Adopted by the Town of Holland Selectboard on_____

2025 Holland, Vermont
Local Hazard Mitigation Plan Update

Holland Historical Society, Gore Road

Town of Holland
120 School Road
(802) 895-4440

Prepared by:

Town of Holland

CERTIFICATE OF LOCAL ADOPTION

Town of Holland, Vermont
A Resolution of the Town of Holland Selectboard, Vermont Adopting
the 2025 Holland, Vermont Local Hazard Mitigation Plan

WHEREAS, Town of Holland recognizes the threat that natural hazards pose to people and property within Town of Holland; and
WHEREAS, Town of Holland has prepared a multi-hazard mitigation plan, hereby known as the 2025 Holland, 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, Town of Holland identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Town of Holland from the impacts of future hazards and disasters; and
WHEREAS, adoption by Town of Holland demonstrates its commitment to hazard mitigation and achieving the goals outlined in the 2025 Holland, Vermont Local Hazard Mitigation Plan.

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

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

_____
Date

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Selectboard Member

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Selectboard Member

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Attested to by Town Clerk

Executive Summary

In April of 2025, the town began to develop this Local Hazard Mitigation Plan (LHMP) Update with the help of a contractor. Since the last approved plan in 2018, the town has seen the impacts of natural disasters and a global pandemic.

A 2024 report places Vermont in seventh place for most federal disaster declarations in the country due to extreme weather. The increased frequency of severe weather, especially rain, is an evident indication of a new level of challenge that all Vermonters are faced with. What the town can do to mitigate the impact of natural disasters and the destruction they bring to residential property, infrastructure, and the overall resilience of our community defines this challenge like never before. This update identifies the hazards, vulnerabilities, risk, and mitigation opportunities for the town.

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 agencies that contributed to the development of this update. 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 update 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 update, will have a guide for action that will foster enhanced emphasis on mitigation in the years to come. As the town moves towards formally adopting this Local All-Hazards Mitigation Plan Update, 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 Holland 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 Holland have been profiled and are introduced in the grid below:

Severe Winter/Ice Storm	Extreme Cold and Heat	Flooding/Erosion
High Wind	Infectious Disease	Invasive Species

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 current knowledge 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 damage 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 Selectboard and integrate the strategies into the existing town plan as annexes until the next formal update 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 Selectboard will review the LHMP and use language/actions from it to inform the integration and future 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 mitigation actions:

Action #1: Reduce vulnerability to flooding and erosion.
Action #2: Improve resilience to severe winter/ice 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 of invasive species
Action #7: Reduce 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 Holland Select Board.

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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 the 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. 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 Orleans County.

1.2 Hazard Mitigation

The 2023 Vermont State All-Hazards 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 2018 Vermont 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 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 otherwise not 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:

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 damage caused by previous and potential future hazard events as identified specifically in this Local 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 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 Selectboard and will integrate the strategies into the existing Town Plan as annexes until the next formal update occurs, when a section devoted to mitigation planning will be integrated into the plan.
7) Maintain 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 update process. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budgets.

8) 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 Updates specific to flood resilience.

1.6 Holland Population and Characteristics

Community History and Background

Chartered: October 26, 1779
Coordinates: (Geographic Center): N44°58' W72°00'
Altitude: 1,405 feet ASL
Population (2020): 632

Holland is a sparsely developed rural town comprising approximately 40 square miles in Orleans County in the Northeast Kingdom of Vermont. The Town is located on the Canadian border and abuts the town of Coaticook, Quebec on the north; and the U.S. towns of Derby on the west, Morgan on the south, and Norton and the Unified Towns and Gores of Essex County (UTG) on the east. Holland is the highest town in Orleans County. Perhaps due to its high altitude, Holland has historically had the coolest weather and highest rate of snowfall in Orleans County. Holland contains three unincorporated villages:

- Holland Center
- Holland Pond
- Tice Hollow

Holland has one paved road, Valley Road. The terrain of Holland is rolling, and the land is primarily used for residences, agriculture and home−based occupations. The Holland Elementary School was closed permanently after the 2018-2019 school year. The school is used for community functions, including Town Meeting and large public hearings. The school is equipped with a backup generator and serves as a secondary Local Emergency Operations Center, and emergency shelter.

The Town offices are also located on School Road and consist of a small one−story structure on approximately one acre of land accommodating the Town Clerk's office, vault, and a meeting room. The Town offices are the designated primary Emergency Operations Center for the Town.

The Town garage is located on Valley Road and also serves as the Town recycling center.
The Sladyk Wildlife Management Area (WMA) comprises 9,493−acres that extend into neighboring Norton and the UTG, and is owned and managed by the Vermont Fish & Wildlife Department. Approximately 4,655 acres of the WMA are in Holland. A public fishing access area with a boat launch serving small boats is located on Holland Pond and is maintained by the Vermont Department of Fish and Wildlife.

Holland Pond is used a back−up water source for the neighboring Village of Derby Line. The Quebec−based International Water Company, which provides public water to the Derby Line, owns a dam on Holland Pond and a waterline connecting the pond to a reservoir in Derby Line. In an emergency, water would be pumped from Holland Pond into a reservoir in Derby Line.
The Town of Holland does not have a public water system, although there are two hydrants in town that are connected to the waterline owned by the International Water Company: one on Goodall Road (Town hydrant # 4) and one on Lyon Road, near LaFoe Road (Town hydrant #3). There are four additional "dry" hydrants in Town at the following locations: School Road, north of the Town offices; Gore Road

south of TH 8; Valley Road near Hunting Camp Road; and Holland Pond Road at crossing of Holland Brook.

The Town of Holland does not have any local emergency services. Police protection is provided by the State Police, and the Border Patrol officers who frequently patrol the border in Holland also have "police officer" status in Vermont. The International Boundary Commission also has a presence in Holland, and their capabilities include repairing damage to monuments along the border. Fire and ambulance service is provided by volunteer companies in neighboring Derby Line Village. The closest hospital is North Country Hospital in Newport, about a 20-minute drive from the Holland Elementary School.

The Town of Holland is governed by a three−member Select Board. The Select Board is responsible for the maintenance of Town−owned facilities and road infrastructure and hires a road foreman who undertakes this work. The Town has adopted a local road access ordinance, which sets minimum requirements for driveways, including culvert size. The Town does not have zoning or subdivision regulations and therefore does not have a zoning administrator. There is an active Planning Commission that has recently completed an update to the Town Plan, which was adopted by the Town in January of 2017. The Town Plan is a guidance document, rather than a regulatory document.

Land development that exceeds thresholds established in State statute triggers Act 250 development review and/or other State permits such as wetlands, stream encroachment, or stormwater permits. The State Department of Environmental Conservation issues permits for potable water supplies and wastewater systems for all residential development in town.

The Town of Holland has adopted the State Road and Bridge Standards and has an up−to−date Local Emergency Operations Plan. The Town is served by Vermont Agency of Transportation (VTRANS) Maintenance District #9.

National Flood Insurance Program (NFIP)

The town does not participate in the NFIP and FEMA has not completed a study to determine flood hazard for the selected location; therefore, a flood map has not been published at this time.

1.7 Summary of Planning Process

The town contracted with OPH Consulting Services to create the plan on April 1st, 2025. Jim Davis and Dianne Judd served as the primary points of contact during the planning process. The following table presents the Planning Team members and their title:

Table 1-0: 2024 Holland Mitigation Planning Team Roster

2025 Hazard Mitigation Planning Team	Title
Stacy Boone	Planning Commission
David Jacobs	Select Board
Dianne Judd	Town Clerk
Adam Provost	Road Foreman
Rick Gonyaw	Planning Commission

Jim Davis	Planning Commission
Darrell Martin	Planning Commission
Parker Castle	Planning Commission

Public Involvement:
April 24th, 2025, marked the kick-off correspondence with the newly formed planning team. The community was alerted that the plan was being drafted 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. 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 all hazards specific to the 2023 and 2024 flood events. Public notice 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 May 2025 the draft was made available to the public with an opportunity for review and feedback.

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.

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 Holland include Derby, Morgan, UTG, and Norton. 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 Holland 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 formal outreach informing public on opportunity to provide comment.
- 2024 Holland Town Plan (provided current goals and regulations supporting mitigation, recent capital expenditures and infrastructure value helped to drive vulnerability assessment.
- 2023 Vermont 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).
- 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).

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 selectboard meetings are summarized below.

- *04/1/25: Project Start. Planning meeting with town POC to establish planning team and develop action plan.*
- *04/16/25: Community notified of planning process and Hazard Impacts Survey launched via town website. Teleconference with POC to discuss informational needs and planning process.*
- *4/24/25: Kick-off correspondence with planning team to discuss planning process and hazard impact survey.*
- *5/5/25: Town POCs provided an itemized list of information required for the update. Consistent correspondence followed to support expedited plan development.*
- *5/11/25: Planning team sent draft update for review and comment. Teleconference with Project Manager from the Memphremagog Watershed Association to discuss planned mitigation projects. Correspondence related to community notification of draft review and data collection with POC.*
- *5/12/24: Draft plan made available on town website and community made aware of the opportunity to review and provide comment.*
- *5/13/2025 Draft Plan and Review Tool submitted to VEM.*

SECTION 2: HAZARD IDENTIFICATION

The methodology for determining the natural hazards profiled in this plan combines information from the state mitigation plan, disaster history, public input, and severe weather data to estimate risk 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. Flooding is the greatest threat to the town.

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 Holland. 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.

2018 Profiled Natural Hazards:

- Flooding/Stream Bank Erosion
- High Winds
- Severe Thunderstorm (with associated lightning)
- Severe Winter Storms
-

2025 Profiled Hazards

- Severe Winter Storm
- Extreme temperatures
- Flooding/fluvial erosion
- Infectious Disease
- Invasive Species
- High Winds

2.1 Natural Hazards

The National Oceanic and Atmospheric Administration (NOAA) Storm data shows 103 severe weather events were reported between 04/16/2018 and 12/31/2024 in Orleans County. These events resulted in $4.38 million in property damage and $100k in crop damage. 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	Vermont 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

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

Number	Year	Type
4816	**2024**	**Vermont Severe Storms and Flooding**
***4826**	**2024**	**Vermont Severe Storms and Flooding**
4810	**2024**	**Severe Storm and Flooding, Landslides, Mudslides**
***4720**	**2023**	**Severe Storm and Flooding**
4695	**2023**	**Severe Storm and Flooding**
4621	2021	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**
3338	**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**
518	**1976**	**Severe Storms and Flooding**
397	**1973**	**Severe Storms and Flooding**

Source: FEMA

2.1.1. An Introduction to Severe Weather Trends

The Town is aware that changes in the frequency and severity of weather events have the potential to increase risk and vulnerability now and in the future. Observed changes in weather patterns pose challenges in mitigating the impact of more intense storms, frequent heavy precipitation resulting in repetitive flooding, heat waves and cold spells, and drought conditions. Developing mitigation strategies that reduce the town's vulnerability to these events defines the town's commitment to building a resilient community. 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 (16 years), there were 28. In essence, 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 an influx of diseases and pests that cold winters previously prevented.

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

- *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.*
- *Average annual precipitation has increased almost 6 inches since 1960.*
- *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

Severe Winter/Ice Storm

Since 2018, there have been 51 severe winter weather events impacting the county. According to the *2023 Vermont State All-Hazards 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.

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. 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, Holland 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 1-3, 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’’. The snowfall totals are annual averages based on weather data collected from 1981 to 2010 for the NOAA National Climatic Data Center. Because such storms are expected during a Vermont winter, the town is well-equipped to deal with snow removal and traffic incidents. The most damaging types of snowstorms are ice-storms caused by heavy wet snow or rain followed by freezing temperatures. 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 Selectboard 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 storm updates.

Based on past occurrences, the worst anticipated winter weather Holland 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. Using the wind chill scale and historical information, the estimate for extreme cold is negative 60 degrees Fahrenheit.

Ice Storms

While there were no NOAA-reported ice events in the last planning period, the frequency of severe winter weather events maintains a level of risk of ice-related hazards. The two “ice storm” events listed on the NOAA database occurred on January 6, 1998, and December 21−22, 2013. The January 1998 ice storm event resulted in $80K in property damage County−wide, with ice accumulations of ¾ inches or less. NOAA describes the effects of this event:

“The impact on the region ranged from ice accumulations damaging tens of thousands of trees. Downed power lines resulted from the weight of the ice with several thousand without power. Farmers who lost electricity were unable to milk cows with loss of income and damage to cows. Automobile travel was negatively impacted with a number of roads closed due to ice and fallen trees. There were numerous traffic accidents. Indirect injuries were reported due to carbon monoxide poisoning while improperly using generators. Falling tree limbs and other debris was a significant hazard during and following the storm.”

