Adopted by the Town of Lunenburg Select board on September 18, 2025

2025 Lunenburg, Vermont
Local Hazard Mitigation Plan

Prepared by:

The Town of Lunenburg Select Board

CERTIFICATE OF LOCAL ADOPTION

Town of Lunenburg, Vermont
A Resolution of the Town's Select Board Adopting
the 2025 Lunenburg, Vermont Local Hazard Mitigation Plan

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

WHEREAS, the Town of Lunenburg has prepared a multi-hazard mitigation plan, hereby known as the 2025 Lunenburg, Vermont 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 Town of Lunenburg identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Town of Lunenburg from the impacts of future hazards and disasters; and

WHEREAS, adoption by the Town of Lunenburg demonstrates its commitment to hazard mitigation and achieving the goals outlined in the 2025 Lunenburg, Vermont Local Hazard Mitigation Plan .

NOW THEREFORE, BE IT RESOLVED BY THE TOWN OF LUNENBURG, VERMONT SELECT BOARD THAT:

In accordance with local rule for adopting resolutions, the Town of Lunenburg Select board adopts the 2025 Lunenburg, Vermont Local Hazard Mitigation Plan. While content related to Town of Lunenburg may require revisions to meet the plan approval requirements, changes occurring after adoption will not require Town of Lunenburg to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

9/18/25
Date

Select board Member

Select board Member

Nancy Benoit
Select board Member

Attested to by Town Clerk

Executive Summary

In January of 2025, the town began to develop this Local Hazard Mitigation Plan with the help of a consultant. All references to the Town of Lunenburg include the unincorporated Village of Gilman. While a draft plan from 2005 was used for some data, this is considered a first-time plan based on guidance from FEMA. The town has seen the impacts of climate change, historic flooding and a global pandemic. The Great Vermont Flood of July 2023 (DR-4720) claimed two lives and caused millions in damage across the state. The Canadian Wildfires of 2023 affected air quality and arguably, the psyche of many Vermonters. Precipitation in December 2023, which is usually in the form of snow, turned to rain melting the early snowpack and caused flooding across the state, once again. 2023 was the hottest year on record in Vermont, furthering the real and present concerns related to climate change. 2024 brought additional flooding to region and resulted in historic damage for many towns. For a small rural community with a 3-person Road Crew, both the July 2023 and July 2024 floods were very impactful to the town.

The COVID-19 pandemic—an event with unprecedented health, social, and economic impacts, in addition to the natural disasters experienced, emphasize the importance of hazard mitigation planning. From June 23rd to July 31st, 2024, there were three declared disasters in Vermont. Essex county was included in two of these declarations (DR4810 7/9-11 and DR4826 7/29-31). In early July, the remnants of Hurricane Beryl brought major flooding and damage to central Vermont—a year to the day after the July 2023 event. Some areas received over 6 inches of rain and the town had significant road damage from this event. Less than a month later, a 1 in 1,000-year rainstorm dropped upwards of 8 inches of rain in a matter of hours causing localized and catastrophic damage to the Northeast Kingdom. The increased frequency of severe weather, especially rain, may be a new norm as precipitation is slated to increase by 52% during this century. What the town can do to combat the impact of climate change will help to define the resilience of our community. To help meet this challenge, this plan includes a list of suggested agenda items for departmental meetings to best prepare the town for future events.

This plan identifies changes, advancements, and future needs in the areas most vulnerable to the profiled hazards. Also included are the proposed mitigation actions for the next 5-year planning period and the status of the previous planning period's actions. The description and results of the 2025 planning process are contained herein and represent the collaborative efforts of the newly formed Hazard Mitigation Planning Team and associated residents, towns, non-profits, and agencies that contributed to the development of this plan.

As hazard mitigation is a sustained effort to permanently reduce or eliminate long-term risks to people and property from the effects of reasonably predictable hazards, the town has communicated its efforts related to developing this plan to its residents, businesses, and surrounding municipalities, providing a formal opportunity to give input and review relevant sections of the plan. In realization that eligibility to receive federal hazard mitigation grants and optimize state-level reimburse or "match" dollars during a federally declared disaster is dependent on a federally approved plan, the town remains committed to sustaining its mitigation efforts and by developing this plan, will have a guide for action that will foster enhanced emphasis on mitigation in the years to come. The town realizes the importance of mitigation inherent to its own resilience as well as means to establishing strong partnerships with regional

support agencies and associations, state government and Federal Emergency Management Agency (FEMA).

As the town moves towards formally adopting this Local All-Hazards Mitigation Plan, the purpose of this plan is to:

- Identify specific natural hazards that impact the town.
- Prioritize hazards for mitigation planning.
- Recommend town-level goals and strategies to reduce losses from those hazards.
- Establish a coordinated process to implement goals and their associated strategies by taking advantage of available resources and creating achievable action steps

This plan is organized into 5 Sections:

Section 1: Introduction and Purpose explains the purpose, benefits, implications and goals of this plan. This section also describes demographics and characteristics specific to Lunenburg and describes the planning process used to develop this plan.

Section 2: Hazard Identification expands on the hazard identification in the 2024 Town Plan with specific municipal-level details on selected hazards.

Section 3: Risk Assessment discusses identified hazard areas in the town and reviews previous federally declared disasters to identify what risks are likely in the future. This section presents a hazard risk assessment for the municipality, identifying the most significant and most likely hazards which merit mitigation activity. The most significant hazards for Lunenburg have been profiled and are introduced in the grid below:

Severe winter/ice storm	Climate Change (Extreme cold and heat,)	Flooding (including fluvial erosion/landslides, and inundation)
Invasive Species	Infectious Disease	Drought
High Winds		

Section 4: Vulnerability Assessment discusses buildings, critical facilities and infrastructure in designated hazard areas and estimates potential losses.

Section 5: Mitigation Strategies begins with an overview of goals and policies in the most recent Town Plan that support hazard mitigation and utilizes a current road inventory to formulate a work plan for major infrastructure projects. An analysis of existing municipal actions that support hazard mitigation, such as planning, emergency services and actions of the highway department are also included. The following all-hazards mitigation goals are summarized below:

1) Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
2) Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
3) Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this All-Hazards Mitigation Plan.

4) Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.
5) Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
6) Develop a mechanism for formal incorporation of this All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5). This mechanism will be developed by the Planning Commission, Select board, and NVDA and integrate the strategies into the existing town plan as annexes until the next formal occurs, where a section devoted to mitigation planning will be integrated into the plan.
7) Develop a mechanism for formal incorporation of this All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into the municipal/town operating and capital plans & programs as they relate to public facilities and infrastructure within political and budgetary feasibility. The Planning Commission will review the LHMP and use language/actions from it to inform plan integration and update processes. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budget.

Section 5 also identifies and provides a detailed discussion on the following actions:

Action #1: Reduce vulnerability to flooding.
Action #2: Improve resilience to severe winter storms.
Action #3: Reduce impact of extreme hot and cold temperature durations.
Action #4: Raise public awareness of hazards and hazard mitigation actions.
Action #5: Reduce risk and impact of major infectious disease events.
Action #6: Reduce risk and impact of drought.
Action #7: Reduce risk and impact of invasive species.
Action #8: Reduce risk and impact of high wind events.

In conclusion, Section 5 provides an Implementation Matrix to aid the municipality in implementing the outlined mitigation actions with an annual evaluation process to be coordinated and administered by the Select board and associated departments within Lunenburg.

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SECTION 1: INTRODUCTION AND PURPOSE

1.1 Purpose and Scope of this Plan

The purpose of this All-Hazards Mitigation Plan is to assist this municipality in identifying all hazards facing their community and in identifying strategies to begin to reduce the impacts of those hazards. The plan also seeks to better integrate and consolidate efforts of the municipality with those outlined in the Town Plan as well as efforts of NVDA, Vermont State agencies, FEMA and the State Hazard Mitigation Plan. The town is aware that community planning can aid significantly in reducing the impact of expected, but unpredictable natural and human-caused events. The goal of this plan is to provide hazard mitigation strategies to aid in creating disaster resistant communities throughout Essex County.

1.2 Hazard Mitigation

The 2023 State Hazard Mitigation Plan states:

> *"The impact of anticipated yet unpredictable natural events can be reduced through community planning and implementation of cost effective, preventive mitigation efforts.*
>
> *The State of Vermont understands that it is not only less costly to reduce vulnerability to disasters than to repeatedly repair damage, but that we can also take proactive steps to protect our economy, environment and most vulnerable citizens from inevitable natural hazard events. This Plan recognizes that communities have the opportunity to identify mitigation strategies during all phases of emergency management (preparedness, mitigation, response, and recovery) to more comprehensively address their vulnerability. Though hazards themselves cannot be eliminated, Vermonters can reduce our vulnerability to hazards by improving our understanding of both the natural hazards we face and their potential impacts.*
>
> *The 2023 State Hazard Mitigation Plan (SHMP) presents the hazard impacts most likely to affect Vermont and a mitigation strategy to reduce or eliminate our most significant vulnerabilities."*

Hazard mitigation strategies and measures can reduce or eliminate the frequency of a specific hazard, lessen the impact of a hazard, modify standards and structures to adapt to a hazard, or limit development in identified hazardous areas. This plan aligns and/or benefits from the State's 2023 Hazard Mitigation Plan and as part of the Emergency Relief Assistance Funding (ERAF) requirements. With enhanced emphasis on community resiliency, many state agencies and local organizations have increased awareness of the importance of mitigation planning and have produced plans and resources that towns can use to support their planning efforts. This plan will reference, when relevant, pertinent tools and resources that can be used to enhance mitigation strategies.

1.3 Hazard Mitigation Planning Required by the Disaster Mitigation Act of 2000

Hazard mitigation planning is the process that analyzes a community's risk from natural hazards, coordinates available resources, and implements actions to reduce risks. Per *44 CFR Part 201: Hazard Mitigation Planning,* this planning process establishes criteria for State and local hazard mitigation planning authorized by Section 322 of the Stafford Act as amended by Section 104 of

the *Disaster Mitigation Act of 2000*. Effective November 1, 2003, local governments now must have an approved local mitigation plan prior to the approval of a local mitigation project funded through federal Pre-Disaster Mitigation funds. Furthermore, the State of Vermont is required to adopt a State Pre-Disaster Mitigation Plan for Pre-Disaster Mitigation funds or grants to be released for either a state or local mitigation project after November 1, 2004.

There are several implications if the plan is not adopted:

- After November 1, 2004, Flood Mitigation Assistance Grant Program (FMAGP) funds will be available only to communities that have adopted a local plan.
- For disasters declared after November 1, 2004, a community without a plan is not eligible for HMGP project grants but may apply for planning grants under the 7% of HMGP available for planning.
- For the Pre-Disaster Mitigation (PDM) program, a community may apply for PDM funding but must have an approved plan to receive a PDM project grant.
- For disasters declared after October 14th, 2014, a community without a plan will be required to meet a greater state match when public assistance (PA) is awarded under the ERAF requirements (Emergency Relief Assistance Funding)

1.4 Benefits

Adoption and maintenance of this Hazard Mitigation Plan will:

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

1.5 All-Hazards Mitigation Plan Goals

This All-Hazards Mitigation Plan establishes the following general goals for the town and its residents:

- Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
- Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan.

- Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.
- Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
- Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into the municipal comprehensive plan as described in 24 VSA, Section 4403(5). This mechanism will be developed by the Planning Commission and NVDA and will integrate the strategies into the existing Town Plan as annexes until the next formal occurs, when a section devoted to mitigation planning will be integrated into the plan.
- Maintain a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into the town operating and capital plans & programs as they relate to public facilities and infrastructure within political and budgetary feasibility. The Planning Commission will review the plan and use language/actions from it to inform the integration and process. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budgets.
- Flood-related data and information originating in the Hazard Mitigation Plan will continue to be reviewed and assessed for relevant inclusion in the Town Plan specific to flood resilience.

1.6 Lunenburg Population and Characteristics

1.6.1 Community History and Background

Situated in the southern portion of Essex County, Lunenburg has a rich history of agriculture and working with the land. Lunenburg is bordered on the northeast by the town of Guildhall, the northwest by Victory, the southwest by Concord, and on the Southeast by the Connecticut River separating Vermont and New Hampshire. The towns of Dalton and Lancaster, NH border Lunenburg on the other side of the river. Lunenburg contains the villages of West Lunenburg, South Lunenburg, and Gilman. Lunenburg claims a unique position in Essex County, being one of only a few towns with an unincorporated village, Gilman (formerly Fitzdale). Lunenburg's government seat is based in Lunenburg, but Gilman has played an active and vibrant role in the community. The Gilman Paper Company was an American paper producer founded by Isaac Gilman in the 1880s. The paper mill was shut down in September 2002.

Lunenburg is the most populous town in Essex County, Vermont. As of the 2020 census, there were 1246 people living in the Town, slightly fewer than the 1302 counted in the 2010 Census. The population density is 28 inhabitants per square mile.The changing demographic makeup of the Town of Lunenburg will affect municipal priorities in the future. Population migration, aging population, increase in smaller households, as well as persistent levels of poverty will influence decisions related to public services, transportation, land use, education, economic development, recreation, health and housing.

Hospitals and medical centers near Lunenburg:

- Northeastern Vermont Regional Hospital
- Northern Counties Health Care
- Northern Express Care
- Weeks Medical Center
- Littleton Regional Healthcare
- ConvenientMD Urgent Care
- Coos County Family Health

Lunenburg has two water supply systems that have water protection areas surrounding them. Water protection areas are in place to ensure that contaminants do not get into the water and pollute the public drinking water system.

The town's volunteer fire and rescue department serve the community under the umbrella of the area's mutual aid organization. Training, at all levels of emergency service, has a high priority within these organizations. The department has one engine and two tankers. Gilman Rescue is made up of volunteers with some medical supplies. They don't have an ambulance and rely on Lancaster, NH rescue. The town does not maintain a police department but contracts with the Essex County Sheriff and can rely on Vermont State Police.

Lunenburg's waterways are part of Tactical Basin 16. Basin 16 consists of the Upper Connecticut River and direct drainages to it from the Canadian border down to the Passumpsic River. It includes the Nulhegan River, Willard Stream, and Paul Stream watersheds among others. Basin 16 is a largely forested watershed that includes extensive wetland complexes in the Nulhegan River watershed (to the north of Lunenburg). These basin characteristics have led to many unique habitats in the basin and good water quality which have been identified as water quality protection opportunities.

Neal Pond is a 185-acre freshwater pond in the north-central part of Town. Formed by damming Neal's Branch, which runs south from Lunenburg till it runs into the Connecticut River, Neal's Pond is approximately one mile long and a half mile in width. The shoreline is developed with approximately 70 cabins, camps, and a public boat ramp managed by the Vermont Fish and Wildlife Department. Neal Pond has native fish, including Bullhead, Chain Pickerel, Northern Pike, Smallmouth Bass, and Yellow Perch. The pond has several species of rare and/or threatened plants, too.

The Gilman Hydroelectric Project Dam is located in the Village of Gilman and produces 25,000MWh of power annually.

National Flood Insurance Program

1. Lunenburg does not participate in the National Flood Insurance Program. Therefore, there is not a FIRM (Flood Insurance Rate Map) but a Flood Hazard Boundary Map. This map has an effective date of 2/18/1977. No Flood Insurance Study (FIS) has been published.

1.7 Summary of Planning

The town contracted with OPH Consulting Services to complete the plan on December 20th, 2024. Gary Briggs and Tina Breault served as the primary points of contact . The following table presents the Planning Team members and their title:

Table 1-0: 2025 Lunenburg Mitigation Planning Team Roster

2025 Hazard Mitigation Planning Team	Title
Harry Williams, Nancy Benoit, Nate Brown	Select board Officers
Isabella Mertens	Planning Commission Member
Tina Breault	Planning Commission Chair
Town Water Leads	Fire District 1 and 2
Karen Danforth	Lister
Jim Peyton	911 Coordinator
Steve Colby	Chief, Fire Department
Steve Jones	Coordinator, Gilman Fire and Rescue
Gary Briggs	Town Clerk
Gregg Williams	Road Foreman
Luke Robinson	Lunenburg Health Officer

Public Involvement:
February 3rd, 2025 marked the kick-off meeting for the plan at a select board meeting. The community was alerted that the plan was being developed via the town website. The opportunity for all stakeholders to participate and provide feedback was announced along with the community survey, which is seen as the most efficient way for stakeholders to provide input. The online community survey was developed and launched through the town's website and social media page in addition to hardcopy surveys available at the library, town office, and community center. The survey introduced the importance and informational needs of a LHMP and asked for specific concerns the resident and/or business owner had in response to natural disasters.

Agendas, meeting content, and subsequent minutes provided the methodology by which representatives of businesses, schools/academia, and other private organizations that sustain community lifelines, including utilities, were informed of the planning process and ability to provide feedback. In early April, 2025, the draft was made available to the public with an opportunity for review and feedback.

Regional non-profits and other organizations serving vulnerable populations were contacted during plan development. Each entity was informed of the plan, given opportunity to review and comment on the plan, directed to the online Community Hazard Survey, and interviewed. The

main issue for many of these organizations is defined by disaster impacts in other areas of the state where the respective service population is either placed or receiving care. Transportation and housing disruption resulting from a disaster can severely affect many service populations. Developing contingency plans was a common theme in the interview process. The community survey is an anonymous feedback tool and any specificity to organizations and/or individuals who provided feedback via the survey is not available. Essex County is home to several organizations serving vulnerable populations. Individuals from the organizations listed below provided key considerations and concerns related to their service and natural disasters

Table 1-1: Summary of Outreach

Organization	Vulnerable Population Served	Issues/Concerns
Gilman Senior Housing	Senior Housing (62 years and older) and those with disabilities	Any event that compromises structural integrity would impact the population served in addition transportation issues if staff were unable to access location.
Gilman Senior Center	Gilman Senior Center seeks to help the area seniors with networking, meals, tax and financial help and be a welcoming place to come visit and socialize. The Senior Center is a Meal Site, providing meals to anyone in the community and meal delivery Tuesday through Friday from 11:30-1pm. The Center collaborates with other agencies to bring in programming that supports health, wellness, and enrichment activities.	Access is a crucial part of service both as a service hub and outreach to residents. If access is disrupted, services are reduced or stopped which many depend on.
Lunenburg School	This K-5 school serves students of Lunenburg and serves as an emergency shelter.	All enrolled students are eligible for breakfast and lunch at no charge. If school access is disrupted, family's dependent on this may have difficulty meeting nutritional requirements for their children.
Gilman Head Start Day Care	Day care services	Any disruption in services could impact parent ability to work and/or create danger for children if access is compromised while they are at the facility.
NEK Community Action	Acute and essential needs of food, housing, climate, energy, racial and economic justice and assistance to face disparity and oppression.	Increased demand for services during disaster events can place those relying on support to meet basic needs is a concern with the ability to access/coordinate support when transportation routes are flooded.
NEK Human Services	Case management, community and home support, residential care, psychiatry, medication	NKHS has an array of services to aid a person experiencing a crisis. Each service works along a

	management, individual therapy, group therapy, vocational supports, school-based counseling, emergency care and respite services for 3400+ clients annually. In addition, we offer outreach and consultation services to communities, schools, and businesses in our service area.	continuum of care, which allows the person in crisis to determine, when appropriate, how much intervention and support they need. The continuum allows the person in crisis to move freely between different levels of service they require, both during and pre/post-crisis
NEK Council on Aging	Older Adult Support Services for those over 60 and those with disabilities	We are able to, thru the use of our volunteer network, continue home delivered meals during a service-compromising event. During covid and flooding these programs were resourceful and met the needs of elders in our community to ensure both a safety check and meal delivery. We have become flexible in being able to work remotely and well-coordinated so that we can be nimble during challenging times

All neighboring towns were sent notification of the plan's development and were given an opportunity to provide input through email to the Town Clerk. The Vermont towns bordering Lunenburg include Concord, Victory, Granby, and Guildhall. No responses were obtained from this solicitation.

Research and feedback on hazards, community capacities, community assets and potential mitigation projects was also conducted in coordination with other important stakeholders. Phone calls, emails and meetings were exchanged and held to involve the expertise of additional Lunenburg staff, various state agencies and regional stakeholders, with an emphasis on vulnerable populations. Following FEMA guidance in Local Mitigation Plan Review Tool Regulation Checklist, the plan was written using data sources that included:

- Surveys and public comment
- 2024 Town Plan (provided current goals and regulations supporting mitigation, recent capital expenditures and infrastructure value helped to drive vulnerability assessment)
- 2023 State Hazard Mitigation Plan (provided key guidance language and definitions throughout the plan).
- Vermont Agency of Natural Resources (ANR) and Transportation (VTrans) (Provided key policy recommendations on environmental conservation, high accident locations, climate change and fluvial erosion data).
- Vermont Departments of Health (VDH) and Environmental Conservation (DEC) (provided information related with public health services that could be impacted during a disaster and state support functions designated to both VDH and DEC. DEC also provided river corridor data for mapping purposes.

- FEMA Open Source (data.gov) Data for Disaster History and PA funding (provided comprehensive declared disaster by year and type as well as project descriptions and cost per event).
- FEMA NFIP "Bureau.Net" database (provided detailed information on repetitive loss properties and associated flood insurance claims).
- EPA's Incident Action Checklist for cold weather resilience of water systems (provides a guidance tool for public works to cross-reference actions on the system).
- UVM's 2021 Vermont Climate Assessment for key climate change data and water resource management actions.

Based on the information obtained, input from town and state officials, the planning team, state and federal databases and local knowledge, the plan was created. While many small communities in Vermont face similar circumstances (e.g., flooding, winter storms and remote residents), each one has unique considerations and opportunities. There was a point made to capture the subtle characteristics of the town. From this, the specific risks, vulnerabilities, and mitigation strategies were developed and when applicable, broken down to the specific entity impacted. The following planning progress and requests for input during select board meetings are summarized below.

- *12/20/24: Project Start*
- *1/6/25: Planning meeting with town POC to establish planning team, alert community of planning process, and post hazard impact survey*
- *1/13/25: Kick-off correspondence with planning team to discuss planning process and hazard impact survey.*
- *2/2/25: Planning presentation at select board meeting and Q&A session with the public.*
- *2/22/25: Correspondence with planning team on hazard risk analysis feedback.*
- *3/4/25: Sections I and II sent to POC for review and comment*
- *3/10/25: Teleconference with POC on plan development and timeline. Outreach to Senior Center and School to collect disaster-related service narrative and concerns. Inquiry to state on flood zone mapping. Road Foreman queried on potential projects during next planning period.*
- *3/14/25: Entire draft plan sent to POC for initial review, feedback and edits returned by 3/16.*
- *3/17/25: Draft plan sent to planning team for review and comment*
- *3/18/25-3/31/2015: Planning team comments collected and integrated into draft plan.*
- *3/31/25-4/2/25: Community and adjacent towns sent notification that the draft plan was available for review and comment.*
- *4/2/25: Draft resubmitted to VEM.*

SECTION 2: HAZARD IDENTIFICATION

As this is considered a first-time plan, there is no previous hazard profile to draw upon. The narrative methodology for the natural hazards profile combines the natural hazard categories outlined in the state mitigation plan and for each, considered prior history, current trends, and available data to estimate risk and as assessed in Section 3's Qualitative Risk Estimation Matrix. These hazards provide the basis of future mitigation strategies. A profiled hazard can have high, moderate, or low risk. Those hazards omitted from full profiling do not pose enough risk to substantiate mitigation efforts at this time due to lack of occurrence frequency and/or vulnerability.

While there are commonalties of natural hazard risk across most of the state and county, awareness of historic events, financial burden, state, and town level assessments can support trajectory for the future mitigation actions. As indicated in the 2023 SHMP, the hazards of most concern across the state are in-line with Lunenburg. As it pertains to town-level assessments, the planning team reviewed the Natural Hazard and Risk Analysis Tool for changes and additions and feel that while the assessment methodology is distinct from the SHMP Hazard Assessment, there are comparative similarities in scoring relationships. The definitions of each hazard, along with historical occurrence and impact, are described below.

Types of Natural Hazards: weather /climate hazards (drought, hurricane/tornado, high winds, severe winter storm, extreme temperatures, climate change, lightning, hail), flooding, geological hazards (landslide / erosion, earthquake, naturally occurring radiation), and fire hazards.

2025 Profiled Natural Hazards:

- Severe Winter/Ice Storm
- Extreme Temperatures (hot and cold)
- Flooding/fluvial erosion/inundation/dam breach
- Infectious Disease
- Drought
- Invasive Species
- High Winds

2.1 Profiled Hazards

The National Oceanic and Atmospheric Administration (NOAA) Storm data shows 166 events were reported between 1/1/2010 and 12/31/2024 in Essex County. These events included winter storms, flooding/flash floods, high wind, extreme cold, and high heat. 117 of the reported events resulted in property damage county-wide. Five events resulted in crop damage. There have been 23 disasters, and 2 emergencies declared in Essex County from 1973 through 2025. These events resulted in $3.4M in property damage and approximately $810K in crop damage. These are significant numbers given Essex County is the least populous county in the northeast. Winter Weather and Winter Storm were the most numerous types of events and Flash Flood and Flood events had the highest damage costs.

Table 2-0: Summary of Vermont Emergency Declarations

Number	Year	Type
4810	2024	Severe Storm, Flooding, Landslides, and Mudslides
3595	2023	Flooding
3567	2021	Tropical Storm Henri
3437	2020	Pandemic (COVID-19) national 3/13/20
3338	2011	Hurricane Irene
3167	2001	Snowstorm
3053	1977	Drought

Source: FEMA

Table 2-1: Summary of Vermont Major Disaster Declarations since 1998 (Essex County: Bold and "" denotes Lunenburg PA received).*

Number	Year	Type
***4826**	**2024**	**Severe Storm, Flooding, Landslides, and Mudslides**
***4810**	**2024**	**Severe Storm, Flooding, Landslides, and Mudslides**
***4720**	**2023**	**Severe Storm and Flooding**
4695	**2023**	**Severe Storm and Flooding**
***4532**	**2020**	**COVID-19**
4474	**2020**	**Severe Storm and Flooding**
4445	**2019**	**Severe Storms and Flooding**
4356	**2018**	**Severe Storm and Flooding**
4380	2018	Severe Storm and Flooding
4330	2017	Severe Storms and Flooding
4207	**2015**	**Severe Winter Storm**
4232	2015	Severe Storms and Flooding
4178	**2014**	**Severe Storms and Flooding**
4163	**2014**	**Severe Winter Storm**
4140	2013	Severe Storms and Flooding
4120	**2013**	**Severe Storms and Flooding**
4066	2012	Severe Storms, Tornado and Flooding
4043	2011	Severe Storms and Flooding
4022	**2011**	**Tropical Storm Irene**
4001	**2011**	**Severe Storms and Flooding**
***1995**	**2011**	**Severe Storms and Flooding**
1951	2010	Severe Storm
1816	2009	Severe Winter Storm
1790	**2008**	**Severe Storms and Flooding**
1784	2008	Severe Storms, Tornado and Flooding
1778	2008	Severe Storms and Flooding
1715	2007	Severe Storm, Tornado and Flooding
1698	**2007**	**Severe Storms and Flooding**
1559	2004	Severe Storms and Flooding
1488	2003	Severe Storms and Flooding
1428	**2002**	**Severe Storms and Flooding**
1358	2001	Severe Winter Storm

3167	2001	Snow
1336	2000	Severe Storms and Flooding
***1307**	**1999**	**Tropical Storm Floyd**
1228	**1998**	**Severe Storms and Flooding**
1101	1996	Severe Storms and Flooding
1063	**1995**	**Severe Storms and Flooding**
938	1992	Severe Storms and Flooding
840	**1989**	**Severe Storms and Flooding**
397	**1973**	**Severe Storms and Flooding**

Source: FEMA

2.1.1. An Introduction to Climate Change

The Town is aware that climate change has the potential to affect the risks caused by many hazards in the future. Climate change poses challenges for the town including more intense storms, frequent heavy precipitation, heat waves and cold spells, extreme flooding, drought conditions, and generally more unstable weather patterns. These climate changes pose risks to both public and private property, as well as economic risks. Engaging the community in developing mitigation strategies that reduce the town's vulnerability to the impacts of climate change and furthering the town's commitment to building a resilient community are important functions of this plan. The 2023 SHMP relays the following:

"Over the past several decades, there has been a marked increase in the frequency and severity of weather-related disasters, both globally and nationally. Most notably, the Earth has experienced a 1°F rise in temperature, which has far-reaching impacts on weather patterns and ecosystems. This statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer), is known as climate change. The Intergovernmental Panel on Climate Change (IPCC) forecasts a temperature rise of 2.5°F to 10°F over the next century, which will affect different regions in various ways over time. Impacts will also directly relate to the ability of different societal and environmental systems to mitigate or adapt to change6. Increasing temperatures are forecasted to have significant impacts on weather-related disasters, which will also increase risk to life, economy and quality of life, critical infrastructure and natural ecosystems. The IPCC notes that the range of published evidence indicates that the costs associated with net damages of climate change are likely to be significant and will increase over time. It is therefore imperative that recognition of a changing climate be incorporated into all planning processes when preparing for and responding to weather-related emergencies and disasters. Most of the natural hazards identified in this plan are likely to be exacerbated by changes in climate, either directly or indirectly. The National Aeronautics & Space Administration (NASA) reports that global climate change has already had observable effects on the environment: glaciers are shrinking, sea ice is disappearing, sea level rise is accelerating, heat waves are occurring more frequently and intensely, river and lake ice is breaking up earlier, plant and animal ranges have shifted, and trees are flowering sooner. Though climate change is expected to have global reach, the impacts differ by region. While the southwestern United States is expected to experience increased heat, wildfire, drought and insect outbreaks, the northeastern region is predicted to experience increases in heat waves, downpours and flooding. Accordingly, consideration of climate change was identified as a key

guiding principle of the 2023 SHMP, addressed in each of the pertinent hazard profiles and incorporated into all relevant mitigation actions."

