurring hazard event impacting Vermont communities is flooding. There are two types of flooding: inundation and flash flooding. Inundation is when water rises onto low lying land. Flash flooding is a sudden, violent flood which often entails stream bank erosion (fluvial erosion).

Inundation flooding of land adjoining the normal course of a stream or river is a natural occurrence. If these floodplain areas are in their natural state, floods likely would not cause significant damage. However, most business districts within Vermont are built within this floodplain due to the historical significance of water power.

While inundation-related flood loss can be a significant component of flood disasters, the more common mode of damage in Vermont is fluvial erosion, often associated with physical adjustment of stream channel dimensions and location during flood events. These dynamic and often catastrophic adjustments are due to bed and bank erosion of naturally occurring unstable stream banks, debris and ice jams, or structural failure of or flow diversion by human-made structures.



December of 2023 North Main Street. -Photo by Lisa Scagliotti from Waterbury Roundabout

Damage from high flows is the single most costly type of disaster in Vermont, primarily due to the erosive power of water. Many roads and culverts conflict with the room needed by streams and rivers.”
2021 Vermont Climate Assessment

Several major flooding events have affected the state in recent years, resulting in multiple Presidential Disaster Declarations. From 2003 to 2019, Washington County experienced roughly \$88.82 million in municipal property damage due to flood events. The totals from the most recent July 2023 flood event are still being totaled at the time of this writing.

The worst flooding event in recent years to strike the town of Waterbury came in August of 2011 from Tropical Storm Irene (DR4022), which dropped up to 5-7+ inches of rain in some areas of Washington County. Irene caused 2 deaths and \$60 million in reported property damages and \$2.5 million in crop damage in Washington County alone.

The December 2023 rain on snow flooding caused localized flooding in the town but the mitigations actions that were implemented post Irene helped to prevent any large damages, limiting the effects to minor flooding of low-lying areas and road closures due to inundation. For a short period of the event the town was almost cut off and had to adjust medical transport to the local hospital to avoid inundation

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areas. The effects of these storms are profiled in this flooding section.

The town is concerned with the increased temperatures in winter seasons brought on by climate change. The increase in temperature fluctuations and associated precipitation is worrisome of rain on snow events impacting the region and specifically the town of Waterbury due to its location and associated mountains. The snowpack can become hazardous due to the rapid melting from rain on snow and sudden warming, fueling extreme and rapid runoff.

Waterbury is vulnerable to inundation flooding primarily along the Winooski River. A wide range of assets are at risk from inundation flooding in these areas. There are 175 buildings in the FEMA floodway; as well as roads, culverts, bridges well as roads, culverts, and bridges.

With inundation flooding, there are cascading impacts involving infectious disease as floodwater can contain numerous types of infectious agents and host insects that transmit disease. Mosquitos, for example, breed in standing water and when their population increases, so does the risk of diseases they transmit - such as West Nile Virus.

Flash flooding can occur any time the area has heavy rain. It can impact areas that are located outside of designated floodplains, including along streams confined by narrow valleys (also known as River Corridors). Again, a wide range of assets are at risk from flash flooding. **There are ? buildings in the State-mapped River Corridors** (outside of designated floodplains); as well as roads, culverts, bridges, and dams.

The most common type of flash flood damage is road washouts. When runoff volumes exceed the capacity of the stormwater collection system (ditching and culverts), washouts can occur.



Armory Drive bridge near Union Street-photo by Gordon Miller

The town's structures and road erosion inventories as well as VTrans highway flood vulnerability and risk tools were used to help identify locations and assets at risk from flash flooding.

Sections of several roads have a history of flash flooding - Route 100 and US 2 at the traffic circle. Main Street, Winooski Street, and the Union Street. The locations all show as at risk of inundation or fluvial erosion in the Vermont Transportation Resiliency Planning Tool.

Culvert failures and road washouts can have a significant negative impact on the Town. Especially if they occur on roads considered locally important routes for through-traffic, short-cuts, detours, and/or access to critical facilities - such as VT Route 100, US Route 2, and Guptil Road.

When roads are impacted by flooding, the Town coordinates with the fire department, town road crew and State dispatch to close roads and set up detours. Road closures can create longer commute times and longer emergency service response times.

In addition to stormwater runoff from roads, ice jams and dam failures can result in flash flooding in Waterbury. Though historically there isn't much of a risk or documentation of Ice Jam flooding within the community.

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There are eight dams in Waterbury listed in the Vermont Dam Inventory (a database managed by the VT Dam Safety Program containing spatial, structural, historic, and regulatory information on dams in the state).

There is one high hazard potential dam in Waterbury. It is the Waterbury Dam, a flood control dam on the Little River a tributary of the Winooski River. This dam was built in 1938 and is 2130 ft long and 187 ft high and has a normal storage of 37000-acre feet and a maximum storage of 88000-acre feet. The drainage for the lake is 69760 square miles. The last reported inspection of the dam on the ANR dams inventory site was 10/10/2023 and lists the dam as in fair condition. There is currently a dam safety modification study underway and some interim risk reduction measures are to be completed in the Spring of 2024. With a time, frame laid out for design/permitting and construction pending available funding.

The other 7 dams are listed as either low or minimal hazards. With two of these have a low hazard rating. The Bolton Falls hydroelectric dam which is currently in production and a Federal Energy Regulatory Commission inspected structure and the Brisco on Bryant Brook with a 2-acre reservoir. The Colbyville Upper and Lower dams, and Ice pond dam which are all rated as minimal risk. There is one breached dam the Feed company dam and finally the Waterbury 7 dam which is listed in the Vermont dam inventory but has no information about the actual structure but has a small reservoir that can be seen on the map along Ruby Raymond Road.

Community survey respondents ranked [REDACTED] [REDACTED] protect against future severe weather impacts.

Flash flooding often entails stream bank or fluvial erosion. Several existing studies were used to help identify locations and assets at risk from fluvial erosion, specifically, a Structure Stream Geomorphic Assessments.

Stream Geomorphic Assessments (SGAs) provide information about the physical condition of streams and factors that influence their stability. The Upper Winooski-above Bolton Dam SGA identifies priority locations for river corridor protection, planting stream buffers, stabilizing stream banks, removing berms, and removing/replacing human-placed structures (i.e., dams, bridges, culverts). This was used to analyze locations where structures may be undersized.

Stormwater Master Planning (SWMP) involves identifying stormwater, sediment, nutrient, and septic inputs to waterways and designing projects to mitigate those inputs; either eliminating them at the source through green stormwater infrastructure, septic system improvements, back road projects or improving floodplain access within the stream network to increase sediment attenuation. Waterbury is one of the few communities in the region that hasn't completed a Stormwater Master Plan but the town has applied for a Building Resilient Infrastructure and Communities grant from FEMA for developing one with the primary focus being flood mitigation.

As demonstrated in the above referenced studies, environmental impacts from flooding can be significant, especially to the water quality in the Mad River and the Winooski River. This can in turn have an adverse impact on local tourism and recreation. Flood events with associated road closures can also have a short-term impact on the local economy due to fewer shopping trips and commuter delays.

The town recorded ~128,000 in public damages in 2023 due to flooding per the town budget.

Floods Hazard History

These are the most up to date significant events impacting Waterbury. Federal declarations are depicted in **bold**.