The December 2013 event resulted in 750K in property damage, with ice accumulations of ½ to ¾ inches. The effects were described as follows:

"The greatest impact was in northwest Vermont, especially along the Canadian border, with widespread tree and utility line damage as well as numerous vehicle accidents. More than 75,000 customers were without power from hours to days across the region. The areas impacted were similar to the Ice Storm of January 1998, but not the severity as precipitation and ice accumulation were half of the 1998 storm. Ice jams also developed during this time period as runoff from melting snow and rainfall swelled area rivers. River rises were enough to break up and move ice cover, resulting in scattered ice jams."

Extreme Cold

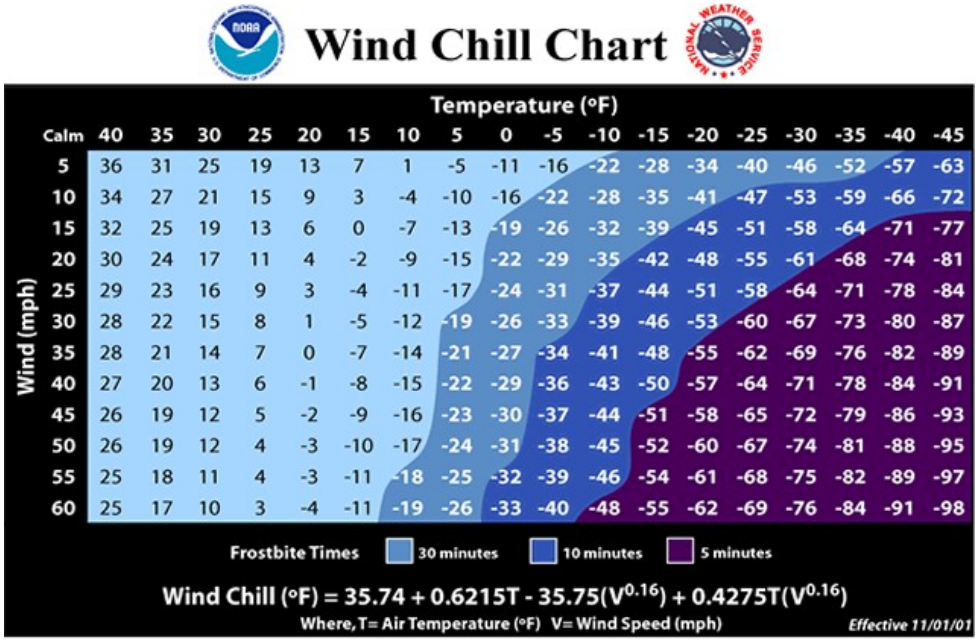
Since 2018, there have been three extreme cold events. An arctic cold front moved across VT Friday night (1/14/22) creating dangerously cold wind chills of 25 to 40 below zero overnight Friday night into Saturday morning. Overnight air temperatures were 10 to 20 below zero. Table 2-4 includes narrative links for these events. 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.

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 2-4: 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 and Erosion

Holland is within Tactical Basin 17, and the majority of the town drains north to Lake Massawippi in Quebec. The southern portion of the town is within the Clyde River subwatershed.

Rainstorms are the cause of most flooding in town. Much of this flooding is flash flooding, occurring within hours and as opposed to general 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 the 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 Vermont State All-Hazards 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 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, 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 the July 2023 flood event.

The Town of Holland has a history of flooding and while none have been totally devastating, there has been significant damage and repair costs from declared disasters, especially in 2023. The last two years have resulted in a severity and frequency of flooding that is arguably unprecedented.

DR4720 was defined by catastrophic flooding caused by a storm system that dropped between 6 to 9 inches of rain in many areas resulting in catastrophic damage. The storm initially struck New York before moving to New England, resulting 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 of 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.

Again, in late July 28-29, 2024, a locally catastrophic flash flood situation unfolded across portions of Caledonia County and Northeast Kingdom. 7.97 inches of rain fell in St. Johnsbury over a period of six hours starting around 11 p.m. Monday night with a month's worth of rain falling in just two hours. Due to the heavy rain and flooding, local police have also issued a "shelter in place" advisory.

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Table 2-5: Bulk PA Funding as a Result of Flooding (019-33775-00)

Disaster Number	Year	Incident Type	Number of Projects	Federal Share Obligated
1559	2004	Severe Storm(s)	9	$88,487.49
1995	2011	Severe Storm(s)	12	$463,098.19
4022	2011	Hurricane	4	$13,459.52
4178	2014	Flood	1	$40,574.14
4474	2020	Severe Storm(s)		
4720	2023	Severe Storm(s)		
4826	2024	Severe Storm(s)		

The Federal Emergency Management Agency has not mapped Holland for flood prone areas, and consequently there is no Flood Insurance Rate Map for the town. The Town of Holland has not participated in the National Flood Insurance Program, because there is no official mapping of flood hazards to serve as the basis for flood hazard regulations that meet the minimum requirements of FEMA. In anticipation of future mapping, the following definitions are provided:

Table 2-6: 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 flood plain. 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.

Previous experiences have proven to the town that flooding is the greatest risk, and another flood event is probable by the time this plan requires an update. With this conviction, the need to complete viable mitigation actions to town infrastructure becomes incredibly important and the town remains aware of this. The following chart indicates the history of occurrence with regard to this hazard in Holland. 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.

DR 1995 resulted in significant damage in Holland. On April 26 – 27th, 2011, a flash flood event resulted in a reported 50K in property damage according to the NOAA database. FEMA disaster number 1995 covered the period when this flood event occurred, and ten separate locations in Holland had recorded damage to road infrastructure including on Mead Hill Road, Tice Mill Road, Twin Bridges Road, Cross Road, Page Hill Road, Stearns Brook Road, Valley Road, Trucott Road, and Holland Pond Road.

Another significant flood occurred in Holland on April 15−16, 2014 (Federal Disaster # 4178) caused by heavy rain combined with snow melt. According to the NOAA database, this event resulted in $125,000 in property damage.

Table 2-7: History of Major Flood Occurrences

Date and Disaster Declaration Number if applicable	Event (By FEMA classification)	Location	Extent and impacts
DR 4720 (2023)	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. Holland had significant damage to both roads and buildings.
DR 4474 (2020)	Severe Storm and Flooding	Countywide	A powerful storm system tracked across the eastern Great Lakes late on 31 October 2019 and produced an axis of 3 to 5 inches of rain, which caused significant flooding across the region. Given how saturated the soils were from the recent heavy rainfall, shallow rooted trees were easily uprooted, exacerbating power outages.
DR 4022 (2011)	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 Holland had moderate damage from this event.
DR 1995 (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 Orleans 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.
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 Holland.

The state has further identified and classified roads at risk of erosion. Regarding flood inundation issues, the *2023 Vermont State All-Hazards 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

Erosion occurs on a consistent, but small−scale, basis within the riparian corridor of Holland's streams. 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.

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 Vermont State All-Hazards 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.

The State of Vermont Agency of Natural Resources (ANR) has mapped "River Corridors" throughout the State. The River Corridors, as defined by ANR, "encompass the area of land surrounding a river that provides for the meandering, floodplain, and the riparian functions necessary to restore and maintain the naturally stable or least erosive form of a river thereby minimizing erosion hazards over time." Since lands within and immediately abutting a river corridor are at higher risk to fluvial erosion, the State recommends that development within mapped River Corridors be avoided, and that a 50-foot setback be maintained from smaller streams.

As an incentive to encourage Towns to restrict new development within River Corridors, the State provides an increased State match under ERAF for Towns that adopt local flood regulations incorporating regulation of State River Corridors.

River Corridors have been mapped by the State for portions of Stearns Brook, Orcutt Brook and Holland Brook in Holland (see map in appendix). An estimated 403 acres of land in Holland is within the State−identified River Corridors, indicating the extent of land that may be subject to fluvial erosion hazards. Most of this acreage is within undeveloped areas of Town, although there are a few locations where roads or existing houses are located within the River Corridor (see map in the Appendix).

Although the title of Disaster #1995 which occurred in 2011 is simply "Severe Storms and Flooding," some of the infrastructure damage was due to fluvial erosion (e.g., Tice Mill Road and the Stearns Brook Road BR. 31 over Stearns Brook). The number of instances where flood damage in Holland was caused by fluvial erosion is not available, nor is there documentation of the extent of fluvial erosion

Extreme Heat

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."

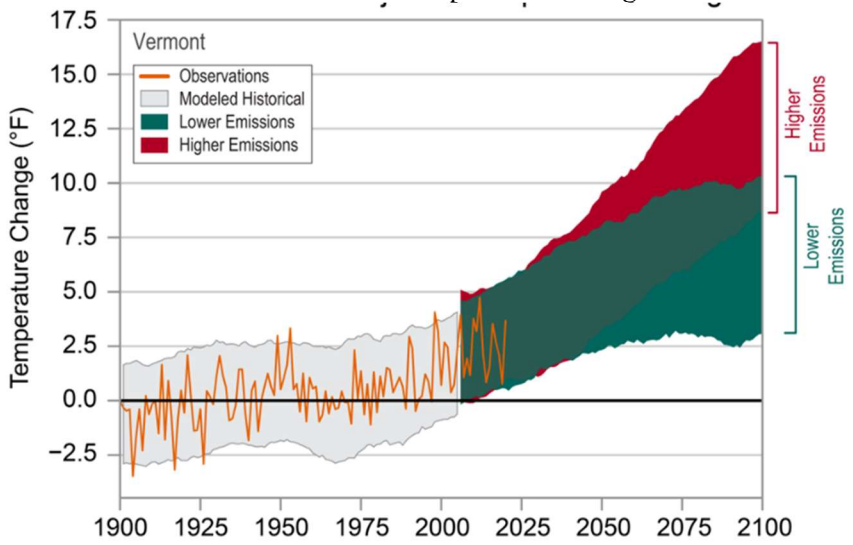
In anticipation of extreme heat events, the National Weather Service (NWS) may issue the following advisories:

- *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]

[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.

Table 2-8: 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 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 a significant loss of ski industry revenue due to a 25-50% reduction in snow loading.

Dangerously High Summer Heat

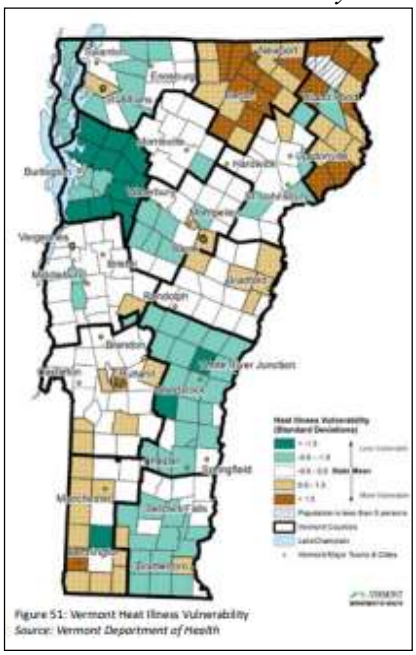
Heat is most likely to pose the greatest risk to human health in July, which is typically the hottest month of the year. In July of 1911, Holland had a 12-day average of 90.75°F. The summer of 1949 was also very hot, with 25 days above 90°F. It is important to note here, however, that hot weather can 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. The maximum temperature reached 89°F on July 21st and July 24. Notable, if not record setting heat events include:

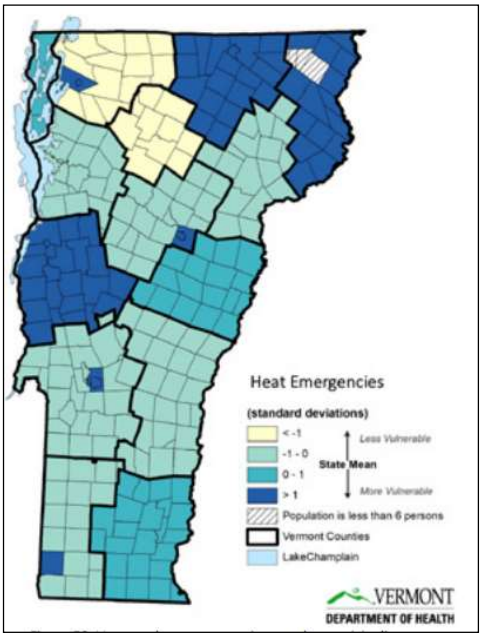
- *June 18th-20th, 2024: Heat advisories were issued on June 18th with temperatures reaching 100 degrees and remain in the 90's through the weekend with high humidity.*
- *August 1-2, 2006: A heat ridge moved into Vermont during the early morning August 1. Temperatures soared into the 90s but significantly more important were dewpoints that reached the middle to upper 70s to produce excessive heat index values of 100°F to 105°F, some of the highest values in nearly a decade.*
- *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.*

- *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.*

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 2-9: Heat Vulnerability and Emergency Mapping





Source: https://www.healthvermont.gov/sites/default/files/documents/pdf/ENV-CH-hot-weather-planning-guidance.pdf

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 2-10: 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 Holland. 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 2-11: 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.