From 1973 to 2006 (33 years), there were 13 Major Disaster Declarations in Vermont. From 2007-2024 (17 years), there were 31. In essence, more than double the disasters in half the time. It is commonly accepted that weather extremes are becoming more commonplace in Vermont. Since 2011, record setting snow, rain and cold have been experienced in the state. In recent years, it has become evident that human activities, mostly associated with the combustion of fuel, have added to the natural concentration of greenhouse gases in the atmosphere and are contributing to rapid climate change on a global scale. While projections of the effects of climate change vary, it is generally predicted that Vermont will have warmer temperatures year-round, with wetter winters and drier summers. An increase in the size and frequency of storms is also predicted. Thus, climate change in the next century will likely increase the chance of weather-related hazards occurring. An increase in precipitation may also result in increased flooding and fluvial erosion. Drier summers may increase the chance of drought and wildfire. A warmer climate may also result in the influx of diseases and pests that cold winters previously prevented. The severity of climate change is difficult to predict, though the effects may be mitigated somewhat if greenhouse gas emissions are reduced soon. The Vermont Climate Action Office (CAO) coordinates and provides significant expertise and capacity on state-led climate initiatives, as well as the monitoring, assessment and tracking of climate adaptation, mitigation, and resilience activities necessary to evaluate progress over time in achieving the requirements of the Global Warming Solutions Act (GWSA) through implementation of the Climate Action Plan. The CAO is a division within the Agency of Natural Resources (ANR) Secretary's Office, and is focused on three core areas:

- Climate Program Coordination
- On-going support of implementation of the Global Warming Solutions Act (GWSA)
- Community and Stakeholder Engagement

The 2022 NOAA National Centers of Environmental Information State Climate Summary concludes:

1. *Temperatures have risen about 3 degrees Fahrenheit since the beginning of the 20th Century in Vermont. 2010-2020 was the warmest 11-year period on record. As warming trends continue, the intensity extreme winter cold is projected to decrease.*
2. *Average annual precipitation has increased almost 6 inches since 1960.*
3. *Extreme weather events (e.g., floods and severe storms) are having a stronger impact on Vermont and extreme rainfall is projected to become more frequent and intense while long-term droughts continue to pose challenges to water-dependent sectors.*

The Vermont Climate Assessment has established state-level climate change information with implications for local surface waters. Vermont's average annual temperature has increased by almost 2°F (1.11°C) since 1900 with warming occurring twice as fast in winter. The assessment highlights five key messages for water resources in Vermont:

• Due to extreme variation in precipitation with our changing climate, periods of prolonged dry-spells and drought, coupled with higher water usage in snowmaking and agriculture could exacerbate low water availability.

• Increases in overall precipitation, and extreme precipitation, have caused streamflows to rise since 1960. Climate change will further this pattern, although the overall increase in streamflow comes with disruptions in seasonal flows cycles.

• Increases in heavy precipitation jeopardize water quality in Vermont. Storms produce large runoff events that contribute to erosion and nutrient loading. Combined with warm temperatures, this creates favorable conditions for cyanobacteria blooms.

• Increased occurrence of high streamflows increase the risk of flooding that causes damage to many roads and crossing structures. Risk reduction requires addressing outdated and unfit structures.

• Nature-based solutions are an effective, low-cost approach to climate change adaptation. River corridor, floodplain, and wetland protection dampen flood impacts and improve water quality along with green infrastructure.

2.1.2 Profiled Hazards

While not all severe weather events that impacted the county were experienced in Lunenburg, the frequency of occurrence of event type helps to support the hazard profile in addition to the qualitative risk analysis included in this plan. Below is a discussion on each hazard profiled in this plan.

Severe Winter/Ice Storm

In Essex county, 48 "winter storm" events were reported between 01/01/2010 and 12/30/2024 (noaa.gov). These events resulted in $370K in property damage and $10k in crop damage. Town assets were not damaged during these events. An additional 44 "winter weather" events occurred during this span and accounted for $182K in property damage but no crop damage. 2 "heavy snow" events with $20K in property damage occurred. No town assets were damaged during these events. There were no recorded ice storms during this period. In Lunenburg, snow, ice, and cold events have historically caused temporary road and bridge closures affecting access to regional medical facilities, power outages impacting town offices and garage, and increased heating demands that place vulnerable populations at risk. Historically however, the duration has been brief and quickly mitigated. According to the *2023 State Hazard Mitigation Plan*:

"Severe winter storms bring the threat of heavy accumulations of snow, cold/wind chills, strong winds, and power outages that result in high rates of damage and even higher rates of expenditures. A heavy accumulation of snow, especially when accompanied by high winds, causes drifting snow and very low visibility. Sidewalks, streets, and highways can become extremely hazardous to pedestrians and motorists. Severe winter storms develop through the

combination of multiple meteorological factors. In Vermont and the northeastern United States, these factors include the moisture content of the air, direction of airflow, collision of warm air masses coming up from the Gulf Coast, and cold air moving southward from the Arctic. Significant accumulations of ice can cause hazardous conditions for travel, weigh down trees and power lines, and cause power outages. Freezing rain can also be combined with snowfall, hiding ice accumulation and further hindering travel, or with mixed precipitation and potentially ice jams or flooding."

Vermont is known for its cold snowy winters and Vermont towns and their residents are generally equipped to handle this weather. It is when the winter weather becomes extreme that a hazard is created. Severe winter storms bring heavy snow loads, ice, damaging winds, dangerous wind chills, below zero temperatures, power outages, downed trees and power lines, collapsed roofs and buildings, stranded motorists and vehicles, road closings, restricted transportation, and school and business closings. The physical impacts of winter storms are town wide due to the expansive nature of winter storms. A winter storm is defined as a storm that generates enough snow, ice or sleet to result in hazardous conditions and/or property damage.

Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is like hail only smaller and can be easily identified as frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to wires or trees, but in sufficient depth, can cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surfaces coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. Periods of extreme cold tend to occur with these events. One of the major problems associated with ice storms is the loss of electrical power. Major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by ice, severe winds and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes and placing new distribution lines underground. 2014 marked the last major ice storm resulting in significant damage for many towns in the NEK but it was the 1998 ice storm that was the most severe state-wide.

NOAA's National Centers for Environmental Information is now producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, like the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. NCEI has analyzed and assigned RSI values to over 500 storms going as far back as 1900. New storms are added operationally. As such, RSI puts the regional impacts of snowstorms into a century-scale historical perspective. The index is useful for the media, emergency managers, the public and others who wish to compare regional impacts between different snowstorms. The RSI and Societal Impacts Section allows one to see the regional RSI values for particular storms as well as the area and population of snowfall for those storms. The area and population are cumulative values above regional specific thresholds. For example, the thresholds for the Southeast are 2", 5", 10", and 15" of snowfall while the thresholds for the Northeast are 4", 10", 20", and 30" of snowfall. 2010, 2012 and 2015 have some of the highest rankings for notable storms. These rankings are based, in part on the severity of the storm using the following system. NOAA defines heavy snow as generally snowfall accumulating to 4" or more in depth in 12 hours or less; or snowfall accumulating to 6" or more

in depth in 24 hours or less. In forecasts, snowfall amounts are expressed as a range of values, e.g., "8 to 12 inches." However, in heavy snow situations where there is considerable uncertainty concerning the range of values, more appropriate phrases are used, such as "...up to 12 inches..." or alternatively "...8 inches or more..." A Blizzard is defined as conditions that are expected to prevail for a period of 3 hours or longer that involve sustained wind or frequent gusts to 35 miles an hour or greater; and considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than a ¼ mile). January 2016 was the last category 5 storm for the NE. The following table lists major NE snowstorms since the last approved plan. However, Lunenburg remained relatively insulated from major damage or disruption.

Table 2-2: Major Northeast Snowstorms 2018-present

Event Date	Category	Description
January 3–5, 2018	1	Notable
March 1–3, 2018	1	Notable
March 5–8, 2018	2	Significant
March 11–15, 2018	2	Significant
March 20–22, 2018	1	Notable
December 14–18, 2020	2	Significant
January 30–February 3, 2021	3	Major
January 3-4, 2022	1	Notable

Table 2-3: NOAA's Regional Snowfall Index (RSI)

CATEGORY	RSI VALUE	DESCRIPTION
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

Regionally, the winter of 2010-2011 was the third snowiest on record with a total of 124.3 inches. In any Vermont community, this potential exists every winter for a storm that exceeds immediate capacity. Regional historic January snowfall totals fell in 1987 (47.5''), 1978 and 1979 (46.5'', 45.8''). Total average snowfall for the region in December is 26.2'', January is 22.6'', February averages are slightly less at 16.9'' and March is 18.3''. February 14th-15th, 2007 saw the greatest 24-hour max snowfall total at 23.5''. While declared snowstorm disasters have been declared for the county, Lunenburg has not received PA funding for these events. Because such storms are expected during a Vermont winter, the town is well-equipped to deal with snow removal and traffic incidents. This leads to widespread and numerous power and telephone outages as lines either collapse due to the ice weight or are brought down by falling trees and branches.

There are no standard loss estimation models or methodologies for the winter storm hazards. Potential losses from winter storms are, in most cases, indirect and therefore difficult to quantify. According to the 2014 National Climate Assessment, there is an observable increase in severity of winter storm frequency and intensity since 1950. While the frequency of heavy snowstorms has increased over the past century, there has been an observed decline since 2000 and an overall decline in total seasonal snowfall (*2023 SHMP*). Refer to Table 2-4 for winter storm event narrative by date in the county during the last planning period.

The lack of power and telecommunications throughout the town is especially concerning for the most vulnerable populations; the elderly, disabled and medically dependent. Lack of access to power and telecommunication services can hinder response efforts. The Town equipment (trucks, plows, etc.) is maintained on a regular schedule and the Select board with the input from the Road Foreman, budget for equipment replacement.

Many of the impacts from these hazards can be reduced by using common sense and practicing preparedness measures such as staying off the snow and ice covered roads until they are cleared, having vehicles equipped with proper winter gear and snow tires, using moderation and resting when removing snow and cleaning up from a storm, keeping heating pipes cleared and well ventilated, keeping roofs clean of heavy snow/ice loads, checking on and helping the elderly and disabled residents of the community, and listening to the local weather forecast for storms. Participating in the free VT Alert system is highly encouraged and an important resource in emergency preparedness.

Based on past occurrences, the worst anticipated winter weather Lunenburg could experience would be 2 to 3 feet of snowfall in a 24-hour period with more totals at higher elevations and several days of power outages.

Extreme Cold

NOAA defines extreme cold as a wind chill of -25°F or colder but there is variance in regional definitions. A cold weather advisory is issued when temperatures are expected to fall below -15°F. Since 2010, 3 "cold/windchill" and 4 "extreme cold/windchill" events occurred with no property or crop damage. 3 of the extreme cold/windchill events have occurred since 2022.

An arctic cold front moved across VT Friday night (1/14/22) creating dangerously cold wind chills of -25° to -40°F overnight Friday night into Saturday morning. Overnight air temperatures were -10° to -20°F. The 2023 SHMP states:

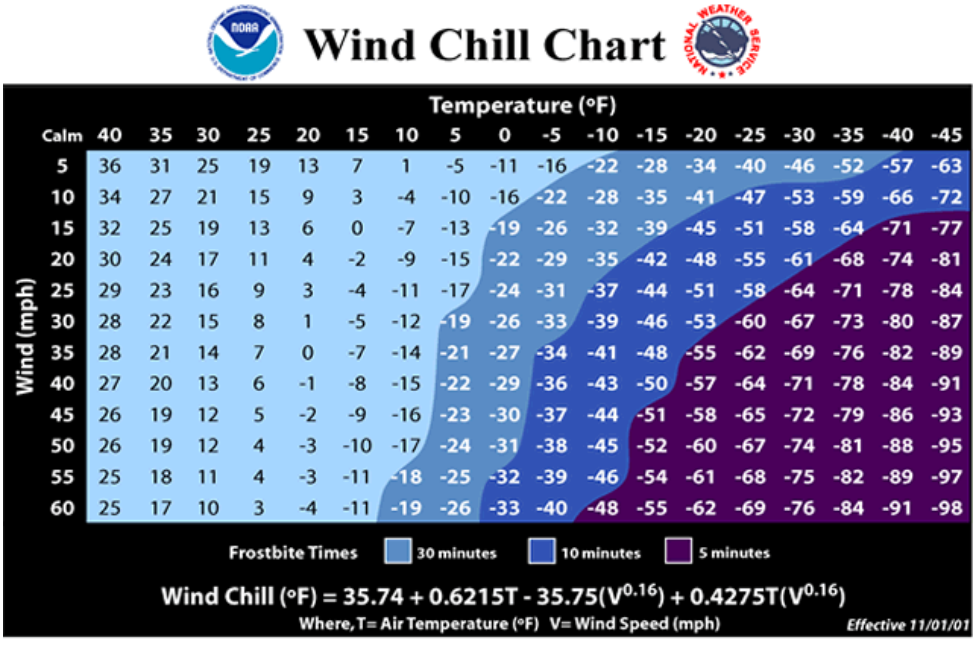
"Extreme cold temperatures can have significant effects on human health and commercial and agricultural businesses, as well as primary and secondary effects on infrastructure (e.g. burst pipes from ice expansion and power failure). What constitutes "extreme cold" can vary across different areas of the country based on what the population is accustomed to in their respective climates. Exposure to cold temperatures can cause frostbite or hypothermia and even lead to heart attacks during physically demanding outdoor activities like snow shoveling or winter hiking. When temperatures dip below freezing, incidents of icy conditions increase, which can lead to dangerous driving conditions and pedestrian-related slipping hazards.

A large area of low pressure and cold air surrounding the poles, known as a polar vortex, is strengthened in the winter (Figure 44). When these polar vortex winds are distorted, due to cyclical strengthening and weakening or interaction with high-amplitude jet stream patterns, they have the potential to split into two or more patterns, allowing artic air to flow southward along a jet stream1. As this arctic air is able to access more southerly regions, extreme cold conditions can be observed in Vermont, which also have the potential to remain over the region for extended periods."

Recent extremes in cold temperatures are a concern and impact the entire town and region. 2015 tied the coldest winter (January to March) on record (1923) for Vermont according to the NOAA's National Climatic Data Center whose dataset dates to 1895. Cold temperatures are expected in the Northeast, but they can pose a serious threat to health and safety, especially as the severity and duration increases in conjunction with other technological (e.g., power outage, fuel oil delivery disruption) and societal (ability to purchase heating fuel) factors. Risk to people during major snow events include being trapped in vehicles, unable to drive on snow covered roads, increased risk of vehicle accidents, hypothermia, and dehydration. Additionally, heavy snow can cause roofs to collapse which can injure or kill people inside. Climate change can cause trajectory alterations in a polar vortex and move them more south.

The NOAA Wind Chill Chart identifies those temperatures and associated wind speeds that may cause frostbite if skin is exposed to the air over a certain period.

Table 2-5: NOAA Wind Chill Chart



In anticipation of extreme cold temperatures, the National Weather Service may issue the following watches, warnings or advisories, which are aimed at informing the general public as well as the agricultural industry:

• ***Wind Chill Warning****: Dangerously cold wind chill values are expected or occurring*
• ***Wind Chill Watch****: Dangerously cold wind chill values are possible*
• ***Wind Chill Advisory****: Seasonably cold wind chill values but not extremely cold values are expected or occurring*
• ***Hard Freeze Warning****: Temperatures are expected to drop below 28°F for an extended period of time, killing most types of commercial crops and residential plants*
• ***Freeze Warning****: Temperatures are forecasted to go below 32°F for a long period of time, killing some types of commercial crops and residential plants*
• ***Freeze Watch****: Potential for significant, widespread freezing temperatures within the next 24-36 hours*
• ***Frost Advisory****: Areas of frost are expected or occurring, posing a threat to sensitive vegetation*

Flooding

Since 2010, there have been at least 15 events of flooding and flash flooding in Lunenburg, Flooding mainly occurs when small streams overflow and run down into town where the population is concentrated. Overall, flooding is the most common recurring hazard event in the state of Vermont.

There are three main types of flooding that occur in Vermont: flooding from rain or snow melt, flash flooding and urban flooding. Flooding has also been known to occur because of ice jams in rivers adjoining developed towns and cities. While ice jam risk for the town is considered low, these events may result in widespread damage in major river floodplains or localized flash flooding caused by unusually large rainstorms over a small area. The effects of all types of events can be worsened by ice or debris dams and the failure of infrastructure (especially culverts), private and/or beaver dams. Rainstorms are the cause of most flooding in town. Winter and spring thaws, occasionally exacerbated by ice jams, are another significant source of flooding, especially when coupled with high rain levels. Much of this flooding is flash flooding, occurring within hours of a rainstorm or other event. Flash flooding, as opposed to flooding with a gradual onset, causes the largest amount of damage to property and infrastructure. Flash flooding is characterized by intense, high velocity torrent of water that occurs in an existing river channel with little or no notice. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurling debris that is often swept up in flow. This type of flooding threatens high-elevation drainage areas and typically occurs during summer when a large thunderstorm or a series of rainstorms result in high volumes of rain over a short period of time, particularly on already saturated soils from a spring melt. Floods cause two major types of damage: water damage from inundation and erosion damage to property and infrastructure. The 2023 State Hazard Mitigation Plan discusses flooding extensively:

"Flooding is the most common recurring hazard event in Vermont. In recent years, flood intensity and severity appear to be increasing. Flood damages are associated with inundation flooding and fluvial erosion. Data indicate that greater than 75% of flood damages in Vermont,

measured in dollars, are associated with fluvial erosion, not inundation. These events may result in widespread damage in major rivers' floodplains or localized flash flooding caused by unusually large rainstorms over a small area. The effects of both inundation flooding and fluvial erosion can be exacerbated by ice or debris dams, the failure of infrastructure (often as a result of undersized culverts), the failure of dams, continued encroachments in floodplains and river corridors, and the stream channelization required to protect those encroachments."

The Town of Lunenburg has a history of flooding with the May floods of 2011 (DR 4001) being the most catastrophic in terms of damage costs with 11 projects receiving $564K in Federal funding.

The town is susceptible to both flash flooding in higher elevation areas and overbank flooding in some lower lying areas. These events are frequently caused by excessive rainfall over an extended period of time, heavy spring snow runoff, and ice jams. The damage from a river flood can be widespread as overflow affects rivers and streams downstream and can cause dams and dikes to break, inundating lower lying areas. Fluvial erosion of riverbanks, which often accompanies flood events due to the narrow stream valleys and steeply sloped topography, can severely threaten mountain communities. This is because most of rural town development lies in valley areas along rivers and streams. Infrastructure and structures within the narrow stream valleys receive drainage from the higher elevations and are often the most vulnerable to damage from flash flooding. Although flash floods are not frequent events, hazards posed can be significant as seen with the state-wide flooding from Tropical Storm Irene in the summer of 2011 and to some extent, the July 2023 flood event.

Essex County received nearly 6 inches of rain in June 2015, but flooding did not result. This amount is high but not highest for the region. 9.65'' fell in 1973 in Saint Johnsbury and the greatest 24-hour rainfall records for the town occurred on May 30th, 2011, at 6.47''.

In July of 2023, catastrophic flooding caused by a storm system that dropped between 6 to 9 inches of rain in many areas throughout the state resulted in catastrophic damage to many areas in the state. Fortunately, Lunenburg was spared from significant impact from this event. The storm, which initially struck New York before moving to New England, resulted in severe flooding that shut down major roads and highways and prompted hundreds of evacuations. Two major rivers, the Winooski and the Lamoille, surpassed water level records set during 2011's Hurricane Irene. Statewide, the impact on individuals and businesses was unprecedented during the July 2023 event. Equally unique was that the damage to homes was not caused by river flooding, but either existing brooks that jumped their banks, or surface water from runoff entering their homes. Water entering from existing basement drains was another major contributor to basement flooding. The event was a reminder how severe and relatively arbitrary damage locations can be based on weather patterns. People are at risk during flooding events. Vehicles crossing inundated roads can be swept away in the current causing significant safety risks to drivers and rescue services. Electrical systems can short circuit, increasing risk of electrocution and homes can be flooded, exposing people to toxins in the present tense and in the future with mold development. Water systems can become contaminated, furthering risk to health. The Town suffered approximately $85k in road damages as a result of the July 2023

flooding. The heaviest damage was to dirt roads with the most damage on Baptist Hill, Pond Hill, and Cole Hill. Repairs included culvert replacement, debris clearing, replacing road materials lost due to flooding and ditching.

Exactly to the day, another storm brought flooding to the state in July 2024. Damage was extensive, with significant damage in central Vermont and counties east and west. Lunenburg was impacted significantly. About $100k in road damage occurred. Baptist Hill continued to receive significant damage, but two primary areas on Class 2 River Road suffered significant damage which included loss of paved roadway, significant bank erosion and guardrail loss. In addition, the Village of Gilman suffered loss of a culvert at the intersection of River Road and Baptist Hill. An auxiliary access road was completely washed out into the pathway of River Road. Several homes suffered basement flooding, and one resident lost their home. On a positive note, during the July 24 flooding, Pond Hill held very well as a result of repair work that took place after the July 2023 flooding.

Table 2-7: Bulk PA Funding as a Result of Flooding

Disaster Number	Declaration Date	Incident Type	Applicant Name	Number of Projects	Federal Share Obligated
4810	08/20/2024	Severe Storm, Flooding, Landslides, and Mudslides	LUNENBURG (TOWN OF)	Pending (P)	$85,000 (P)
4720	07/14/2023	Severe Storm and Flooding	LUNENBURG (TOWN OF)	Pending (P)	$100,000 (P)
1428	07/12/2002	Severe Storm(s)	LUNENBURG (TOWN OF)	2	$7,411.73
1698	05/04/2007	Severe Storm(s)	LUNENBURG (TOWN OF)	3	$10,062.56
1995	06/15/2011	Severe Storm(s)	LUNENBURG (TOWN OF)	1	$12,574.82
4001	07/08/2011	Severe Storm(s)	LUNENBURG FIRE DISTRICT #1	1	$5,273.22
4001	07/08/2011	Severe Storm(s)	LUNENBURG (TOWN OF)	11	$564,337.61
4022	09/01/2011	Hurricane	LUNENBURG (TOWN OF)	1	$24,346.84

The Federal Emergency Management Agency (FEMA) has designated floodplains in the town. As defined below, the areas along these rivers are particularly at risk for flooding and are identified by FEMA as 100-year floodplain. Areas within the river corridor are also considered

areas of flood and erosion risk as rivers and streams seek equilibrium in accommodating the high flows causing major flood and erosion damage outside of special flood hazard areas. Vermont Agency of Natural Resources has mapped river corridors for these stream segments along with special flood hazard areas. The ANR FLOOD READY link shows river corridors overlays and FEH zones.

Table 2-8: Flood Zone Definitions

Flood Zone Definitions	
Floodway	The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height; also known as the regulatory floodway as designated and determined by FEMA.
Floodway Fringe or Floodplain	The remaining portion of special flood hazard areas after exclusion of the floodway; also known as floodplain.
Fluvial Erosion	The erosion or scouring of riverbeds and banks during high flow conditions of a river. Fluvial erosion can be catastrophic when a flood event causes a rapid adjustment of the stream channel size and/or location.
Fluvial Erosion Hazard Zone	Includes the stream and adjacent lands necessary to accommodate the slope and plan form requirements of a geomorphically stable channel and is subject to fluvial erosion as defined by the Vermont Agency of Natural Resources and delineated on the current Fluvial Erosion Hazard Zone Map.
Special Flood Hazard Area	The land in the flood plain within a community subject to a 1 percent or greater chance of flooding in any given year; also known as floodplain. As designated by FEMA.
River Corridor	The land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition and for minimization of fluvial erosion hazards, as delineated by the Agency of Natural Resources in accordance with river corridor protection procedures.

The following chart indicates the history of occurrence with regard to this hazard in Lunenburg. Data on the fluvial erosion damage in number of acres lost was not found for the events. Fluvial erosion extent data is unavailable. Information to complete the history of occurrences was taken from the National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI), formally the National Climate Data Center, the FEMA Declared Disasters in Vermont data base, the State of Vermont Hazard Mitigation Plan, and town records.