12/18-19/23: 2" of rain on snow event

7/11/2023: DR4720 5-9" rain: \$Still to be determined

7/20/2021: Heavy rain: \$50,000 county damages

7/14/2020: 3-4" rain: \$5,000 town damages

11/1/2019: 2-4" rain: \$250,000 county damages

6/20/2019: Heavy rain: \$25,000 county damages

5/20/2019: Heavy rain: \$25,000 county damages

4/15/2019: DR4445 1" rain with significant snow melt:

7/1/2017: DR4330 3-4" rain the previous 3-4 days with flash flooding on 7/1/17: \$240,000 county damages

Floods Hazard History-cont.

These are the most up to date significant events impacting Waterbury. Federal declarations are depicted in **bold**.

7/19/2015: Heavy rain: \$1,000,000 county damages

4/15-18/2014: DR 4178 heavy rain on snow event

\$250,000 county damages

6/25-7/10/2013: DR4140 1-3" of heavy rain over a half

hour: \$625,000 county damages

8/28/2011: DR4022 Tropical Storm Irene with 3-7+” rain:

\$172,500 local damage (\$?????Individual / \$75,000,000

Public county damages

5/26-27/2011: DR4001 3-5+” rain on snow

event: \$5,500,000 county damages

5/20/2011: DR4043: Heavy rain: \$400,000

county damages

4/23-5/9/2011: DR4043 rain on snow event:

\$1,000,000 county damages

exacerbated by fluvial erosion as most of the landslides occur on or near a stream bank, or during extreme wet conditions in areas of clay substrate.

Landslides have three major causes: geology, morphology, and human activity. Geology refers to characteristics of the material itself. The earth or rock might be weak or fractured, or different layers may have different strengths and stiffness.

Morphology refers to the structure of the land. For example, slopes that lose their vegetation to fire or drought are more vulnerable to landslides. Vegetation holds soil in place, and without the root systems of trees, bushes, and other plants, the land is more likely to slide away.

Human activity, such as agriculture and construction, can increase the risk of a landslide. Irrigation, deforestation, excavation, and water leakage are some of the common activities that can help destabilize, or weaken, a slope.

The Town of Waterbury has 69 landslide locations within the town as listed on the Vermont Agency of Natural Resources Landslide map that was last updated in 2020. Most of the slide locations are found within the Little River State Park and Mount Mansfield State Forest.

Total damages for landslides are not tracked well within Vermont since often landslides are associated with Fluvial Erosion and are often lumped together there. With the increase in precipitation trends due to climate change the risk from landslides is increasing. This can be addressed through land use regulations and mitigation of surface runoff from human actions and development.

As weather patterns shift and we see larger storms and more frequent freeze-thaw cycles, the town will monitor for signs that rivers that have historically been stable becoming less stable, with increased erosion, widening, trees falling in from its banks, etc.



Landslides: A landslide is the sliding of a large mass of rock, earth, or debris, down a sloped section of land. Landslides can be caused by rainstorms, fires, alternate freezing or thawing and/or by the steepening of slopes by erosion or human modification. In Waterbury, landslides tend to occur or are



Severe Storms with Snow, Wind and Ice events typically occur between the months of December and March in the Central Vermont Region. They can include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Events can also be associated with strong wind or floods, increasing the potential hazard.

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The costs of these storms come in the form of power outages due to heavy snow or ice, damaged trees, school closings, and traffic accidents. From 2014 to 2022, Washington County experienced \$585,000 in property and crop damage from winter storms.

There have been two winter storm-related federally declared disasters in the county (the ice storm of January 2020 – DR 4474; and December 2014 DR 4207, respectively (see table at right).

Extreme cold can have impacts on public health and safety, especially if extreme temperatures coincide with power outages, which can cut off heat and communication services. Severe winter storm impacts can put vulnerable populations (e.g., older adults, children, sick individuals, pets) at even greater risk.

See the strong wind profile below for more information about the town’s vulnerability to power outages.

Snow accumulation typically does not result in loss of road accessibility. The town’s fleet of snowplows ensures all roads are accessible, even in major accumulation events. Roads adjacent to critical facilities are well maintained and along with connector routes, are prioritized in winter storm events.

Environmental impacts are predominantly tree damage. Extreme snow and ice events typically have a short-term impact on the local economy – fewer shopping trips and commuter delays.

Extreme Cold, Snow, and Ice Hazard History

These are the most up to date significant events impacting Waterbury. Federal declarations are depicted in **bold**.

- 1/11-14/2022: 10-40 below zero with winds: no reported damages
- 12/18/2021: 5-7” snow \$10,000 county damages
- 1/16/2021: 3-6” wet snow: \$50,000 county damages
- 3/23/2020: 7-10” snow: \$5,000 county damages
- 2/7/2020: 10-16”; ¼” ice: \$20,000 county damages
- 1/16/2020: DR 4474** 6-10” snow: \$10,000 county damages
- 3/22/2019: 9” snow: \$25,000 county damages
- 2/12/2019: 7-15” snow: \$10,000 county damages
- 1/29/2019: 6-10” snow: \$10,000 county damages
- 1/19/2019: 10-18” snow: \$25,000 county damages
- 1/8/2019: 8-20+” snow: \$25,000 county damages
- 11/26/2018: 6-14” heavy snow: \$125,000 county damages
- 3/13/2018: 12-30” snow: \$20,000 county damages
- 3/7/2018: 7-13” snow: \$10,000 county damages
- 1/7/2015: 0-10 degrees with wind of 15-30 mph creating wind chills colder than 20-30 below zero: no reported local damage
- 12/9/2014: DR4207** 10-20” snow: \$250,000 county damages



Strong wind can occur alone, such as during straight-line wind events, or it can accompany other natural hazards, including severe thunder and/or winter storms.

FEMA’s National Risk Index defines strong wind as damaging winds that exceed 58 mph. Strong wind poses a threat to lives, property, and vital utilities primarily because of flying debris or downed trees and power lines.

From 1996 to 2022, wind events caused more than \$1.270 million in property damage in Washington County, with \$450,000 due to one event in December 2022.

Strong wind is possible here; Waterbury is susceptible to high directional winds town wide. Many storms with high winds result in downed trees as well as damaged phone and power lines, buildings, and other property.

Downed trees within the road right-of-way are the root cause of many power outages. Roads that pass

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through dense wooded areas are prone to downed trees, which often can lead to fallen power lines.

Power outages are the main reason for disrupting communications, which are crucial in times of crisis. For example, the loss of phone service is of particular concern for Waterbury’s vulnerable populations and residents. Landline phones that have been converted from copper wire to fiber rely on an in-home battery back-up. The battery life is typically less than eight hours, whether the phone is used or not. Though many residents use cell phones, longer power outages and damage from high winds further complicating the problem of contacting emergency services during power outages.

Telecommunications are also needed for warning systems before a disaster, as well as for response during and after recovery. During a disaster, municipal response is managed by the local Emergency Operations Center (EOC), this would include all communications – from phone calls to internet browsing and 2-way radio.

To mitigate the impacts of power outages, the following public buildings/critical facilities have been equipped with backup power or generator hookup: Water supply pump house, fire station, Waterbury ambulance, and Brookside Primary school (as emergency shelter).

The town has installed backup power for all its critical infrastructure. Wastewater and water treatment, town garage, both town fire stations, and the town office all have generator backups to facilitate continuity of operations during power outages.