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. Starting May 11, 2023, the CDC and Vermont Department of Health no longer use the COVID-19 Community Level to measure COVID-19 activity in the U.S. and Vermont. Instead, Vermont's statewide COVID-19 level is measured by the rate of COVID-19 in people being admitted to the hospital, per 100,000 residents. Focusing on hospitalization data is a better estimate of how COVID-19 is impacting the community now that reported COVID-19 cases represent a smaller proportion of actual infections. This also allows us to compare Vermont's hospitalization levels with other parts of the country.

As grant funding and related projects continue, the town considers the recovery phase of this disaster as still active and while the present reduction in severity of the pandemic comes with great relief and a perceived cultural wish to forget about the pandemic and move on, there is prudency in not forgetting while moving forward. One issue for all communities is that of health disparity. The role of town government in relation to public health measures and improving health equity is not entirely clear but working together with state agencies and the community is a logical path forward. As stated by the Vermont Department of Health:

"The population of those who are Black, Indigenous, and people of color (BIPOC) have faced disparities throughout the COVID-19 pandemic. In Vermont, BIPOC Vermonters continue to have a lower vaccination rate than those who are White, non-Hispanic, 54% vaccinated compared with 60%, as of May 7, 2021. However, this gap has been decreasing since the week of April 4th. The conditions in which we live, work, and play, known as the social determinants of health, affect a wide range of health outcomes. Systems of structural oppression and racism greatly impact social determinants of health. In other words, even before the COVID-19 pandemic, not everyone in Vermont had equal access to the conditions that favor health. COVID-19 shines a light on these inequities. BIPOC Vermonters are at disproportionate risk for poor health outcomes, including COVID-19. In addition, this population is at higher risk for more serious outcomes, such as hospitalization, and may lack access to information and resources. For more information on what the Vermont Department of Health is doing to mitigate racial and ethnic health disparities, please visit www.healthvermont.gov/about-us/our-vision-mission/health-equity." -May 2021 Vermont COVID-19 Vaccination Rates by Race and Ethnicity Report

High Winds

NOAA lists 25 "high wind" events during the last planning period. While some of these events were specific to other towns in the county, the majority were county-wide. The National Oceanic and Atmospheric Administration (NOAA) lists three type of wind events that effect Orleans County: "Strong Wind," "High Wind," and "Thunderstorm Wind."

Strong Wind is defined as non−convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph). High Wind is defined by NOAA as sustained non−convective winds

of 35 knots or greater lasting for 1 hour or longer, or winds (sustained or gusts) of 50 knots for any duration, on a widespread or localized basis.

High Winds from a thunderstorm can gust up to 50 mph and cause 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 2-12: 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**

The multi-hazard storm in late December of 2022 resulted in 71MPH winds recorded at the Burlington Airport (BTV) which was the second highest ever recorded with the first at 72 MPH in 1950. This storm resulted in a fatality due to falling limb and 98k without power. The NEK was of the hardest hit.

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 Town Plan includes information on invasive species, much of which is included below:

The spread of invasive species is endemic in Vermont. Aquatic invasives species 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**.**
Invasive plants can cause damage to the natural ecosystem by out-competing native plants at the determinant of different characteristics. Additional notice is provided in this Plan because of its tangled relationship with the watershed. Invasives can lead to increased erosion, clogging of streams and waterways, as well as provide less nutritious food and habitat for wildlife. Like many places in Vermont, Holland has seen an increase in invasive plant species, some having a very noticeable impact.
Terrestrial invasive plants include:

- Common Reed (Phragmites)
- Japanese Knotweed
- Poison Hemlock
- Purple Loosestrife
- Reed Canary Grass

Invasive insects pose a serious threat to forests as well and include:

- Spruce Budworm
- Beech Bark Disease
- Paper Birch decline
- Balsam Woolly Adelgid
- Emerald Ash Borer

The Asian Longhorn Beetle is another invasive insect that attacks hardwood trees, and an infestation has been found covering over 18 square miles in Massachusetts. There are other invasive insects that could pose a threat to the current natural heritage if an outbreak were to oc

Profiled Natural Hazard Summary

The natural hazards affecting 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. With the growing severity of severe weather events, 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 from which we can define achievable and viable mitigation strategies that will 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 and historic risk within the town. 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 update.

3.1 Designated Hazard Areas

3.1.1. Flood Hazard Areas

All of Orleans County is located in the Barton River watershed, a drainage area of approximately 164 square miles. Areas along the banks of the Barton River, the Black River (which flows through the Village of Holland), Stony Brook, Day Brook, Alder Brook and Trout Brook, have been identified as Flood Plain areas but as previously mentioned, a SFHA has not been mapped for the town.

A SFHA 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. FEMA is currently updating the Flood Insurance Rate Maps (FIRMs) in Vermont for the National Flood Insurance Program (NFIP). This will be the first map update for many towns since the 70's or 80s. Some Vermont counties received official "digital" FIRMs in 2007 but most of the flood hazard areas did not get fresh studies. This new update will cover the entire state in stages and may become effective in some counties as soon as 2025. The National Flood Hazard Layer (NFHL) is a geospatial database that contains current effective flood hazard data. FEMA provides flood hazard data to support the National Flood Insurance Program. Holland can use the information to better understand the level of flood risk and type of flooding. Areas in Holland that may be at risk of fluvial erosion are delineated on the VT Agency of Natural Resources River Corridor (RC) Maps. All these maps are discussed in the most recent Town Plan:

> *"The State of Vermont Agency of Natural Resources (ANR) has mapped "River Corridors" throughout the State. The River Corridors, as defined by ANR, "encompass the area of land surrounding a river that provides for the meandering, floodplain, and the riparian functions necessary to restore and maintain the naturally stable or least erosive form of a river thereby minimizing erosion hazards over time." Since lands within and immediately abutting a river corridor are at higher risk to fluvial erosion, the State recommends that development within mapped River Corridors be avoided, and that a minimum 50-foot setback be maintained from smaller streams. River Corridors have been mapped by the State for portions of Stearns Brook, Orcutt Brook, and Holland Brook in Holland."*

The risk of flood damage is influenced by factors of location to a body of water, elevation, slope, drainage, and magnitude of precipitation. There is a local knowledge of areas in town most at risk of flood damage but as seen in 2023 and 2024 flooding across the region, the potential for areas not previously perceived as high risk for flooding may be impacted by a high-magnitude rain event. Road infrastructure is a main concern related to flood damage. Historically, Twin Bridge Rd., Holland Pond Rd., and Stearns Brook Rd. have sustained significant damage during flooding disasters (e.g., DR1995). To a lesser extent, Valley, Mead Hill and Page Hill Roads have also been areas of flood risk as seen by repair costs as result of declared disasters. In 2014, many town highways were damaged.

The estimated number of bridges and culverts from the Vermont Online Bridge and Culvert Inventory Tool is 7 bridges and 395 culverts.

3.1.2. Fluvial Erosion Hazard Areas

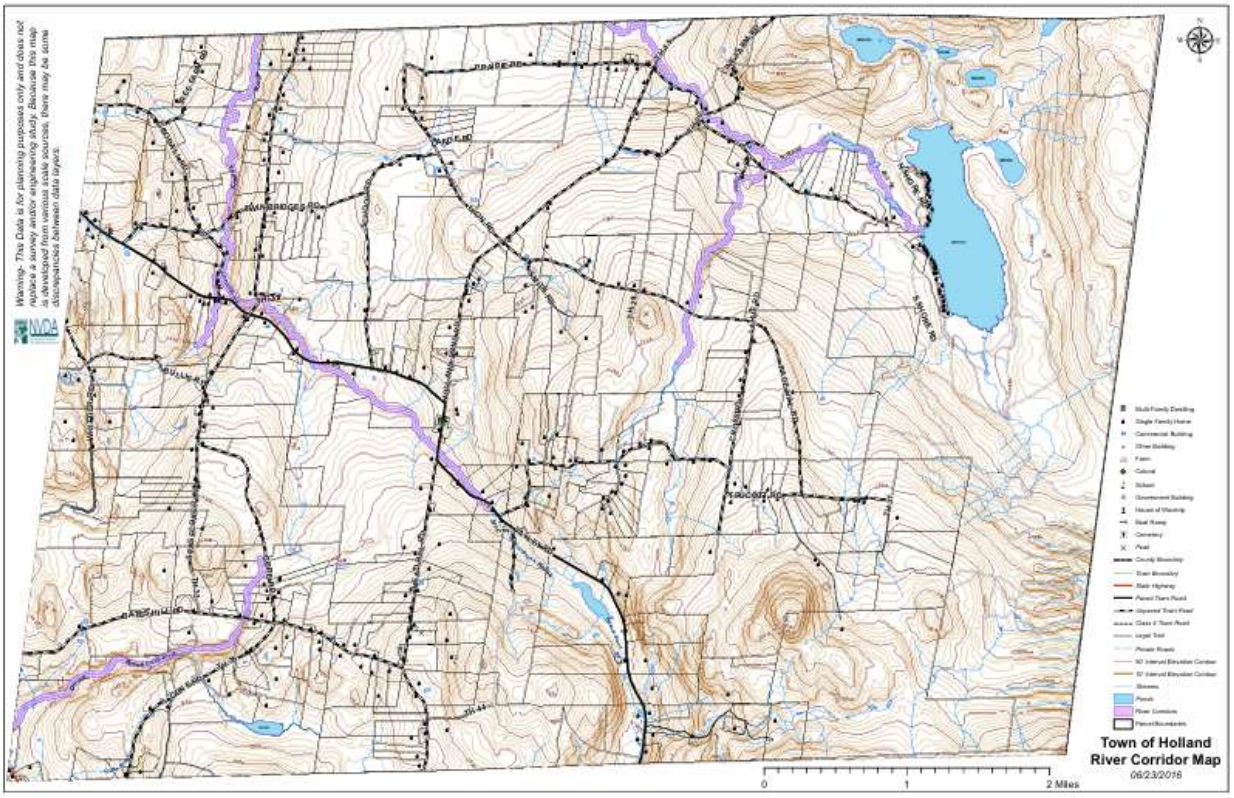
Fluvial Erosion Hazard (FEH) Zones extend beyond floodplains and consider the movement of a river channel. About two-thirds of Vermont's flood-related losses occur outside of mapped floodplains, and this reveals the fundamental limitations of the FEMA FIRMs. A mapped floodplain makes the assumption that 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.

DR1995, the most costly disaster for Holland, resulted in infrastructure damage due to fluvial erosion Stearns Brook is impaired from sediment and stream bank erosion is close to Gore Rd. which is considered a high-risk area for erosion. No occurrences of landslides are known.

A River Corridor map was created by NVDA in 2016. An estimated 403 acres of land in Holland is within the State− identified River Corridors, indicating the extent of land that may be subject to fluvial erosion hazards. Most of this acreage is within undeveloped areas of Town, although there are a few locations where roads or existing houses are located within the River Corridor. As a means of visualization, the River Corridor Map is provided below.

Map 1: Holland River Corridor Map



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

While Holland has had a history of flooding, losses to public infrastructure in the May floods of 2011 were the most severe for the town. The flooding of 2023 and 2024 impacted the town but not nearly to the degree seen in 2011.. Holland and its Villages have received public assistance funding from FEMA for the following natural disasters:

Table 3: Public Assistance Summary: 2001-Current:

Disaster Number	Declaration Date	Incident Type	Number of Projects	Federal Share Obligated
3167	2001	Snow	1	$3,027
1559	2004	Flooding	9	$88,487
1995	2011	Flooding	12	$463,098
4022	2011	Hurricane	4	$13,460
4178	2014	Flooding	1	$40,574
4532	2020	COVID-19	n/a	$183,584
4720	2023	Flooding	14	$93,930
4826	2024	Flooding	5	$44,151

Non-Declared Disaster Summary:

Non-declared disasters have not resulted in damage above and beyond normal maintenance. 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 a 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.

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 plan as well as the qualitative vulnerability ranking in Table 4-1. 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.