Table 2-9: History of Major Flood Occurrences

Date and Disaster Declaration Number if applicable	Event (By FEMA classification)	Location	Extent and impacts
8/20/2024 DR 4810	Severe Storm, Flooding,	Countywide	The Town is working with FEMA to recover more than $100k in road damages due to the

	Landslides, and Mudslides		July 2024 flooding. Baptist Hill continued to receive significant damage, but two primary areas on Class 2 River Road suffered significant damage which included loss of paved roadway, significant bank erosion and guardrail loss. In addition, the Village of Gilman suffered loss of a culvert at the intersection of River Road and Baptist Hill. An auxiliary access road was completely washed out into the pathway of River Road. Several homes suffered basement flooding and one resident lost their home.
7/7/2023 DR 4720	Severe Storm and Flooding	Countywide	A storm system dropped between 6 to 9 inches of rain in many areas throughout the state. Two major rivers, the Winooski and the Lamoille, surpassed water level records set during 2011's Hurricane Irene. The storm initially struck New York before moving to New England and resulted in severe flooding that shut down major roads and highways and prompted hundreds of evacuations. The flooding caused 14 Vermont rivers to be in flood stage 2. The Town suffered approximately $85k in road damages as a result of the July 2023 flooding. The heaviest damage was to dirt roads with the most damage on Baptist Hill, Pond Hill, and Cole Hill. Repairs included culvert replacement, debris clearing, replacing road materials lost due to flooding and ditching.
8/26/2011 – 9/2/2011 DR 4022-VT	Tropical Storm causing mass, severe flooding and flash flooding, and fluvial erosion.	Countywide	Tropical Storm Irene tracked north northeast across eastern New York and western New England producing widespread flooding, and damaging winds across the region. The greatest impact across central and southern Vermont was due to catastrophic flash flooding as a result of 4 to 7+ inches of rainfall Lunenburg had moderate damage from this event.
April 27, 2011	Flood	Countywide	Snowmelt from an above normal snowpack and daytime high temperatures in the 50s and 60s on the 25th and 26th, combined with rainfall of a half to one inch early on the 26th to set the stage for a significant flood event across the region. Late in the day on the 26th into the early morning hours of the 27th thunderstorms repeatedly moved over central and northern Vermont, dumping over two inches of rain into already saturated soils and swollen rivers and streams. Flash flooding during the overnight hours late on the 26th quickly transitioned into river flooding by the morning of April 27. Runoff from heavy rain and snowmelt caused

			flash flooding across Essex County VT. Numerous roads and culverts were washed out. In Beecher Falls, several homes were flooded and the fire station was flooded by 6 feet of water. This event resulted in the most significant damage historically at well over $563k in total project costs.
The Great New England Hurricane of 1938	Flood/Flash Flood Severe Storm	Countywide	One of the most powerful and destructive hurricanes to hit southern New England and the region of Southeast Vermont with winds over 100 mph. Authorities were unaware of the magnitude so no evacuation procedures were instituted and very few precautions were taken. The only tropical cyclone to make a direct hit on Vermont in recorded history. Hurricane-force winds caused extensive damage to trees, buildings, and power lines.
11/02/1927-11/04/1927 (Flood of 1927)	Flood	Countywide	Montpelier flood gauge at 27.10 feet. One of VT's worst disasters. Heavy rain, 4-9 inches statewide, fell on frozen ground. Damage and loss of live occurred with 84 deaths, over 1,000 bridges taken out, over 600 farms and businesses destroyed, and miles of roads and railways claimed. No specific data for Town of Lunenburg.

Inundation and Floodplains

The state has further identified and classified roads at risk of erosion. Regarding flood inundation issues, the *2023 State Hazard Mitigation Plan* states:

Inundation flooding is the rise of riverine or lake water levels, while fluvial erosion is streambed and streambank erosion associated with physical adjustment of stream channel dimensions (width and depth). Both inundation flooding and fluvial erosion occur naturally in stable, meandering rivers and typically occur as a result of any of the following, alone or in conjunction:

• Rainfall: Significant precipitation from rainstorm, thunderstorm, or hurricane/tropical storm. Flash flooding can occur when a large amount of precipitation occurs over a short period of time.
• Snowmelt: Melted runoff due to rapidly warming temperatures, often exacerbated by heavy rainfall. The quantity of water in the snowpack is based on snow depth and density.
• Ice Jams: A riverine back-up when flow is blocked by ice accumulation. Often due to warming temperatures and heavy rain, causing snow to melt rapidly and frozen rivers to swell.

Inundation and fluvial erosion may both increase in rate and intensity as a result of human alterations to a river, floodplain, or watershed. For instance, when a dam fails there may be significant, rapid inundation which can occur without warning. Public and private structures

and infrastructure become vulnerable when they are located on lands susceptible to inundation and fluvial erosion.

Riverine Inundation Flooding:
The land area where inundation flooding occurs is known as the floodplain. During high water events, water flows out of the riverbank and spreads out across its floodplain. FEMA defines the portion of the floodplain inundated by the 1% annual chance flood as the Special Flood Hazard Area (SFHA); the area where the National Flood Insurance Program (NFIP) floodplain management regulations must be enforced and where the mandatory purchase of flood insurance applies for federally secured loans.

Inundation flooding on larger rivers and streams typically occurs slowly, over an extended period but can spread out over a large area of land. Due to the slower onset of inundation flooding on larger rivers, there is time for emergency management planning (e.g. evacuations, electricity shut-off considerations, etc.) to take place. Though the inundation floodwaters are slower to hit, they often take time to recede as well, and exposure to water for an extended period of time can result in significant property damage. U.S. Geological Survey's (USGS) National Water Information System monitors real-time streamflow gaging stations in Vermont.

Fluvial Erosion

Fluvial erosion occurs most significantly during flood events, and therefore the history of occurrences for flood also includes fluvial erosion. High risk locations are in the mapped SFHA and River Corridors. This erosion occurs on a consistent, but small-scale, basis within the riparian corridor of the town streams and rivers. This is a part of normal natural processes and as such is necessary for the proper functioning of the ecosystem of these waterways. However, fluvial erosion on a large scale can damage stream banks and undercut infrastructure such as roads, bridges and culverts as well as agricultural land and structures, causing severe damage. Fluvial erosion on a large scale can cause stream bank collapses, which are generally classified as landslides. Most flood damage is associated with fluvial erosion rather than inundation. The *2023 State Hazard Mitigation Plan* contains the following discussion of fluvial erosion:

In Vermont, most flood-related damage is due to fluvial erosion. Erosion occurs when the power of the flood (i.e. the depth and slope of the flow) exceeds the natural resistance of the river's bed and banks. Rivers that have been overly straightened or deepened may become highly erosive during floods, especially when the banks lack woody vegetation, or when the coarser river bed sediments have been removed. In areas where rivers are confined due to human activity and development, they have become steeper, straighter, and disconnected from their floodplains. The more trapped the river is, the greater power it will gain, which eventually results in a greater degree of damage to critical public infrastructure such as roads and stream crossings, as well as homes, businesses, community buildings and other man-made structures built near rivers. Fluvial erosion is also increased downstream when all the eroded materials (i.e., sediment and debris) come to rest in a lower gradient reach, clog the channel, and cause the river to flow outside its banks. When severe enough, fluvial erosion can also be the cause of Landslides (see Landslides). The land area that a river accesses to meander and overtop its banks to release flood energy without excessive erosion is known as the River Corridor. A river corridor includes

the meander belt of a stream or river and a buffer of 50'. The River Corridor, as defined in Vermont statute, is: the land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition, as that term is defined in section 1422 of this title, and for minimization of fluvial erosion hazards, as delineated by the Agency of Natural Resources in accordance with river corridor protection procedures.

Vermont's River Corridor maps delineate river corridors for larger streams and rivers, and standard setbacks for smaller, upland streams. The setbacks were determined by factoring in the same stable stream slope requirements used when delineating a river corridor using a meander centerline setback. These maps are located on the Vermont FloodReady3 and Vermont Natural Resources Atlas websites.

Erosion is exacerbated by failure of infrastructure including roads, culverts, bridges and dams. The sediment and stone that is dislodged can expose roots of trees and vegetative buffers which become detached and carried downstream blocking culverts and bridges causing further flood damage. Lunenburg's exposure is limited by the length and character of the rivers within the town, the potential for significant property damage under unique circumstances is a concern. Therefore, new river corridor data will be evaluated as it becomes available to identify any potential problem areas and any measures that will minimize or eliminate the impact of fluvial erosion shall be implemented. No extent data is available for the town of Lunenburg.

Ice Jams and Dam Failure

Ice jams, which can cause rapid and catastrophic flooding, are considered increasingly hazardous in parts of Vermont. In addition to the inundation damage they cause, ice jams can block infrastructure such as roads and culverts. Ice jams pose a risk in the town. Jams on the Moose River near Fornier Road can block the road in one example. A list of historic ice jams, including municipalities and streams, is maintained by VEM and the Vermont Agency of Natural Resources (ANR). The US Army Corps of Engineers Cold Regions Research and Engineering Laboratory maintains a more specific database of ice jams, which includes over 987 events in Vermont with the latest occurring in 2025. The Connecticut River ranks number one in the state for most ice jams. Despite this statistic, Lunenburg has not experienced any ice jams.

Upstream on the Connecticut River is the Gilman Dam and the Stratford Dam. There is little or no residential or business population along Connecticut River. A dam failure may occur for multiple reasons, such as an overtopping caused by floods that exceed the capacity of the dam, deliberate acts of sabotage, structural failure, movement of the foundation supporting the dam, soil erosion in embankment dams, and inadequate maintenance and upkeep. VEM classifies dams according to the potential impact on loss of life and property damage to downstream areas if it were to fail. The Downstream Classification System used by the State is the same as that used by the U. S. Army Corps of Engineers and is shown below.

Table 2-10: Downstream Classification System

Class	Hazard Category	Potential Loss of Life	Potential Property Damage
3	Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structure or agriculture)
2	Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry, or structures)
1	High	More than few	Excessive (Extensive community, industry, agriculture)

Dam dewatering is the manipulation of waterflow from a dam to reduce pool level and risk of a dam breach and to manage or eliminate flooding damage upstream. According to the *2023 State Hazard Mitigation Plan*:

> "*The VT Agency of Natural Resources (ANR) Dam Safety Program maintains an inventory of 1205 dams (including 85 ANR owned dams) with impoundments greater than 500,000 cubic feet*".

Failure of any of these dams could result in significant downstream flooding. There are 55 high hazard dams on the dam inventory, none of which are considered at significant risk for failure in the town. There have been no recent or historically relevant flooding events associated with the failure of any dam in Vermont. However, as stated in FEMA Guide P-956 "*Living with Dams: Know Your Risks*" (2013): "Although dam failures are infrequent, the impacts can be catastrophic, often far exceeding typical stream or river flood events." The Gilman Dam is rated "low risk" by the Vermont ANR Dam Safety Program.

Extreme Heat

NOAA defines extreme heat as a period of high heat and humidity that lasts several days. The National Weather Service (NWS) issues alerts when temperatures are expected to exceed 105°F. Heat impacts all health systems and impacts everyone without effective cooling and/or adequate hydration.

2023 was the hottest year on record for Vermont. Extreme heat and prolonged periods of hot weather have direct and indirect effects on other hazards such as drought, wildfire, invasive species, and infectious disease. Vermont has a climate where extreme heat is less likely than other regions in the country. However, heat-related events do occur and are beginning to occur in much greater frequency. While climate change specific to extreme temperatures is considered a high risk, associated hazards are not, by default, included as high risk. Vermont has a climate where extreme heat may be less likely than other regions in the country, but observation of temperature increases in the state have resulted in some concern. Extreme maximum temperatures are often observed during drought years, and in many cases, the records that are broken were long-standing and set during previous droughts. It should be noted that a heat wave could be either a boon or a bane depending upon the time of year and the antecedent conditions.

For example, the hot conditions of August 1996 followed a cool, wet summer, thereby providing an extra boost for plants. The 2023 SHMP states:

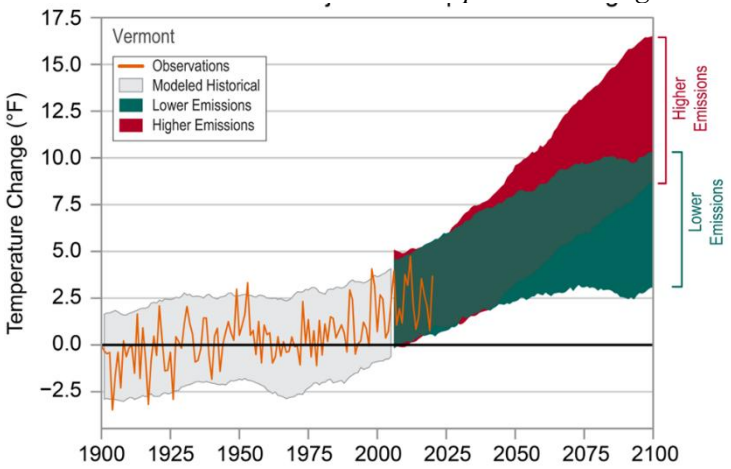
"Extreme hot temperatures can have significant effects on human health and commercial and agricultural businesses, as well as primary and secondary effects on infrastructure (e.g. damage to asphalt roadways from softening). What constitutes "extreme heat" can vary across different areas of the world based on what the population is accustomed to in their respective climates. An example of this difference in acclimatization can be understood when comparing analyses of excess mortality due to heat: in New York City, the data show that the heat index threshold needs to reach at least 95°F to measure a significant rise in heat-related mortality, whereas the threshold in Montreal, Canada, only 400 miles north, is 91°F and did not need to factor in heat index. Similar epidemiological analyses completed by the Vermont Department of Health suggest that the heat threshold in which hospitals in the State see a rise in heat-related emergency room visits is 87°F1 . Temperature fluctuations are a result of several meteorological processes2 . Due to the tilt of Earth's axis, regions of the globe receive varying levels of solar radiation. The delta between these levels produces circulation patterns at the global level, which drive air and storm system movement via air masses. Air masses, as defined by NOAA, are thousands of feet thick and extend across large areas of the earth. Air masses that form over tropical ocean regions will become exceptionally hot and humid, while those masses above high latitude continents will become cool and dry. When these air masses meet, a front is created; fronts can either be cold or warm. In addition to these air mass and front-related impacts humans feel at ground level, movement of narrow bands of strong wind high in the atmosphere, known as jet streams, maneuver weather systems below and transfer heat and moisture across the globe. The speed and intensity of the jet stream will affect the duration and temperature associated with a cold or warm front. Extremely high temperatures can occur when a high-pressure system (under which air is descending toward the Earth's surface) develops and intensifies. Under such conditions, the potential for a heat wave exists. A heat wave is a period of three or more consecutive days during which the maximum temperature meets or exceeds 90°F." 2023 SHMP

In anticipation of extreme heat events, the NWS may issue the following advisories:

- *Excessive Heat Outlook: A period of excessive heat is possible within the next 3 to 5 days.*
- *Heat Advisory – Take Action: A period of excessive heat is expected. The combination of hot temperatures and high humidity will create a situation in which heat related illnesses are possible. Heat Advisories are issued when heat indices are expected to reach at least 95°F*
- *Excessive Heat Watch: A prolonged period of dangerous excessive heat is possible within about 48 hours.*
- *Excessive Heat Warning – Take Action: A prolonged period of dangerous excessive heat is expected within about 24 hours. The combination of hot temperatures and high humidity will create a situation in which heat related illnesses are possible. Excessive Heat Warnings are issued when heat indices are expected to reach at least 105°F.*

The National Centers for Climate Information show that temperatures in Vermont have risen about 3°F since the beginning of the 20th century. While there are no data trends on the number of hot days (days with temperatures of 87°F or greater, the past 11 years (2010-2020) was the warmest period in history and 2023 was the warmest year Vermont has ever seen. In fact, 2023 was the planet's warmest year on record, according to an analysis by scientists from NOAA's National Centers for Environmental Information (NCEI). Under a higher emissions pathway as shown below, we can expect unprecedented warming to continue through this century, while the intensity of extreme winter cold will drop as well.[1]

Table 2-11: Observed and Historical Temperature Change Scale



Source: NOAA National Centers for Environmental Information, State Climate Summaries 2022. https://statesummaries.ncics.org/chapter/vt

Unseasonal Heat

Higher spring and fall temperatures are leading to longer freeze-free seasons, as well as "backward" or "false" springs, where warming temperatures in the late winter or spring are followed by snow or freezing rain. These events are happening more frequently, and rapid thawing and refreezing are likely to damage roads. Early spikes in temperatures can also curtail maple production and disrupt the region's outdoor recreation sector.

March 8-9, 2000, is the only excessive heat event for Vermont on NOAA's records, impacting Windham and Bennington Counties. Temperatures climbed through the 60s to near 70°F on both afternoons. At Albany International Airport, the high of 66°F on March 8 established a new record high, eclipsing the old record of 64°F set in 1942. On March 9, the temperature reached 68°F, replacing the old daily record high of 66°F set in 1977. March of 2012 set new records. March 17, 2012: Winter of 2011-12 had temperatures that averaged 4-5°F above normal and snowfall 40-60% of normal. This combination accounted for snowpack across the region to be largely below normal or even non-existent by mid-March. In Vermont, temperatures climbed

[1] Runkle, J., K.E. Kunkel, S.M. Champion, L.-A. Dupigny-Giroux, and J. Spaccio, 2022: Vermont State Climate Summary 2022. NOAA Technical Report NESDIS 150-VT. NOAA/NESDIS, Silver Spring, MD, 4 pp.

into the 70s March 18 and low-80s. March 19-22, 2012: Record heat was recorded across all of Vermont with maximum temperatures 30-40°F above normal and some daily records being broken by 10°F or more. This event caused an estimated reduction of 30% of maple sugar production, resulting in an estimated impact of nearly $10 million. In addition, there was significant loss of ski industry revenue due to a 25-50% reduction in snow loading.

Dangerously High Summer Heat

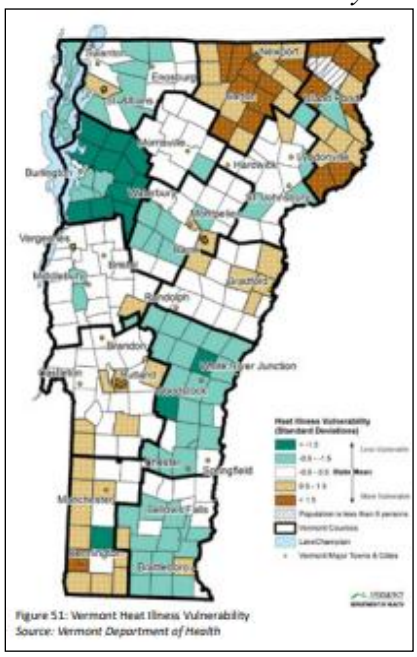
Heat is most likely to pose the greatest risk to human health in July, which is typically the hottest month of the year. In July of 1911, the region had a 12-day average of 90.75°F. The summer of 1949 was also very hot, with 25 days above 90°F. It is important to note here, however, that hot weather can have health impacts at even lower temperatures, with health risks increasing considerably when temperatures reach the mid-to-upper 80s4 . Between 2000 and 2017, the number of recorded days per year with a daily temperature high greater than or equal to 85°F peaked during the 2016 summer at 45 days, closely followed by the summer of 2015 at 41 days in Burlington. A heat wave across Vermont in late July 2022 resulted in seven consecutive days of temperatures above 80°F from July 20 through July 26. Maximum temperature reached 89°F on July 21st and July 24.

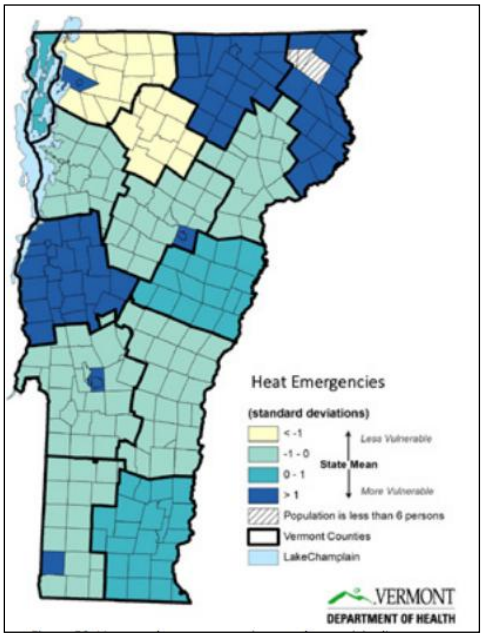
- *June 18th-20th, 2024: Heat advisories were issued on June 18th with temperatures reaching 100 degrees and remain in the 90's through the weekend with high humidity.*
- *July 1st-6th, 2018: A dangerous heat wave, one of which that likely hasn't impacted the North Country in decades occurred. High temperatures exceeded 90 degrees for at least 5 of the six days in many locations were above 85 degrees for 7 days. Heat indices, the combination of temperature and humidity, were recorded in the 100 to 110 range considered excessive and very dangerous. A substantial increase in hospitalizations occurred due to the excessive heat and duration and at least 4 deaths were attributed to the heat. Burlington VT witnessed the warmest consecutive stretch since records have been kept in 1892. Also, the ALL-TIME warmest minimum temperature was recorded on July 2nd of 80 degrees, breaking the old record of 78 degrees.*
- *July 21, 2011: Temperatures across much of southern Vermont warmed into 90s with dew points in the 70s, combined with the hot temperatures and resulted in heat indices of 100°F to 104°F. This was the 2nd day of a 3 to 4-day heat wave across a large portion of Vermont with heat index values of 100°F to 108°F across the Champlain and Connecticut valleys as well as some interior valleys*

The Heat Vulnerability in Vermont report suggests that Vermonters are at a greater risk for serious, heat-related illness – potentially even death – when the statewide average temperature reaches or exceeds 87°F. The Health Department's Climate & Health Program has reviewed six heat vulnerability themes (population demographics of a town or city, socioeconomic status, health status of residents, environmental characteristics, the ability of residents to acclimate to hot temperatures and emergency room visits for heat illness) and determined a thematic vulnerability for each. In general, those at higher risk during hot weather include older adults and children, people with chronic medical conditions, people active outdoors, people without air conditioning, and people living in more urbanized parts of Vermont. The hot-weather vulnerability maps by theme, and more information regarding the health impacts of increasing

temperatures and prolonged periods of hot weather are available at the Department of Health's Climate & Health website.

Table 2-12: Heat Vulnerability and Emergency Mapping





Vermont data indicate that Vermont residents experience heat-related illnesses at temperatures lower than in many other parts of the country. This is likely related to how infrequently hot weather occurs in Vermont, which has several impacts:

- We do not experience enough hot weather for people's bodies to adapt to hotter conditions.
- Many homes in Vermont are not adequately weatherized and do not have air conditioning.
- At a state and community level, we have not developed plans and policies needed to be prepared for hot weather.
- At an individual level, it can be hard to adapt behaviors to stay safe during hot weather, and Vermont has a large population of older adults, who are at more risk for heat-related illnesses.

The primary impact of extreme heat or prolonged periods of hot weather is to human life. Hot conditions, especially when combined with sun and high humidity, can limit the body's ability to thermoregulate properly. Prolonged exposure to hot conditions can lead to heat cramps, heat exhaustion, heat stroke, or exacerbate other pre-existing medical conditions. Some of these impacts require medical attention and can be fatal if left untreated. Heat kills more people in the

US each year than any other type of weather event. A new guidance report released by the Vermont Department of Health highlights the health risks from extreme heat. The report is informed by the 2021 heat wave in the Northwestern US and Western Canada, an area with a similar summer climate to Vermont. More than 1,400 people died during that event. Between 2009 and 2019, the Vermont Department of Health reports that there was an average of 104 heat-related emergency department (ED) visits per year and 12 total heat-related deaths across the state. Heat-related ED visits have trended up over that period by more than 2 additional ED visits each year. 2018 was the deadliest year in recent record, with 173 heat-related ED visits and 5 heat-related deaths in total, including 90 ED visits and 4 deaths during a 6-day heat wave in early July. These numbers only include ED visits and deaths specifically attributed to heat in a hospital or death record. (Data at the County level is not available). Heat-related illnesses mainly occur between May and September. It takes time for our bodies to adjust to warmer weather, so unseasonably hot days early in the year can be particularly harmful.

Table 2-13: Heat Index with ED Visits

	May	June	July	August	September
Average daily high heat index* (°F), Burlington Airport	68°	75°	83°	81°	72°
Heat-related ED visits, statewide total, per month (2009-2019)	14	19	47	17	7

The risk for heat-related illnesses and deaths increases substantially when the heat index reaches 90°F or above in Burlington – which is equivalent to about 85°F in cooler places like Lunenburg. All ED visits and deaths (related to any cause) increase as the heat index rises, as many chronic physical and mental health conditions are worsened by heat exposure.

Table 2-14: Heat Index Magnitude and Frequency with ED Visits and Deaths

Max heat index (°F), Burlington Airport	Days per year*	Heat-related ED visits, per day*	Heat-related deaths, total*	All ED visits, per day*	All deaths, per day*
Less than 80°	97	0.2	2	742	12.9
80° - 89°	46	1	2	778	13.3
90° - 94°	6	3	2	789	14.1
95° or hotter	3	7	6	795	14.2

* Heat-related data are reported for May-September, 2009-2019. ED visits and deaths are statewide totals.

Vulnerable Populations

Although all Vermonters can be affected by hot weather, there are specific factors that can increase an individual's risk for experiencing heat-related health impacts. The risk for heat illnesses tends to be greater for the following groups of people:

People Living in Urban Areas: Only about one-third of Vermonters live in urban areas as defined by the US Census, but a disproportionate number of heat-related deaths from 2009-2019 (10 of 12) occurred in municipalities that are at least partially urban. Urban heat risk data collected by Health Department volunteers in 2020 were used to estimate that on a hot day, the heat index can be as much as 15°F hotter in the most urban locations in Vermont compared to largely undeveloped and wooded locations.

People Who are Unusually Sensitive to Heat Exposure: This category can include anyone not acclimated to hot weather, especially older adults and young children, pregnant women, people that are overweight or have a chronic medical condition, people using drugs, alcohol or some prescription medications, and people who experienced a prior heat illness. The most severe heat-related impacts in Vermont have been experienced by older adults. Ten of the 12 people that died in Vermont from a heat-related cause between 2009 and 2019 were over the age of 50. Additional vulnerabilities related to extreme heat are included below:

1. Vector-born disease:

Data suggest that health impacts are also associated with prolonged hot weather and increasing average temperatures. For example, increases in the incidence of vector-borne diseases (e.g. Lyme, West Nile and Eastern equine encephalitis) in Vermont and New England at-large have been observed and are attributed to warming conditions. The increase in average annual temperatures and shortened winters have allowed mosquitos and ticks to become more active earlier in the spring and remain active later in the fall. Because the incidence of Lyme disease in Vermont is higher than the national average at present, lengthening vector seasons is of great concern to the health community in Vermont. People working in the outdoors – loggers and farmers, for example – are most vulnerable to vector-borne illness.

Cyanobacteria blooms: Hot weather can increase thermal stratification in water bodies, where shallow water layers are much warmer and do not readily mix with cooler, deeper water layers. Stratified water layers are most common in late summer and early fall, providing more favorable conditions for development of cyanobacteria blooms in Vermont's lakes and ponds. Some types of cyanobacteria can release natural toxins or poisons (called cyanotoxins) into the water, especially when they die and break down. Swimming or wading in water with cyanobacteria may cause minor skin rashes, sore throats, diarrhea, stomach problems, or occasionally more serious health problems. Children and pets are at higher risk of exposure because they are more likely to play near the shoreline and drink water while swimming10. The rise in average annual temperature and increased occurrence of prolonged hot weather events will also have impacts on infrastructure, the environment and the economy in Vermont.

2. Drought & Wildfire:

As temperatures continue to rise, there is likely to be heightened consideration for water supplies. Higher temperatures will lead to increased evapotranspiration, soil drying rate and the frequency of short-term droughts, limiting water availability for tree growth. With a changing forest complexion and greater levels of evapotranspiration, extreme heat and prolonged hot weather could also lead to an increase in the occurrence of wildfires in Vermont. Remote fires are now a concern and included in a following section.

3. Forest Impacts & Invasive Species:

Native forests and ecosystems are projected to experience negative impacts of these warming trends, as well11. Northern hardwood species like maple, yellow birch and American beech are anticipated to be nearly eliminated in the State, replaced by those tree species that thrive in warmer, drier conditions, like oak and pine. Additionally, the changing climate will allow for greater survival and reproduction of forest pest species, as trees that are stressed due to lower water availability reduce their ability to maintain sufficient defense mechanisms, making them more vulnerable to pest invasion and disease.

Planning Considerations:

Community cooling sites can be an essential resource for community members that do not have access to air-conditioning and need extra assistance to stay safe during hot weather. To be most effective, cooling site locations should be identified and advertised before hot weather occurs. The Vermont Department of Health maintains a map of known cooling sites at healthvermont.gov/climate/heat. Experience has shown that individuals can be reluctant to leave their homes, even in the event of an emergency. Successful messaging about cooling sites in the event of an extended heat advisory will depend largely on communication with property managers of rental properties, visiting nurses, and other home service providers for at-risk populations.