In addition to power outages, downed trees during strong wind (and heavy snow/ice) events can damage buildings and other property and in rare cases result in fatality.



Environmental impacts are predominantly tree and roof damages. Strong wind events with associated power outages can have a short-term impact on the local economy due to business closures.

Vermont’s Emerald Ash Borer infestation was first detected in 2018 in northern Orange County. The potential risk to public and private structures and impacts on the local economy have not been quantified. But the impact of invasive pests has a real economic effect on landowners and utilities in dealing with dead trees and their potential to cause damages.

As weather patterns shift and we see larger storms and more frequent freeze-thaw cycles, the Town will monitor for signs that rivers and streams that have historically been stable are becoming less stable, with increased erosion, widening and trees falling in from its banks, etc.

Strong Wind Hazard History

These are the most up to date significant events impacting Waterbury. Federal declarations are depicted in **bold**. Damages are to Washington County.

- 12/23/2022:** 50-60+ wind gusts: \$450,000
- 10/30/2017: 40 mph wind: \$250,000
- 2/26/2010: 55 mph wind: \$15,000
- 2/17/2006: 37 mph wind: \$10,000
- 9/29/2005: 35 mph wind: \$50,000
- 11/13/2003: 35 mph wind: \$10,000
- 10/15/2003: 50 mph wind: \$10,000
- 3/10/2002: strong wind: \$5,000
- 12/12/2000: strong wind: \$5,000
- 3/28/2000: strong wind: \$5,000
- 9/17/1999: strong wind: \$75,000
- 11/23/1998: strong wind: \$10,000
- 2/22/1997: 50 mph wind: \$15,000



Infectious Disease and Invasive Species

This Plan must assess the risk of all hazards identified in the 2018 Vermont State Hazard Mitigation Plan, including infectious disease and invasive species. Due to the different nature of these hazards, the Planning Team assessed them separately from the natural hazards in **Table 4**.

Infectious diseases and invasive species are diverse categories of hazards. So, while their probability of occurrence in Waterbury may be likely, potential impacts will be highly dependent on the specific infectious agent or invasive.

The Planning Team acknowledges that impacts to Waterbury's people, environment, and local economy from infectious disease and/or invasive species could be significant. However, given the diverse nature of these hazards, they cannot be fully explored in this plan. This plan doesn't include information about the potential hazards and risks associated with a specific infectious agent due to the varying nature of the response. Infections travel by multiple different pathways and an entire planning document could be created for dealing with these, be they bacterial, fungal, viral, protozoan or helminth. Invasive species are primarily addressed in the same way except for mention of (Emerald Ash Borer) due to cascading impacts associated with flooding and storm-related tree damage.

Readers should look to the Vermont Department of Health for more information on significant infectious disease outbreaks, such as epidemics and pandemics and the Vermont Agency of Natural Resources for more information on invasive species, including terrestrial invasives, forest pests, and aquatic invasives.



Droughts in the Northeast. We frequently experience what are referred to as "flash" droughts, defined as rapid onset of intense dry periods that can follow periods of normal or above normal precipitation. These may last from 2-6 months, and can have profound impacts within the region, on agricultural losses, shortages of water supply and very low stream flows. This

pendulum often swings from a dry year to a wet year.

The Town's risk of droughts is mainly addressed through the Ordinances for the Town water supply. Most residents of the Town are on private wells and bear the costs and risks of mitigation themselves. The Town's Water Ordinance has the appropriate language for conserving water and limiting non-essential usage during a drought emergency.



Wildfires are not often much of a concern within our region, although the spring and fall can be times when dry hazardous conditions exist. Opportunity for wildfires occurs due to the lack of foliage in these seasons, before spring green up or in the fall after foliage has died back when combined with dry conditions. Historically, Vermont has seen the most wildland fires between March and June. These are generally times when dry conditions exist for an extended period causing drought conditions.

Ignition of wildfires is predominantly caused by human activity and mainly from debris fires that are not contained or not supervised. Thus, messaging when conditions exist is very important to convince individuals not to make mistakes in relation to ignition sources. This messaging is handled by the town fire warden in association with the fire department.

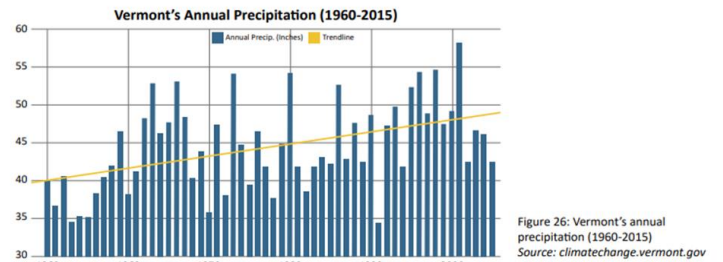


Extreme heat and cold warnings are becoming increasingly more prevalent due to our shifting climate. Vermont has been seeing a increase in 90+ degree temperature days. This trend is expected to continue. Most of our housing stock and individuals are well adapted to dealing with cold temperature, but the quick swings to higher temperatures do not allow for acclimation, and many of our structures are designed to retain, rather than shed, heat. Due to the climate of our region the high temperatures and high humidity often create situations that negatively affect older individuals and those with preexisting conditions.

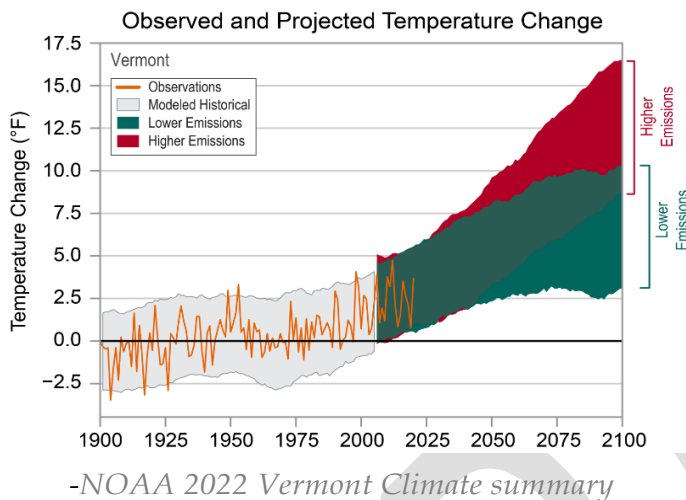
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Due to the instability of the jet stream from climate changes, extreme cold can still be an issue. If it is a long-lasting cold without snow cover, frost can migrate deep into the ground freezing pipes and heaving roadways. Most of this would be dealt with by the town either through their utility contracts or by the town road crew in keeping the transportation infrastructure in usable condition. Loss of power during one of these cold snaps may require use of the town shelter and is planned for in the town Local Emergency Management Plan.

increase since 1950 and an increase in extreme weather events. It is imperative that we have solid plans of mitigating future disasters proactively to minimize risk.