1.4.1 Natural Hazards

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

- Severe Winter Storm (32), Ice Storm (28)
- Flooding/inundation (40), erosion (20)
- Extreme Cold (16)
- Extreme Heat (16)
- Infectious Disease (20)
- High Wind (16)
- Invasive Species (16)

Table 3-1: Natural hazards risk estimation matrix

Holland Hazard & Risk Analysis: NATURAL HAZARDS	Drought	Flooding/inundation	High Winds	Erosion	Landslide	Extreme Heat	Infectious Disease	Fire	Winter Storm	Ice Storm	Extreme Cold	Earthquake	Invasive Species	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	2	1	1	1	4	1	3	4	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	1	2	2	1	1	0	0	1	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	1	2	2	0	1	1	0	2	1	1	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	1	3	1	2	1	1	3	2	2	2	1	1	3	1
Sum of Area & Consequence Scores	5	10	8	5	5	4	9	7	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	2	4	2	1	4	4	2	1	2	2
TOTAL RISK RATING														
Total Risk Rating = Sum of Area & Consequence Scores x Probability of Occurrence	**10**	**40**	**16**	**20**	**10**	**16**	**18**	**7**	**32**	**28**	**16**	**5**	**16**	**8**

Flooding remains the most likely event to incur the most cost for the town based on historical analysis. Given the magnitude of damage in 2023, 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. Areas of repetitive flooding and ongoing streambank erosion were reviewed by the planning team, with the Town Road foreman providing detailed information on the problem areas.

Surface water in Holland includes eight ponds that are large enough to be regulated by the July 2014 State Agency of Natural Resources under the Shoreland Protection Act. The act establishes a protected area consisting of the first 250 feet from the mean water level of lakes and ponds greater than 10 acres in size. These ponds are Beaver Pond, Holland Pond, Line Pond, two Mud Ponds, Round Pond, Stearns Pond, and Turtle Pond. Holland Pond is by far the largest of these at 329 acres. The other ponds range in size from 13 acres to 39 acres. It is noted that six of these ponds are located within the WMA. Named streams in Holland include Stearns Brook, Orcutt Brook, and Holland Brook. The most significant body of water is Holland Pond in the northeast. Along the pond's west side are numerous summer camps but an increase in full-time owner use of individual properties is noticed. The pond is essentially surrounded by the Bill Sladyk Wildlife Management Area (WMA) which contains 4,655 acres or roughly 17% of the Town.

Overall development is limited and consists principally of year-round homes (283), seasonal homes (118), and several working farms. During the last planning period, the total number of farms has decreased with farms incorporating and merging with one another. There are also several former farms whose land continues to be open and productive through rental or lease. There is no true commercial development in Town and most businesses are home based. In what was originally the Town Center is one church, Holland Community Church. The Holland Historical Society building is located on Gore Road. The Town's three public buildings include the Town offices and school building on School Road and the Town Garage on Valley Road.

There are approximately 10 residences in or directly adjacent to the mapped River Corridors, indicating that these properties may be at risk of damage. There are also portions of the town's road infrastructure that are within the mapped River Corridors.

Vulnerable, or "at-risk" populations would include the elementary school, a senior residence at the corner of Page Hill Road and Holland Pond Road, and the visiting population of second homeowners, most of which are concentrated around Holland Pond. 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. All of the 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 is significantly vulnerable to loss during a disaster. All Town-owned buildings are collectively assessed at $2,347,900.00. The largest of these is the school which remains town property but is no longer functioning as a school. The lack of a local gravel supply for road repair and maintenance remains an issue for the town. The 2024 Town Plan states:

"A significant problem with maintaining the Town roads is the both the lack of and cost of gravel. The Town has no sand/gravel pit and thus must purchase and haul winter sand and gravel. This is an increased cost. To adequately maintain Town roads, additional funds must be allocated for gravel.-- Without a viable source of gravel, the roadways may not be maintained in the manner consistent with the safety needs, desires of residents, and the financial wherewithal of the Town."

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 Holland properties and their use. With this, there is no evidence to suggest that any critical facility is highly vulnerable during any hazard event. Given the recent change in frequency and severity of rain events and the observed impact of these events, additional considerations must be

employed during the next planning cycle to not only protect town assets but also assure continuity of operations should a building and/or equipment be rendered non-functional due to damage incurred during a hazard event.

Table 4: Critical Facilities

Asset / Critical Infrastructure	Location	Ownership	Estimated Value ($)
Holland Elementary School (also emergency shelter)	School Road	Holland School District	**1,856,900**
Holland Town Offices	School Road	Town of Holland	**206,900**
Holland Town Garage	Valley Road	Town of Holland	**284,100**
Fire hydrants (Dry and Live)	6 in various locations	Town of Holland/ International Water Co.	**2,000-5,000 per hydrant**
Holland Historical Society (Old Congregational Church) – National Register property	Holland Pond Road	Holland Historical Society	**26,200**
Methodist Church	Holland Pond Road	Holland Community Church, Inc.	**137,100**
Valley Road (only paved road). Link to Interstate 91 and south to State Rt 111	Across town	Town	**NA**
Holland Pond Dam	Holland Pond	International Water Co.	
Water pipeline from Holland Pond (backup water supply for Derby Line)	Across town from Holland Pond	International Water Co.	**NA**

The Holland Pond Dam is regulated by the Vermont Department of Environmental Conservation and is rated as a "low hazard potential". Its original purpose was for log driving and it is now used for the purpose of a backup water supply for the Town of Derby. Holland Pond is also an important recreational resource in the Town, and a state-maintained fishing access is located on the western shore. The dam is 137 feet long, 5 feet high and is constructed of earth, stone and concrete.

4.3 Infrastructure

Flooding is the highest risk profiled hazard and town infrastructure has high vulnerability to damage during major flood events. There are 45.118 miles of road and highway in Holland (this excludes Class 4, Legal Trail, and unidentified corridor mileage). State Highways account for only .138 miles. Class II (TH-1 and 2); 10.6 miles Class III; 34.38 miles Class IV: 2.3 miles. 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. The town highway map can be found here.

4.4 Estimating Potential Losses in Designated Hazard Areas

The severity and frequency of severe weather, changes in population, land use, and development can all influence the hazard impacts on people and community assets. As the frequency of severe weather and/or other natural events increases, 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. While the considerations for rural communities and densely populated can have a stark contrast, awareness of the variable that can enhance vulnerability are important.

Related to overall changes in development during the last planning period and impact on overall vulnerability, there have been minor changes. The increase in full-time owner use of individual properties on the west side of Holland Pond does not significantly increase vulnerability at this time. A factor that does increase vulnerability is the continued trend of an aging population however. Priorities have not changed to a great degree. Rather, the work involved in meeting those priorities has increased. Staffing and road maintenance are common issues for Holland but as an increase in work demand is seen, largely due to the increased frequency of disasters damaging infrastructure, any staffing challenge like the town is facing, compromises abilities to meet the demands of day-to-day operations in the face of consistence disaster recovery work.

A flooding event like the worst experienced in the last 10 years could result in substantial damage to buildings or residential housing that exceeded 1%. As seen with the July floods of 2023, 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.

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. Recent events have shown the level of devastation from one rain event and these events sometimes only span a matter of hours. These events have not impacted all communities to the same extent and neighboring towns can often be spared while Holland is significantly impacted. The opposite can also be true. Future losses should be lessened through mitigation of the repetitively flooded properties, most of which are roads, bridges and culverts.

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 disaster history and greatest financial impact resulting from a 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 Holland residents, workers or travelers.

4.1 Vulnerability Narrative by Profiled Hazard

Severe winter/ice storm: Moderate
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
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
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.

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
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).

High Wind: Moderate
High wind events have the potential to cause significant harm to both infrastructure and people. Fallen limbs blocking roads and culverts and falling on property (e.g., roofs, cars, fencing) can pose a threat to safety. When high wind events are coupled with extreme cold, the risk of freezing pipes increases along with the consequences of losing power, which can arguably be the greatest vulnerability associated with high wind events. When high wind events are coupled with high rain events, the risk of limbs being carried in streams and rivers increase risk to transportation infrastructure, especially bridges, and property.

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).

Specific asset vulnerability is included in the table below.

Table 4-1: Holland Natural Hazard Risk and Vulnerability Summary

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, wastewater, infrastructure, and private property.	The 2023 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.	DR1995 in May of 2011 resulted in over $.5 million in infrastructure damage with the bulk of damage occurring on Twin Bridge Rd., Holland Pond Rd., and Stearns Brook Rd. In 2024, a 1000 yr flood hit nearby Morgan, several hundred feet of Valley Rd. had to be repaired.	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.
Fluvial Erosion (high)	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.	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	Land use changes that decrease natural protection systems (tree cutting for lumber) increase vulnerability while repetitive damage properties can be acquired to reduce vulnerability.

			following flood damage, contaminated water supplies, sewer/septic 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 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; The December 2013 event resulted in 750K in property damage, with ice accumulations of ½ to ¾ inches. The impact was greatest in northwest Vermont, especially along the Canadian border, with widespread tree and utility line damage as well as numerous vehicle accidents. More than 75,000 customers were without power from hours to days across the region. The areas impacted were similar to the Ice Storm of January 1998, but not the severity as precipitation and ice	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, Holland is expected to see more heavy, wet, snow events that would increase impacts to power lines, and could increase impacts on critical assets.

		accumulation were half of the 1998 storm.		

Extreme heat (moderate)	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 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. Drought can impact health and safety of people and livestock through limited access to potable water. Crops can be damaged, disrupted agricultural economy and food supply.	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.

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 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	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).

	natural protection from infections disease and/or creating situations for epidemics and future pandemics.			
High Wind (moderate)	The entire planning area is vulnerable.	12/23-25/ 2022: 71MPH winds recorded at BTV (second highest ever recorded, first was 72 MPH in 1950).	The multi-hazard 2022 storm caused a fatality due to falling limb (not in Holland). 98k without power. NEK was of the hardest hit.	Tree clearing can decrease the risk of property damage from falling trees. Climate change can increase weather patterns causing high wind events. Increases in affordable housing (mobile homes) increases overall vulnerability to property damage. Vulnerable populations residing in living facilities have reduced vulnerability to property and safety.
Invasive Species (moderate)	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 support species	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	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.

		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.	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 flood, often in unprecedented ways. With other significant flood events in 2024, both in the state as well as regional, the impact of climate change on severity and frequency of precipitation is evident. This change has increased vulnerability for the town in areas prone to flooding but also areas that were once thought protected from flooding. The sheer volume of precipitation during short time spans leaves virtually all infrastructure vulnerable. What Vermont will do collectively to support the growing need to protect assets and people during the next planning period will be crucial for Holland as the town embarks on 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 the direct experiences in responding to, and recovering from, the major disasters that have impacted the town. The greatest challenge the town has seen is also a result of these disasters, especially flood disasters. With the increased frequency of major flood events, disaster response and recovery 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 changed the way towns go about their day-to-day operations and planning, both in emergency situations and out. Mitigating a disaster is a challenging task, especially for small, rural communities. Issues of capacity in both staffing and budget quickly rise to the top of the list of challenges for the town but there are some key considerations for the town to assess during the next planning cycle. But even with this initiative, there must be an acknowledgement of the difficulty in turning planning into action due to the reactionary nature of disaster response and meeting the ever-changing demands of day-to-day operations. Sometimes these actions fall into the category of mitigation but so often, they fall into a cycle of disaster response and recovery. An important intention of this update is for the town to have a working document, a series of actions, questions, and discussion topics that may spring forth planning and actions that will protect the town from being caught in the revolving door of response and recovery. As planning tends to capture the ideal--the perfect world scenario given ample time and resources, reality can immediately challenge the implementation of the best plans. A balance must be found, and the town is committed to this imperative.

5.1 Town Goals and Policies that Support Hazard Mitigation

Holland currently has no land use or building codes. Zoning was adapted in the early 1990s but voted out due to a significant negative reaction. Development in Holland does fall under the confines of the State's Act 250, which is meant to protect an area that is to be developed from environmental damage. Sewage treatment is of prime concern during an Act 250 review. Holland is not a rapidly developing community and is not expected to have a rapid influx of new development in the near future.

5.1.1. Capital Improvement and Transportation Goals

a. The Town should have a capital budget plan, particularly as it relates to roadways.
b. Support potential upgrades or newly installed private or governmental services that align with community values.
c. Continue to meet or exceed the VTrans Road and Bridge standards. Participate in regional road foreman trainings and Transportation Advisory Committee meetings to stay abreast of flood resilience measures for the Town's roads and bridges.
d. Continue to update the Town's transportation infrastructure information in the Vermont Online Bridge and Culvert Inventory Tool (vtculverts.org).
e. Replace undersized and failing culverts.
f. . Ensure sufficient personnel are employed to perform maintenance in a timely and effective manner.
g. Continue to ensure that new access meets appropriate standards and consider addressing existing access problems.
h. Obtain a viable long-term source of gravel.
i. Provide training for all road personnel to ensure they are familiar with and competent in appropriate techniques of road maintenance, e.g. grading, ditching, and drainage.
j. Prepare a five-year plan for roadway maintenance and update this plan yearly.
k. Begin the evaluation process for the MRGP permit in 2025.