Invasive Species

An invasive species is an introduced, nonnative organism (disease, parasite, plant, or animal) that begins to spread or expand its range from the site of its original introduction and that has the potential to cause harm to the environment, the economy, or to human health. A few well-known examples include the unintentional introduction of the West Nile virus, chestnut blight, the South American fire ant, zebra mussels, Burmese pythons, and sea lamprey. These are in addition to the intentional introductions of salt cedar (Tamarisk), kudzu vine, house sparrows, starlings, and nutria. Harmful, non-native species can be found in all ecosystems across the United States. These species can cause costly economic and ecological damage each year including crop decimation, clogging of water facilities and waterways, wildlife and human disease transmission, threats to fisheries, increased fire vulnerability, and adverse effects for ranchers and farmers.

The spread of invasive species is endemic in Vermont. Aquatic Invasive Species (AIS) are a serious threat to water quality because they can change the surrounding ecosystem and out-compete native species for food and habitat. Once established, they are nearly impossible to eradicate. Some invasives, such as Eurasian milfoil are easy to detect, while others, such as larval zebra mussels and the spiny water flea, are too small to see.

Visitors to the pond can unwittingly transport invasives from other waterbodies on boats and equipment that have not been properly drained, cleaned, or dried. Significant flood events, including dam breaches, could increase risk of AIS. There are some invasives that will kill certain tree species (e.g., Emerald Ash Borer) and having a greater concentration of dead trees contributes to the potential for more severe wildfires. This has been a contributing factor to the severity of wildfires out west.

Aquatic invasive plant species can add to the biomass of a waterbody, which can create hypoxic conditions and increase nutrient loading, both of which produce prime habitat for cyanobacteria blooms. Japanese Knotweed is present along many river corridors in VT. Because of the open root structure, it can reduce the ability of the riparian zone and stream to hold water, which can lead to flash floods during heavy runoff.

Studies have shown that when AIS are present in a waterbody, the value of the homes are decreased up to 16%.

Vermont is ranked worst in the U.S. for lakeshore disturbance. Stormwater is a major contributor to disturbance. The Vermont ANR has a Lake Wise Award to support and recognize lake-friendly shoreline property. The Vermont Invasive Patrollers (VIP) are a crucial line of defense from invasive species and the Neal Pond Camp Owners Association are active in initiatives to support the health and safety of Neal Pond.

High Winds

Since 2020, there have been nine high wind events county-wide. Three of these were specific to the town. High winds often occur in conjunction with a thunderstorm and can gust up to 50 mph, causing property damage and disruption in electric and telecommunication utilities, transportation and commercial businesses. Although difficult to predict, these storms also pose a high risk of injuries and loss of life. The downward draft from these storms can produce microbursts which are not uncommon in Vermont. These events can come with wind speeds in excess of 80 mph and pose an additional threat to low flying aircraft making it difficult for them to maintain altitude. Although less common in Vermont, super cell thunderstorms are the largest, longest lasting and most devastating thunderstorms which can produce tornadoes and widespread destruction of crops and property. Tropical storms, hurricanes, nor'easters, and winter storms can also cause high wind damage throughout the state.

The Beaufort Wind Scale shown below can be used to predict damage based upon wind speeds. The National Weather Service issues wind advisories when sustained winds of 31-39 miles per hour are reached for at least one hour or gust between 46-57 miles per hour and High Wind Warming for winds of 58 mph or higher. Thunderstorm winds tend to affect areas of Vermont with significant tree stands as well as areas with exposed property and infrastructure and aboveground utilities.

Table 2-15: Beaufort Wind Scale

Beaufort Wind Scale		
Classification #	**Wind Speed**	**Land Conditions**
6	25 to 31 mph	**Large branches in motion; whistling in telephone wires**
7	32 to 38 mph	**Whole trees in motion; inconvenience felt walking against wind**
8 to 9	39 to 54 mph	**Twigs break off trees; wind generally impedes progress**
10 to 11	55 to 73 mph	**Damage to chimneys and TV antennas; pushes over shallow rooted trees**

12 to 13	74 to 112 mph	**Peels surfaces off roofs; windows broken; mobile homes overturned; moving cars pushed off road**
14 to 15	**113 to 157 mph**	**Roofs torn off homes; cars lifted off ground**

Drought

Drought is a hazard that is compounded by extreme heat and/or lack of precipitation. Severe droughts are rare in Vermont. Summer is potentially a dry period, but local thunderstorms and moisture from tropical air masses generally prevent serious drought. Prior to the summer of 2021, Lunenburg had not seen the risk of drought conditions in decades but with wells running dry in other areas of the state, the town is aware of the potential for this. A severe drought during 1930-36 affected the entire State. The drought of 1960-69 affected the entire State and was the most severe for regions of the state. The recurrence interval of this drought was greater than 50 years and was regional in scope, encompassing most of the northeastern United States. Precipitation in the State was less than normal every year during 1960-68, which was the longest continuous spell of deficient precipitation since 1895. Streamflow deficiency was greatest during 1965. In 1969, the drought ended abruptly. Water was trucked in to provide relief to drought-stricken dairy herds. Spring can also bring abnormally dry conditions as was evident in early 2015. Drought periods have historically remained as brief periods of abnormally dry conditions in the spring and occasionally, summer months. .

Given that March 2024 was the 3rd wettest March on record, over the past 130 years and that 2024 is, so far, the 7th wettest year to date over the past 130 years[2], the risk of drought appears nil. However, with climate change comes unpredicted and severe weather patterns and the town is concerned about the potential impact of drought on water availability, crop health, livestock health, people with well systems, and overall well-being. No two states have the same experience during a drought and while data specific to Lunenburg was not available (gauge levels at the reservoir have not reached drought conditions in recent memory, county data is available here. The National Integrated Drought Information System (NIDIS) uses the Palmer Drought Severity Index (PDSI) which s every 5 days. The PDSI is a standardized index based on a simplified soil water balance and estimates relative soil moisture conditions. The magnitude of PDSI indicates the severity of the departure from normal conditions. A PDSI value >4 represents very wet conditions, while a PDSI <-4 represents an extreme drought. Additionally, the U.S. Drought Monitor assigns drought numbers (D0-D4). D4 is the most severe drought, with the worst conditions on record. It would only be expected to occur once or twice within a 100-year period. Extreme drought, D3, occupies positions 3 through 5. These conditions are still among the worst on record and would be expected to occur once every 20 to 50 years. Severe drought, D2 would be expected to occur once every 10 to 20 years. Moderate drought, D1 would be expected to occur about once every 5 to 10 years. Abnormally Dry conditions, D0, would be expected once every 3 to 5 years.

[2] https://www.drought.gov/states/vermont/county/orleans

Below are examples of some of the impacts experienced in Vermont in the past per the D0-D4 categories.[3]

Table 2-16: Drought Category by Observed Impacts

Category	Examples of historically observed impacts
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	Honey production declines
	Irrigation use increases; hay and grain yields are lower than normal
	Trees and landscaping are stressed; fish are stressed
	Voluntary water conservation is requested; reservoir and lake levels are below normal capacity
	Wildfires and ground fires increase
D2	Fish kills occur; wildlife move to farms for food
	Golf courses conserve water
	Producers begin feeding cattle; hay prices are high
	Specialty crops are impacted in both yield and fruit size
	Trees are brittle and susceptible to insects
	Warnings are issued on outdoor burns; air quality is poor
	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
	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
	Water recreation and hunting are modified; wildlife disease outbreak is observed
	Well drillers and bulk water haulers see increased business

Source: https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?VT

To view a more complete record, and to filter impacts by drought severity, sector and season, check out the interactive State Impacts Tool.

[3] The process for developing this example impact table is described in "Linking drought impacts to drought severity at the state level Bulletin of the American Meteorological Society", 101(8), pp.E1312-E1321. doi: 10.1175/BAMS-D-19-0067.1

Current and future assets that may be vulnerable to drought include people, structures, infrastructure, natural and historic resources, and valued activities. Droughts can have significant impacts on community assets. Examples for the town include:

Water Supply and Quality:

- Droughts can lead to reduced water availability, affecting drinking water supplies, irrigation for agriculture, and industrial processes.
- Lower water levels in lakes, rivers, and reservoirs can impact water quality and availability.
- Agriculture:
- Droughts directly affect crop yields by reducing soil moisture, leading to crop failure or lower productivity.
- Livestock may suffer due to poor forage availability and insufficient water.
- Economy:
- Agricultural losses impact local economies, affecting farmers, businesses, and employment.
- Reduced water availability can disrupt industries that rely on water, such as manufacturing and energy production.

Natural Environment:

- Dry conditions can lead to wildfires, damaging forests, grasslands, and wildlife habitats.
- Ecosystems may suffer due to reduced water availability, affecting plant and animal species.
- Public Infrastructure:
- Land subsidence (sinking) can occur during prolonged droughts, damaging roads, bridges, and buildings.
- Seawater intrusion into coastal aquifers can impact water supply infrastructure.

Health and Social Impacts:

- Drought-related stress can affect mental health in communities.
- Migration away from drought-affected areas can strain social services and resources.

Community Assets:

- Well-maintained infrastructure (such as water storage facilities, irrigation systems, and wells) can help communities cope with water scarcity.
- Collective efforts, like community-based water management and conservation practices, contribute to resilience during droughts. Explain what assets in the community are vulnerable to drought, be sure to include how people can be vulnerable.

The effects of climate change, changes in population, changes in land use, and development can impact vulnerability to all hazards, including drought. As seen with the COVID-19-related influx of people moving to Vermont, an increased demand for water and water-related resources specific to point-of-use increases on all water supply systems can increase vulnerability during drought conditions. This cascade of demand could impact farm and livestock as well, further exacerbating the risk of increased demand with supply is compromised. While populations have

remained relatively stable, as other areas of the country experience the prolonged impacts of climate change and natural disasters, Vermont could see additional increases in population and this increase can tax community assets, especially during a disaster.

Infectious Disease

Climate change, global travel, and population density can all influence infectious disease incidence and prevalence. Small communities do have some level of protection from some infectious disease but others, like Lyme Disease can affect any community. The 2023 State Hazard Mitigation Plan states:

> *The Vermont Department of Health defines an infectious disease as one that is caused by micro-organisms, such as bacteria, viruses and parasites. A vector-borne disease is an infectious disease that is transmitted to humans by blood-feeding arthropods, including ticks, mosquitoes and fleas, or in some cases by mammals (e.g., rabies). Infectious Disease Trends & Vulnerability According to the Centers for Disease Control (CDC), the number of reported cases of vector-borne infectious disease has more than tripled between 2004 and 20162 . Those infectious diseases that fall into the first threat classification category identified in Table 38 (i.e. currently present in Vermont and which may be exacerbated by climate change) are already exhibiting increased prevalence in New England. For example, with both temperature (see: Extreme Heat) and precipitation (see: Inundation Flooding & Fluvial Erosion) expected to increase in Vermont, West Nile Virus mosquito vector activity will likely increase, as well as the vector's period of activity. Similarly, between 1964 and 2010, counts of Eastern Equine Encephalitis (EEE) have continued to rise in New England, though they remain constant in the southeastern states. Perhaps the most significant trend in infectious disease vulnerability in Vermont is that of Lyme disease, where Vermont ranks second in highest rate of disease incidence in the nation. The Vermont Department of Health reports that the number of reported cases of Lyme disease have increased dramatically over the last decade, and with shrinking winters, the potential for infection through tick bite continues to grow. Additionally, Vermont's increase in forest cover could provide a more suitable habitat for ticks and their hosts, which may lead to further spread of Lyme disease in the State. Outdoor laborers and recreationalists are especially vulnerable to Lyme disease, as exposure to ticks is greater. The southern and western halves of the State are more vulnerable to Lyme disease, as the warmer climate contributes to longer period of vector activity. Vermont is typically not vulnerable to diseases such as HIV/AIDS, SARS, cholera, malaria, and resistant tuberculosis, though they are considered to be major disasters in some parts of the world. However, an incident that caused water supplies to become contaminated or resulted in people eating spoiled food could have significant health implications. An animal infected with the rabies virus would be a localized threat. The potential for large-scale infection of Vermont's commercial animal population with foot and mouth disease, bovine spongiform encephalopathy (i.e., Mad Cow Disease), or any number of poultry viruses, while unlikely, could cause widespread economic problems. A health threat might also result from an act of bioterrorism.*

Pandemic planning in Vermont appears to ebb and flow. Following the H1N1 Virus Outbreak in 2009-2010, increased emphasis on pandemic planning was seen across the state. From 2010 to 2019 however, without another major U.S. event, emphasis on pandemic planning diminished. While Vermont, due to its rural nature, has some level of protection from national infection rates

during a pandemic, the financial implications experienced during the COVID-19 pandemic in 2020 hit the state extremely hard.

COVID-19 is a new disease, caused by a virus not previously seen in humans. COVID-19 is highly contagious and people with COVID-19 who do not have any symptoms can spread the virus to other people. On March 13, 2020, President Trump declared a nationwide emergency pursuant to Sec. 501(b) of Stafford Act to avoid governors needing to request individual emergency declarations. All 50 states, the District of Columbia, and 4 territories have been approved for major disaster declarations to assist with additional needs identified under the nationwide emergency declaration for COVID-19. Additionally, 32 tribes are working directly with FEMA under the emergency declaration. FEMA announced that federal emergency aid has been made available for the state of Vermont to supplement the state and local recovery efforts in the areas affected by the Coronavirus Disease 2019 (COVID-19) pandemic beginning on January 20, 2020 and continuing. Public assistance federal funding was made available to the state and eligible local governments and certain private nonprofit organizations on a cost-sharing basis for emergency protective measures (Category B), including direct federal assistance under Public Assistance, for all areas in the state of Vermont affected by COVID-19 at a federal cost share of 75 percent.

In early 2020, there was a quick return to the tenets of effective pandemic planning. Preparing for hospital surge, high death rates and the medical equipment necessary for both patients and health care workers are examples of the state's early focus. Public information and guidance on safety, isolation, travel and quarantine also became extremely important while mitigating the pervasive economic consequences of reducing work forces, sending students home and closing businesses. Additionally, Vermont had to consider the implication of, and work to control, the immigration of people from other states. Both infection risk and taxing of local resources were the main concerns associated with this real consequence of the pandemic.

Despite having relatively low illness and death, the economic and operational consequences of pandemic are of concern to the town. Having the capacity to navigate the funding opportunities as result of the pandemic for the town and residents is a concern in addition to providing resources to residents to mitigate spread (e.g., testing and vaccination services) and assure continuity of operations for government and community-based organizations. *(https://www.healthvermont.gov/response/coronavirus-covid-19/current-activity-vermont#town*

On May 5th, 2023, The World Health Organization lifted the Public Health Emergency of International Concern (PHEIC) for COVID-19. As stated by Director General Tedros Adhanom Ghebreyesus, "COVID-19 has been so much more than a health crisis, disrupting economies, travel, shattering businesses and plunging millions into poverty." Being prepared for a future event is critical for states and communities and the town will depend on guidance and recommendations coming down from national and state sources during the next planning period if needed.

Profiled Natural Hazard Summary

The natural hazards impacting Vermont communities are, for the most part, homogenous. Each town and city in the Green Mountain State are called to assess their capabilities in mitigating the

ongoing relationship we all share with mother nature when that relationship becomes a difficult one. Flooding remains the greatest hazard in terms of frequency, severity/disruption, and cost. As the impact of climate change continues to be defined by experience and data, new mitigation strategies must be developed with a collaborative approach at all levels of government. The data and information presented above, combined with the knowledge of living and experiencing life in our town, serves as the foundation required to define achievable and viable mitigation strategies that can serve to protect both the safety and financial investments of the town and its residents.

SECTION 3: RISK ASSESSMENT

This section first explores and defines specific locations of known, historic risk within the town with a disaster and non-disaster expenditure summary. Following, a qualitative risk analysis is documented for each hazard category. The highest ranked hazards, coupled with historic data, therefore, substantiate the profiled hazards in this plan.

3.1 Designated Hazard Areas

3.1.1. Flood Hazard Areas

A special flood hazard area is defined in terms of likelihood of damage impacts in a one hundred (100) year period. A floodway is the pathway and watercourse that must be reserved to carry flood water away during the 100-year incident. As stated in the 2024 town plan:

> "*There are no Special Flood Hazards Areas indicated on the FEMA Flood Insurance Rate Map for the Town from 1974. New FEMA Flood Insurance Rate Maps should be in place within the next few years. Updated maps should provide more accurate and up-to-date information about flood hazard areas."*

Further expanding on this information, the Vermont ANR Flood Ready Mapping Tools states that flood hazards in this area have not been mapped by FEMA for the NFIP because the town does not participate in the NFIP. There are Flood Hazard Boundary Maps, however. Maps are also available through FEMA's online Flood Map Service Center. Digital FIRM data can also be viewed through ANR's Natural Resource Atlas or the Flood Ready Vermont website which makes estimates based on e911 data. FEMA is working on updates to the hazard area mapping. Updates on the process are noted by county here. As with many towns without zoning in Vermont, community support for enhanced regulations as would come with NFIP participation is often lacking, if not strongly opposed. However, the town is open to exploring participation after the updated maps are available should community support be achieved. The following summarizes structures in Lunenburg at risk in these identified flood hazard boundary areas:

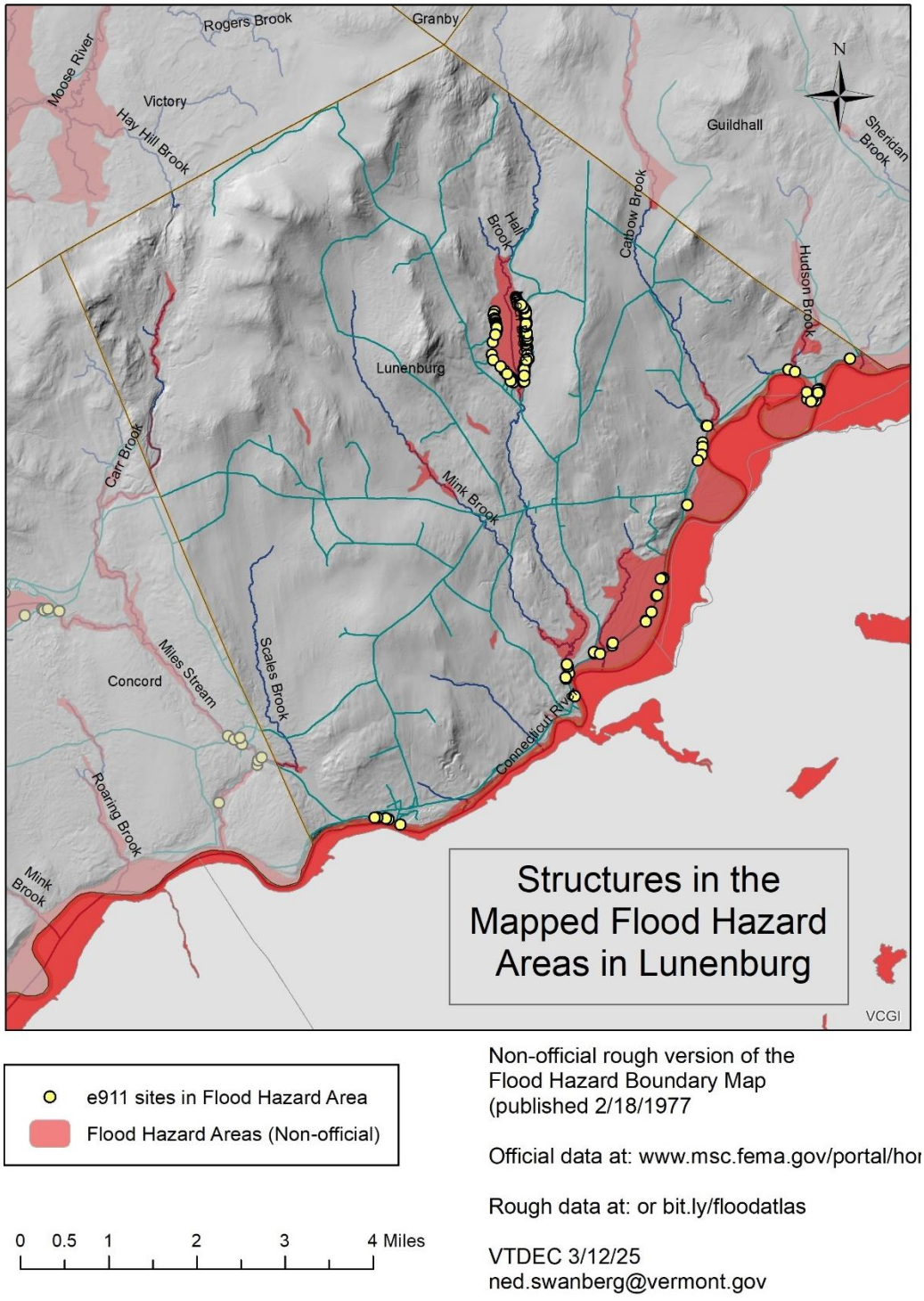
Table 3-0: 2025 Estimated Structure Types in Flood Hazard Boundary Areas

31	CAMP
26	SINGLE FAMILY DWELLING

23	ACCESSORY BUILDING
12	SEASONAL HOME
6	MOBILE HOME
2	INDUSTRIAL
1	ACCESSORY BARN
1	COMMERCIAL
1	COMMERCIAL FARM
102	All

Map 3.0: Lunenburg Flood Risk Map

Note: The red areas below indicate a 1% annual chance of flooding (the equivalent of Special Flood Hazard Areas). These are mapped by approximate methods and then unofficially and roughly digitized.



There are four main brooks in the Town of Lunenburg (Neil Brook, Mink Brook, Catbow Brook, and Hudson Brook). There is a 50’ river corridor buffer along each brook to provide the brook with enough space to change its course overtime. Maps of the river corridors along each brook can be found on the Flood Ready Vermont Atlas. As a general rule, and as a way to protect

personal property, it is recommended that future development not be situated within the 50' buffer. This protects any person and development from an encroaching brook channel as it shifts over time and protects water quality.

The River Management Program of the Vermont Agency of Natural Resources has been funding with Clean and Clear Water Federal funds fluvial geomorphic assessments in various rivers and streams around the State. Where phase I and II assessments have been completed, a corridor plan is then written. Existing plans are hosted on the River Management Program's web site.

The risk of flood damage is influenced by other factors in addition to location within these designated flood zone areas. Road infrastructure located in the floodplain, including bridges and culverts, particularly those that are undersized or in poor condition, are vulnerable and exacerbate flood risk to surrounding areas. The estimated number of bridges and culverts from the Vermont Online Bridge and Culvert Inventory Tool is 7 bridges and 480 culverts.

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3.1.2. Fluvial Erosion Hazard Areas

About two-thirds of Vermont's flood-related losses occur outside of mapped floodplains, and this reveals the fundamental limitations of the FEMA FIRMs. A mapped floodplain makes the dangerous assumption that the river channel is static, that the river bends will never shift up or down valley, that the river channel will never move laterally, or that riverbeds will never scour down or build up. River channels are constantly undergoing some physical adjustment process. This might be gradual, resulting in gradual stream bank erosion or sediment deposit – or it might be sudden and dramatic, resulting in a stream bank collapse. The losses experienced during the May 2011 storms and Tropical Storm Irene were most often related to the latter. In fact, this type of flood-related damage occurs frequently in Vermont, due in part to the state's mountainous terrain. Land near stream banks is particularly vulnerable to erosion damage by flash flooding, bank collapse, and stream channel dynamics. The Vermont Department of Environmental Conservation, Agency of Natural Resources, has identified river corridors, which consist of the minimum area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition. In other words, the river corridor provides "wiggle room" for a stream as its channel changes over time. Keeping development out of the river corridors therefore reduces vulnerability to erosion.

The RC term is defined under State statute as

> *"…the land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition and for minimization of fluvial erosion hazards, as delineated by the Agency of Natural Resources in accordance with river corridor protection procedures." (24 V.S.A. §4303).*

The Agency of Natural Resources has released a State-wide River Corridor map which depicts areas subject to fluvial erosion. In many cases, the River Corridors coincide with the areas mapped on the FIRM. However, the river corridor maps are intended to depict areas at risk of

fluvial erosion due to the dynamic movement of water in rivers and streams, whereas the FIRM depicts areas subject to inundation. For that reason, areas like wetlands that are depicted on the FIRM will not be mapped on the River Corridors. Areas that are currently within the Statewide River Corridors in Lunenburg are not subject to the local flood hazard regulations unless they coincide with the FIRM areas. Currently the town does not have a RC protection plan and with pending updates to FEMA maps, increased awareness of risk is forthcoming.

3.2 Infrastructure and Buildings at Risk

Generally speaking, infrastructure within the SFHA and RC are at highest risk for flood damage. Areas that have seen significant flooded in the past include sections of Baptist Hill, River, Pond Hill, and Cole Hill Roads. Additionally, Turner Brook Bridge, Bobbin Hill Road, Monahan, and Kimball Roads received damage in 2011.

3.3 Previous FEMA-Declared Natural Disasters and Non-declared Disasters

Lunenburg has had a history of flooding and the financial impact has been significant. The May floods of 2011 resulted in the greatest cost for the town with nearly $600k in Federal funding obligated.

Non-declared disasters have not resulted in damage above and beyond normal maintenance to a great extent. Extreme, long-lasting cold temperatures during winter months do pose a concern for the town as in many communities where the price of heating fuel often exceeds resident's ability to pay. Coupled with high unemployment, there is an increased risk for the town's residents to not meet the financial requirements for adequate heat, especially during long periods of extremely cold temperatures. Extreme, long-lasting cold temperatures during winter months do pose a concern for the town as in many communities where the price of heating fuel often exceeds the resident's ability to pay. Coupled with high unemployment, there is an increased risk for the town's residents to not meet the financial requirements for adequate heat, especially during long periods of extremely cold temperatures. Without adequate provisions, 48 hours of extremely cold temperatures could create a serious health hazard.

As with any municipality, maintaining town infrastructure, including transportation routes, is ongoing and requires fiscal, environmental, communication and engineering planning to be successful. The work accomplished in the town since that was not directly related to a declared disaster has supplemented the work accomplished in direct response to disaster-related damage to town roads and bridges. The cumulative effect of this work has served to enhance overall resilience to future events while assuring to the best degree possible, consistent use of transportation infrastructure and public utilities in the face of severe weather precluding a level of disaster declarations.

3.4 Future Events

Although estimating the risk of future events is far from an exact science, using available data and best professional judgment to conduct a Hazards Risk Estimate analysis can help frame future mitigation actions. Climate change and future conditions were considered in determining

probability scores. This analysis assigns numerical values to a hazard's affected area, expected consequences, and probability and supports the inclusion of all profiled hazards in this plan. This quantification allows direct comparison of very different kinds of hazards and their effect on the town and serves as a method of identifying which hazards hold the greatest risk based on prior experience and best available data and the growing impact of climate change. Current information includes frequency of events since the last approved plan and associated impact of those events on the fiscal, health, transportation, and overall resources on the town. The quantitative probability ranking is included below and used to substantiate the hazards profiled in this as well as the qualitative vulnerability ranking in Table 4-0. The following scoring system was used in this assessment:

Area Impacted: scored from 0-4, rates how much of the municipality's developed area would be impacted.

Consequences: consists of the sum of estimated damages or severity for four items, each of which are scored on a scale of 0-3:

- Health and Safety Consequences
- Property Damage
- Environmental Damage
- Economic Disruption

Probability of Occurrence: (scored 1-5) estimates an anticipated frequency of occurrence based on prior experience and current information.

To arrive at the Overall Risk Value, the sum of the Area and Consequence ratings was multiplied by the Probability rating. The highest possible risk score is 80.