-precipitation data showing increased precipitation trends from VT state climate action plan

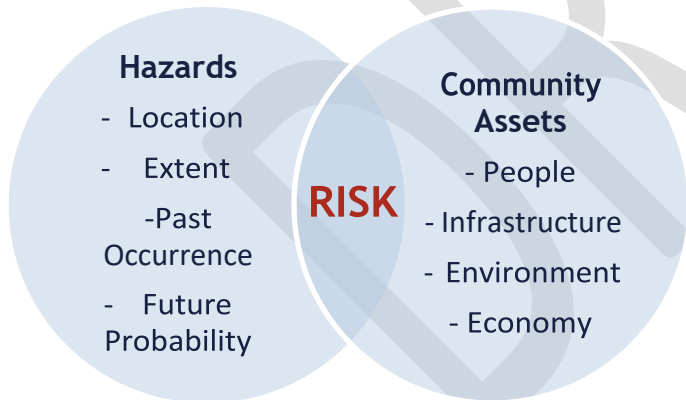


Hazardous Materials The Village of Waterbury has a high concentration of population, an elementary school, public facilities, commerce, industry, a railroad, an

interstate with an interchange, and major highways. The Village is situated in a precarious position in the middle of several major intersecting transportation routes that have frequent and large volumes of heavy traffic. Whether a train derailment or a severe weather event (flood, snow, ice, wind) triggers a traffic incident with a train or truck carrying hazardous materials traveling within the Village boundaries, or an incident occurs due to another factor, a response effort including evacuation could pose a significant problem in the densely populated downtown area.

The Vermont Freight Plan was updated in 2021. The excerpt below from that plan indicates that most volumes of rail traffic originating in Canada and flow through the state to points south along the New England Central Railroad that goes through the Village of Waterbury. According to this report, it should be expected that rail traffic will increase to meet state climate goals due to the efficiencies of rail over trucking.

A 2017 Vermont State Commodity Flow Study by the Two Rivers-Ottawaquechee Regional Commission was just released in October 2017 that inventories and describes hazardous materials traveling within Vermont's State Emergency Planning Committee (SEPC) district.



The Hazard Identification and Risk Assessment is the foundation for the Mitigation Strategy to reduce future risk.

With the increasing risks of events from our changing climate, all weather-related natural events are expected to have an increase in both frequency and in intensity. Vermont is predicted to experience increases in heat waves, downpours and flooding.

The Northeastern United States has already seen an increase of seventy one percent precipitation totals

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A 2019 Hazardous Material Commodity Flow Study on roads and rail with chemical placards traveling through Washington County and Waterbury was conducted by the Two Rivers Outaquechee Regional Commission. The truck survey results showed propane and flammable gases as the contents followed by diesel fuel and liquid carbon dioxide.

The Waterbury Fire Department is notified of Tier II materials and their locations by the State Local Emergency Planning Committee. The fire department trains regularly to assure safety with responses where chemicals are present.



Commodity flow study from the Vermont Freight and Rail Plan-2021

6 HAZARD MITIGATION STRATEGY

The highest risk natural hazards and vulnerabilities identified in the previous section of this Plan directly inform the hazard mitigation strategy outlined below, which the community will strive to accomplish over the coming years. The mitigation

strategy chosen by the Town includes the most appropriate activities to reduce future risk from potential hazards.

Mitigation Goals

The Hazard Mitigation Planning Team identified the following as the community's primary mitigation goal:

Increase the Town of Waterbury's resilience to natural hazards by advancing mitigation investment to reduce or avoid long-term risk to people, homes, neighborhoods, the local economy, cultural and historic resources, ecosystems, and Community Lifelines such as transportation, water, sewer, energy, and

See Community Survey results in **Appendix D** for which assets survey respondents thought were most important to protect against potential future severe weather impacts.

Community Capabilities

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

Administrative & Technical This capability refers to the Town's staff and their skills and tools that can be used for mitigation planning and to implement **actions**.

In addition to the Emergency Management staff described in Section 3, municipal staff that can be used for mitigation planning and to implement specific mitigation actions include: Municipal Manager, Zoning Administrator, Town Clerk & Treasurer, Planning Director, Assistant Town Clerk & Treasurer, Assistant Town Clerk, Public Works Director, Town and EFUD Engineer, Highway Supervisor.

[Type here]

In addition to paid staff, there is a 5-member Selectboard, 5-member Planning Commission, Fire Warden, Town Health Officer, Development Review Board, and Natural Disaster Preparedness Committee.

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

Planning & Regulatory These capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Examples of planning capabilities that can either enable or inhibit mitigation include land use plans, capital improvement programs, transportation plans, stormwater management plans, disaster recovery and reconstruction plans, and emergency preparedness and response plans. Examples of regulatory capabilities include the enforcement of zoning ordinances, subdivision regulations, and building codes³ that regulate how and where land is developed, and structures are built.

Town Plan: December 2018

Description: A framework and guide for how future growth and development should proceed.

Relationship to Natural Hazard Mitigation Planning: Includes goals and policies related to flood resilience and land use.

Zoning Ordinance with Flood Hazard Area Overlay

District Requirements: May 2016 Description: Provides for orderly community growth promoting the health, safety, and general welfare of the community.

Relationship to Natural Hazard Mitigation Planning: Establish site plan review requirements and zoning districts, including Flood Hazard Overlay Districts, with specific standards for proposed development. Requirements are designed to prevent overdevelopment; to mitigate negative impacts to the natural and human environment; minimize effects to the historical and aesthetic character of the community; and ensure design and construction of development in flood and other hazard areas are accomplished in a manner that minimizes or eliminates the potential for flood loss or damage to life and property.

Description: Provide minimum codes and standards for construction, repair, maintenance of town roads and bridges.

Relationship to Natural Hazard Mitigation Planning: Standards include management practices and are designed to ensure travel safety, minimize damage to road infrastructure during flood events, and enhance water quality protections.

Road Erosion Inventory Report: 2019

Description: Prioritizes those infrastructure projects necessary to improve transportation network resiliency and water quality.

Relationship to Natural Hazard Mitigation Planning: Improvements are designed to minimize or eliminate flood impacts on hydrologically connected road segments.

³ Waterbury does not have any local building codes. Vermont has adopted statewide codes for commercial building fire safety and energy standards. The energy code also applies to residential buildings. Codes enforced by Vermont's Division of Fire Safety are the 2015 National Fire Protection Association (NFPA) 1 Fire Code; 2015 NFPA 101 Life Safety

Road and Bridge Standards: April 2021

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Local Emergency Management Plan: April 2024

Description: Establishes lines of responsibility and procedures to be implemented during a disaster and identifies high risk populations, hazard sites, and available resources.

Relationship to Natural Hazard Mitigation Planning:

Includes actions for tracking events and response actions including damage reports to facilitate funding requests during recovery. This type of information can be essential to preparing hazard mitigation project applications for FEMA funding.

Fire Department ISO Rating: Description: Where municipal water is available, the rating is 4 and 9 in rest of community.. This rating is a score from 1 to 10 that indicates how well- protected the community is by the local fire department.

Relationship to Natural Hazard Mitigation Planning: Everyone wants to keep family, home, and business safe from fires. The ISO rating is a measure of the effectiveness of a community's fire services.

EFUD Water Ordinance: February 2023

Description: Establish minimum standards for design, construction, installation, control, operation of public drinking water system.

Relationship to Natural Hazard Mitigation Planning:

Adopted standards that reduce risk, make the system more resilient, and conserve water.

EFUD Source Protection Plan: April 2023 Description:

Defines the area of land that likely recharges a public drinking water source and addresses actions a public water system will perform to minimize the contaminant risks to the source(s).