5.1.2. Tactical Basin Plan Goals

a. Increase awareness of stormwater runoff issues and available solutions through newspaper articles and outreach materials.
b. Complete demonstration projects addressing stormwater issues in the basin, such as rain barrels or rain gardens, to show how these practices can be used and increase awareness of these methods.
c. Increase educational opportunities and outreach to the public, landowners, agricultural farmers, dairy farmers, and loggers on good forestry practices and the mechanics of logging.
d. Increase awareness of landscaping techniques to minimize nutrient, herbicide, and other pollutant runoff from lawns and pastures/fields. Techniques include aerating, increasing organic content, maximizing natural vegetative cover, and using less and only phosphorus free fertilizers except where soil testing shows low soil phosphorus levels.
e. Conduct extensive outreach of existing programs that provide financial incentives for cover crops, conservation cropping, no-till etc. to all farms.
f. Increase awareness of sediment runoff from driveways and roads.

5.1.3. Other Natural Resources Goals

a. Vegetated Buffer Areas and Coverage Limitations

b. Upland forests and wetland area management

e. In line with DEC's best practices regarding fluvial erosion, the town will work to:

- Slowing, Spreading, and Infiltrating Runoff (The State Surface Water Management Strategy.[2]
- Avoiding and Removing Encroachments.[3]
- River and Riparian Management: DEC has prepared a compendium of *Standard River Management Principles and Practices* to support more effective flood recovery implementation; improve the practice of river management; and codify best river management practices in Vermont. The document compiles the most current river management practices based on the best available science and engineering methods to create consistent practice and language for risk reduction while maintaining river and floodplain function. Best practices are established to address common flood damages, including:
  - Erosion of banks adjacent to houses and infrastructure
  - Erosion of road embankments
  - Channel movement across the river corridor
  - Riverbed downcutting that destabilizes banks, undermines structure foundations, exposes utility crossings, and vertically disconnects rivers from adjacent floodplains
  - Bridge and culvert failure.[4]

Future Development and Housing

Future development in Holland is severely constrained by natural conditions and ownership patterns. The Natural Resources Constraints Map contained in the Town Plan shows locations unavailable or unlikely to develop significantly. Its findings illustrate this point. As shown on this map, there is a Source Protection Area (SPA) for the public water supply to the school building. The use of land in the SPA can affect the water quality of the public water system and can impact private wells. While growth has generally been moderate over the past few decades, the Town believes residential growth may occur in any location that can meet State

[2] http://www.watershedmanagement.vt.gov/swms.html and http://www.watershedmanagement.vt.gov/stormwater.htm)

[3] http://www.watershedmanagement.vt.gov/rivers/htm/rv_floodhazard.htm and http://www.watershedmanagement.vt.gov/rivers/docs/rv_RiverCorridorEasementGuide.pdf

[4] http://www.watershedmanagement.vt.gov/permits/htm/pm_streamcrossing.htm

requirements. According to estimates provided by the Census Bureau, the rate of growth in population and housing in Holland has exceeded that in Orleans County.

Strictly commercial development (unassociated with home business) should be limited to properties abutting Valley Road or along the short section of Vermont Route 111. Farming operations are a valuable resource for employment and maintaining the character of the Town as deemed important by its residents. The Town should support the agricultural character through the retention of the farming operations.

As of 2019, the Town received Village Center designation for the area around the Holland Community Church on Valley Road because this area was the original Town center. Such designation supports revitalization efforts by bringing financial incentives, training, and technical assistance needed to attract new residents and businesses (including agricultural or forestry based) to Vermont's smaller communities. The Village Center designation can assist with the re investment in the areas surrounding important civic buildings, such as the Holland Community Church.

5.2 Existing Holland Capabilities that Support Hazard Mitigation

The town has worked to address transportation issues out of necessity in response to flood damage and as part of daily operational protocols. Applicable funding opportunities to address needs are consistently pursued and the town is learning how to work with FEMA to assure maximum reimbursement for damages sustained during recent declared disasters as this can be challenging due to adequate staffing and experience. ARPA funds were received as well. The town continues to move forward with administrative and operational policies and procedures that help define life in Holland. The town faces challenges as road maintenance remains a significant issue, particularly as it relates to the gravel roads.

There are several reasons that maintenance of the gravel roads is problematic. These include natural wear and tear on roadways, the continued severe weather events which cause both minor and major damage to the roads with unfortunate frequency, the deterioration caused by large farm vehicles (which continue to increase in size from years past), and the addition of ATVs/UTVs to the local roadway system. There exists a lack of authority and/or ability to expand and improve current capabilities. Staffing the road department is an issue and the town does not possess unlimited resources and must operate within the confines of allotted budgets and personnel, even when grant funding is available. The Town Highway budget exceeds 70% of the total Town budget. Additionally, the town's level of authority in taking actions that directly impacts the health and safety of residents (e.g., evacuations, avoiding travel, etc.) are at a level of recommendation only.

The town has addressed its current and future needs through a recently adopted Town Plan. Road improvement projects remain the primary focus for the town. In many cases, culverts properly

sized for normal rain events are overwhelmed by the severe ones. Several culvert upgrades are planned and with the help of the Memphremagog Watershed Association, flood debris wood has been pulled from blocked culverts and then recycled to promote bank stabilization in other areas of need.

Substantial damage (SD) determinations were required following the July 2024 floods and individual property owners were tasked with the process and the town remained a sub-grantee for FEMA acquisition projects (i.e. "buyouts"). The Memphremagog Watershed Association is serving as the project manager for all tasks related to buy-outs. At the time of this update, there is one property applying for a buy-out.

With no building department or building inspection system, the town relies on state regulations and its own recommendations. The town is aware of Title IX Flood Hazard Review Procedures, where substantial improvement of existing buildings states that all substantial improvements require a site plan and conditional use review and approvals. While not applicable to the town, awareness of these measures is important.

Table 5: Existing Town Capabilities that Support Hazard Mitigation

Type of Existing Protection	Description /Details/Comments	Issues/Information
Emergency Response		
Police Services	The Vermont State Police and the Orleans County Sheriff's department are available to Holland's residents.	These services are provided by the Vermont State Police whose barracks are located on Crawford Road in Derby. Additionally, the Town is contracted with the Orleans County Sheriff's Department, headquartered on Route 5 in Derby, for annual services (renewal April 1 of each year) which includes law enforcement and policing as a contract service. Holland borders the international border of Canada and as such the Border Patrol's regular patrol presence is evident on the community roadways. Border agents can act as first responders, when necessary, but they do not act as law enforcement officers.
Fire Services	Derby Line, all volunteer.	Services are adequate. No changes are needed. The Town needs to continue to support both fire and rescue through annual tax appropriations and volunteer assistance.
EMS Services	Ambulance service is provided by emergency services in Newport, with a satellite ambulance station in Morgan, near the Morgan Country Store.	See above
Other Municipal Services		
Highway Services	Town Highway Department	Difficulty in finding members for the Town highway crew (typically three including the foreman). When the road foreman retired in 2022, the road crew was short a person for several months, resulting in an increased burden on the two remaining and less work being accomplished. Two of the current members are on the cusp of retirement, and this increases the pressure to hire and train. The Town Garage is in poor condition.

Highway personnel	2 FTE field personnel	See above
Water / Sewer Department	none	none
Planning and Zoning personnel	Planning Commission, no zoning.	Enhanced planning is a stated action in current Town Plan
Emergency Plans		
Local Emergency Management Plan (LEMP)	2024	Assure sheltering plans and contact information is up to date and vulnerable populations are addressed. Up to date.
Shelter, Primary	Derby Line School	none
Replacement Power, backup generator	yes	none
Shelter, Secondary:	Holland Village School	none
Replacement Power, backup generator	Yes	none
Municipal Plans		
Town/Municipal Comprehensive Plan	2024	none
Flood Hazard Regulations	none	none
Hazard Specific Zoning (slope, wetland, conservation, industrial, etc.)	No zoning. Utilize most current state regulations	Town relies largely on Act 250 jurisdictional requirements for guiding development.
Participation in National Flood Insurance Program (NFIP) and Floodplain/Flood Hazard Area Ordinance	no	none
Road and bridge standards	2019 (adopted)	Strive to coordinate lists and keep up to date.

5.3 Holland All-Hazards Mitigation Goals

5.3.1. Flood Resilience Goals:

a. Undertake restoration projects in river corridors.
b. Encourage best practices to handle stormwater runoff from existing and new development.
c. Discourage development on steep slopes and within river corridors.
d. Create a capital improvement plan to address the mitigation projects identified in the LHMP, beginning with the highest priority projects.
e. Consider adopting Flood Hazard regulations to regulate development within the River Corridor Areas mapped by DEC to mitigate flood and fluvial erosion hazard risks, protect investments in streambank restoration projects, and receive a higher amount of funding under ERAF.
f. Hold periodic education events to inform residents how to mitigate flood and fluvial erosion hazards.
g. Have an approved and adopted Local All-Hazards Mitigation Plan.
h. Maintaining an up-to-date Local Emergency Management Plan.

5.3.2 Mitigation Goals

The following mitigation goals were developed by the planning team, vetted during a warned community meeting and approved during the development of this plan:

a. Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.

b. Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.

c. 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.

d. 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.

e. Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.

f. 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, Selectboard, and NVDA and integrate the strategies into the existing town plan as annexes until the next formal update occurs, where a section devoted to mitigation planning will be integrated into the plan.

g. 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 the integration and update process. 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 Progress in Mitigation Efforts

The following table provides status summaries for all actions identified in the last approved Hazard Mitigation Plan:

Table 5-1: 2018 LHMP Action Status

2018 Mitigation Actions	Status
Integrate Hazard Mitigation Plan into relevant sections of Town Plan (e.g., facilities and utilities, transportation, flood resilience)	Complete
Integrate Hazard Mitigation Plan into annual budget	No action/no longer needed
Develop and implement a public education program on hazards and mitigation measures	No action/continuing in next planning period
Develop regular maintenance plan to remove silt and vegetation from around dry hydrants in town, and make repairs when necessary	No action/not required but remains a function if needed
Undertake stream geomorphic assessments for State-mapped River Corridors as a basis for future Flood Hazard regulations, and to join the NFIP	**No action, corridors are mapped. A different basis for establishing hazard areas would need to be established for the Town to adopt flood hazard regulations and join the NFIP (as stated in Town Plan)**
Require propane tank tie-downs (free-standing ordinance or in conjunction with flood hazard regulations)	**No action, will not be pursued in next planning period due to limited resources**
Maintain bridge and culvert inventory	**Completed**
Undertake a cost/benefit analysis for replacement of Br. 31 on Holland TH 8 (Stearns Brook Road) as per VTrans hydraulics report. Compare to alternative of discontinuing road section, after traffic count.	**No action, will not be pursued in next planning period due to limited resources**
Undertake a road erosion inventory with the assistance of a Category A Better Backroads grant, to identify problem areas	**Completed**

Identify and develop a convenient source of gravel for roads, including potential in-Town sources. Roads tend to be silty, and more prone to erosion	**Completed. Using Island Pond which provides a good source of gravel. Based on need, other alternatives may be pursued in next planning period**
Restore riparian areas with stream buffer plantings	**Partially complete. Memphremagog Watershed Association is managing removal of flood debris wood from blocked culverts and then recycled to promote bank stabilization in other areas of need.**
Facilitate addition of drainage structures (gutters, downspouts, drywells) on commercial agricultural property to contain stormwater runoff and avoid spillage onto public road. (Currently, excessive stormwater runoff creates flooding/icing hazard on Valley Road adjacent to commercial agricultural property.)	**No action, will not pursue in next planning period due to limited resources .**
Protect public buildings, and town roads from wind damage through regular tree pruning, maintenance and upkeep, taking aesthetic considerations into account	**Partially complete. Done as needed and will continue as-needed in next planning period.**
Retrofit/replace public buildings (Town Garage in particular) and critical facilities to reduce future wind damage	**Partially complete. Will continue in next planning period.**
Increase public awareness of severe wind by providing information on property maintenance and building retrofits. Encourage use of natural protection using landscape and vegetation as wind buffers.	**No action, will not be pursued in next planning period due to limited resources**
Recommend burial of utilities serving new development.	**No action, will not be pursued in next planning period due to limited resources**
Develop and maintain a local database to track Holland's vulnerability to severe wind (possibility integrate into a school project.)	**No action, will not be pursued in next planning period due to limited resources**
Protect facilities such as the School, Town Garage, Municipal Offices and the Holland Historical Society building with lightning protection devices	**No action, will not be pursued in next planning period due to limited resources**
Install and maintain surge protection on critical Town-owned electronic equipment	**Completed.**

Provide information on lightning-protection devices to property owners via mailing with property tax bill.	**No action, will not be pursued in next planning period due to limited resources**
Increase public awareness of severe winter storms by distributing information about available weatherization and heating assistance programs, how to protect pipes from freezing, and how to guard against carbon monoxide poisoning	**No action but will remain for next planning period.**
Develop plans for safe and effective snow plowing, assure roads are plowable before winter, and identify alternative support mechanisms for snow removal when local capacity is overwhelmed	**Completed.**

5.4.1 Mitigation Actions

Recent flood events have created new challenges and insights. Given this new awareness, the town is determined to enhance the resilience of both infrastructure and residents from all-hazards and by doing so, improve 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 this 5-year 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 are foundational elements of success moving forward. The following defines town mitigation planning for the next five years:

Mitigation Action Groups:

(P) Prevention: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

(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

To adequately meet the challenges of road maintence and disaster response and recovery, there first needs to be adequate staffing. The Town Plan's goals and recommendations support hazard mitigation and flood resilience and the plan to assess future needs and the financial considerations required to meet objectives are current objectives. As with most towns in the state, mitigating flood-prone areas is a continuous effort that sees increased attention following a major event. 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 serious concern 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. 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 and erosion
Action #2: Improve resilience to severe winter/ice storms
Action #3: Reduce impact of extreme hot and cold temperature durations
Action #4: Reduce impact of high winds
Action #5: Reduce impact of infectious disease event

Action #6: Reduce risk of invasive species

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

Action #1: Reduce vulnerability to flooding and erosion

Group: SP, NRP, PP

Lead Responsible Entity: Holland Selectboard

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, VAOT grants; Municipal Operating and Capital budgets.