3.4.1 Natural Hazards

According to the Hazard and Risk Estimation for Lunenburg, the following natural hazards received the highest risk ratings out of a possible high score of 80:

- Severe Winter Storm (32) with Ice Storm (16)
- Flooding/Inundation/Dam Breach (40) with Erosion (20), and Landslide (24),
- Extreme Cold (16)
- Drought (16)
- Extreme Heat (20)
- Infectious Disease (20)
- Invasive Species (16)
- High Wind (14)

Flood-related disasters have had the greatest financial impact on the town. While no deaths or injuries have been recorded for declared or non-declared disasters, the potential for health and safety risk during a severe winter storm are considered higher than that posed by a flooding event.

Table 3-1: Natural hazards risk estimation matrix

Lunenburg Hazard & Risk Analysis: NATURAL HAZARDS	Drought	Flooding/Inundation/DamBreech	High Winds	Erosion	Landslide	Extreme Heat	Infectious Disease	Fire	Winter Storm	IceStorm	Extreme Cold	Earthquake	InvasiveSpecies	Hail
Area Impacted														
Key: 0 = No developed area impacted														
1 = Less than 25% of developed area impacted														
2 = Less than 50% of developed area impacted														
3 = Less than 75% of developed area impacted														
4 = Over 75% of developed area impacted	1	2	1	1	1	1	4	1	3	3	4	1	1	1
Consequences														
Health & Safety Consequences														
Key: 0 = No health and safety impact														
1 = Few injuries or illnesses														
2 = Few fatalities or illnesses														
3 = Numerous fatalities	1	1	1	1	1	1	2	1	1	1	1	1	1	1
Property Damage														
Key: 0 = No property damage														
1 = Few properties destroyed or damaged														
2 = Few destroyed but many damaged														
3 = Few damaged but many destroyed														
4 = Many properties destroyed and damaged	2	2	1	1	1	1	0	2	1	2	1	1	1	1
Environmental Damage														
Key: 0 = Little or no environmental damage														
1 = Resources damaged with short-term recovery														
2 = Resources damaged with long-term recovery														
3 = Resource damaged beyond recovery	2	2	2	0	1	1	1	2	1	2	1	1	2	0
Economic Disruption														
Key: 0 = No economic impact														
1 = Low direct and/or indirect costs														
2 = High direct and low indirect costs														
2 = Low direct and high indirect costs														
3 = High direct and high indirect costs	2	3	2	2	2	1	3	2	2	2	1	1	3	1
Sum of Area & Consequence Scores	8	10	7	5	6	5	10	8	8	7	8	5	8	4
Probability of Occurrence														
Key: 1 = Unknown but rare occurrence														
2 = Unknown but anticipate an occurrence														
3 = 100 years or less occurrence														
4 = 25 years or less occurrence														
5 = Once a year or more occurrence	2	4	2	4	4	4	2	1	4	2	2	1	2	2
TOTAL RISK RATING														
Total Risk Rating = Sum of Area & Consequence Scores x Probability of Occurrence	**16**	**40**	**14**	**20**	**24**	**20**	**20**	**8**	**32**	**16**	**16**	**5**	**16**	**8**

Flooding remains the most likely event to incur the most cost for the town based on historical analysis and disaster declaration-related funding since 2004 has all been a result of severe rainstorms. Given the magnitude of damage to such few areas during DR 4001, the realization that a major flooding event can result in major expense is evident and likely to have a significant impact over a smaller area while a severe winter storm tends to affect the entire town. As with most Vermont towns, there is almost an inherent resilience to winter weather events because they

are expected. However, as severity increases and consequences mount (e.g., power outage, road closures, etc.), the risk for health and safety also increases.

SECTION 4: VULNERABILITY ASSESSMENT

Vulnerability refers to the potential impact of a specific loss related to an identified risk. While the loss of any one facility would cause a disruption in town services and operations, the overall vulnerability is moderate. There are roads, bridges, and culverts vulnerable to flooding in addition to utilities and buildings. Loss of equipment function for all municipal services is a vulnerability for the town. The entire planning area has the potential to be affected by flooding. From the 2023 SHMP:

"Recent studies have shown that most flooding in Vermont occurs in upland streams and road drainage systems that fail to handle the amount of water they receive. Due to steep gradients, flooding may inundate these areas severely, but only briefly. Flooding in these areas generally has enough force to cause erosion capable of destroying roads and collapsing buildings. These areas are often not mapped as being flood prone and property owners in these areas typically do not have flood insurance (DHCA, 1998). Furthermore, precipitation trend analysis suggests that intense local storms are occurring more frequently. Additionally, irresponsible land use and development will exacerbate the preexisting vulnerability. Urban flooding usually occurs when drainage systems are overwhelmed and damages homes and businesses. This flooding happens in all urban areas, but specifically in Burlington where the area is located at the bottom of a gradient, which adds to the intensity of this localized flooding…

…Over the past two decades, flood damage costs have risen dramatically in Vermont due to increasing occurrences of flooding and increases in vulnerability associated with unwise land use development in flood plains or within stream corridors. The geography and topography are right for a significant localized storm with extreme damage at almost any location in Vermont. Heavy rains with previous ground saturation, which causes runoff, are a significant part of the flooding formula in Vermont. Steep topography and narrow, inhabited, stream and river valleys further increase the dangerous nature of this hazard. Furthermore, precipitation trend analysis suggests that intense, localized storms that can cause flash flooding are occurring with greater frequency. While flooding will continue, planning and other mitigation measures can help minimize damages.

All of Vermont's major rivers have inhabited flood plains. While residents in mountain valleys are at risk, they may not be aware of the danger or may choose to ignore it. There are many reasons property owners are reluctant to relocate to less flood prone ground, not the least of which is the lack of personal experience of flooding. In addition, many communities originated beside rivers and streams; some of the most attractive property is located in vulnerable areas. Lakeshore property in Vermont is vulnerable to flooding from high water levels, either by surface water erosion or flooding. Occasionally, water-saturated ground and high-water tables cause flooding to basements and other low-lying areas. Lakeshore property is highly desirable and valuable, making the development of lakeshore areas very likely, even with the high potential for flooding. Restrictions on lakeshore property development have significant negative economic and tax revenue impacts that must be carefully weighed against the gains in personal safety and protection of property."

The town's vulnerability to loss during a disaster is high and this applies mainly to roads and bridges as there is no significant historical damage to buildings as result of a natural hazard. Town structural and property assets are below.

Table 4-0: Town Assets

Property	Address	Taxable Valuation
Alden Balch Memorial Library	24 East Main Street	406,600.00
Town Office Building	2 West Main Street	776,600.00
Town Shed	291 West Main Street	964,800.00
South Lunenburg Cemetery	South Lunenburg Road	7,800.00
Lunenburg Cemetery	Park Avenue	1,000.00
Memorial Park	Memorial Park, Gilman	17,500.00
Old RR Station Lot	Beech Street, Gilman	37,100.00
Gilman Fire & Rescue Station	41 Treatment Plant Road	596,100.00
Baptist Hill Cemetery	Baptist Hill Road	1,700.00
Baptist Hill Cemetery	Baptist Hill Road	400.00
Gilman Park & Bandstand	Commercial Ave, Gilman	37,200.00
Lunenburg Transfer Station	47 Transfer Station Road	471,100.00
Future Park	7 Covey Road	41,800.00
Fox Field	Fox Field	UNKNOWN

For this section of the plan, prior history and worst-case scenarios were assessed. The primary vulnerability for the town is transportation-related infrastructure damage due to flooding. Of the profiled hazards, the following vulnerability rating (high, moderate, low) is given below. This vulnerability rating is based on the disaster case history for the town and when the greatest financial impact was seen due to the disaster. A "high" vulnerability reflects substantial case history (≥2 in last five years) of events with an economic impact requiring action. A "moderate" vulnerability reflects limited case history (< 2 in last five years) of an event with and economic impact requiring action. A "low" vulnerability reflects little to no case history in the last five years. The specific vulnerability to the population as a whole or any specific sub-population (e.g., elderly) is subjective because there is no historical data to rank vulnerability to the health and safety of Lunenburg residents, workers or travelers.

4.1 Vulnerability Narrative by Profiled Hazard

Severe winter/ice storm: Moderate

Summary: While all structures are vulnerable to major snow loads, there is little evidence to support concern over structure failure due to snow loads on roofs, ice on gutters, etc. Town snow removal equipment is vulnerable to damage with greater use, especially during emergency situations as well as road damage from plowing. Populations caught outdoors, commuting or

working outside during a serve winter storm are more vulnerable to cold-related injury and/or snow related accidents but winter comes every year and residents, and the town are accustomed to making intelligent decisions regarding safety and protection of infrastructure. Special populations (e.g., aging, disabled, etc.) are more vulnerable in terms of mitigating structure loads, hazardous travel and relocating to safety.

Extreme Heat and Cold: Moderate
Summary: Recent evidence shows that greater extremes in temperature and overall weather fluctuation are occurring with increased frequency. A long-duration cold snap can cause significant damage to structures due to bursting pipes and the residential health and safety considerations include factors related to financial resources, fuel supply, sheltering, provisions and employment. Extreme heat is a risk for the town because of the health and environmental variables associated with this growing threat.

Flooding: High
Summary: Flooding is one of the primary natural disasters in Vermont. According to the Vermont Economic Resiliency Initiative website, 25% to 40% of businesses affected by a disaster never reopen. Current demands/priorities for the highway department are directly linked to past or potential flood damage. While the magnitude of damage has been slight, there is a consistent effort to mitigate flood and flood-related damage to the town's infrastructure. In the event of a major flood, most of the land lying between Vermont Route 102 and the Connecticut River would be flooded. Fortunately, practically all of this land is currently in agricultural use. To insure against the damage and inconvenience a major flood would cause, other types of development should be somewhat limited in this general area.

The risk of flood damage is influenced by other factors in addition to location within these designated flood zone areas. Road infrastructure located in the floodplain, including bridges and culverts, particularly those that are undersized or in poor condition, are vulnerable and exacerbate flood risk to surrounding areas. Infrastructure, including bridge and culvert inventories, are also vulnerable to flood and fluvial erosion damage. The failure of bridges and culverts during a flood disaster is primarily due to being undersized and constricting flow. The resulting debris jams, increased streambed scour, bank erosion both up and downstream of the crossing and slope failure further exacerbate the impact of undersized culverts. Factors contributing to debris jams include materials stored in the floodplain and unsecured structures (i.e. hay bales, propane tanks; small sheds; wood piles). Vermont State has begun to focus its efforts on hydrologically connected road segments to improve overall flood resiliency of roadways as recently adopted as part of the new Municipal Roads General Permit (MRGP) Standards.

Infectious Disease: Moderate
Summary: Not only is the COVID-19 virus current during the drafting of this plan but it will likely remain active for some time to come. While Vermont has remained relatively insulated from the worst-case scenarios already seen in other states regarding infection rates and deaths,

there have been significant financial impacts for the region and state. There are several important considerations for the town and villages to take on. Issues such as tax revenue reductions from failure to pay on a large scale to how a major storm event could compromise pandemic response (e.g., sheltering operations and resource allocation).

Drought: Moderate
Summary: While relatively rare, the potential for extreme weather patterns, including heat are on the rise. A drought scenario has both direct and indirect costs and consequences that can often be difficult to respond and recover from. During drought situations, wells will often need to be dug deeper and when there is such a drastic increase in demand for contractors, the wait times to get water flowing again can be long. As with any disaster, the capacity to adequately respond is surpassed and in a major drought, this holds true. With recent rains and flooding, a drought scenario seems almost implausible, but history has shown that they do occur and like flooding, the consequences could be severe and long-lasting.

Invasive Species: Moderate
Assessing the vulnerability of species to climate change is a key step in anticipating climate impacts on species. Vulnerability assessments characterize species' future conservation needs and can guide current planning and management actions to support species persistence in the face of climate change. Changing climate conditions have bearing on every aspect of biological invasions, in some cases worsening existing problems. Climate change is creating new pathways for invasive species to be introduced, such as shipping routes that open up as sea ice retreats. Warmer temperatures can allow existing invasive species to expand their range into habitat that is currently too cool. Similarly, impacts to native species and people may change if new conditions affect invasive species abundance. Climate change may make existing invasive species control tools less effective, such as aquatic barriers that require minimum water flows (USGS).

High Wind: Moderate
Given that high wind events often occur in conjunction with rain events, there is potential for a duel threat that could impede response efforts to major flood event (e.g., downed limbs or power lines blocking access, loss of power, etc.). High wind events are to be expected and normally pass without major incident. But given increases in weather severity and frequency, the town is vulnerable, especially during colder months when the loss of power could cause a health and safety issue.

4.2 Critical Facilities

The Center for Disaster Management and Humanitarian Assistance defines critical facilities as: "Those structures critical to the operation of a community and the key installations of the economic sector." The town plan lists all Lunenburg properties and their use. With this, there is no evidence to suggest that any critical facility is highly vulnerable during any hazard event.

4.3 Infrastructure

Roadways in Lunenburg are classified as follows:

- *Class 1 (town) highways* – .18 *miles:* Class I highways are those town highways that form the extension of a state highway route. The Agency of Transportation shall determine which highways are Class I highways. US-2 (state): *9.039 miles*
- *Class II Town highways -11.14 miles:* These are the most important highways in each town. As far as practicable, they shall be selected with the purpose of securing main lines of improved highways from town to town and to places which by their nature have more than the normal amount of traffic. They are designated by the Select board and approved by the Vermont State Highway Board.
- *Class III Town highways* -29.93 *miles:* These are all traveled highways other than Class I or II. The Select board, after conferencing with a representative of the State Agency of Transportation, shall determine Class III highways. The minimum standards for Class III highways are that they be negotiable under normal conditions all seasons of the year. This would include, but not be limited to, sufficient surface and base, adequate drainage, and sufficient width to permit winter maintenance.
- *Class IV Town highways* -15.39 *miles:* Class IV town highways include all other town highways as designated by the Select board. These roads are not eligible for state aid funds and are not maintained for winter use. These highways are maintained for summer service only; persons erecting dwellings served by these roads cannot expect winter service. There has been little change in the classification of roads in the past ten years, and there is no anticipated change during the current planning period. Adequately repairing class 4 roads through funding support will require re-classification and if residents are isolated from flooding on class 4 roads that require action, this can be a challenge.

Table 4-1 Town highway mileage by class, Town of Lunenburg

Class 1	Class 2	Class 3	Class 4	State Hwy	Fed Hwy	Interstate	Total 1, 2, 3, State Hwy
.18	11.140	29.93	15.39	9.039	0	0	65.679 Miles

Source: data derived from VTrans TransRDS GIS data/Lunenburg Town Plan

Bridges: There are eight bridges in Lunenburg. The State of Vermont manages and maintains bridges 15, 16, 18, 122, 123 (over Neal Brook, scheduled for arch rehabilitation in 2026), 125, and 126. These bridges are a mix of short (under 20 feet long) and long bridges and are a mix of construction types. The Mount Orne Covered Bridge, built in 1911, connects Lunenburg to Lancaster, NH and is managed by the State of NH. The historic structure is a Howe Truss bridge spanning 266 feet. The Mount Orne Covered Bridge is listed on the National Register of Historic Places. The Whitcomb bridge is a second historical bridge running across the Connecticut River from Gilman to Dalton and is listed on the State Register of Historic Places. While no longer in active use, the bridge is historically significant because of its important link between NH and the historical Gilman Paper Mill.

In Gilman there is the old Whitcomb Bridge which still stands but there is uncertainty about its structural integrity. There has been some discussion on turning this bridge into an outdoor pedestrian walkway/park. This bridge was replaced by a newer bridge that sits right beside the old Whitcomb Bridge.

The Johns River Railroad Bridge, part of the former Maine Central rail line, utilizes three steel spans to cross the Connecticut River west of Whitefield, NH to near Gilman, VT. The railroad bridge is no longer in use. The bridge could be the point of passage across the Connecticut river if the Twin State Rail Trail is established. A disruption of service to any bridge due to flood-related action is a vulnerability to the town. As many residents utilize essential services in Lancaster, NH, and have to cross the Connecticut River via the Mount Orne bridge, there is enhanced vulnerability in addition to US-2 running along the Connecticut River.

Dams: The Gilman Hydroelectric Project Dam is located in the Village of Gilman and produces 25,000MWh of power annually. The 2023 State Hazard Mitigation Plan states the following:

"While a rare occurrence, dam failure and resulting flooding can be devastating and threaten life and property downstream of dams. Dam failure can occur not only during large storms and high flows, but also during normal, sunny day conditions. While the depths and extents of flooding caused by dam failure are most severe during storms when reservoir elevations and rivers are at their highest, the public is generally conscience of flooding under these conditions. For this reason, it is often the sunny day failure scenario, that occurs with no warning, that is most dangerous. Dam failure is caused by the overtopping or structural failure of a dam resulting in a significant, rapid release of water, which can lead to flooding. Structural failure can be caused by many factors, such as internal soil erosion in earth embankment dams, sliding or overturning of concrete dams, gate failure, or caused by other means, such as deliberate sabotage. Dams are classified according to their potential for causing loss of life and property damage in the area downstream of the dam if it were to fail using the general classification system: High Hazard, Significant Hazard, and Low hazard. It is important to note that the hazard class is independent of the condition of a dam. Depending on the entity that regulates the dam, these definitions have minor but notable differences. In Vermont, dams are regulated by four distinct entities depending on the purpose and owner of the dam:

• Dams that are part of the production of power (i.e. hydropower) constructed before 1935 (with a few exceptions) are regulated by the State of Vermont Public Utility Commission (PUC). The PUC regulates approximately 25 dams, six of which are considered HIGH hazard and five of which are considered SIGNIFICANT hazard.
• Hydropower Dams constructed after 1935 (with a few exceptions) are regulated by the Federal Energy Regulatory Commission (FERC). FERC regulates approximately 80 dams, 18 of which are considered HIGH hazard and seven of which are considered SIGNFICANT hazard.
• Dams owned by the Federal Government (i.e. United States Army Corps of Engineers, USACE) are essentially self-regulated by that agency. Federal entities regulate approximately 5 HIGH hazard dams and one SIGNIFICANT Hazard dam.
• Non-federal, non-power dams are regulated by the Department of Environmental Conservation, (DEC). The DEC regulates approximately 41 HIGH Hazard Dams and 110 SIGNIFICANT hazard dams

In 2018, the Vermont State Legislature passed a law updating the existing regulation of dams, Statute 10 V.S.A. Chapter 43 which applies to the DEC and PUC. The purpose of the law is to serve to protect public safety and provide for the public good through the inventory, inspection, and evaluation of dams in the State. The law aims to provide a definition for a dam, and modernize the State's dam inventory and give the DEC rulemaking authority for items such as exemptions, registration, hazard classifications, EAPs, inspections and design standards. These rules will be developed over the next several years."

Following DR4720, state inspectors fanned out to examine the conditions of more than 350 dams in Vermont. Inspectors found defects in at least 60 dams. Five of those dams were classified as "high" hazard, which means a "probable or certain" loss of life downstream in case of failure. Twenty-two were "significant" hazards — meaning failure could cause "major or extensive" property loss. However, none of those 27 dams are "at risk of imminent failure." But at least three small dams failed completely during the flooding: the Hands Mill Dam, the Clark Sawmill Dam in Cabot, and the Lyons Dam in Peru, according to state officials. No injuries were reported, and it's not clear how much damage, if any, the failure of those dams caused downstream. The Gilman Dam is not high risk and therefore town vulnerability is low related to dam breach.

4.3.1 Water System

There is municipal water within Gilman and Lunenburg. Lunenburg Fire District #1 (located in Lunenburg) consists of six wells supporting 93 connections which serve about 250 people within the system. Lunenburg Fire District #2 (located in Gilman) consists of one well and one active spring supporting 115 connections serving about 400 people. Lunenburg Fire District #2 owns and operates the Lunenburg FD#2 Wastewater Treatment Facility (WWTF). The facility was built in the 1970's and consists of three aerated lagoons and chlorination for disinfection before being discharged into the Connecticut River. The collection system primarily serves the village of Gilman. The original clay sewer lines have been replaced with PVC as repairs and replacements occur. Municipal water and wastewater are key infrastructure systems needed to improve and expand housing and support economic development. But with this comes increased vulnerability to system compromise due to flooding. Destruction or significant damage to these systems would have considerable and potentially long-term consequences. As evidenced in other areas of the NEK, recent floods can destroy water and sewer systems. With a loss of function, there are both economic and health and safety concerns.

4.3.2 Electric Power Transmission Lines and Telecommunications

Green Mountain Power Corp is the sole provider of electricity in Lunenburg. Fuel providers are centered in neighboring communities such as Lancaster and Littleton, NH and St. Johnsbury, VT Landline phone service is widely available; however, cell phone service is limited in town. Because of Lunenburg's proximity to New Hampshire population centers, Tilson Broadband has supported fiber internet connections into parts of the town with upload and download speeds of

100/100. It is hoped that the expansion of NEK Broadband and Tilson Broadband will provide high speed internet access to more households in town.

4.4 Estimating Potential Losses in Designated Hazard Areas

The effects of climate change, changes in population, changes in land use, and development all can potentially influence the hazard impacts on people and community assets. Specific asset vulnerability is included in the table below with considerations for climate change, ice, snow, wind, drought, landslides, wildfire, and infectious disease.

Climate change brings the risk of more extreme weather patterns and events. As the frequency of severe weather and/or other natural events increase, so does the chance of significant impact. New development can influence land-use impacts to all hazards along with changing demographics (e.g., older adults have increased needs and decreased resilience during disaster events). Housing development in a flood prone area impacts flood vulnerability as does the clearing of trees for lumber may cause landslide issues. For Extreme Heat, new development can influence those extremes by methods such as the Urban Heat Island effect.

Flooding events like those experienced in 2011 and 2024 could result in substantial damage to buildings or residential housing that exceeds 1%. As seen with the July floods of 2024, the volume of public and private property damage can be catastrophic, especially when municipal systems are compromised and/or destroyed (e.g., water and sewer systems). Changing demographics, especially an aging and more vulnerable populations poses enhanced vulnerabilities simply because these populations tend to have less autonomy in protecting personal safety and engaging in the required processes to recover from the impact of a hazard.

Both population and demographic changes in town have not resulted in new service demands related to natural disasters. Rather, service demands related to law enforcement, opioid use disorder, affordable housing, and services for the older adults have increased—arguably state-wide, with increased needs in higher population density areas. Specific asset vulnerability is included in the table below with considerations for climate change, ice, snow, wind, drought, landslides, wildfire, and infectious disease as they relate to climate change, changes in population, changes in land use, and development.

Table 4-2: Lunenburg Natural Hazard Risk and Vulnerability Summary
[Note: Climate change and future conditions were considered in determining probability scores]

Hazard (probability)	Vulnerability	Extent (Storm Data from most severe event)	Impact (economic/health and safety consequence)	Climate, population, land use, and development change impact
Flooding (high)	Roads, Bridges,	A storm system dropped between 6 to 9 inches of rain in many areas throughout the state. Two major rivers, the Winooski and the Lamoille, surpassed water level records set during 2011's Hurricane Irene. The flooding caused 14 Vermont rivers to be in flood stage 2. Reservoir stage levels reached a level of 80.5 feet during Irene. July 2023 reached a level of 78.25 feet. The record is from April of 1987 at 85.2 feet.	The Town suffered approximately $85,000 in road damages as a result of the July 2023 flooding. Heaviest damage was to our dirt roads with the most damage on Baptist Hill and Pond Hill, and Cole Hill. Repairs included culvert replacement, debris clearing, replacing road materials lost due to flooding and ditching. Baptist Hill continued to receive significant damage, but two primary areas on Class 2 River Road suffered significant damage which included loss of paved roadway, significant bank erosion and guardrail loss. In addition, the Village of Gilman suffered loss of a culvert at the intersection of River Road and Baptist Hill. An auxiliary access road was completely washed out into the pathway of River Road. Several homes suffered basement flooding and one	Climate change can bring more severe rain events, increasing frequency. Mitigation actions may not occur fast enough to reduce repetitive damage to an area. Land use changes that decrease natural protection systems (tree cutting for lumber) increase vulnerability while repetitive damage properties can be acquired to reduce vulnerability. Population growth can increase development in higher risk areas. Population changes that decrease individual capacity to respond, recover from flooding increases overall vulnerability.

			resident lost their home.	
Fluvial Erosion/inundation/landslides (moderate)	In most areas where roads cross waterways, including bridges and culverts. Areas of steep slopes.	Road scouring results from drainage issues. Erosion occurs at shoreline but poses little risk.	Erosion of the banks of the Connecticut River is ongoing concern. People can be negatively impacted by fluvial erosion through disruption in property integrity and in severe cases, dangerous acute scenarios during where erosion poses immediate safety risks during travel or inside a home. Further inundation flooding brings risk of drowning, property damage and subsequent health and safety concerns (e.g., structural integrity following flood damage, contaminated water supplies, sewer/septc failure, and mold). Landslides could pose safety risk to people located withing the landslide zone and/or during travel where acute landslide could down trees that could land	Land use changes that decrease natural protection systems (tree cutting for lumber) increase vulnerability while repetitive damage properties can be acquired to reduce vulnerability.

			on vehicles or bury them in debris.	

Extreme Cold/ Snow/Ice Storm (moderate)	Elderly & handicapped populations, remote structures, old/under insulated structures, public infrastructure and utilities, telecommunications, trees, school system.	February 2015 – 15 – 20 days below zero with wind chill of -30 º below zero 12/9/2014 - 12/12/2014 DR 4207 VT 12 inches very wet heavy snow; 3/6-3/7/2011 event 15-30" of snow/ 4" ice accumulation	For roof collapse: monetary damages will depend on each structure but, collapse of barn roof is often a total loss. This does not include the loss of livestock. People can be impacted via collapse of a house roof which may be at a 50% loss. For car crashes due to poor driving conditions resulting in operator injury/death. Risk of hypothermia and death are possible especially in older adults with reduced mobility, living alone, and reduced capacity to mitigate cold during power outage. Loss of energy or communication capabilities may occur and impede recovery.	Older adults and other vulnerable populations have increased vulnerability due to reduced resilience to extreme temperatures in addition to the ability to mitigate (e.g., shovel snow, stay warm, and meet ADLs). Climate change can produce more extremes in temperature and winter precipitation. There is no anticipated development that would increase the towns vulnerability to extreme cold, ice, and snow. However, in the future, Lunenburg is expected to see more heavy, wet, snow events that would increase impacts to power lines, and could increase impacts on critical assets.