Relationship to Natural Hazard Mitigation Planning: Source water protection can complement a broad sweep of community objectives, including protection of water quality, open space, natural systems, and disaster resilience.

EFUD Sewer Ordinance: February 2023

Description: Establish minimum standards for design, construction, installation, control, operation of public sewage and sewage disposal systems.

Relationship to Natural Hazard Mitigation Planning:

Adopted standards that reduce risk and make the system more resilient.

Town of Waterbury Tree Care Ordinance: July 2023

Description: Establish minimum standards for design, construction, installation, control, operation of public sewage and sewage disposal systems.

Relationship to Natural Hazard Mitigation Planning:

Adopted standards that reduce risk of damages from downed trees and removal of shade trees in the community.

Emerald Ash Borer Preparedness Plan: March 2020

Description: Establish minimum standards for design, construction, installation, control, operation of public sewage and sewage disposal systems.

Relationship to Natural Hazard Mitigation Planning:

Planning to reduce risk of damages from downed trees and removal of impacted trees in the community.

Code; the 2015 International Building Code (IBC); 2017 NFPA 70 National Electrical Code; 2021 International Code Council (ICC) International Plumbing Code; and the 2015 National Board Inspection Code from the National Board of Boiler and Pressure Vessel Inspectors.

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

Waterbury's 2024-2025 town budget is \$6,305,174, with \$1,958,716 to fund the Highway Department. In addition to property tax revenues, the Town collects separate fees for sanitary sewer services.

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

- *A River Runs Through It Garden Club, Community Awareness Services Team, Revitalizing Waterbury Inc., American Legion Post #59, Waterbury Area Senior Citizens Association, Waterbury Rotary Club, Historical Society, Central Vermont Chamber of Commerce*
- *Town website, Front Porch Forum, several Department Facebook pages,*

National Flood Insurance Program Compliance

The Town joined the National Flood Insurance Program (NFIP) in 1982. The effective date of the current Flood Insurance Rate Map (FIRM) is March 19, 2013. The Zoning Administrator enforces NFIP compliance through permit review requirements in its Flood Hazard Area regulations. Waterbury's regulations outline detailed minimum standards for development in flood hazard areas defined as FEMA Special Flood Hazard Areas and Floodway Areas. The regulations also require administering Substantial Improvement and Substantial Damage (SI/SD) requirements in accordance with FEMA P- 758 SI/SD Desk Reference, May 2010:

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

- 1) *Prepare, distribute, or make available NFIP insurance explanatory pamphlets or booklets.*
- 2) *Participate in NFIP training offered by the State and/or FEMA.*

State Incentives for Flood Mitigation Vermont's Emergency Relief Assistance Funding (ERAF) provides state funding to match FEMA Public

Assistance after federally declared disasters. Eligible public costs are generally reimbursed by FEMA at 75% with a 7.5% State match. The State will increase its match to 12.5% or 17.5% if communities take steps to reduce flood risk as described below.

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

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

17.5% funding for communities that also participate in FEMA's Community Rating System OR adopt Fluvial Erosion Hazard or other river corridor protection bylaw that meets or exceeds the Vermont ANR model regulations.

Waterbury's current ERAF rate is 7.5%. Upon adoption of the 2024 Local Hazard Mitigation Plan, their ERAF rate will increase to 12.5% because the Town has adopted River Corridor Bylaws.

Mitigation Action Identification

The Hazard Mitigation Planning Team discussed the mitigation strategy, reviewed projects from the 2018 Plan, and identified possible new actions from the following categories for each of the highest risk natural hazards identified in Section 5.



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



Structure & Infrastructure Projects These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This applies to public or private structures as well as critical facilities.



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



Outreach & Education Programs These actions inform and educate the public about hazards and potential ways to mitigate them. Although this type of action reduces risk less directly than structure projects or regulation, it is an important foundation. Greater awareness is more likely to lead to community support for direct actions.

Local Plans & Regulations Examples

Integrate Mitigation into Capital Improvement Programs: Incorporate risk assessment and hazard mitigation principles into capital planning.

Reduce Impacts to Roadways: The leading cause of death and injury during winter storms is automobile accidents, so it is important to plan for and maintain adequate road and debris clearing capabilities.

Develop a Road Right-of-Way Vegetation Management Plan: Identify community priorities and plan of action for site-specific tree and roadside forest management to increase roadside resilience.

Improve Flood Resilience with a Flood Study: The aim of a flood study is to define existing flood behavior for a particular catchment, river, or creek. The study helps inform building, land use planning, community awareness and disaster management.

Improve Stormwater Management Planning: Rain and snowmelt can cause flooding and erosion in developed areas. A community-wide stormwater management plan can address stormwater runoff-related flooding.

Manage Development in Erosion Hazard Areas: The intent of River Corridor Bylaws is to allow for wise use of property within river corridors that minimizes potential damage to existing structures and development from flood-related erosion.

Structure & Infrastructure Project Examples

Protect Power Lines: Protect power lines by 1) inspecting and maintaining hazardous trees in the road right-of-way and 2) burying power lines.

Protect Critical Roadways: Use snow fences or living snow fences (e.g., rows of trees) to limit blowing and drifting of snow.

Retrofit Critical Facilities: Critical facilities can be protected from the impacts of high winds and winter storms by 1) retrofitting them to strengthen structural frames to withstand wind and snow loads; 2) anchoring roof-mounted mechanical

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equipment; and 3) installing back-up generators or quick connect wiring for a portable generator.

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Remove Existing Structures from Flood Hazard Areas: FEMA policy encourages the removal of structures from flood-prone areas to minimize future flood losses and preserve lands subject to repetitive flooding.

Improve Stormwater Drainage Capacity: Minimize flooding and fluvial erosion by 1) increasing drainage/absorption capacities with green stormwater management practices; 2) increasing dimensions of undersized drainage culverts in flood-prone areas; 3) stabilizing outfalls with riprap and other slope stabilization techniques; and 4) re-establishing roadside ditches.

Conduct Regular Maintenance for Drainage Systems: Help drainage systems and flood control structures function properly with 1) routine cleaning and repair; 2) cleaning debris from support bracing underneath low-lying bridges; and 3) inspecting bridges and identifying if any repairs are needed to maintain integrity or prevent scour.

Protect Infrastructure and Critical Facilities: Minimize infrastructure losses and protect critical facilities from flooding by 1) elevating roads above base flood elevation to maintain dry access; 2) armoring streambanks near roadways to prevent washouts; 3) rerouting a stream away from a vulnerable roadway; and 4) floodproofing facilities.

Natural Systems Protection Examples

Protect and Restore Natural Flood Mitigation Features: Natural conditions can provide floodplain protection, riparian buffers, groundwater infiltration, and other ecosystem services that mitigate flooding. Preserving such functionality is important. Examples include 1) adding riparian buffers; 2) stabilizing stream banks; 3) removing berms; 4) minimizing impervious area development; 5) *restore floodplain; and 6) restore incision areas.*

Outreach & Education Program Examples

Educate Residents about Extreme Winter Weather: Winter storms create a higher risk of car accidents, hypothermia, frostbite, carbon monoxide poisoning, and heart attacks from overexertion. Educational outreach can help minimize these risks.