Progress: Formal planning, grant funding, equipment, and subject matter experts acquired during last planning cycle. Town appropriates funds to manage needs over a million dollars per year in paving projects. .Maintenance and improvement of municipal water, sewer and transportation systems are established and will continue to function as a means of protection. The Road Foreman continually monitors road and storm water management capabilities in an annual road assessment. There is a 5-year rotation plan in place to assure proper drainage and surfacing of non-paved roads. 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). Specific projects include:
    - Valley brook restoration project culvert replacement
    - Stearns brook culvert near Morin farm on Valley road
    - Stearns brook crossing on twin bridges road culvert
    - Erosion control from Stearns Brook on Gore Rd.
- 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.
    - Develop and maintain transportation capital budget plan

- Assess current gravel supply source and determine if further action is required
- Restore riparian areas with stream buffer plantings
- Investigate options and potential funding for new town garage
- Use 2025-2030 Mitigation Actions Short List: Suggested Agenda Items for Select board review
- Continue collaborative relationship with Memphremagog Watershed Association for mitigation project management
- Complete 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.
- Complete 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.
- 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. The street construction cost shown in the summary by fund does not include any cost for water and sewer infrastructure. 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.

Rationale / Cost-Benefit Review: 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. Road improvement costs are a necessary expenditure of town operations. These costs increase benefit 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/ice storms

Group: SP, PP, PEA
Primary Responsible Entities: Holland Selectboard, Planning Commission
Timeframe: See Implementation Matrix

Funding Requirements and Sources: Grant-in-Aid (GIA), HMGP, FHWA, 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. All designated shelters have back-up power. Snow clearing equipment is regularly serviced, and the town maintains an adequate supply of salt.

Specific Identified Tasks:

- Maintain Existing 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. More formalized training is required.
- 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. Maintain function of generators.
- Notification: Develop a notification/communication plan that conveys essential sheltering information using school phone system and back-up methodology (email, text, etc.)
- 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.
    - Increase public awareness of severe winter storms by distributing information about available weatherization and heating assistance programs, how to protect pipes from freezing, and how to guard against carbon monoxide poisoning.
- 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 impacts of extreme temperatures

Group: SP, NRP, PP

Primary Responsible Entities: Holland Planning Commission, NVDA, Emergency Planning services, VDH

Timeframe: See Implementation Matrix

Funding Requirements and Sources: Municipal Operating and Capital budgets. Federal sources can include HMGP, PDM, 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. Specific infrastructure actions include:
    - Upgrade the energy efficiency of all town buildings.

Review Considerations:

- Enhance and expand availability of publicly available cooling sites. Holland'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.
- Specific mitigation actions to consider:
- Execute an operating agreement with one facility to function as a dedicated cooling site that meets all of the minimum requirements, and at least two of the encouraged amenities
- 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 Holland's energy-burdened households.
- Using permeable driveways and surfaces to reduce runoff and promote groundwater recharge (NBS) as means of mitigating drought.

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 Holland 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. 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. 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.

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 #4: Reduce vulnerability to high wind events

Group: SP, NRP, PP
Lead Responsible Entities: Select board
Timeframe: See Implementation Matrix

Progress: Much has been down to protect mobile homes and mobile home parks at the state level from hazards. Tree trimming to protect electrical infrastructure is completed annually.
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, and PDM grants.
Specific Identified Tasks:

1) Understanding Best Practices:
    - Build knowledge of (FEMA P-804 (2023), Wind Retrofit Guide for Residential Buildings.
    - Retrofit/replace public buildings (Town Garage in particular) and critical facilities to reduce future wind damage
    - Protect public buildings, and town roads from wind damage through regular tree pruning, maintenance and upkeep, taking aesthetic considerations into account
    - Consider public and town procedures on high wind mitigation strategies
    - Inform the public about high winds
    - Develop and maintain a local database to track Holland's vulnerability to severe wind.

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: Improved public awareness could potentially significantly reduce the loss of life and property damage through ongoing, formal, ongoing, public information campaigns that address property protection actions (flood proofing, elevation, anchoring mobile homes/propane tanks, electric and water system elevation, electric grounding, etc.) Improved awareness would also build understanding and public support for municipal mitigation actions to reduce potential infrastructure and liability costs.

Action #5: Reduce risk and impact of infectious disease events
Group: PEA, PP, SP
Risk or Hazard Addressed: Risk to infrastructure, environment and residents
Lead Responsible Entities: Holland Selectboard, ACCD, VDH
Timeframe: See Implementation Matrix
Potential Partner Entities: VEM, FEMA
Funding Requirements and Sources: CDBG, 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: The cost of 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 #6: Reduce vulnerability to invasive species.

Group: SP, NRP, PP

Lead Responsible Entity: Select board, Planning commission

Potential Partner Entities: Vermont Agency of Natural Resources

Timeframe: See Implementation Matrix

Progress: To-date, the town has been able to keep its natural water systems free of invasive species.

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.
- Follow the 2024 Town Plan's Implementation Plan for Invasive Species (p. 42-43)

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: Holland 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
1	Reduce vulnerability to flooding and erosion	5	4	5	2	5	3	3	4	4	35
4	Protect infrastructure and population from extreme temperatures	4	2	4	2	3	2	3	3	2	25
3	Reduce impact of high wing events	3	4	5	2	5	3	3	5	1	27
2	Improve resilience to severe winter/ice storms	4	3	3	2	4	3	4	3	3	29
5	Reduce risk to invasive species	3	2	2	1	3	3	3	2	4	23
6	Reduce impact of infectious disease event	2	4	2	2	3	2	3	3	1	22

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, or their designee, is the project lead and will work in conjunction with the Selectboard, 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 Selectboard meetings, the town will schedule one meeting annually to formally assess the plan and adopt updates 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 update will be populated with the specific actions related to each mitigation strategy by year.

5.5.3 Plan Evaluation and Update Process

The town's Select board chair, or their designee, 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 will begin upon final adoption of this approved plan and related to flood resilience measures, achieving optimal ERAF rates, and the importance and rational of mitigation planning efforts. This integration across the town plan and subsequent revisions to recommendations, when appropriate to integrate, 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 Selectboard, Town Clerk and Road Foreman but also the community at large, including the organizations represented by the current planning team. 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

The Plan update will be led by the Select board chair and Town Clerk. Depending on funding availability, the town may elect to acquire the assistance of NVDA and/or a consultant to update the plan following a declared disaster and/or the next five-year planning cycle. To assure that the Plan does not expire, the town will begin the update process within no less than six 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 update 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 updates, Fire Safety Awareness, meetings, etc.), will provide the town the bulk of information required in the update 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 Holland 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 update the Implementation Matrix as 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 fill in 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. The following Mitigation Implementation Matrix can be used to guide and monitor progress with the suggested actions during the next planning cycle.

Action	Responsible Entity (Primary in **Bold**)	Timeline	Specific Identified Tasks	Annual Progress
Reduce vulnerability to flooding and erosion	**Road Foreman (RF),** Selectboard (SB)	Fall 2025 and each subsequent spring	Infrastructure Projects: Valley brook restoration project culvert replacement Stearns brook culvert near Morin farm on Valley Road Stearns brook crossing on twin bridges road culvert Erosion control from Stearns Brook on Gore Rd.	
			Develop and maintain transportation capital budget plan Assess current gravel supply source and determine if further action is required Restore riparian areas with stream buffer plantings Investigate options and potential funding for new town garage Use 2025-2030 Mitigation Actions Short List: Suggested Agenda Items for Select board review Continue collaborative relationship with Memphremagog Watershed Association for mitigation project management	

			Complete 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. Complete 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. 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.	
	SB	Fall 2025	Property Acquisition through FEMA (and other) Buy-out Program: 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.	
	SB	Starting in Spring of 2025, items will be triaged to set timeframe for addressing each specific task	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.	

Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Maintain and improve resilience to severe winter storms	SB	Winter 2025-2026 and each subsequent fall	Maintain Existing Shelter Capability	
	RF	Winter 2025-2026 and each subsequent fall	Reduce risk of power failure due to ice storms	
	SB	Winter 2025-2026 and ongoing as needed	Notification	
	SB	Winter 2025-2026 and ongoing as needed	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.	

			Increase public awareness of severe winter storms by distributing information about available weatherization and heating assistance programs, how to protect pipes from freezing, and how to guard against carbon monoxide poisoning.	
	RF	Winter 2025 and each subsequent Fall in planning period	Monitor roads for safe and effective plowing	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce vulnerability to invasive species	SB	Fall 2025 and as needed based on risk	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. Follow the 2024 Town Plan's Implementation Plan for Invasive Species (p. 42-43	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce impacts of extreme temperatures	**SB**, NVDA	Winter 2025-2026 and ongoing each fall	Economic Resilience: Assess, if feasible, the economic consequences of both extreme cold and heat and develop actions steps to best support the community and protect infrastructure/the environment. Upgrade the energy efficiency of all town buildings. .	
	SB	Fall 2024 and ongoing as preparation for winter	Enhance and expand availability of publicly available cooling sites. Holland'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. Specific mitigation actions to consider: Execute an operating agreement with one facility to function as a dedicated cooling site that meets all of the	

			minimum requirements, and at least two of the encouraged amenities 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.	
	SB	Fall 2024 and ongoing as preparation for winter	Notification and Education Establish a local energy committee or appoint an energy coordinator to help Holland 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. 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.	

			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. Encourage enrollment in CARE.	
	SB	Winter 2025 and ongoing as required	Assess Vulnerable Population	
Action	Responsible Entity	Timeline	Specific Identified Tasks	Annual Progress
Reduce impact to high wind events	SB	Fall 2025 and ongoing as required	Build knowledge of (FEMA P-804 (2023), Wind Retrofit Guide for Residential Buildings. Retrofit/replace public buildings (Town Garage in particular) and critical facilities to reduce future wind damage Protect public buildings, and town roads from wind damage through regular tree pruning, maintenance and upkeep, taking aesthetic considerations into account Consider public and town procedures on high wind mitigation strategies Inform the public about high winds	

			Develop and maintain a local database to track Holland's vulnerability to severe wind. 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.	
Action	**Responsible Entity**	**Timeline**	**Specific Identified Tasks**	Annual Progress
Reduce impact of infectious disease events	Selectboard	Winter 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.	

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 Orleans, 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.