High Winds (moderate)	The entire planning area is vulnerable to high winds. Power lines, trees, and structures are most vulnerable and pose greatest risk to safety.	In 2024, a strong low pressure moved northeast across the Great Lakes on February 28th and created a strong pressure gradient between this storm and high pressure across the Canadian Maritimes. This allowed strong south-southeast winds ahead of a cold front associated with the strong area of low pressure and southwest winds behind the frontal boundary. The strongest winds occurred along and behind the cold front during the evening and early night hours of February 28th. Numerous reports of wind gusts in excess of 45 mph with several gusts in excess of 55 mph occurred along with downed tree limbs. branches and subsequent power outages. Power outages across VT were	Extended power and telecommunication loss in colder months increases risk to many vulnerable populations. Damage to infrastructure through downed lines and trees falling on buildings or vehicles is also a concern.	Climate change can increase risk of severe wind locally and in other areas. Land use changes in adjunct to increased residential housing increases the potential impact of damaging winds. Vulnerable populations (e.g., elderly with diminished health and those without transportation) could be disproportionately impacted.

		between 15,000-20,000.		
Extreme heat/drought (high)	The entire planning area is vulnerable. Specific assets include older populations, children, people who work outdoors, and transportation infrastructure. Extreme heat often results in the highest annual number of deaths among all weather-related disasters. Any material asset requiring consistent maintenance is at risk if continuity of operations are impacted.	Portions of Vermont have the highest concentrated heat illness vulnerability and heat emergency ratings	2023 was the hottest year on record globally and in Vermont. Between 2000 and 2017, the number of recorded days per year with a daily temperature high greater than or equal to 85°F peaked during the 2016 summer at 45 days, closely followed by the summer of 2015 at 41 days in Burlington. A heat wave across Vermont in late June of 2024 resulted in temperatures into the mid-90's The drought of 1960-69 affected the entire State and was the most severe for regions of the state. The recurrence interval of this drought was greater than 50 years and was regional in scope, encompassing most of the northeastern United States. Precipitation in the State was less than normal every year	Changes in development or land use that increase demand on total water supply (public and private) increase vulnerability to drought. Any change in development or land use that decreases natural protection systems to extreme heat (e.g., tree clearing, paving) increase vulnerability to health impact of extreme hear. Any population change resulting in reduce ability to mitigate impact of extreme heat (e.g., stay cool) can increase individual vulnerability.

			during 1960-68, which was the longest continuous spell of deficient precipitation since 1895. Streamflow deficiency was greatest during 1965. In 1969, the drought ended abruptly.	
Infectious Disease (high)	The entire planning area is vulnerable in both health and financial stability. While the main vulnerability is people and financial stability, any material asset requiring consistent maintenance is at risk if continuity of operations are impacted. Climate change has the potential to increase vulnerability to infectious diseases through increased periods of extreme heat where vector-borne diseases	COVID-19 has far-exceeded severity of 2009-2010 HINI Pandemic	2020 COVID-19 has resulted in the greatest infectious disease-related financial consequence for the planning area in history.	Climate change can potentially create weather patterns conducive to increased transmission and/or creation of an infectious disease. Any change in development or land use creating increases in population density increase vulnerability as does any population change defined by reduced immunity and ability to mitigate risk of infection (e.g., elderly, communal housing residents).

	can increase. Flooding can increase infectious agents in community water supplies in addition to any prolonged environmental stressor that negatively impacts human and/or livestock immune function, where-by decreasing natural protection from infections disease and/or creating situations for epidemics and future pandemics.			
Invasive Species	Bodies of water, natural ecosystems, and recreational opportunities.	Assessing the vulnerability of species to climate change is a key step in anticipating climate impacts on species. Vulnerability assessments characterize species' future conservation needs and can guide current planning and management actions to	Changing climate conditions have bearing on every aspect of biological invasions, in some cases worsening existing problems. Climate change is creating new pathways for invasive species to be introduced, such as shipping routes that open up as sea ice retreats. Warmer temperatures can allow existing invasive species to expand their range into habitat that	With increased human interaction with the natural world, the risk of introducing invasive species increases. This relationship is in conflict with the advantages associated with having water-based recreational opportunities and an appealing natural landscape. Stewardship is important to maintain ecosystems when threatened by human activity

		support species persistence in the face of climate change. A full assessment of climate vulnerability involves characterizing three essential components: sensitivity, adaptive capacity, and exposure. Assessing sensitivity and adaptive capacity, as well as determining which aspects of exposure to assess all require detailed knowledge of species-specific traits and ecology. Such a detailed understanding is hard to come by, even for well-studied species, thus, developing vulnerability assessments for lesser-studied species can be extremely challenging.	is currently too cool. Similarly, impacts to native species and people may change if new conditions affect invasive species abundance. Climate change may make existing invasive species control tools less effective, such as aquatic barriers that require minimum water flows.	

Vulnerability Summary:
It can be argued that with each major disaster, the subsequent mitigation efforts reduce overall vulnerability. However, many communities that made major repairs related to flood damage since 2011 were devastated in the July 2023 and 2024 floods, often in unprecedented ways.

Many communities, including Lunenburg, have sustained significant damage during multiple events since 2023 at the municipal and residential levels. Recent events are proving that vulnerability to the impact of climate change is real and increasing. Temperature extremes, precipitation, air quality, and severe weather are becoming more common. With greater frequency comes greater risk that vulnerable areas and populations will be impacted. What Vermont will do collectively to support the growing need to protect assets and people during the next planning period will be crucial for Lunenburg as the town continues its mitigation efforts to reduce overall vulnerability.

SECTION 5: MITIGATION STRATEGIES

As mentioned in the previous section, the greatest advancement in mitigation planning the town has achieved is from direct experiences in responding to and recovering from the major disasters that have impacted the town since 2011. These disaster experiences will continue to evolve and redefine how the entire state views and approaches mitigation. The work of state agencies, including those devoted to transportation, the environment, community development, and emergency management, have also learned from these challenging events. This plan allows for systematic documentation of mitigation efforts in the next planning cycle. The implementation matrix captures specific progress and gives the town a guide from which all future action can be carried out.

5.1 Town Goals and Policies that Support Hazard Mitigation

The 2024 Town Plan lists goals and policies for distinct categories. Specific to flood mitigation, the plan states, as a general rule, and as a way to protect personal property, it is recommended that future development not be situated within the 50' buffer. This protects any person and development from an encroaching brook channel as it shifts over time and protects water quality. Goals supporting flood resilience are as follows:

- *Support the Gilman Senior Center in becoming a Heat Emergency Cooling Center.*
- *Establish the Emergency Preparedness Committee and share the Order of Procedure with key officials and community members so the emergency shelter site can be open and operational when needed.*
- *Explore a reverse 911 calling system to alert community members of potential hazards and resources available during emergencies.*
- *Develop and maintain an up-to-date Local Emergency Management Plan*

5.1.1 Land Use

Goal: Maintain the forested landscape and healthy waterways while supporting appropriately scaled development in the established village clusters of Lunenburg and Gilman.

Policies

- Protect fragile areas and the numerous wetlands and vernal pools by referring all development to the required Vermont Wetland Rules.

- Encourage property owners to connect with land trust organizations to identify priority areas for conservation easements.
- Encourage a 50' vegetative buffer along the brooks to support the natural meandering of the waterways and around Neal Pond to help maintain water quality and healthy natural ecosystems.
- Promote the Use Value Appraisal ("Current Use") Program and encourage property owners to follow a management plan.

5.2 Existing Lunenburg Capabilities that Support Hazard Mitigation

The town has done an excellent job at monitoring and addressing transportation issues, engaging in a documented and systematic approach to mitigation actions. Applicable funding opportunities to address needs are consistently pursued. The town continues to move forward with administrative and operational policies and procedures that help define life in Lunenburg. While the ability to expand and improve the identified capabilities to achieve mitigation is considered adequate to protect the town from the profiled hazards in most cases, there also exists the lack of authority and/or ability to expand and improve on current capabilities. For example, the town does not possess unlimited resources and must operate within the confines of allotted budgets and personnel, even when grant funding is available. Additionally, the town's level of authority in taking actions that directly impact the health and safety of residents (e.g., evacuations, avoiding travel, etc.) are at a level of recommendation only.

Additional funding relationships are established and ongoing with Structures Grants and FEMA. The town has been able to enhance its resilience and overall preparedness. The town has addressed its current and future needs and by and large, road improvement projects remain the primary focus for the town and the areas identified were selected based on the condition of culverts and ditches and primarily focused on runoff issues particularly as the incidence of heavy storms has increased. In many cases, culverts properly sized for normal rain events are overwhelmed by the severe ones. The town will seek local, state and federal funds to address the sites identified as priorities. The town has also adopted municipal road and bridge standards that meet or exceed the most recent standards and has an approved and annually adopted Local Emergency Operations Plan and Town Plan.

The town has not directly engaged in substantial damage (SD) determinations or permitting for substantial improvements (SI) within the SFHA. If a SD determination had to be made, it would be managed by the planning commission who would coordinate that work with a qualified consultant. With no zoning, building department, or building inspection system, the town relies on ACT 250 Regulations.

Table 5-0: Existing Town Capabilities that Support Hazard Mitigation

Type of Existing Protection	Description /Details/Comments	Issues or Concerns
Emergency Response		
Police Services	Vermont State Police/Essex County Sheriff	None at this time

Fire Services	Lunenburg Volunteer Fire Department	The Lunenburg Volunteer Fire Department is located at 291 W. Main Street in Lunenburg. The Gilman Volunteer fire department is located at 41 Treatment Plant Road
Fire Department Personnel		Continued training for fire and rescue personnel, along with maintaining and updating of equipment is essential.
Fire Department Mutual Aid Agreements	Northeast International Mutual Aid (19 participants)	None at this time
EMS Services	Primary: Lancaster, NH Rescue Secondary: Gilman Rescue	Gilman Rescue is a volunteer team that will respond if available and help to stabilize while waiting for an ambulance from Lancaster, ,NH Rescue. We fund Gilman Rescue with $5,000 for supplies, radios, etc. We pay Lancaster $80,000 for their service this year.
Other Municipal Services		
Highway Services	Town Highway Department	Staffing pool is limited in the event of need
Highway personnel	3 FTE field personnel	See above
Water / Sewer Department	Managed by Fire Districts	The original clay sewer lines have been replaced with PVC as repairs and replacements occur. Municipal water and wastewater are key infrastructure to improving and expanding housing and supporting economic development.
Planning Commission	Yes	None at this time
Emergency Plans		
Local Emergency Management Plan (LEMP)	2024	Assure sheltering plans and contact information is up to date and vulnerable populations are addressed.
School Emergency/Evacuation Plan(s)	2024	Increased collaboration (with town staff, school, NVDA), knowledge of roles and drills are next step.
Shelter, Primary	Lunenburg School	Need to develop Order of Procedure so it is clear how to access the facility during emergencies.
Replacement Power, backup generator	Yes	None
Shelter, Secondary:	Lunenburg Fire Department	
Replacement Power, backup generator	Yes	
Municipal Plans		
Town / Municipal Comprehensive Plan	2024	None at this time
Hazard Specific Zoning (slope, wetland, conservation, industrial, etc.)	No	Follow goals and polices set forth in Town Plan
Participation in National Flood Insurance Program (NFIP) and Floodplain/Flood Hazard Area Ordinance	No	None at this time
Road and bridge standards	2019	Strive to coordinate lists and keep up to date

5.3 Lunenburg All-Hazards Mitigation Goals

- Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
- Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.

- Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan.
- Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.
- Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
- Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into the multi-jurisdictional municipal comprehensive plan as described in 24 VSA, Section 4403(5). This mechanism will be developed by the Planning Commission, Select board, and NVDA and integrate the strategies into the existing town plan as annexes until the next formal occurs, where a section devoted to mitigation planning will be integrated into the plan.
- Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into the town operating and capital plans & programs as they relate to public facilities and infrastructure within political and budgetary feasibility. The Planning Commission will review the plan and use language/actions from it to inform future updates. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budgets.

5.4 Mitigation Actions

While the town has seen minor to moderate change in demographics and/or population, the community impact and subsequent needs resulting from the pandemic and recent flood events provided new challenges and insights. Given this new awareness of the vulnerabilities to hazards, the town is poised to enhance protecting vulnerable populations from all hazards and by doing so, improving overall community resilience in a wholistic manner. Improving infrastructure to be more resilient to hazards has financial, health and safety implications. The better a community can merge long-term cost-savings through mitigation actions while addressing the health and safety of its residents, the greater the resilience of that community. In the next planning cycle, the town will have an increased focus on mitigating the consequences of climate change. Assuring the safe and viable functionality of the water system and having adequate staffing in all municipal departments while maintaining a collaborate approach with local and state partners are foundational elements of success moving forward. The following defines town mitigation planning for the next five years:

Mitigation Action Groups:

(P) Prevention: Government administration or processes that reduce hazard losses. Examples include planning, capital improvement programs, open space preservation, and storm water management.

(PP) Property Protection: Actions that involve the modification of existing buildings or infrastructure to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter-resistant glass.

(PEA) Public Education & Awareness: Actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

(NRP) Natural Resource Protection: Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

(SP) Structural Projects: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms

5.4.1. Current Capabilities and Need for Mitigation Actions

The Town Plan's goals and policies that support hazard mitigation and the existing mitigation actions demonstrate the variety of policies and actions forming the foundation of this All-Hazards Mitigation Plan . The town has considered future needs and the financial considerations required to meet these needs. Generally, the Town considers its existing capabilities are adequate to address the identified priority hazards. As with most towns in the state, mitigating flood-prone areas is a continuous effort that sees increased attention following a major event. The town remains aware and diligent in keeping up with mitigation actions for all municipal systems. There exists a collaborative spirit that not only is valued but serves to enhance efficiency of action what needs to be done. The Town regards its current hazard mitigation efforts carried out by the highway department as adequate to address winter storm impacts to local roads, however temporary road closure due to winter storms may isolate parts of town. However, with recent changes in weather patterns and subsequent response, there is increased financial and labor considerations to assure safe driving conditions. Major infrastructure that has seen repeated damage due to flooding is a concern for the town and remaining active in identifying priorities, working with State Transportation and Natural Resource Agencies as means to increasing infrastructure resilience is a priority.

5.4.2 Progress in Mitigation Efforts

This is a first-time plan. This section is a placeholder for future updates.

5.4.3 Specific Mitigation Actions

With emphasis on nature-based solutions (i.e., "green-engineering), several specific actions described below fall into the nature-based solution category. Sustainable planning, design,

environmental management and engineering practices integrate natural features or processes into the built environment to promote adaptation and resilience. When an action is a nature-based solution, "NBS" will be included to denote the association. The following actions define the mitigation measures to be taken by the town in the next five years:

Action #1: Reduce vulnerability to flooding.
Action #2: Maintain and improve resilience to severe winter storms.
Action #3: Reduce impact of high wind events.
Action #4: Reduce impacts of extreme temperatures.
Action #5: Raise public awareness of hazards, hazard mitigation and disaster preparedness.
Action #6: Reduce impact of drought.
Action #7: Reduce impact of infectious disease event.
Action #8: Reduce risk and impact of invasive species.

Below, each of the seven actions listed above are explained below regarding progress, project leads and partner agencies and specific action steps:

Action #1: Reduce vulnerability to flooding

Group: SP, NRP, PP
Primary Responsible Entity: Lunenburg Road Foreman
Secondary Responsible Entities: Select board
Potential Partner Entities: Vermont Agency of Natural Resources; State Geologist; Vermont Agency of Transportation; NVDA, VEM, FEMA and the ACCD
Timeframe: See Implementation Matrix
Funding Requirements and Sources: Grant-in-Aid (GIA), HMGP, FHWA, BRIC, VAOT grants; Municipal Operating and Capital budgets.
Progress: The town has put forth significant effort in restoring safe, functional roads following major flood events. The Road Foreman continually monitors road and storm water management capabilities. Since 2005, all bridges and culverts have been electronically accounted for.

Specific Identified Tasks:

- Infrastructure Projects: Funding and staff resources permitting, assess the vulnerability and operational capability of municipal-owned roads, culverts and other storm water management infrastructure to predicted storm water and snowmelt in areas with a documented history of recurring problems. Use the included Mitigation Action Agenda Items Short List included in this plan. The infrastructure will be evaluated regularly prior to replacement or upsizing of the existing infrastructure. Assessment of increased risk in specific areas with increased frequency of flood events should be considered (e.g., scoured/eroded slopes, stressed infrastructure, fluvial erosion).
    - Addressing general maintenance needs when repetitive flood damage work competes with time normally allotted for general maintenance, where-by increased risk of damage during next flood event. Specific projects include:
        - Currently scheduled projects that address flood damage from last year and/or reduce flood risk and damage:

1. Replace bridge on Mallett Road with 6' culvert
2. Resurface Old Pond Hill Road and replace the culverts
3. Reconstruct 1700 feet of Monahan Road
4. Resurface half mile of Simonds Road and put in 3 culverts

- Potential projects to be accomplished in the next 5 years:
  1. Complete reconstruction of Baptist Hill Road (4 mile long gravel road)
  2. Repaving River Road (7.250 miles)
  3. Reconstructing portion of Fournier Road (.25 to .50 mile)
  4. Reconstruction of sidewalks in Lunenburg and village of Gilman
- Consider analysis and discussion on general maintenance projects that, if not completed due to competing demands, may increase risk of flood-related damage during next event.
- Consider analysis and discussion on large projects that, if funding were available, would greatly reduce risk of flood damage during next event. Work with VEM and FEMA to propose these projects.
- Implement a monitoring and tracking program for landslides, or work with the state on monitoring.
- Develop strategies that aim to reduce competing demands for road department when they are working to recover from a disaster and still need to perform general maintenance duties. These strategies can include:
  - Budgeting for contractors
  - Establishing efficiencies in issuing RFPs and establishing contracts
  - Understanding the timeline of all grant-funded work and the consequences of not being able to complete a project due to competing demands.

- <u>Property Acquisition through FEMA (and other) Buy-out Program:</u>
  - The town should assess repetitive and significantly damaged property for eligibility in Buy-out programs to assist in mitigating future damages if and when required.
  - The town should convey the opportunity to owners of repetitive loss properties and/or those potentially eligible for acquisition in addition to educating property owners on best practices for mitigating future risk of property loss.
  - Utilize best practices for acquired property use and function in-line with town goals.

- <u>Street reconstruction and street resurfacing</u> (NBS) is considered a viable mitigation action and is the most visible part of the capital program for this planning cycle. The rationale for street resurfacing/reconstruction as mitigation is explained and summarized by the belief that through the consistent attention to areas in need, the town is reducing vulnerability to

flood/snow-damaged transportation routes by reducing permeability to moisture invasion. Considering road engineering practices (e.g., permeable road surfaces) that enhance green engineering practices will allow the town to mitigate hazard risk while benefiting the environment. Within political and financial restraints, re-engineer certain sections of roads to lower overall maintenance costs, improving snow plowing speeds and improve overall capability of roads to handle current and projected traffic volumes. Specific projects will be identified and prioritized during the planning period through municipal coordination situational awareness.

- Develop understanding of best practices related to NBS and consider implementation when feasible:
    - Protecting and enhancing landforms that serve as natural mitigation features (i.e., riverbanks, wetlands, dunes, etc.).
    - Using vegetative management, such as vegetative buffers, around streams and water sources.
    - Protecting and preserving wetlands to help prevent flooding in other areas.
    - Establishing and managing riparian buffers along rivers and streams.
    - Retaining natural vegetative beds in stormwater channels.
    - Retaining thick vegetative cover on public lands flanking rivers.
    - Preserving natural areas and vegetation benefits natural resources while also mitigating potential flood losses. Techniques include:
        - Developing an open space acquisition, reuse, and preservation plan targeting hazard areas.
        - Developing a land banking program for the preservation of the natural and beneficial functions of flood hazard areas.
        - Using transfer of development rights to allow a developer to increase densities on another parcel that is not at risk in return for keeping floodplain areas vacant.
        - Compensating an owner for partial rights, such as easement or development rights, to prevent a property from being developed.
        - Utilize and incorporate best practice guides for the creation and implementation of enhanced planning and response initiatives (e.g., Toolkit | Agency of Commerce and Community Development (vermont.gov)
        - Reassess need for fluvial erosion hazard mapping.

Rationale / Cost-Benefit Review: Road improvement costs are a necessary expenditure of town operations. These costs increase benefits in mitigating flood-related risk. Conducting vulnerability assessments facilitates a targeted and effective approach to road and storm water management infrastructure. This will prove useful in the development and implementation of

municipal capital and operating plans as well as the development and implementation of grant-funded mitigation projects. Some areas suffer low-level but consistent damage during heavy rains and snowmelt. Mitigating against these problems would reduce short- and long-term maintenance costs and improve the flow of traffic for personal and commercial purposes during flooding events.

Action #2: Maintain and improve resilience to severe winter storms

Group: SP, PP, PEA

Primary Responsible Entity: Select board
Secondary Responsible Entities: Road Foreman
Potential Partner Entities: VTrans
Timeframe: See Implementation Matrix
Funding Requirements and Sources: Grant-in-Aid (GIA), HMGP, FHWA, BRIC, VAOT grants; Municipal Operating and Capital budgets.
Progress: Roads are monitored and altered, when necessary, so that plowing can occur without damage to trucks and/or road. Snow clearing equipment is regularly serviced, and the town maintains an adequate supply of salt.

Specific Identified Tasks:

- Shelter Capability: Maintain and improve capabilities of existing shelters. Notification procedures and shelter staffing is a priority for the town and intends to move forward on planning and public involvement.
- Reduce risk of power failure due to ice storms: Enhance collaboration between town Road Foreman and electric company related to down-limbed induced power failure.
- Notification: Develop a notification/communication plan that conveys essential sheltering information using school phone system and back-up methodology (email, text, etc.). Encourage and enhance efficacy of CARES registry for residents in need.
- Residential Programs (NBS): Provide guidance and communication to residents on the structural and mechanical actions that can occur to reduce risk to severe winter storms (e.g. weatherproofing, anchoring, alternative heating sources, tree trimming, financial programs, etc.)
    - Ask property owners to report ice jams and adverse changes in the river conditions.
    - Provide information to owners for how to report sightings and conditions to town officials. This will include the development of a process to receive and disseminate the information to the designated town officials.
- Enhance monitoring of roads for safe and effective plowing: Efficient snow removal is the foundation to winter storm (snow) events, assuring roads are plowable before winter remains an important facet of highway department functions. This process will allow for the systematic mitigation of previous year ice humps, paved road cracks and potholes that are deemed a risk to safe plowing and winter travel.

Rationale / Cost-Benefit Review:
This mitigation action serves to reduce the economic impact and risk to both human and animal (livestock and pet) health and safety during severe winter storm events by reducing risk and

enhancing the mechanisms of winter storm mitigation in the long term. Costs associated with snow removal, safe roads (e.g., salting), vehicle maintenance, and labor are a necessary function of town operations and provide great benefit to reducing risk from winter storms. More formalized policy formation in both staffing and notification procedures, especially pertaining to vulnerable populations where transportation and special needs are a concern could potentially significantly reduce the physical, psychological and social impacts of a disaster.

Action #3: Reduce risk of high wind events

Group: SP, NRP, PP

Primary Responsible Entity: Select board
Potential Partner Entities: Fire Chief, VDH, GMP.
Timeframe: See Implementation Matrix
Progress: Trees are cleared as needed by road department.
Funding Requirements and Sources: While structure upgrades/retrofitting to improve resilience to wind damage are a recommended best strategy, costs can be significant and a barrier to achieving ultimate structural resilience. HMGP, BRIC, and PDM grants.
Specific Identified Tasks:

1) Understanding Best Practices:
    - Build knowledge of (FEMA P-804 (2023), Wind Retrofit Guide for Residential Buildings in Hurricane-Prone Regions for applicable and feasible strategies.
    - Use public and town procedures for high wind mitigation strategies.
    - Inform the public about high winds

2) Enhance Electrical System Resilience through coordination with electrical suppliers:
    - Assess high risk areas for power system damage during high winds through formal and informal means (e.g., in the course of routine operations) and address feasible actions, including communication with electric supply companies.

Rationale / Cost-Benefit Review:

This mitigation action serves to reduce the economic impact and risk to both human safety and the environment during high wind events by reducing risk. To a large degree, costs associated with high wind response (e.g. clearing limbs) are a normal function of town operations. Periodic trimming near power lines is a function of electric utility providers. Informing the public on accepted best practices to protect against high wind events is a low cost initiative.

Action #4: Reduce impacts of extreme temperatures

Group: SP, NRP, PP

Primary Responsible Entity: Planning Commission
Potential Partner Entities: Fire Chief, NVDA, VDH, ACCD, Community-based Organizations
Timeframe: See Implementation Matrix
Progress: Library and Senior Center are designated cooling sites
Funding Requirements and Sources: Municipal Operating and Capital budgets. Federal sources can include HMGP, PDM, BRIC, USDA (RFSI). LIHEAP and WAP programs help pay for heating, cooling, and home weatherization.

Specific Identified Tasks:
Economic Resilience:

- Consider assessing, if feasible, the economic consequences of both extreme cold and heat (with drought) and develop actions steps to best support the community and protect infrastructure/the environment.

Planning:

- Enhance and expand availability of publicly available cooling sites. Lunenburg's cooling options will need to serve a range of needs for a diverse population. Some sites will need to be located indoors and operate extended hours.
- Promote use of the Vermont Department of Health resources and review the map every time the Local Emergency Management Plan is updated.
- Improve cooling and ventilation of existing housing stock. Current statewide and regional efforts to weatherize and fuel switch provide an excellent opportunity to address cooling and ventilation as well. Organizations such as HEAT Squad and Northeast Employment Training Organization provide low- and no-cost services to Lunenburg's energy-burdened households.

Notification and Education – Investigate and develop a notification/communication plan that conveys essential sheltering information. Educating citizens regarding the dangers of extreme cold and the steps they can take to protect themselves when extreme temperatures occur by sustaining a process that serves to disseminate educational resources for homeowners and builders on how to protect pipes, including locating water pipes on the inside of building insulation or keeping them out of attics, crawl spaces, and vulnerable outside walls. Inform homeowners that letting a faucet drip during extreme cold weather can prevent the buildup of excessive pressure in the pipeline and avoid bursting through a yearly public service campaign.

- Establish a local energy committee or appoint an energy coordinator to help Lunenburg residents become more aware of weatherization and fuel-switching opportunities (NBS)
- Expand on "neighbor-to-neighbor" networks. Many Vermont residents are famously independent and self-reliant, and many individuals will not ask for help, even in more dire situations.
- One statewide system that can be used in any community is the Citizens Assistance Registry for Emergencies. Anyone can register in CARE, and it is the responsibility of the local Emergency Management Director to request the CARE database for their municipality as needed. Registration in CARE is typically low but promoting the use of it annually (such as Town Meeting Day) may help.
- Ensure that rental housing management staff, social service agencies, and visiting nurses have relevant and timely information on heat emergencies, including availability of cooling sites.
- Encourage enrollment in CARE.

Rationale / Cost-Benefit Review:
With an increase in extreme weather, there is a need to protect property, the environment, and the population. Costs associated with this mitigation action can be excessive and sometimes difficult to utilize prior to an event. Planning and education costs are the most effective way, during the next planning period, to address the hazards so closely associated with climate change. Given the magnitude of population dependence on social services, indicating economic

and other social vulnerabilities, effective outreach, education and collaboration with resources supports this mitigation action category. Given the high risk for heat related illness in the town, coordination with VDH and planning for such events is important.

Action #5: Raise public awareness of hazards, hazard mitigation and disaster preparedness

Group: PEA

Primary Responsible Entity: Select board
Potential Partner Entities: ANR, VEM, VDH, NVDA
Timeframe: See Implementation Matrix
Progress: When important information comes from NVDA and/or other agencies, the town works to share with residents. Town Meeting Day can serve as an annual outreach opportunity as well.
Funding Requirements and Sources: PDM grants, ARPA, BRIC and municipal operating budgets.
Specific Identified Tasks:

1. Vulnerable Populations: Continue school programs to raise student awareness of hazards, safety, preparedness and prevention. Explore establishing the school emergency notification system as the primary methodology for all emergency notification procedures and build in the contact information accordingly. Encourage participation in VT Alert and educate residents on why this is important. Assess ability to enhance town-state communication for providing town-specific information for VT Alert (e.g., road closures, cresting rivers, flash flooding, evacuation, etc.).
2. Hazard Resilience for Property Owners and Farms: Develop and maintain education materials to inform property owners on how to protect their homes and businesses through accepted hazard resilience actions (e.g., securing their structures from high winds, elevating their electrical equipment/furnaces in basements, protecting from lightning strikes by grounding electrical outlets, buyouts, etc.). Inform the public about the identified hazards in this plan as needed. Promote the Climate Adaptation and Mitigation Fellowship which can assign advisors to farmers and help with mitigation actions.

Rationale / Cost-Benefit Review: The benefit of improved public awareness could significantly reduce the loss of life and property damage through ongoing, formal, public information campaigns that address suggested property protection actions. Improved awareness would also build understanding and public support for municipal mitigation actions to reduce potential infrastructure and liability costs.