Assist Vulnerable Populations: Measures can be taken to protect vulnerable populations from natural hazards, such as 1) organizing outreach and 2) *establishing and promoting accessible heating or cooling centers in the community.*

Mitigation Action Evaluation

For each mitigation action identified, the Planning Team evaluated its potential benefits and/or likelihood of successful implementation. Actions were evaluated against a range of criteria, including a planning level assessment of whether the costs are reasonable compared to the probable benefits. Results of this evaluation are presented in **Table 5**.

See Community Survey results in **Appendix D** for which category of mitigation actions survey respondents wanted the Town to prioritize.

Mitigation Action Plan for Implementation

After careful evaluation, the Planning Team agreed on a list of actions that support the Mitigation Goals of this Plan and are acceptable and practical for the community to implement.

Actions without overall public support/political will were not selected for implementation. Actions whose costs were not reasonable compared to probable benefits were also not selected.

For the selected actions, the Planning Team then 1) assigned a responsible party to lead the completion of each action; 2) identified potential grant funding; 3) defined a timeframe for implementation; and ranked each action's priority (high, medium, low).

Natural hazards pose a unique threat to the Town's vulnerable populations. Data has shown that underserved and marginalized populations tend to live in at-risk hazard-prone areas or in homes with substandard construction. The data also suggests that this segment of the community is less likely to fully recover after a disaster. ⁴ When ranking an action's priority, those that directly benefit a vulnerable population were ranked high.

The action plan is presented in **Table 6**.

additional sediment transport downstream.										
Depending on its infrastructure capabilities, using check valves, sump pumps, and backflow prevention devices in homes and other buildings.										
Routinely Clean and Repair Stormwater Infrastructure										
Routine Clear Debris from Support Bracing Underneath Low-Lying Bridges										
Increase Dimension of Drainage Culverts to Bank full width standard										
Remove Existing Structures from Flood-Prone Areas										
Elevate and upsize bridges to increase debris passage										
Elevate structures to Base Flood Elevation										
Pursue projects to lower flooding at mouth of Thatcher Brook										
Upsize culvert on Blush Hill Road just North of Mist Hollow Road. From TRPT tool										
Upsize culvert on Sweet Road just south of town line. From TRPT tool										
Armor ditches on identified segments of road per Municipal Roads General Permit requirements.										
Utilize buyouts were appropriate to mitigate flood damages in low lying areas										

Elevate Roads Above Base Flood Elevation to Maintain Dry Access										
Bury Power Lines										

Structure & Infrastructure Projects (cont.)

Floodproof downtown businesses										
Retrofit Critical Facilities to Strengthen Structural Frames to Withstand Wind and Snow Loads										
Anchor Roof-Mounted Mechanical Equipment on Critical Facilities										
Dry flood proofing non-residential structures by strengthening walls, sealing openings, or using waterproof compounds or plastic sheeting on walls to keep water out.										
Floodproof Critical Facilities										

Natural Systems Protection

Stabilize Stream Banks where necessary										
Remove Berms and/or Accumulated Debris from Stream to Restore Flood Capacity										

Implement stormwater management projects from Stormwater Master Plan									
Streambank buffer plantings									
Identify and restore wetlands in appropriate locations									
Increasing drainage or absorption capacities with detention and retention basins									
Establish Vegetative Buffers in Riparian Areas									
Restore Floodplain									
Restore Incision Areas									

Outreach & Education Programs

Educate the Public About the Risks of Infectious Disease and vectors such as lyme disease.									
Outreach on programs for managing and care of aging and diseased trees by Tree Warden to prevent power outages and road debris.									
Outreach/education program on native plants and invasive plant removal									
Outreach and education program on invasive pests and risks of ticks									
Public education campaign on fire permits and possible handout.									
Outreach program on water efficiency opportunities									
Education campaign on banning fill along streams, river and how it leads to increased flooding									
Outreach during severe cold or heat of risks to exposure									
Education program about rain gardens and what individuals can do to lessen runoff									

Table 5 Evaluation Criteria:

Life Safety – Will the action be effective at protecting lives and preventing injuries?

Property Protection – Will the action be effective at eliminating or reducing damage to structures and infrastructure?

Technical – Is the action a long-term, technically feasible solution?

Political – Is there overall public support/political will for the action?

Administrative – Does the community have the administrative capacity to implement the action?

Other Community Objectives – Does the action advance other community objectives, such as capital improvements, economic development, benefit a vulnerable population, environmental quality, or open space preservation?

Rank each of the above criteria in Table 5 with a -1, 0, or 1 using the following table:

1 = Highly effective or feasible

0 = Neutral

-1 = Ineffective or not feasible

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

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

Integrating Into Existing Plans and Procedures

For Waterbury to succeed in reducing long-term risk, information from this Plan should be integrated throughout government operations. When activities are connected, they can not only reduce risk and increase resilience, but also accomplish other objectives such as environmental protection, economic development, financial stability, and land use planning.

There are several ways the Town can achieve integration into existing plans and procedures to support risk-informed community planning. They can include the community's primary mitigation goal as stated on page 18, information from the risk assessment, and mitigation actions as follows:

- *Funding for mitigation actions can be prioritized in the annual budget process.*
- *The mitigation goal and risk assessment information can be incorporated into the next Town Plan update (Land Use and Flood Resilience chapters in particular) to help steer growth and redevelopment away from high-risk locations. The town has already made significant progress in its latest **bylaws update***
- *The mitigation goal and risk assessment information can be incorporated into any plans to expand public water and sewer utilities to ensure they are not expanded into high-hazard areas.*
- *Several flood-related mitigation actions for increasing road resiliency can be implemented under the existing Municipal Road General Permit (8273-9040) for controlling stormwater discharges from town roads.*

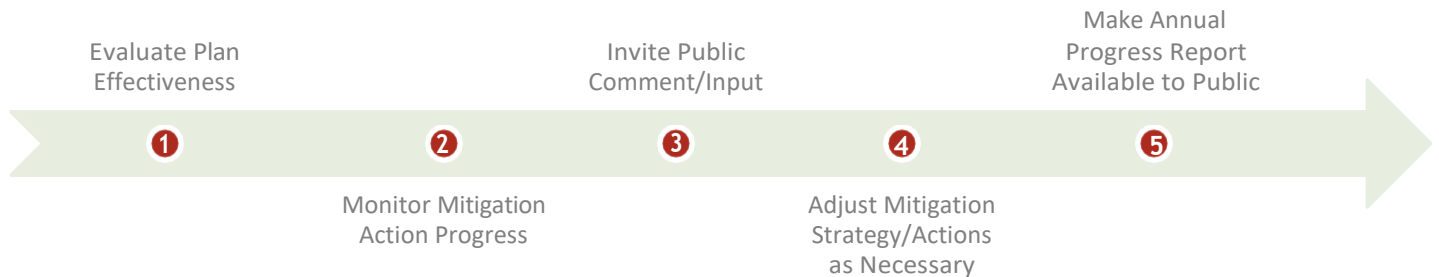
The Town will make every effort to maximize use of future Public Assistance Section 406 Mitigation opportunities when available during federally declared disasters.

6 PLAN MAINTENANCE

This Plan is dynamic. To ensure it remains current and relevant, it should be annually evaluated and monitored and updated every five years, in accordance with FEMA guidelines in effect at the time.