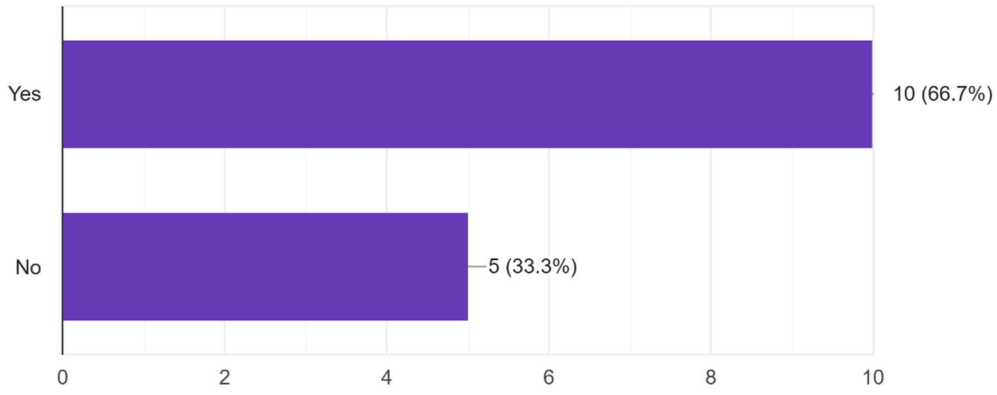
Vermont Emergency Management (VEM) – part of the Department of Public Safety, Division of Emergency Management and Homeland Security (DEMHS). VEM provides support and aid to Vermont's Local Emergency Management Directors, Local Emergency Planning Committees, Regional Planning Commissions, Community Emergency 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 and Community Notification

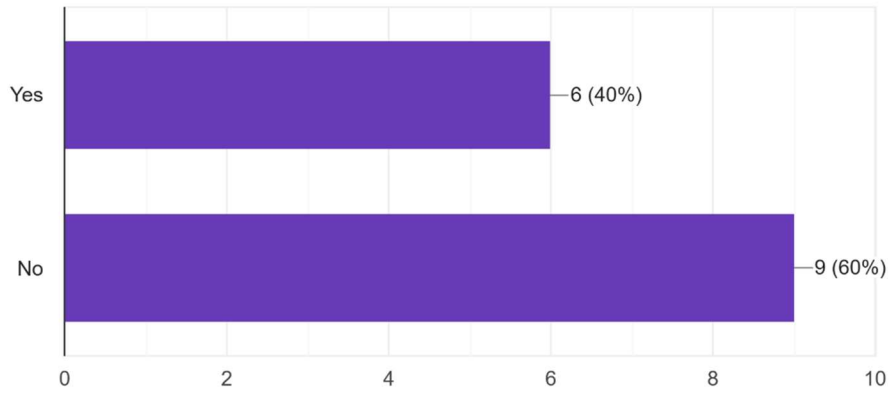
Have you ever been impacted physically, financially, or psychologically by a natural disaster in Holland?

15 responses



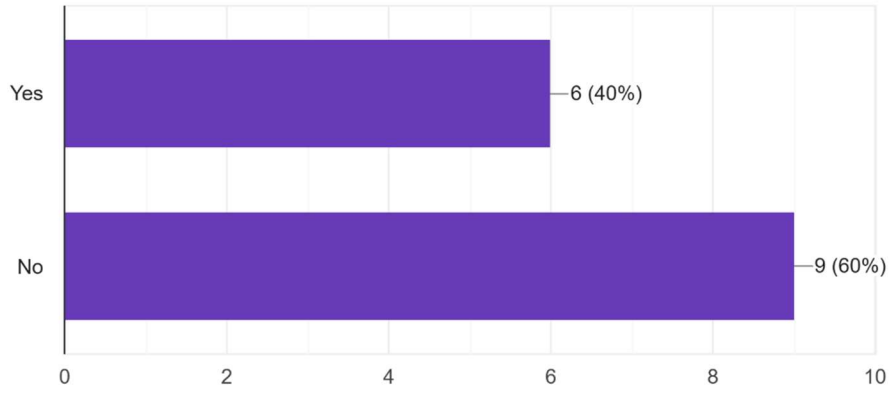
Has a road washout and/or flooding impacted your daily travels?

15 responses



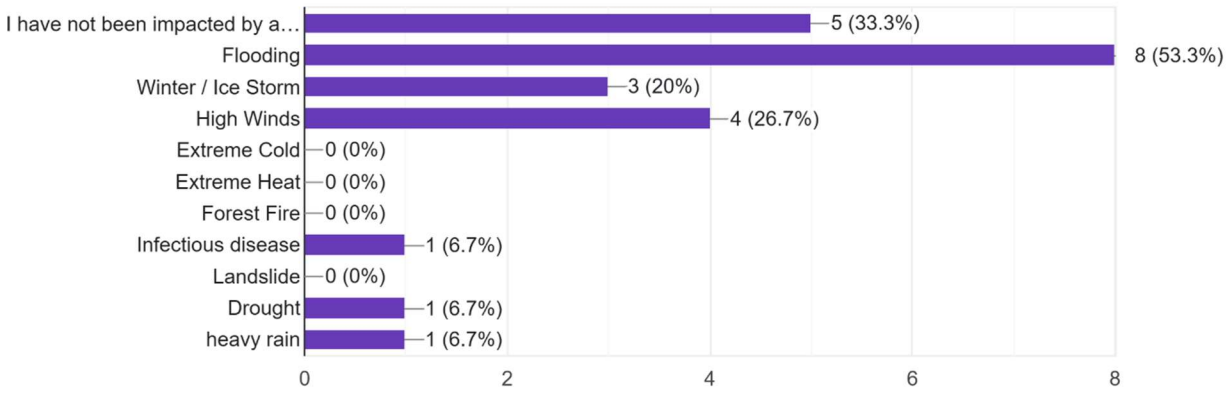
Has a road washout and/or flooding impacted your daily travels?

15 responses



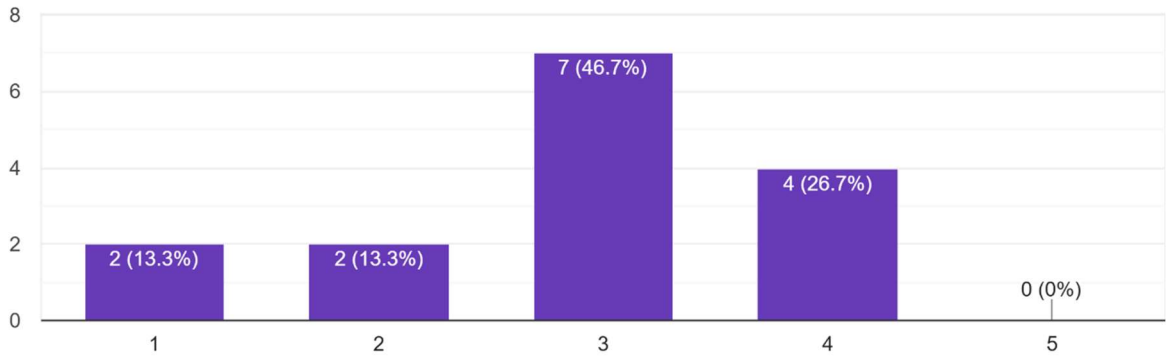
Which Hazard(s) was the cause of the disaster you experienced?

15 responses



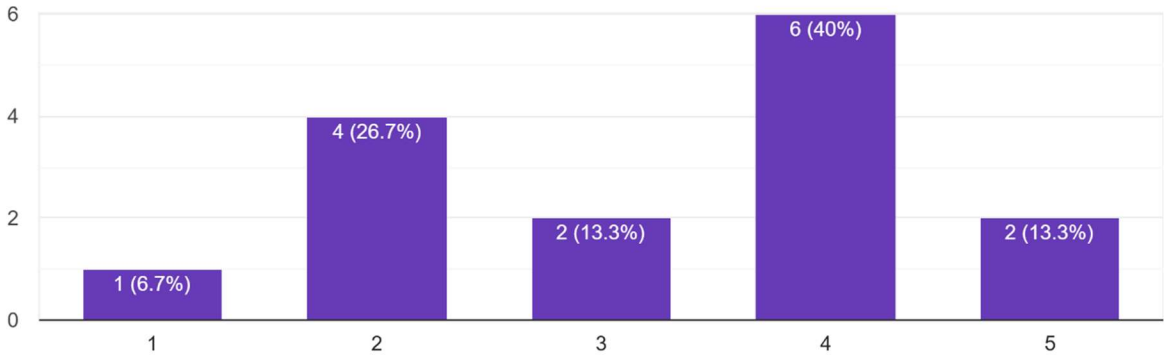
How concerned are you about flooding?

15 responses



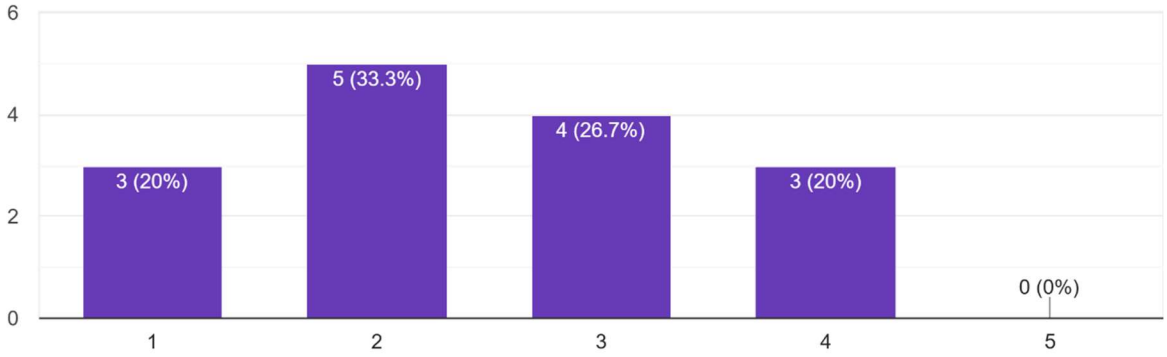
How concerned are you about high winds?

15 responses



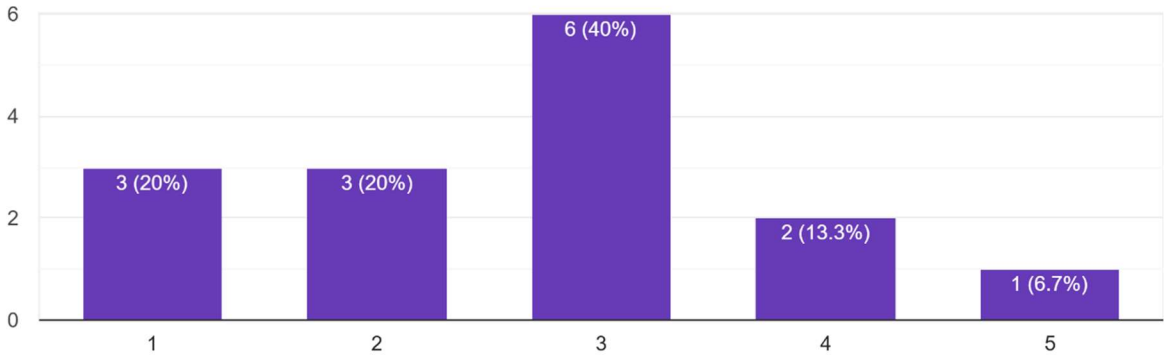
How concerned are you about extreme cold or heat?

15 responses



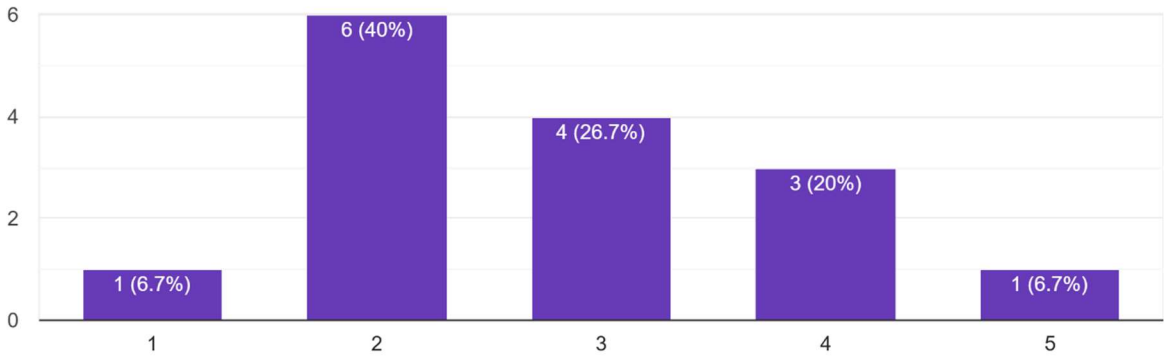
How concerned are you about drought?

15 responses



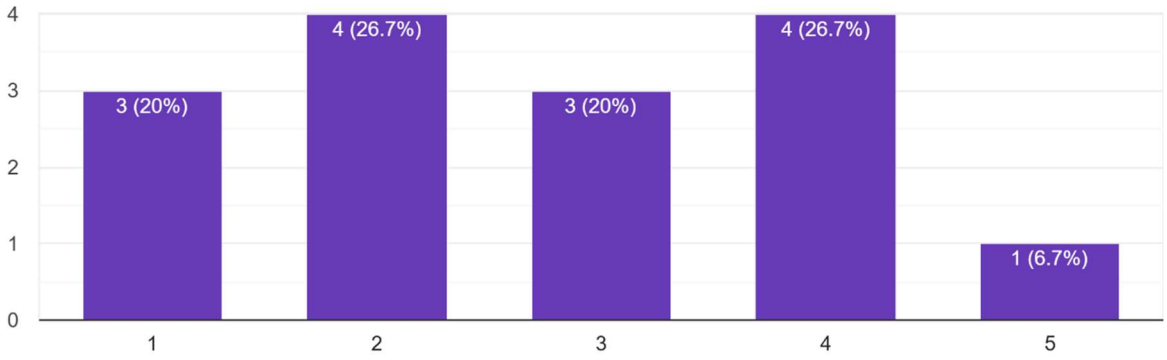
How concerned are you about wildfires locally and elsewhere (that can impact air quality)?