Action #6: Reduce vulnerability to drought

Group: SP, NRP, PP

Primary Responsible Entity: Select board
Secondary Responsible Entity: Planning Commission
Potential Partner Entities: ANR, VEM, NVDA
Timeframe: See Implementation Matrix

Progress: N/A
Funding Requirements and Sources: HMGP, USDA, BRIC, and PDM grants.
Specific Identified Tasks:

- Drought Planning: The town should consider what, if any, actions should be considered based off best practices related to drought mitigation, state guidance, and risk (NBS). Examples include encouraging drought-tolerant landscape design through measures such as:
    - Consider options for how best to meet competing demands for contractors during drought where properties require drilling.
    - Suggest using permeable driveways and surfaces to reduce runoff and promote groundwater recharge.

Rationale / Cost-Benefit Review: Improved public awareness on the risk and implications of drought in addition to developing action plans in the event of a drought could help reduce risk to this hazard.

Action #7: Reduce risk and impact of infectious disease events

Group: PEA, PP, SP
Primary Responsible Entity: Select board
Timeframe: See Implementation Matrix
Potential Partner Entities: ACCD, VDH, NVDA
Funding Requirements and Sources: CDBG, BRIC, ARPA, FEMA, and SBA grants.
Specific Identified Tasks:

1) Work with facility leads on understanding risk factors and what can be done to mitigate and enhance training and skills for response, misinformation, and support.
2) Enhance awareness and planning for COVID-19/other pathogen-related mandates, communication, isolation and quarantine logistics for residents, municipal operations and maintaining economic stability.
3) Maintain process for funding acquisition related to COVID-19/other pathogens for schools, government, impacted residents, and other essential services.
4) Develop and maintain continuity of operations plans for critical government and community services.

Rationale / Cost-Benefit Review: Improved public awareness and continuity of operations could potentially significantly reduce the loss of life and morbidity during an event while assuring functionality of staff-centric operations where-by protecting infrastructure from degradation due to limited staffing.

Action #8: Reduce vulnerability to invasive species

Group: SP, NRP, PP
Primary Responsible Entity: Select board
Potential Partner Entities: ANR
Timeframe: See Implementation Matrix
Progress: The Vermont Invasive Patrollers (VIP) are a crucial line of defense from invasive

species and the Neal Pond Camp Owners Association are active in initiatives to support the health and safety of Neal Pond.

Funding Requirements and Sources: Education and enforcement measures are specific considerations before an invasive species is established. At this time, funding would be the town's responsibility. Federal Invasive Species Rapid Response Fund is designated to support mitigation as well.

Specific Identified Tasks:

- FEMA has several initiatives and resources aimed at mitigating the impact of invasive species. One key approach is through the National Flood Insurance Program (NFIP), which integrates floodplain management with wildlife conservation. This helps protect habitats essential for threatened and endangered species while reducing flood risks.
- Additionally, the Federal Invasive Species Rapid Response Fund plays a crucial role in quickly containing or eradicating newly detected invasive species. This fund, supported by the U.S. Fish and Wildlife Service, provides financial resources to address invasive species before they become widespread and costly to manage.
- Education on prevention and enforcement of expected precautions, when applicable and feasible through understanding of risk and environmental/climate-related precursors to invasive likelihood.

Rationale / Cost-Benefit Review: Climate change is bringing many challenges to communities in Vermont and the risk of invasive species is increasing with more accommodating climate patterns. Protecting bodies of water and forests from invasive species requires coordination and compliance from individuals.

5.4.3. Prioritization of Mitigation Strategies

Because of the difficulties in quantifying benefits and costs, it was necessary to utilize a simple "*Action Evaluation and Prioritization Matrix*" in order to affect a simple prioritization of the mitigation actions identified by the town. This method is in line with FEMA's STAPLEE method. The following list identifies the questions (criteria) considered in the matrix so as to establish an order of priority. Each of the following criteria was rated according to a numeric score of "1" (indicating poor), "2" (indicating below average or unknown), "3" (indicating good), "4" (indicating above average), or "5" (excellent).

- Does the action respond to a significant (i.e. likely or high risk) hazard?
- What is the likelihood of securing funding for the action?
- Does the action protect threatened infrastructure?
- Can the action be implemented quickly?
- Is the action socially and politically acceptable?
- Is the action technically feasible?
- Is the action administratively realistic given capabilities of responsible parties?
- Does the action offer reasonable benefit compared to its cost of implementation?
- Is the action environmentally sound and/or improve ecological functions?

The ranking of these criteria is largely based on best available information and best judgment of project leads. For example, all road improvement projects were initially identified by Road Foreman and approved for inclusion in this plan by the road commission. It is anticipated that, as the town begins to implement the goals and actions of their Mitigation Strategies, they will undertake their own analysis in order to determine whether or not the benefits justify the cost of the project. Also, most proposed FEMA HMGP mitigation projects will undergo a benefit-cost analysis using a FEMA BCA template and approved methodology.

Table 5-2: Lunenburg Action Evaluation and Prioritization Matrix

Rank	Action	Responds to High Hazard	Funding Potential	Protection Value	Time to Implement	Social and Political Acceptance	Technical Feasibility	Admin Feasibility	Benefit to Cost	Environmental Advantage	Total
2	Reduce vulnerability to flooding by evaluating capabilities of existing road and storm water management infrastructure, public education and through municipal services and regulations.	5	4	5	2	5	3	3	4	4	35
5	Protect infrastructure and population from extreme temperatures	4	2	4	2	3	2	3	3	2	25
4	Reduce impact of high wind	3	4	5	2	5	3	3	5	1	27
1	Raise public awareness of hazards, hazard mitigation and disaster preparedness	4	5	5	5	5	5	5	5	1	40
3	Improve resilience to severe winter storms	4	3	3	2	4	3	4	3	3	29
6	Reduce vulnerability to drought	3	2	2	1	3	3	3	2	4	23
7	Reduce impact of infectious disease event	2	4	2	2	3	2	3	3	1	22

6	Reduce vulnerability to invasive species	2	1	3	1	5	2	1	3	5	23

Rating incorporated prior experience, institutional awareness of both public engagement with town and town response to specific hazards, and projected impacts of climate change in the future to the best degree possible. For example, all road improvement projects were initially identified by Road Foreman and approved for inclusion in this plan by the road commission. It is anticipated that, as the town begins to implement the goals and actions of their Mitigation Strategies, they will undertake their own analysis in order to determine whether or not the benefits justify the cost of the project.

5.5 Implementation and Monitoring of Mitigation Strategies

5.5.1. Public Involvement Following Plan Approval

After adoption, the town will continue to maintain web-presence of the mitigation plan with an opportunity for community input available on its website. Additionally, the town will hold an annual public meeting after performing the annual progress report for the mitigation plan to discuss achievements and the following year's implementation plan. At town meeting, the town will present mitigation information and provide the public an opportunity to increase understanding and involvement with planning efforts. The town will also notify its neighboring municipalities of the availability of information for review and any significant risks and/or mitigation actions that have an impact on surrounding towns.

5.5.2. Project Lead and Monitoring Process

The town's Select board chair is the project lead and will work in conjunction with the Select board, town clerk and NVDA to complete the yearly progress report included in the plan. The town will create a mitigation action collection system that will be used as the source of future updates following the annual evaluation that will occur in conjunction with the progress report using the Plan Implementation Matrix provided below. While mitigation actions are, by default, often addressed at monthly Select board meetings, the town will schedule one meeting annually to formally assess the plan and adopt changes following the annual progress report and community meeting regarding the LHMP. Once the plan is approved by FEMA, the calendar will begin for annual review. The town will take the following implementation matrix and add actions to it each year, modifying tasks and/or needs as required so that the next LHMP will be populated with the specific actions related to each mitigation strategy by year.

5.5.3 Plan Evaluation and Process

The town's Select board chair will lead the plan evaluation process as part of the annual progress report. Prior to town meeting and in preparation for the annual town report, a mitigation section will be included that provides an executive summary for the public that addresses the following topics:

- Status of recommended mitigation actions for the five-year planning period
- Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk
- Identification of a lead person to take ownership of, and champion the Plan if different from Select board Chair

- An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.)
- Discussion of how changing conditions and opportunities could impact community resilience in the long term
- Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience

Formal integration into other community planning mechanisms included the Town Plan related to flood resilience measures, achieving optimal ERAF rates, and the importance and rational of mitigation planning efforts. This integration across the town plan will continue in the future. By engaging in the annual evaluation, the town will have a viable method for capturing the facets of efficacy and areas needing revision and improvement in its mitigation plan. The town is committed to "institutionalizing" mitigation into its normal operating procedures and with approval of this plan, embarks on the formal incorporation of mitigation actions and discussion, maintaining an awareness that involves not only the Select board, Town Clerk and Road Foreman but also the community at large. Along these lines, the town will maintain a contact list of the current planning team and make revisions as required, including the team on the evaluation process each year. Through this consistent attention resulting from the evaluation process, progress reports and communication in the annual town report, the town will achieve the consistency required to enhance resilience through planning, assessment and actions devoted to mitigation.

5.5.4. Plan Update Process

Plan updates will be led by the Planning Commission Chair and Town Clerk. Depending on funding availability, the town may elect to acquire the assistance of NVDA and/or a consultant to the plan following a declared disaster and/or the next five-year planning cycle. To ensure that the Plan does not expire, the town will begin the update process within no less than 18 months of the current Plan's expiration date. Following a disaster and during the recovery phase, the town will use the experience to assess the current Plan's ability to address the impact of the most recent disaster and edit the plan accordingly. Using the annual progress reports and evaluation narratives as a guide, along with perceived changes in risk or vulnerabilities supported by data and/or observation, strategies will be captured in accordance with FEMA guidelines, which includes reconvening the planning team during the process. The town will establish a "Mitigation File" that documents all evaluations and progress reports, along with actions, especially related to infrastructure improvement projects. While the progress reports are designed to capture the specific actions the town has accomplished related to implementation, keeping a narrative list with dates on all actions relatable to mitigation (e.g. school drills, LEOP s, Fire Safety Awareness, meetings, etc.), will provide the town the bulk of information required in the process.

5.5.5. Implementation Matrix for Annual Review of Progress

The following table is intended to aid municipal officials in implementing the mitigation actions for Lunenburg and to facilitate the annual monitoring and progress reporting. Progress has been included as a guide to future updates. Each year, the town will reserve a Planning Commission meeting to review and amend the Implementation Matrix as a means to establishing an accurate evaluation of the plan's efficacy and the information required for the succeeding update to the

plan. The town will enter information into the implementation matrix specific to work accomplished relevant to the actions outlined, especially as it pertains to outreach, municipal system actions and road improvement projects.

Action	Responsible Entity (Primary in **Bold**)	Timeline	Specific Identified Tasks	Annual Progress
Reduce vulnerability to flooding	**Road Foreman (RF)**	Summer 2025 and each subsequent spring and/or as required by events.	Use Mitigation Action Agenda Item Short List to drive discussions in next planning period. Addressing general maintenance needs when repetitive flood damage work competes with time normally allotted for general maintenance, where-by increased risk of damage during next flood event. Currently scheduled projects that address flood damage from last year and/or reduce flood risk and damage: 1.Replace bridge on Mallett Road with 6' culvert 2.Resurface Old Pond Hill Road and replace the culverts 3.Reconstruct 1700 feet of Monahan Road 4.Resurface half mile of Simonds Road and put in 3 culverts Potential projects to be accomplished in the next 5 years: 1.Complete reconstruction of Baptist Hill Road (4 mile long gravel road) 2.Repaving River Road (7.250 miles) 3.Reconstructing portion of Fournier Road (.25 to .50 mile)	

			4.Reconstruction of sidewalks in Lunenburg and village of Gilman Evaluation and discussion on general maintenance projects that, if not completed due to competing demands, may increase risk of flood-related damage during next event. Evaluation and discussion on large projects that, if funding were available, would greatly reduce risk of flood damage during next event. Work with VEM and FEMA to propose these projects. Implement a monitoring and tracking program for landslides, or work with the state on monitoring. Develop strategies that aim to reduce competing demands for road department when they are working to recover from a disaster and still need to perform general maintenance duties. These strategies can include: • Budgeting for contractors • Establishing efficiencies in issuing RFPs and establishing contracts • Understanding the timeline of all grant-funded work and the consequences of not being able to	

			complete a project due to competing demands.	
	RF	Fall 2025	Property Acquisition through FEMA (and other) Buy-out Program	
	RF	As needed during entire planning period	Street reconstruction and street resurfacing, including culvert upgrades	
	RF and associated municipal systems managers	Ongoing each fall and spring of planning period	Continued Monitoring of Vulnerable Infrastructure	
	Select board	Starting in Summer of 2025, items will be triaged to set timeframe for addressing each specific task	Planning and Public Education • Continue to work with the State and NVDA to make progress on River Corridor Maps and in adopting River Corridor regulations. • Identify and educate property owners located within Special Flood Hazard Areas or River Corridor on flood and erosion risks, mitigation, FHA By-Laws, and NFIP. • Develop an evacuation plan for communities for business and residents in identified flood hazard areas and floodplains.	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress

Maintain and improve resilience to severe winter storms	Fire Chief	Fall 2025 and with each annual of the LEMP	Maintain Existing Shelter Capability	
	RF	Winter 2025/26 and each subsequent fall	Reduce risk of power failure due to ice storms	
	Fire Chief	Winter 2025-Summer 2029	Notification	
	PC and **Fire Chief**	Winter 2025/2026- Fall 2029	Residential Programs • Ask property owners to report ice jams and adverse changes in the river conditions. • Provide information to owners for how to report sightings and conditions to town officials. This will include the development of a process to receive and disseminate the information to the designated town officials.	
	RF	Winter 2025 and each subsequent Fall in planning period	Monitor roads for safe and effective plowing	
	Fire Chief	Winter 2025-Winter 2029	Increase awareness of ICS structure and recommended practices	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce vulnerability to invasive species	SB	Fall 2025 and ongoing in cadence with current	Specific Identified Tasks: • FEMA has several initiatives and resources aimed at mitigating the impact of invasive species. One key	

		operational strategy	approach is through the National Flood Insurance Program (NFIP), which integrates floodplain management with wildlife conservation. This helps protect habitats essential for threatened and endangered species while reducing flood risks. • Additionally, the Federal Invasive Species Rapid Response Fund plays a crucial role in quickly containing or eradicating newly detected invasive species. This fund, supported by the U.S. Fish and Wildlife Service, provides financial resources to address invasive species before they become widespread and costly to manage. • Education on prevention and enforcement of expected precautions, when applicable and feasible through understanding of risk and environmental/climate-related precursors to invasive likelihood.	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce impacts of extreme temperatures (cold)	**PC Chair**, NVDA, School, local/regional assistance organizations.	Winter 2025 and ongoing each fall	Economic Resilience	
	Fire Chief	Fall 2025 and ongoing as	Maintain Existing Shelter Capability	

		preparation for winter		
	Fire Chief, NVDA, School, local/regional assistance organizations.	Fall 2025 and ongoing as preparation for winter	Notification and Education	
	Fire Chief, PC,	Winter 2025 and ongoing as required	Assess Vulnerable Population with annual update to LEMP	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce Impact of Extreme Heat	PC	Summer 2025 and ongoing as required	<u>Economic Resilience</u>: • Consider assessing, if feasible, the economic consequences of both extreme cold and heat (with drought) and develop actions steps to best support the community and protect infrastructure/the environment. • Promote use of the Vermont Department of Health Cooling Sites map and review the map every time the Local Emergency Management Plan is updated. • Establish procedures for ensuring that potable water is available for outdoor cooling sites during heat emergencies. • Work with local housing providers, social service agencies, and the regional	

			planning commission to ensure that cooling options are considered when planning for warming shelters for unhoused populations. • Improve cooling and ventilation of existing housing stock. Current statewide and regional efforts to weatherize and fuel switch provide an excellent opportunity to address cooling and ventilation as well. Organizations such as HEAT Squad and Northeast Employment Training Organization provide low- and no-cost services to Lunenburg's energy-burdened households. <u>Notification and Education</u> – Investigate and develop a notification/communication plan that conveys essential sheltering information. Educating citizens regarding the dangers of extreme cold and the steps they can take to protect themselves when extreme temperatures occur by sustaining a process that serves to disseminate educational resources for homeowners and builders on how to protect pipes, including locating water pipes on the inside of building insulation or keeping them out	

			of attics, crawl spaces, and vulnerable outside walls. Inform homeowners that letting a faucet drip during extreme cold weather can prevent the buildup of excessive pressure in the pipeline and avoid bursting through a yearly public service campaign. • Establish a local energy committee or appoint an energy coordinator to help Lunenburg residents become more aware of weatherization and fuel-switching opportunities. • Expand on "neighbor-to-neighbor" networks. Many residents are famously independent and self-reliant, and many individuals will not ask for help, even in more dire situations. The neighbor-to-neighbor efforts that were mobilized during the pandemic response, however, establish a valuable precedent for future emergency responses, including heat emergencies. • One statewide system that can be used in any community is the Citizens Assistance Registry for Emergencies, CARE (https://e911.vermont.gov/care). Anyone can register in CARE, and it is the responsibility of the	

			local Emergency Management Director to request the CARE database for their municipality as needed. Registration in CARE is typically low but promoting the use of it annually (such as Town Meeting Day) may help. • Specific mitigation action to consider: • Ensure that rental housing management staff, social service agencies, and visiting nurses have relevant and timely information on heat emergencies, including availability of cooling sites. • Encourage enrollment in CARE.	
Action	Responsible Entity	Timeline	Specific Identified Tasks	
Reduce vulnerability to drought	**PC**	Summer 2025 (as-required)	Drought Planning: The town should consider what, if any, actions should be considered based off best practices related to drought mitigation, state guidance, and risk. Consider options for how best to meet competing demands for contractors	

			during drought where properties require drilling.	
Action	**Responsible Entity**	**Timeline**	**Specific Identified Tasks**	Annual Progress
Raise public awareness of hazards and hazard mitigation actions	Fire Chief, NVDA, **PC**, EMD	Summer 2025-annually as required	Hazard Resilience for Property Owners	
	School Planning Team	Winter 2025-Fall 2027	School Programs	
	Fire Chief	Fall 2025 and on-going as needed	Fire Prevention Programs	
	Fire Chief	Summer 2025 on on-going as needed	Other Hazard Awareness Programs	
Action	**Responsible Entity**	**Timeline**	**Specific Identified Tasks**	Annual Progress
Reduce impact of infectious disease events	Select board	Fall 2025 and annually as-needed	1) Work with facility leads on understanding risk factors and what can be done to mitigate and enhance training and skills for response, misinformation, and support. 2) Enhance awareness and planning for COVID-19/other pathogen-related mandates, communication, isolation and quarantine logistics for residents, municipal operations and maintaining economic stability.	

			3) Maintain process for funding acquisition related to COVID-19/other pathogens for schools, government, impacted residents, and other essential services. 4) Develop and maintain continuity of operations plans for critical government and community services.	
Action	**Responsible Entity**	**Timeline**	**Specific Identified Tasks**	Annual Progress
Reduce impact of high wind events	Select board	Summer 2025 and annually or as anticipated by forecasting	Specific Identified Tasks: 1) Understanding Best Practices: • Build knowledge of (FEMA P-804 (2023), Wind Retrofit Guide for Residential Buildings in Hurricane-Prone Regions for applicable and feasible strategies. • Use public and town procedures for high wind mitigation strategies. • Inform the public about high winds 2) Enhance Electrical System Resilience through coordination with electrical suppliers: • Assess high risk areas for power system damage during high winds through formal and informal means (e.g., in the course of routine operations) and address feasible actions, including communication with electric supply companies.	

Appendix A: Glossary of Terms and Acronyms

The following terms and acronyms are defined as used in this plan.

Base Flood Elevation (BFE) - the elevation of the water surface elevation resulting from a flood that has a one percent chance of equaling or exceeding that level in any given year. On the Flood Insurance Rate Map the elevation is usually in feet, in relation to the National Geodetic Vertical Datum of 1929, the North American Vertical Datum of 1988, or other datum referenced in the Flood Insurance Study report, or the average depth of the base flood, usually in feet, above the ground surface as defined in Vermont DEC Flood hazard Area and River Corridor Protection Procedures December 5, 2014.

Critical facilities -facilities that provide services or functions related to public health and safety during emergency response and recovery and facilities that must be protected to a higher standard to protect public health and safety.

Declaration - Presidential finding that a jurisdiction of the United States may receive Federal aid as a result of damages from a major disaster or emergency.

Emergency - Any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and Local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States. Defined in Title V of Public Law 93-288, as amended, Section 102(1); The Robert T. Stafford Disaster Relief and Emergency Assistance Act.

Federal Emergency Management Agency (FEMA) - The lead Federal agency with responsibility for responding to Presidential emergencies and major disasters. FEMA's mission is to reduce loss of life and property and protect our Nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of hazard mitigation, preparedness, response, and recovery.

Flood Insurance Rate Maps (FIRMS) - The official map of a community prepared by FEMA, showing base flood elevations along with the special flood hazard areas and the risk premium zones.

Flood Mitigation Assistance Program (FMA) - Provides pre-disaster grants to State and local governments for both planning and implementation of hazard mitigation strategies. Each State is awarded a minimum level of funding that may be increased depending upon the number of NFIP policies in force and repetitive claims paid. Grant funds are made available from NFIP insurance premiums, and therefore are only available to communities participating in the NFIP.

Fluvial Erosion Hazard (FEH) - those hazards related to the erosion or scouring of riverbeds and banks during high flow conditions of a river as defined in Vermont DEC Flood hazard Area and River Corridor Protection Procedures December 5, 2014.

Hazard – an emergency or disaster resulting from– (A) a natural disaster; or (B) an accidental or man-caused event. Defined in Title VI, Emergency Preparedness of Public Law 93-288, as amended, Sec. 602. Definitions (42 U.S.C. 5195a); The Robert T. Stafford Disaster Relief and Emergency Assistance Act.

Hazard Mitigation - Sustained actions taken to reduce or eliminate the long-term risk to people and property from hazards and their effects.

Hazard Mitigation Grant Program (HMGP) – a program authorized under Section 404 of the Stafford Act, 42 U.S.C. 5170c that provides funding for cost-effective hazard mitigation projects in conformance with the post-disaster hazard mitigation plan required under Section 409 of the Stafford Act.

Hazard Mitigation Plan - The plan resulting from a systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards present in society that includes the actions needed to minimize future vulnerability to hazards.

Hazardous Materials (HazMat) – all petroleum and toxic, corrosive or other chemicals and related sludge included in any of the following: (a) Any substance defined in CERCLA § 101(14); (b) Petroleum, including crude oil or any fraction thereof; or (c) Hazardous waste. Defined in Vermont statute Title 10, Chapter 159, Waste Management, Subchapter 001, section 6602 definitions. Note: "Hazardous material" does not include herbicides and pesticides when applied consistent with good practice conducted in conformity with federal, state and local laws and regulations and according to manufacturers' instructions.

Hazardous waste - means any waste or combination of wastes of a solid, liquid, contained gaseous, or semi-solid form, including but not limited to those which are toxic, corrosive, ignitable, reactive, strong sensitizers, or which generate pressure through decomposition, heat or other means, which in the judgment of the Secretary may cause, or contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness, taking into account the toxicity of such waste, its persistence and degradability in nature, and its potential for assimilation, or concentration in tissue, and other factors that may otherwise cause or contribute to adverse acute or chronic effects on the health of persons or other living organisms, or any matter which may have an unusually destructive effect on water quality if discharged to ground or surface waters of the state. All special nuclear, source, or by-product material, as defined by the Atomic Energy Act of 1954, as amended, codified in 42 U. S. C. § 2014, is specifically excluded from this definition. Defined in Vermont statute Title 10, Chapter 159, Waste Management, Subchapter 001, section 6602 definitions.

Invasive Species - The National Invasive Species Council defines an invasive species as one that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Major Disaster - Any hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, explosion, or other catastrophe in any part of the United States that, in the determination of the

President, causes damage of sufficient severity and magnitude to warrant major disaster assistance under the Stafford Act, above and beyond emergency services by the Federal Government, to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby defined under Public Law 93-288.

Mitigation - One of the four phases in emergency management. Preventing future emergencies or minimizing their effects. Includes any activities that prevent an emergency, reduce the chance of an emergency happening, or reduce the damaging effects of unavoidable emergencies. Example: Buying flood and fire insurance for your home is a mitigation activity. Mitigation activities take place before and after emergencies.

National Flood Insurance Program (NFIP) - Provides the availability of flood insurance in exchange for the adoption and enforcement of a minimum local floodplain management ordinance. The ordinance regulates new and substantially damaged or improved development in identified flood hazard areas.

Natural disaster - The term "natural disaster" means any hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, or other catastrophe in any part of the United States which causes, or which may cause, substantial damage or injury to civilian property or persons. Defined in Title VI, Emergency Preparedness of Public Law 93-288, as amended, Sec. 602. Definitions (42 U.S.C. 5195a); The Robert T. Stafford Disaster Relief and Emergency Assistance Act.

NOAA's National Centers for Environmental Information (NCEI) – a consolidation of the former National Climatic Data Center, the National Geophysical Data Center, and the National Oceanographic Data Center. NCEI is responsible for preserving, monitoring, assessing, and providing public access to the Nation's comprehensive atmospheric, coastal, oceanic, and geophysical data.

NE Vermont Development Association (NVDA) – an organization serving the communities in Essex, Orleans, and Caledonia Counties. The mission of the NVDA is to assist member municipalities in providing effective local government and to work cooperatively with them to address regional issues. NVDA works with area non-profits, other regional organizations, State and Federal agencies, and the general public. NVDA implements a variety of projects and programs tailored to local and regional needs, and also completes projects of statewide importance and interest.

Preparedness - One of the four phases in emergency management. Preparing to handle an emergency. Includes plans or preparations made to save lives and to help response and rescue operations. Example: Evacuation plans and stocking food and water are both examples of preparedness. Preparedness activities take place before an emergency occurs.

Recovery - One of the four phases in emergency management. Recovering from an emergency. Includes actions taken to return to a normal or an even safer situation following an emergency. Activities necessary to rebuild after a disaster. Recovery activities include rebuilding homes,

businesses, and public facilities; clearing debris; repairing roads and bridges; and restoring water, sewer, and other essential services. Recovery includes getting financial assistance to help pay for the repairs. Recovery activities take place after an emergency.

Response- One of the four phases in emergency management. Responding safely to an emergency. Includes actions taken to save lives and prevent further property damage in an emergency situation. Response is putting your preparedness plans into action. Examples: Seeking shelter from a tornado or turning off gas valves in an earthquake are both response activities. Response activities take place during an emergency.

River corridor - the land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition and for minimization of fluvial erosion hazards, as delineated by the Vermont Agency of Natural Resources in accordance with the ANR River Corridor Protection Procedures. 38 10 V.S.A. § 1422(12).

River corridor protection area - the area within a delineated river corridor subject to fluvial erosion that may occur as a river establishes and maintains the dimensions, pattern, and profile associated with its dynamic equilibrium condition and that would represent a hazard to life, property, and infrastructure placed within the area. The river corridor protection area is the meander belt portion of the river corridor without an additional allowance for riparian buffers. As delineated by the Vermont Agency of Natural Resources in accordance with the ANR River Corridor Protection Procedures. 38 10 V.S.A. § 1422(12).

Special flood hazard area - is synonymous with "flood hazard area" and "area of special flood hazard" (44 C.F.R. § 59.1) and is the floodplain within a community subject to a one percent or greater chance of flooding in any given year. This area is usually labeled Zone A, AO, AH, AE, or A1-30 in the most current flood insurance studies and on the maps published by FEMA.

Sustained action – to support and continue for an extended time or without interruption; to maintain, to keep in existence, to continue.

Vermont Agency of Commerce and Community Development (ACCD) – state agency with three main departments and a variety of programs to support economic and community development needs of Vermont. The three departments are: Department of Economic Development, Department of Housing and Community Development, and the Department of Tourism and Marketing.