Annual Evaluation and Monitoring

Within 12 months of FEMA Final Approval, the Plan will be annually evaluated and monitored as follows:



1 The Municipal Manager and Selectboard will evaluate the effectiveness of the Plan in meeting the stated goals. Things to consider during this evaluation:

- *What disasters has the town (or region) experienced?*
- *Should the list of highest risk natural hazard impacts be modified?*
- *Are new data sources, maps, plans, or reports available? If so, what have they revealed, and should the information be incorporated into this plan?*
- *Has development in the region occurred and could it create or reduce risk?*
- *Has the town adopted new policies or regulations that could be incorporated into this plan?*
- *Have elements of this plan been incorporated into new plans, reports, policies, or regulations?*
- *Are there different or additional community capabilities available for mitigation implementation?*

2 Next, the Municipal Manager and Selectboard will monitor mitigation action progress. Things to consider:

- *Is the mitigation strategy being implemented as anticipated?*
- *Were the cost and timeline estimates accurate?*
- *Should new mitigation actions be added?*
- *Should proposed actions be revised or removed?*
- *Are there new funding sources to consider?*

The status (e.g., in progress, complete) of each action should be recorded in **Table 7**. If the status is “in progress” note whether the action is on schedule. If not, describe any problems, delays, or adverse conditions that will impair the ability to complete the action.

3 The Municipal Manager and Selectboard will seek public comment from the Whole Community on plan implementation. Things to consider:

- *Are there any new stakeholders to include?*
- *What public outreach activities have occurred?*
- *How can public involvement be improved?*

4 Based on input received, the mitigation strategy and/or actions will be modified, if needed.

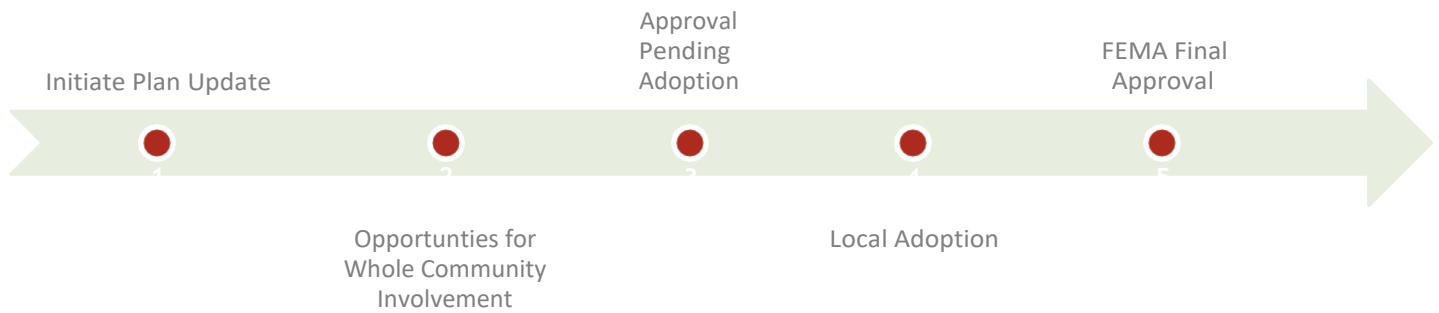
5 A report (or record in the form of meeting minutes) of the annual evaluation and monitoring will be made available to the public.

Table 7: Mitigation Action Status-Still to be updated

Mitigation Action	2024	2025	2026	2027	2028
Local Plans & Regulations					
Plan for and Maintain Adequate Road and Debris Clearing Capabilities					
Update Road Erosion and Culvert Inventories					
Road Right-of-Way Vegetation Management Plan					
Plan for Bridge Repairs					
Stormwater Master Plan					
Flood Study					
Structure & Infrastructure Projects					
Remove Hazard Trees in Road Right-of-Way					
Install Back-up Power at Critical Facilities					
Install Green Stormwater Management Practices					
Stabilize Culvert Outfalls					
Install/Re-work Roadside Ditches					
Routinely Clean and Repair Stormwater Infrastructure					
Routinely Clear Debris from Low-Lying Bridge Support Bracing					
Adequately Size Culverts in Flood-Prone Areas					
Remove Structures from Flood-Prone Areas					
Install Live Snow Fence or Equivalent Technique on Critical Roadways					
Natural Systems Protection					
Stabilize Stream Banks					
Remove Accumulated Debris to Restore Flood Capacity					
Outreach & Education Programs					
Infectious Disease and/or Invasive Species Awareness					
Disease Vector Control Training					

5-Year Updates

This Plan will be updated at a minimum every five (5) years as follows:



- 1 Currently, funding to assist municipalities in paying for planning services to update the Local Hazard Mitigation Plan is available through FEMA’s Building Resilient Infrastructure and Communities grant program. If using this grant, Waterbury should contact Vermont Emergency Management (VEM) to apply for funding in 2026 – approximately 2 years before the Plan expires.

Once funding is secured and the grant agreement between the Town and State is in place, the Town Manager can issue a request for proposals (RFP) to procure planning services in accordance with the grant agreement. The RFP should be issued approximately 14 months before the Plan expires.

Once a consultant is procured, the Plan update can begin with a kick-off meeting including the consultant and local hazard mitigation planning team. The kick-off meeting should be scheduled approximately 12 months before the Plan expires. The Town should allot approximately 8 months for the Plan update process.

- 2 Opportunities for Whole Community involvement throughout the Plan update process need to be factored into the schedule. These opportunities may include a community survey, planning workshop, and public meetings at critical milestones agreed to at the project kick-off meeting.
- 3 Once the local hazard mitigation planning team has prepared a final draft, they can seek authorization from the Selectboard to submit the Plan for VEM/FEMA approval. Plan approval is accomplished in two steps – the first is Approval Pending Adoption. The Town should submit for Approval Pending Adoption approximately 4 months before the Plan expires to allow for time to respond to any review comments received from VEM/FEMA.
- 4 Once the Town receives Approval Pending Adoption, the Selectboard should adopt the Plan as soon as their next regular meeting.
- 5 Once adopted, the Town can submit the Plan for VEM/FEMA Final Approval. The Town should submit for Final Approval approximately 1 month before the Plan expires to ensure there is no gap in coverage between updates. The FEMA Final Approval date starts the clock on the effective dates of the 5-year Plan.

CERTIFICATE OF ADOPTION

**Town of Waterbury, Vermont
Selectboard**

A Resolution Adopting the Waterbury, Vermont 2024 Local Hazard Mitigation Plan

WHEREAS the Waterbury Selectboard recognizes the threat that natural hazards pose to people and property within the Town of Waterbury; and

WHEREAS the Waterbury Selectboard has prepared a natural hazard mitigation plan, hereby known as the Waterbury, Vermont 2024 Local Hazard Mitigation Plan in accordance with federal laws, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and the National Dam Safety Program Act, as amended; and

WHEREAS the Waterbury, Vermont 2024 Local Hazard Mitigation Plan identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the Town of Waterbury from the impacts of future hazards and disasters; and

WHEREAS adoption by the Waterbury Selectboard demonstrates its commitment to hazard mitigation and achieving the goals outlined in the Waterbury, Vermont 2024 Local Hazard Mitigation Plan.