15 responses



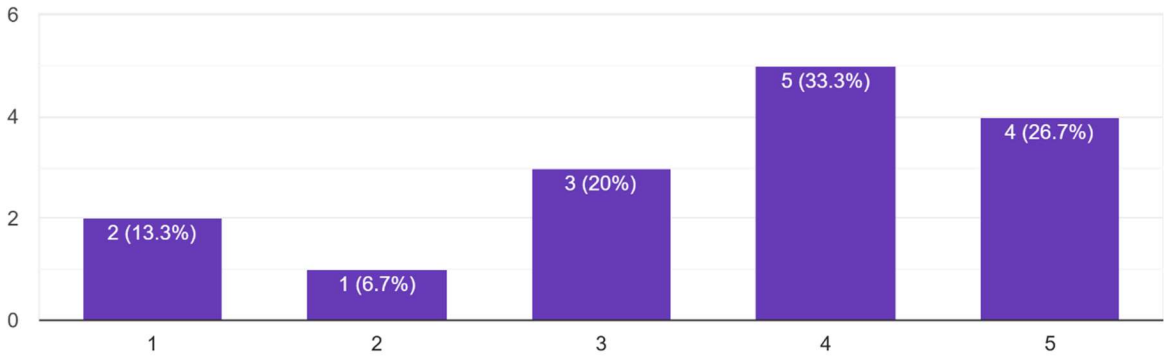
How concerned are you about another pandemic and/or infectious disease event?

15 responses



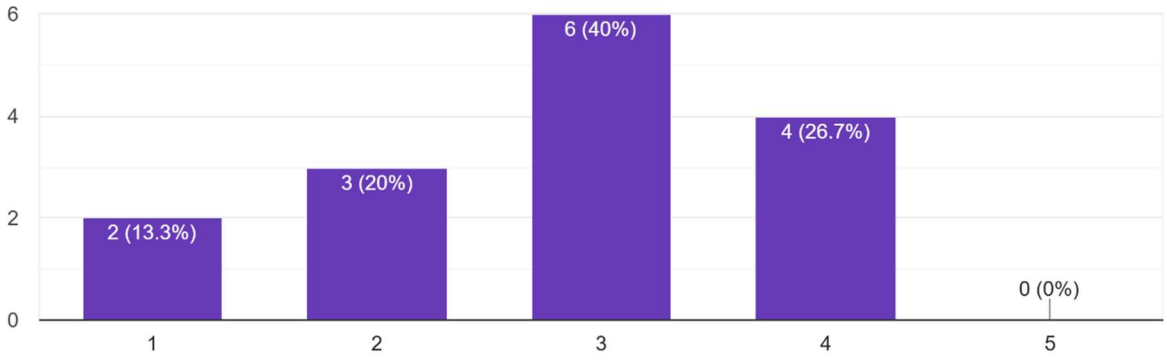
How concerned are you about climate change?

15 responses



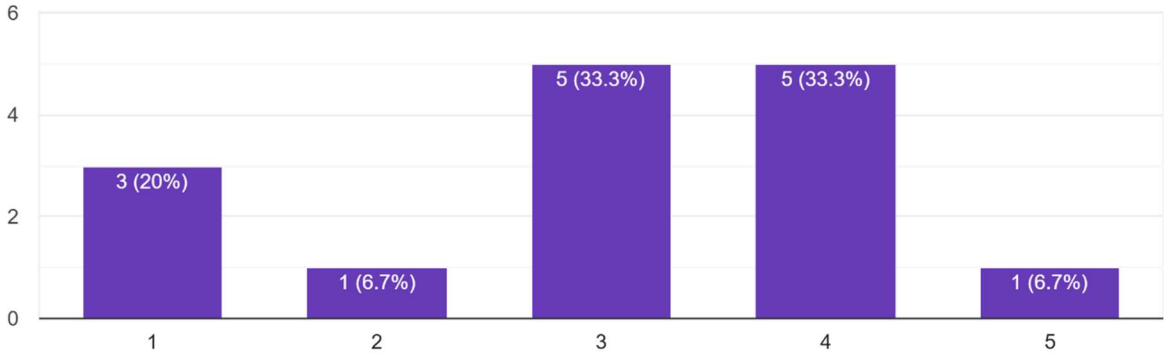
How concerned are you about winter / ice storms?

15 responses



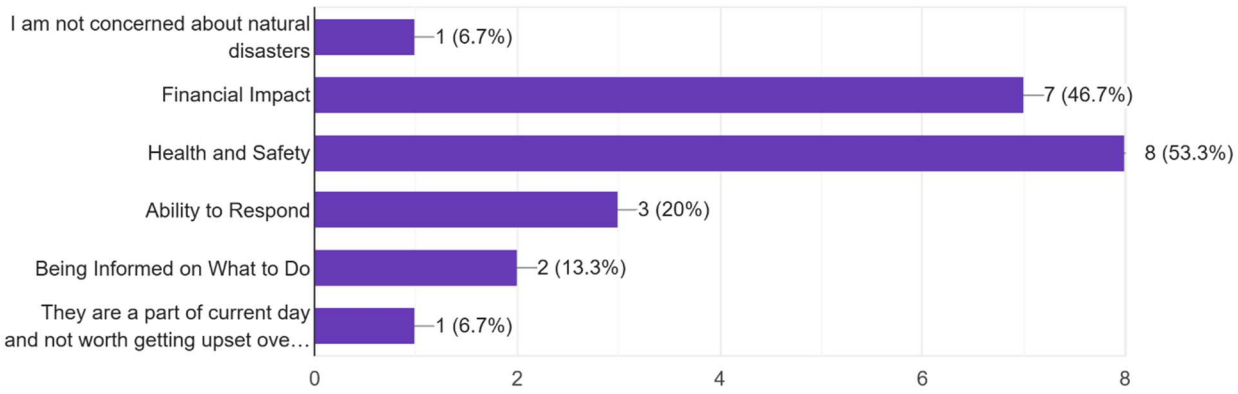
How concerned are you about road access during mud season?

15 responses



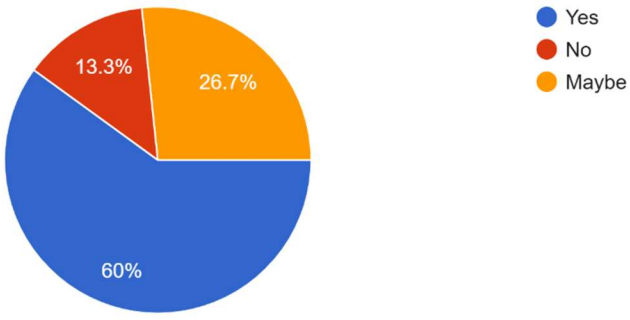
What concerns you the most about natural disasters?

15 responses



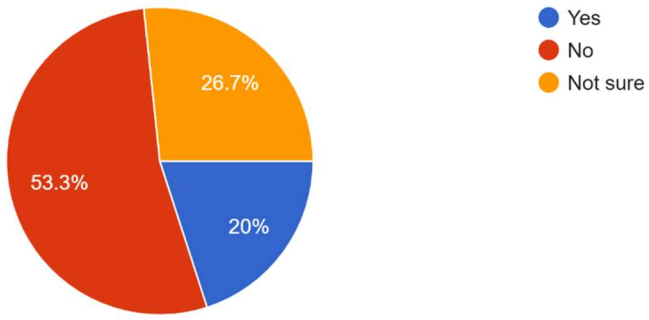
Do you feel that the town is negatively impacted by the current level of cellular and wi-fi service in regard to vulnerability to natural disasters?

15 responses



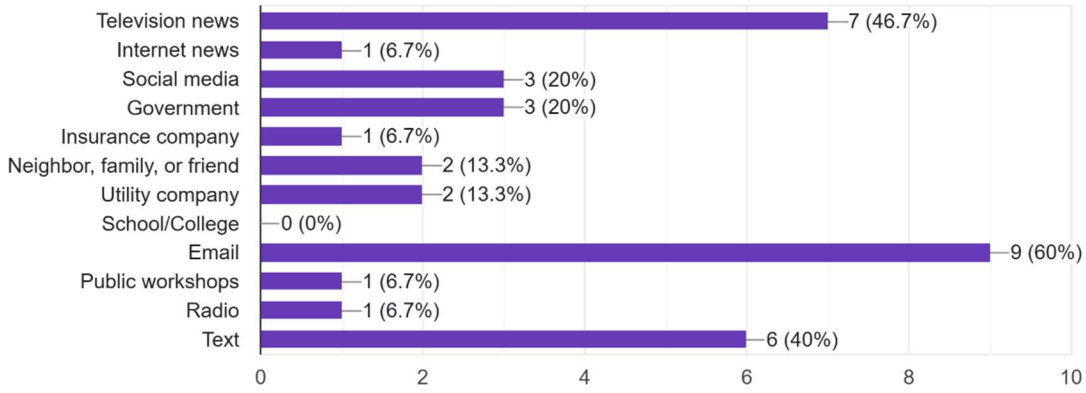
Have you ever received information about how to protect your property from disasters?

15 responses



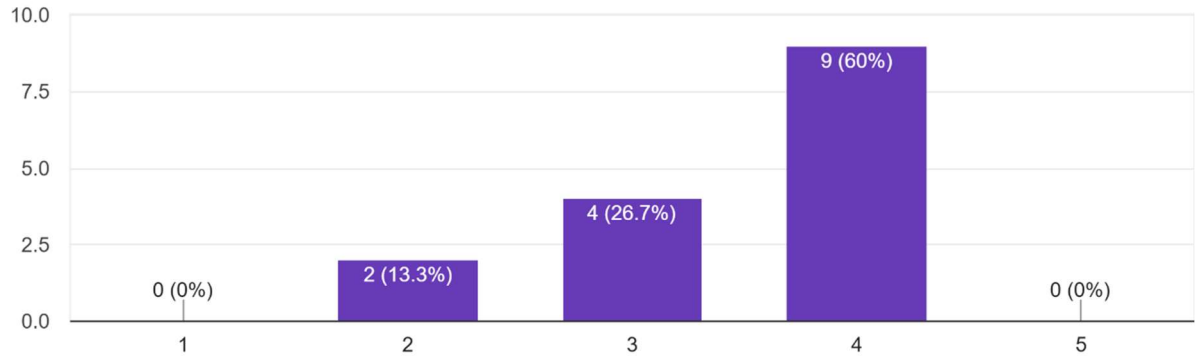
What is the best way for you to receive information about natural disasters?

15 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?

15 responses



If there is anything you would like to say or ask related to natural disasters, please include below. Also, if you were impacted by the flood events of 2023 and/or 2024, please describe your experience. Thank you.

As a community we need to have a strategy and plan for what is best for our community and plan to implement what will benefit the greatest good without relying on funding from outside sources.

2023 Flooding destroyed garden crops and prevented me from getting into my vegetable garden.

We had damage to farm roads and infrastructure that were not covered by insurance - challenging at times to access and navigate State / Federal recovery programs for events like these. The town of Holland did on outstanding job of maintaining and responding to these events. Well communicated road closures / hazards through texts / calls. Much appreciated. Grateful to live in this small town that cares about its neighbors.

Town of Holland

PUBLIC NOTICE

Local Hazard Mitigation Plan Update

POSTED: April 16, 2025

Notice is hereby given to the residents of Holland, Vermont, that the Holland Planning Commission is in the process of drafting a Local Hazard Mitigation Plan (LHMP) Update. Once the plan is approved by FEMA, the plan is good for 5 years and the town is eligible for disaster-related funding and cost-savings when receiving funds requiring a "match".

As the town embarks on this process to update the current hazard mitigation plan community input and comment are encouraged and appreciated. To support this process a **Hazard Impact Survey** is available to collect your experiences and concerns with natural disasters in the town. This survey is anonymous and can be found on the town website. When the draft plan is completed the community will be given formal opportunity to review and provide comment.

The current Holland Local Hazard Mitigation Plan can be viewed on the Northeastern Vermont Development Association (**nvda.net**) website following these steps:

TYPE - www.nvda.net
SELECT - "Our Communities"
SELECT - "Holland" from the map. The Local Hazard Mitigation Plan is located on that page on the bottom left.

Holland Planning Commission

Jim Davis, Chair
Rick Gonyaw, Vice Chair
Stacy Boone
Darrell Martin
Parker Castle

Appendix C: Mitigation Planning: Suggested Agenda Items

2025-2030 Mitigation Actions Short List: Suggested Agenda Items for Selectboard

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?