Vermont Agency of Natural Resources (VT ANR) – state agency that promotes the sustainable use of Vermont's natural resources, protects and improves the health of Vermont's peoples and ecosystems, and promotes sustainable outdoor recreation.

Vermont Agency of Transportation (VT AOT) – state agency that provides for the safe and efficient movement of people and goods by planning, developing, implementing, and managing a

statewide transportation network - including roads, bridges, railroads, airports, park-and-rides, bicycle and pedestrian facilities, and public transportation facilities and services.

Vermont Department of Environmental Conservation (VT DEC) – a department in the state Agency of Natural Resources whose mission is to preserve, enhance, restore and conserve Vermont's natural resources and protect human health for the benefit of present and future generations.

Vermont Emergency Management (VEM) – part of the Department of Public Safety, Division of Emergency Management and Homeland Security (DEMHS). VEM provides support and aid to Vermont's Local Emergency Management Directors, Local Emergency Planning Committees, Regional Planning Commissions, Community Emergency Response Teams, state agencies, and emergency response providers in an effort to ensure the state's resilience to disasters.

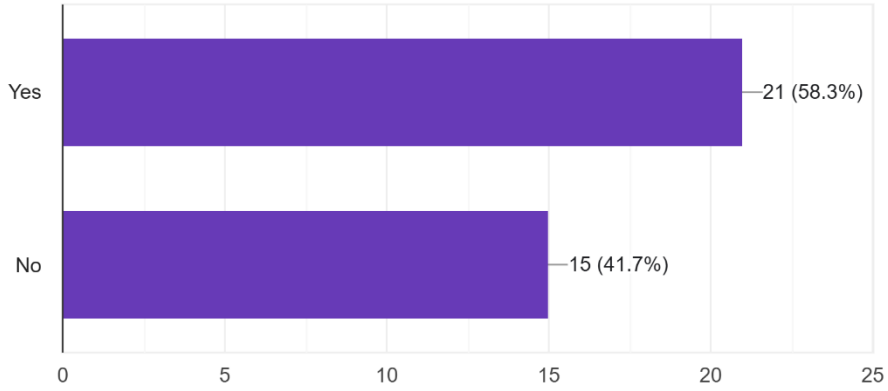
"Vermont addresses emergencies and disasters through two statutes. The Civil Defense Act created the state Emergency Management Division, gives the governor emergency powers, authorizes the rendering of mutual aid, and declares that all emergency management functions be coordinated with the federal government. The Internal Security and Public Safety Act provides for a declaration of a state of emergency and activation of an emergency disaster preparedness plan for the state and counties. Financial and other aid is provided by the state emergency relief and assistance fund, and through grants and loans from both federal and private sources. The governor is authorized to declare a state of emergency, and the state emergency board and local legislative boards may vote to terminate emergencies."

Appendix B: Hazard Impact Survey Results

Note: All "1-5" ratings follow the ranking pictured below:

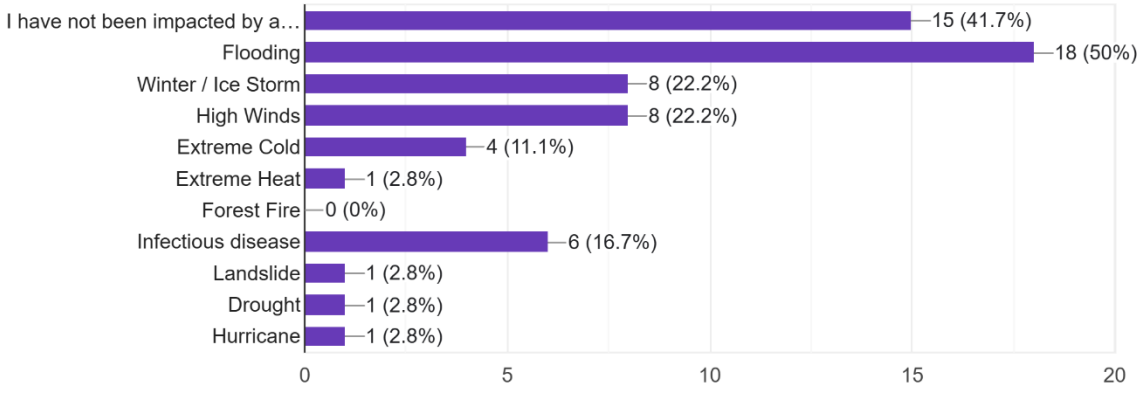
Have you ever been impacted physically, financially, or psychologically by a natural disaster in Lunenburg?

36 responses



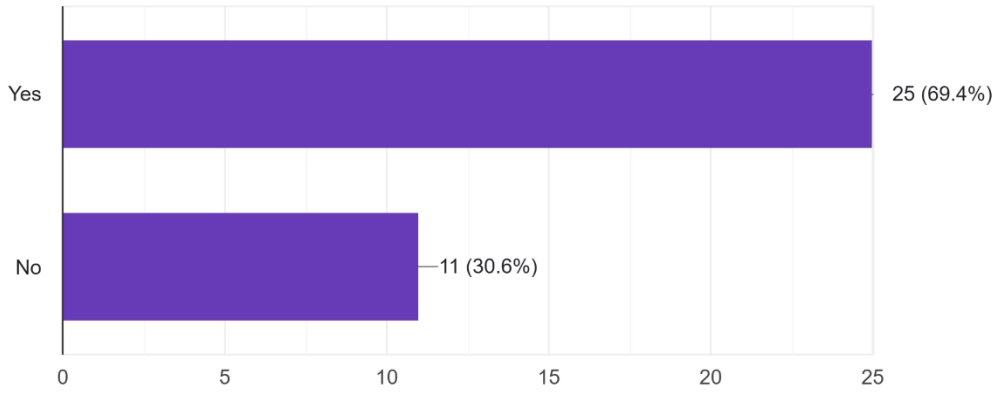
Which Hazard(s) was the cause of the disaster you experienced?

36 responses



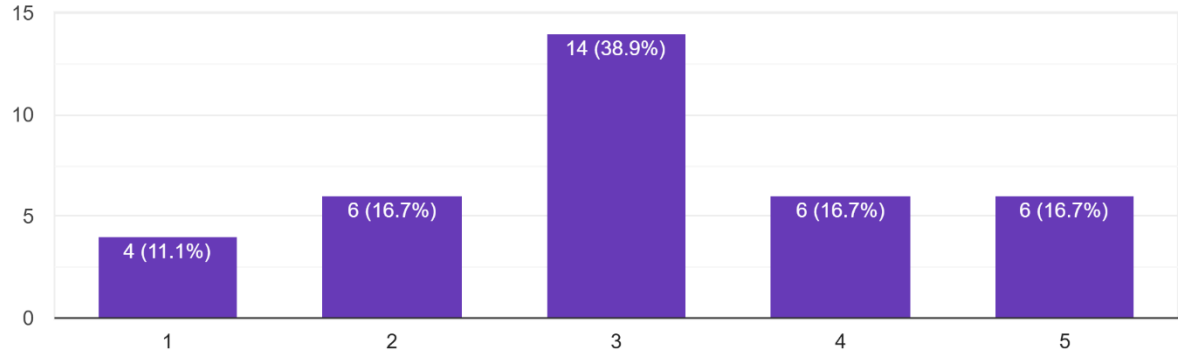
Has a road washout and/or flooding impacted your daily travels?

36 responses



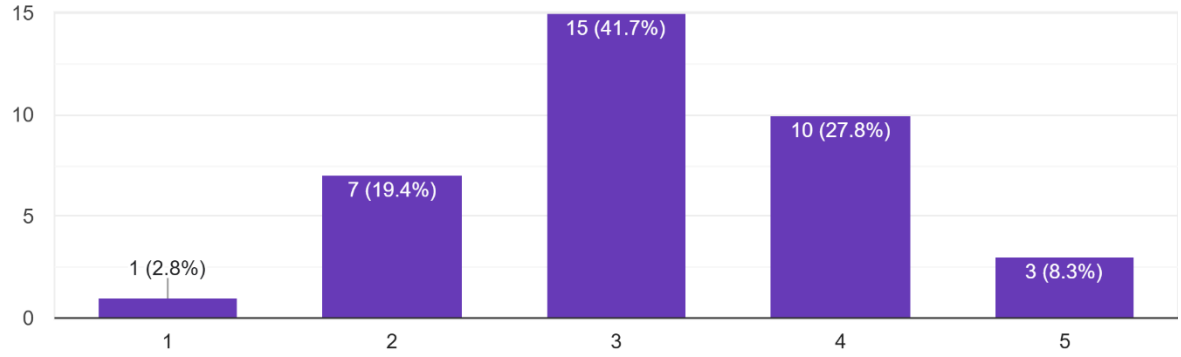
How concerned are you about flooding?

36 responses



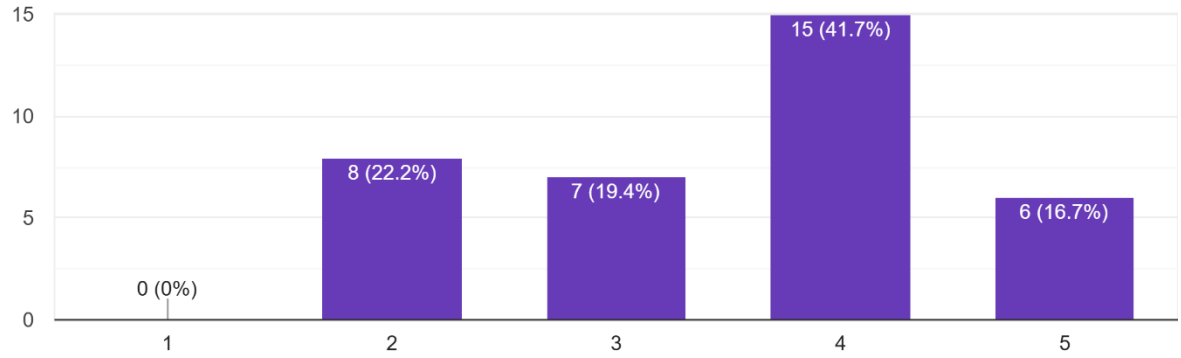
How concerned are you about winter / ice storms?

36 responses



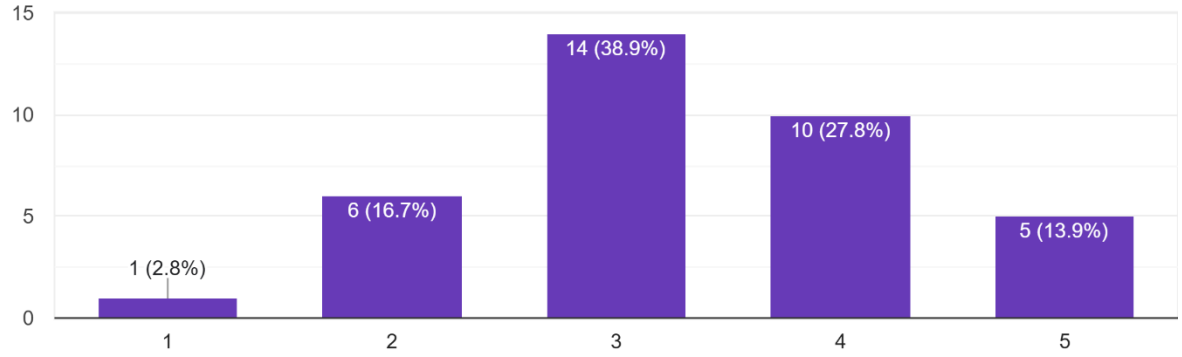
How concerned are you about high winds?

36 responses



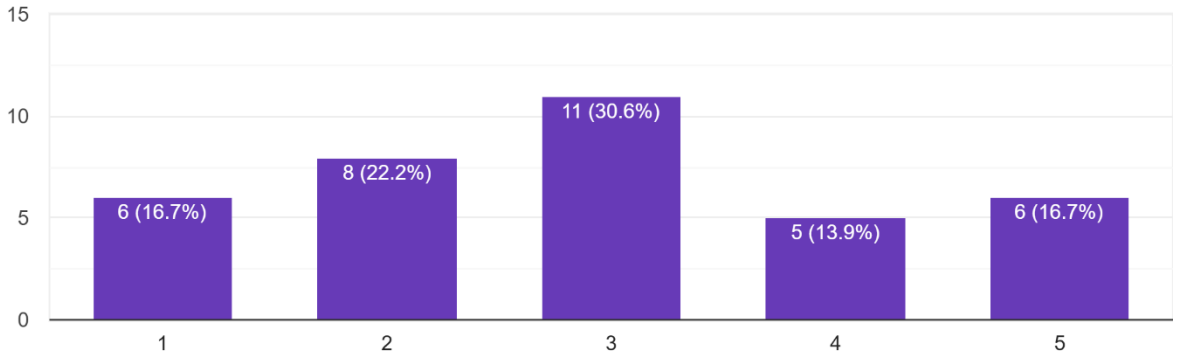
How concerned are you about extreme cold or heat?

36 responses



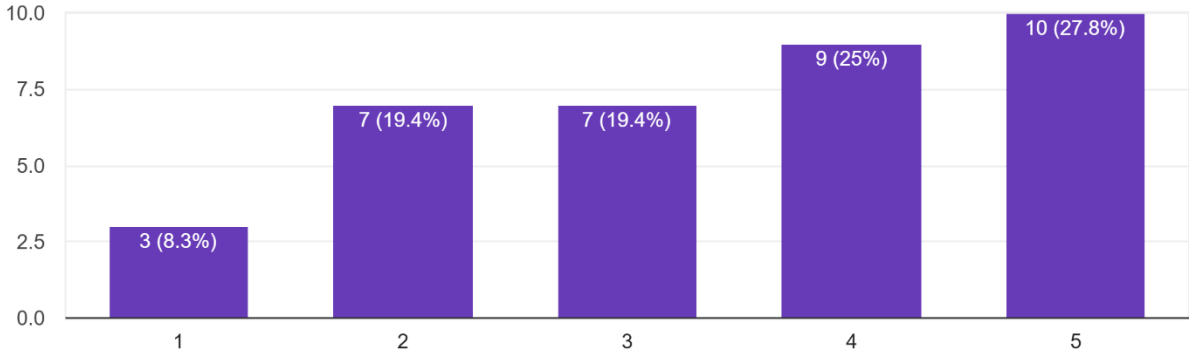
How concerned are you about drought?

36 responses



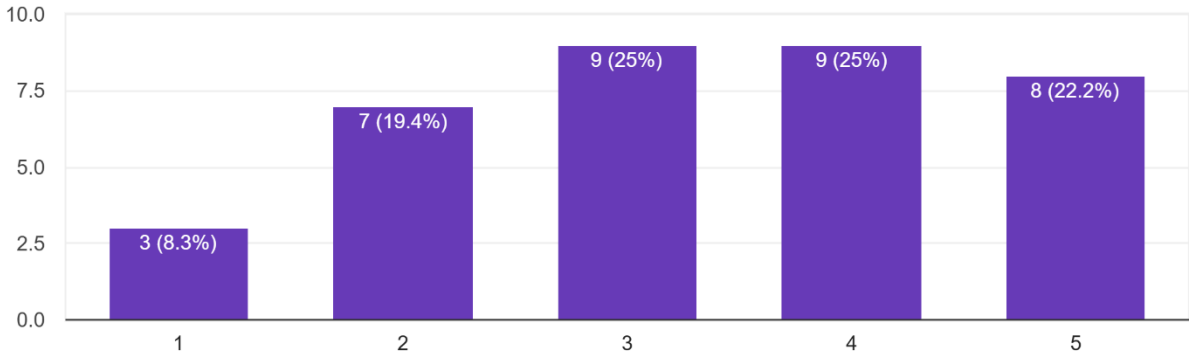
How concerned are you about wildfires locally and elsewhere (that can impact air quality)?

36 responses



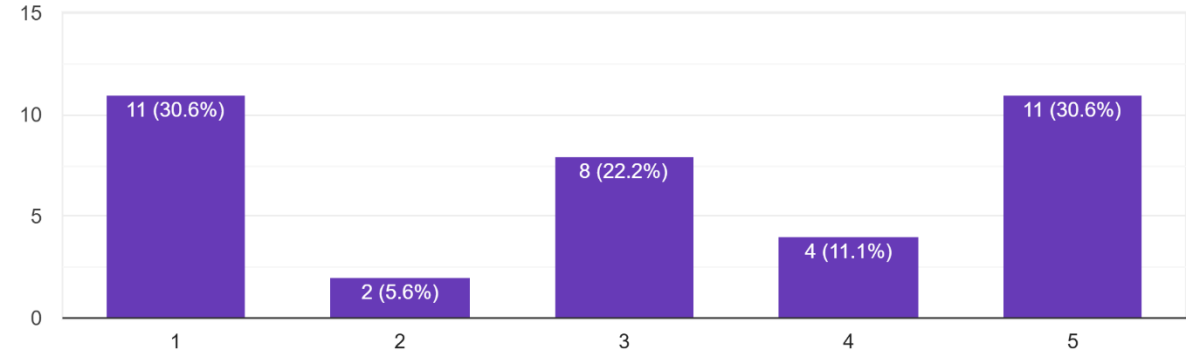
How concerned are you about another pandemic and/or infectious disease event?

36 responses



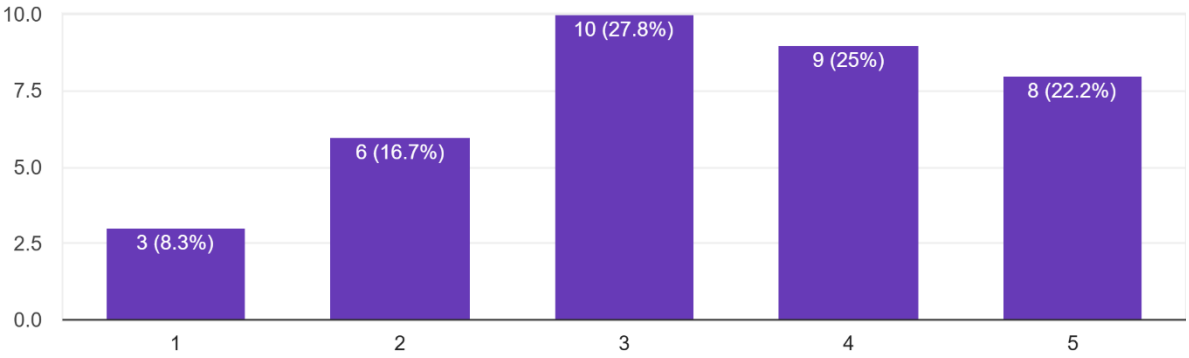
How concerned are you about climate change?

36 responses



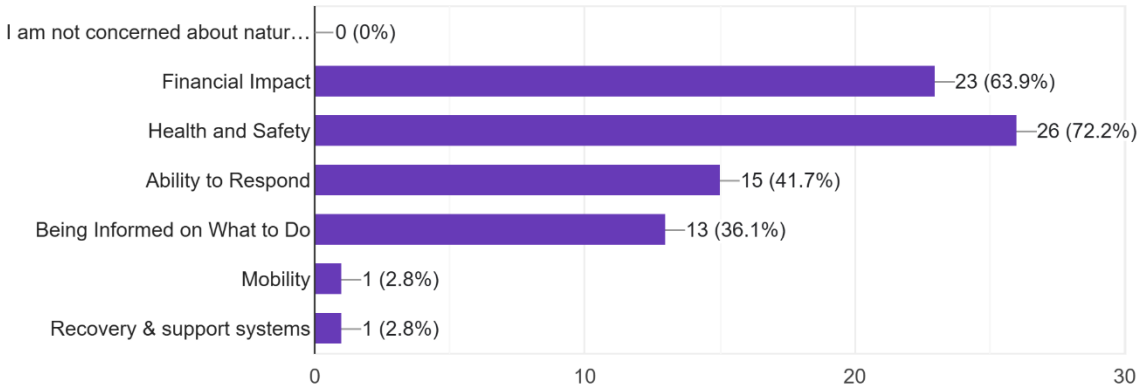
How concerned are you about road access during mud season?

36 responses



What concerns you the most about natural disasters?

36 responses



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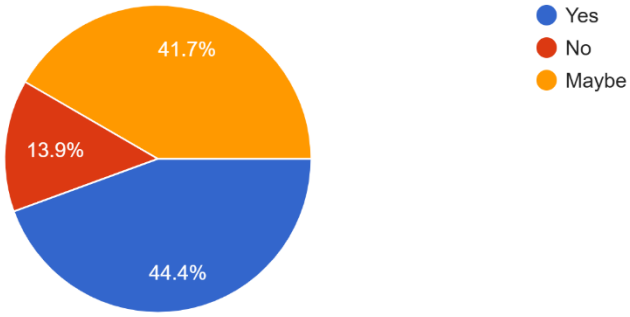
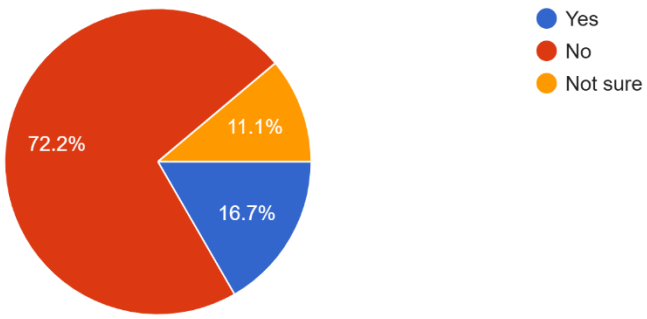
Do you feel that the town is negatively impacted by the current level of cellular and wi-fi service in regard to vulnerability to natural disasters?

36 responses



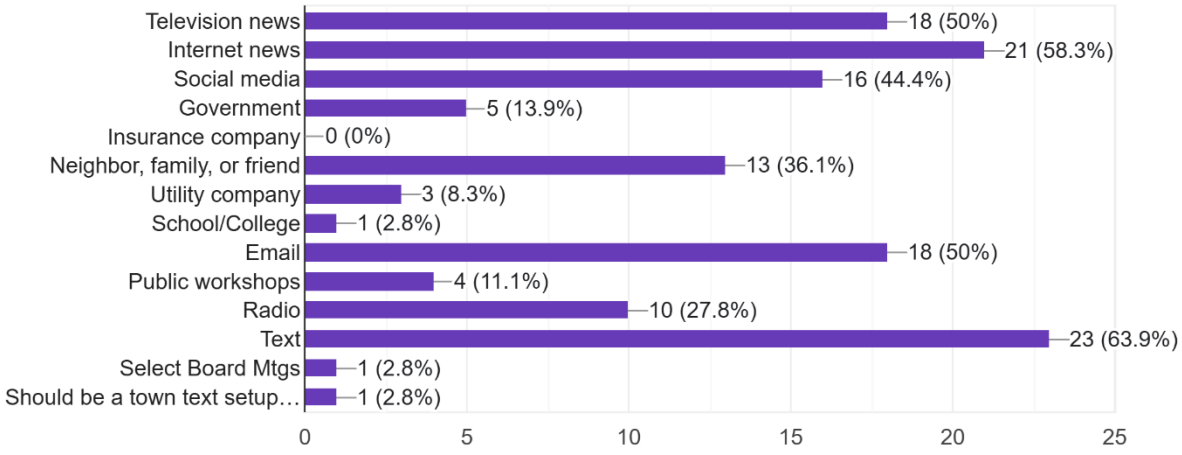
Have you ever received information about how to protect your property from disasters?

36 responses

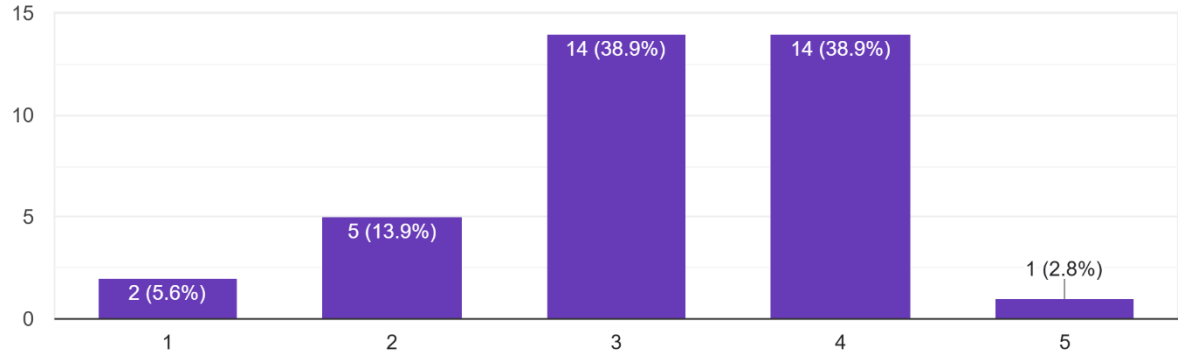


What is the best way for you to receive information about natural disasters?

36 responses



When thinking about the common problems associated with natural disasters (e.g., power outages, closed roads, access to essential services, and com...vel of preparedness for the next natural disaster?
36 responses



Appendix C: Mitigation Planning: Suggested Agenda Items

2025-2030 Mitigation Actions Short List:

Suggested Agenda Items for Select, Planning, and/or Development Review Boards

Introduction: The following actions are suggested discussion and planning topics to best serve town mitigation planning during the next five years.

1. Budgeting for disaster-related infrastructure repairs:

   Background: FEMA reimbursement can take a year or more following a disaster declaration (which can take a month or more following an event). With the increased frequency, severity, and cost of flood repairs recently, municipal budgets can be strained with one significant flood event. Even without history of this challenge for a town, the potential for repetitive damage events in a short time frame to the tune of several hundreds of thousands in repair costs is a real and present concern.

   Suggested Topics of Inquiry:
   a. What level of repair costs can the town feasibly incur from a flood event?
   b. How can the town better manage grant processes at the state and Federal levels?
   c. If a flood event exceeded this level, what are the options for the town”

- What are the short and long-term actions to support increased revenue and/or decreased loss? Has there been a recent reappraisal cue from the state to create more equitable taxation? How can next FY budgeting help?
- Are general maintenance grants at-risk of being lost due to time commitment/labor requirement for damage repair?
- What other options are available to the town to support major flood repair costs before pursuing a bank loan?

2. Strategy for keeping up with general road maintenance during disaster recovery period(s)
   Background: Major flood damage can take months to years to fully recover from. During this time, town resources may be strained to keep up with both general maintenance and flood recovery work. This phenomenon has the potential to increase flood vulnerability to infrastructure requiring general maintenance that without, have less resilience to withstand flooding.

   Suggested Topics of Inquiry:

   a. How is the town's general contracting process functioning and is there room for improvement (e.g., from scope of work, RFP, bid review, contracting and project management)?
   b. At what point does the town seek contractors for work and how has this changed during a flood event/other disaster and subsequent recovery periods?
   c. Is the threat of losing grant funding due to time restraints an issue and if so, what can be done to reduce risk of losing these funds?
   d. Has an MOU been considered/pursued with neighboring towns and/or local contractors for emergency measures, response, and/or recovery work?

3. Utilizing After Action Review to enhance operations and resilience to climate change

   Background: Arguably, a town's experience with disaster events and recovery can provide important information on what worked and what needs to be improved and the questions above can be guided these experiences. However, there may be other areas that will help support the town for future events.

   Suggested Topics:

   a. Has the town formally (or informally) engaged in After Action Reviews related to a disaster response and/or recovery event? If not, would this be helpful in gaining insight on how best to prepare for the next event?
   b. If there has been recent turnover of Road Foreman and/or other leadership at the town level, how best can the town ensure that lessons learned, and overall institutional awareness are utilized to the best degree possible during the next disaster event?

c. Are there communication hurdles existing that prohibit an adequate exchange of information to support town resilience? If so, how can this be mitigated?