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF WATERBURY, VERMONT, THAT:

Section 1. In accordance with 24 VSA §872, the Waterbury Selectboard adopts the Waterbury, Vermont 2024 Local Hazard Mitigation Plan. While content related to the Town of Waterbury may require revisions to meet the plan approval requirements, changes occurring after adoption will not require the Town of Waterbury to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by a vote of _____ in favor and _____ against, and _____ abstaining, this _____ day of _____, 2024.

By: _____ (print name) Selectboard Chair

ATTEST: By: _____ (print name)

7 MITIGATION ACTIONS FROM 2017 PLAN

Vulnerability: Flooding

Improve Physical Infrastructure.

Main Street Reconstruction, upsizing culverts, manage village stormwater drainage, protect utilities.

Who: Town, Village, VTrans, Revitalizing Waterbury, CVRPC When: Summer 2018-Fall
2020 How: VTrans, Municipal Funds Priority: High

2024 Update: Completed 2023 new drainage along Main St. helps with flash flooding

Floodplain

Implement floodplain reconnection strategies to increase low-lying areas that can accommodate floodwater and reduce flooding.

Who: State of VT, VEM, Town, Village
How: HMGP

When: 2020-2022
Priority: High

2024 Update:

Vulnerability: Infrastructure

Colbyville drainage along Route 100, possible ROW expansion.

Who: State of Vermont, State Highway
How: HMGP, VTrans

When: Spring 2018-Fall 2019
Priority: High

2024 Update: Corrected and improved 2018

Stowe Street Bridge

Replace and upsize functionally deficient bridge that was installed following the Flood of 1927. This is a critical connection for pedestrians and access to the VTrans Park and Ride.

Who: Town of Waterbury, State of Vermont
How: VTrans, Town of Waterbury

When: 2020-2023
Priority: High

2024 Update: Preliminary engineering is completed. Bridge is on VTrans bridge list to be replaced in 2025

Lincoln Street

Upsize culvert on Graves Brook and restore floodplain along the northern bank to prevent additional sediment transport downstream.

Who: Select Board, Public Works Director, VTrans, Road Commissioner When: 2018-2022
How: HMGP, EPA, VTrans Priority: High

2024 Update: No work completed still undersized.

Culverts and Bridge

Upsize culvert and bridge on Guptil Road, Shaw Mansion Road, and Ripley Road.

Who: Select Board, VTrans, Road Commissioner When: 2018-2022
How: HMGP, VTrans Priority: High

2024 Update:

Planning/ Regulations

Update Flood Hazard area regulations to include river corridors.

Who: Selectboard, Village Trustees When: 2019-2021
How: Municipal Funds Priority: Medium

2024 Update: The Planning Commission has finalized this update in April 2024

Planning/Emergency Preparedness

Coordinate with Duxbury for emergency evacuation communication and coordination on River Road and flood areas.

Who: Emergency Services, Waterbury, Duxbury When: Ongoing
How: Municipal Priority: Medium

2024 Update:

Mitigation

Consider fuel tank tiedowns for properties in floodprone areas. Consider educational campaign in partnership with Vermont Fuel Dealers Association

Who: Town staff with public and private entities

When: 2020-2022

How: Estimated costs \$500-700/home

Priority: Medium

2024 Update:

Planning/Mitigation

Plan for long-term growth outside of the floodplain. Consider suitable areas for future village development.

Who: Planning Commission, Town, Village

When: 2021-2023

How: Plan update, Municipal grant

Priority:

2024 Update: The Planning Commission has finalized a complete update to the zoning regulations and is adopting in April 2024.

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Identify strategies and opportunities, including permanent easements, for protecting open space/undeveloped land in the floodplain and river corridor from future development, ID potential areas for easements and restoration.

Who: Town Selectboard, Village trustees, Friends of the Winooski River, Conservation Commission

When: Ongoing

How: Municipal funds

Priority:

2024 Update: The Planning Commission has finalized a complete update to the zoning regulations and is adopting in April 2024.

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Engage with State of Vermont and Duxbury to explore mitigation opportunities along state lands, farm lands and River Road.

Who: State of Vermont

When: Ongoing

How: Grant funds

Priority: Medium

2024 Update: Due to Duxbury landowner's choice to not participate with largest piece of project, overall project did not proceed.

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Support state regulations, install signage to prohibit dumping in stream channels, riverbank areas, and wetlands.

Who: Town, Village Green-Up, ANR
How: Municipal funds

When: 2019-2021
Priority: Medium

2024 Update:

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Consider stormwater management regulations requiring that peak runoff from new development be no greater than pre-development runoff

Who: Planning Commission, Town, Village
How: Municipal Planning Grant, Municipal funds

When: 2022+
Priority: Medium

2024 Update:

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Consider regulations that require Erosion and Sedimentation Control on land that is disturbed during development. Utilize technical bulletins and research publications were available.

How: Planning Commission, Town, Village
How: Municipal Planning Grant, Municipal funds

When: 2022+
Priority: Low

2024 Update: State changed rules for this in 2022 that VT DEC mandates sedimentation controls on any disturbance larger than 1/2 acre.

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Consider mandatory use of connectors, brackets, and mobile home tie downs with new mobile home applications in and outside of flood prone areas. Utilize technical bulletins and research publications were available.

Who: Planning Commission, Town, Village
How: Municipal funds

When: 2020-2021
Priority: Low

2024 Update:

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Encourage and support use of public and private riparian buffers using the River Corridor Plan as guidance. Utilize technical bulletins and research publications were available.

Who: Conservation Commission
How: Grant or municipal funds

When: 2020-2021
Priority: Medium

2024 Update:

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Support educational campaign program for installation of sewer line valves on properties in 500-year floodplain. Utilize technical bulletins and research publications were available.

Who: Village Trustees/ Town Selectboard
How: Public, private

When: 2020-2022
Priority: Medium

2024 Update:

Flooding, flash floods, fluvial erosion/Severe Storms, hurricane, tropical storms

Utilize the Stream/Flume table as an educational tool at public events

Who: Friends of the Winooski, Planning commission
How: Public, private

When: Ongoing
Priority: Medium

2024 Update:

Flooding- NFIP compliance.

Promote NFIP/CRS compliance by continuous communication, training, and education. Utilize technical bulletins and research publications were available.

Who: Village Trustees/ Town Selectboard
How: HMGP

When: Ongoing
Priority: Medium

2024 Update:

Vulnerability: Dams

Dam Safety/Emergency Preparedness

Public education for residents and communities downstream on evacuation and early notification procedures.

Who: ANR, Public Works, EMD
How: Municipal/State Funds

When: Fall 2018
Priority: High

2024 Update:

Dam Safety

Coordinate with dam owner and community on Emergency Action Plan (EAP) contacts and information flow for dam safety and preparedness.

Who: Emergency Services, GMP, CVRPC, Town, Village
How: EMPG, Municipal Funds

When: Spring 2019 ongoing
Priority: High

2024 Update:

Vulnerability: Winter Storms/ Severe Cold

Support LEAP members, Capstone and Efficiency Vermont to conduct outreach to residents on how to insulate homes (pipes, attics) for efficiency and extreme cold spells. Snow and ice loads are regulated by state building codes. Utilize technical bulletins and research publications were available.

Who: Town, Village, Planning Commission, Efficiency Vermont, Vermont Fuel Dealers, LEAP, Capstone

How: Efficiency Vermont, LEAP

When: Ongoing
Priority: Low

2024 Update:

