*Adopted by the Town of Charleston Selectboard on:*

*_____, ____ 2026*

**TOWN of CHARLESTON, Vermont**

**Local Hazard Mitigation Plan (LHMP) Update**

**FEMA ID#: 019-13150-00**

**5063 VT Route 105**

**Charleston, VT 05872**

**802-895-2814**

**Prepared by:**

**The Town of Charleston, Vermont**

**CERTIFICATE OF LOCAL ADOPTION**

**Town of Charleston, Vermont**

**A Resolution Adopting the All-Hazards Mitigation Plan Update**

**WHEREAS, the Town of Charleston has worked with its residents and stakeholders to identify its hazards and vulnerabilities, analyze past and potential future losses due to natural and human-caused hazards, and identify strategies for mitigating future losses; and**

**WHEREAS, the Town of Charleston All-Hazards Mitigation Plan contains recommendations, potential actions, and future projects to mitigate damage from disasters in the Town of Charleston; and**

**WHEREAS, the Town of Charleston and the respective officials will pursue implementation of the strategy and follow the maintenance process described in this plan to assure that the plan stays up to date and compliant; and…**

**WHEREAS, a meeting was held by the Town of Charleston to formally approve and adopt the Multijurisdictional All Hazards Mitigation Plan.**

**NOW, THEREFORE BE IT RESOLVED that the Town of Charleston adopts this Hazard Mitigation Plan Update.**

**Date: _____**

**_____**
**Selectperson**

**_____**
**Selectperson**

**_____**
**Selectperson**

**_____**
**Attested to by Town Clerk**

**EXECUTIVE SUMMARY**

**[To be added when draft is finalized]**

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**[To be added when draft is finalized]**

## SECTION 1: PURPOSE & SCOPE

### 1.1 Purpose and Scope of the 2026 Plan Update

The purpose of this 2026 update of the Charleston All-Hazards Mitigation Plan is to identify all natural and human-caused hazards facing the town and recommend practical, cost-effective actions that reduce risks and impacts from future disasters before they occur.

The goal is to protect lives, property, and critical infrastructure while addressing community-identified priorities from the 2025 resident survey: recurring flooding, protection of vulnerable residents (e.g., elderly, disabled, and low-income households), emergency service access, communication improvements, and highway/road resilience.

This update builds on the 2021 adopted plan and, where appropriate for a small rural community, integrates guidance from the 2023 Vermont State Hazard Mitigation Plan (SHMP), the 2025 revisions to the State Emergency Management Plan (SEMP), and the 2025 Vermont Municipal and Regional Hazard Mitigation Policy Guide. These state resources align Charleston's local priorities with current hazard profiles, risk assessment tools, and best practices while keeping actions realistic and affordable.

This plan remains consistent with the Charleston Town Plan and was prepared with assistance from the Northeastern Vermont Development Association (NVDA) and the Orleans-Essex Regional Emergency Management Committee (REMC). It meets the requirements of 44 CFR §201.6 for FEMA-approved local mitigation plans and maintains the town's eligibility for FEMA Hazard Mitigation Assistance programs, which is a precondition for funding such as HMGP and other available grants.

The plan addresses future conditions by incorporating evolving hazard risks (e.g., climate-amplified flooding and drought) and supports long-term community resilience through equity-focused strategies, including an intent to reduce disproportionate impacts on vulnerable populations as informed by 2025 resident survey responses.

### 1.2 Overview of Hazard Mitigation

The 2023 Vermont State Hazard Mitigation Plan (SHMP) emphasizes that proactive mitigation is less costly than repeated repairs, protecting the economy, environment, residents, and visitors. It integrates mitigation across all phases of emergency management (preparedness, mitigation, response, and recovery) to comprehensively address risks by improving understanding of hazards and their impacts. This update focuses on people, compounded hazards, and vulnerabilities to the natural and built environments, economy, and residents, while addressing observed and projected hazards amid climate change, population shifts, and development patterns.

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 with and benefits from the 2023 SHMP and the 2025 Vermont Municipal and Regional Hazard Mitigation Plan Policy Guide, as part of Emergency Relief Assistance Funding (ERAF) requirements. Community input from the 2025 resident surveys highlights priorities such as improving communications during

emergencies and enhancing support for vulnerable populations, including the elderly and disabled. The plan also explores regional mutual aid agreements that proved effective during the COVID-19 pandemic, as well as tools and resources identified through the Orleans-Essex Regional Emergency Management Committee (REMC) and Vermont Emergency Management, such as VT-Alert and the National Weather Service Flood Inundation Mapping (NWS FIM) for better flood forecasting and response.

With enhanced emphasis on community resiliency, many state agencies and local organizations have an increased awareness of the importance of mitigation planning and have produced plans and resources that towns can use to support their 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. According to 44 CFR Part 201, Hazard Mitigation Planning, this 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 must have an approved local mitigation plan prior to the approval of a local mitigation project funded through certain federal Hazard Mitigation Assistance (HMA) programs, such as HMGP and other available grants. The State of Vermont must maintain an approved State Hazard Mitigation Plan to release such funds for state or local projects.

There are several implications if the plan is not adopted or maintained:

- After November 1, 2004, Flood Mitigation Assistance Grant Program (FMA) funds are available only to communities that have adopted an approved local plan.
- For disasters declared after November 1, 2004, a community without a plan is not eligible for Hazard Mitigation Grant Program (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. (Note: PDM has been replaced by BRIC, which was terminated in 2025, limiting pre-disaster mitigation funding options.)
- For disasters declared after October 14, 2014, a community without a plan will be required to meet a greater state match when public assistance is awarded under the Emergency Relief Assistance Fund (ERAF) requirements—currently 17.5% state contribution for base eligibility (75% federal + 7.5% state), versus up to 25% for towns without an approved plan, as reinforced by the 2024 floods.

Recent uncertainty surrounding the federal Building Resilient Infrastructure and Communities (BRIC) program has affected the availability and predictability of non-disaster mitigation funding, making an up-to-date local plan even more essential to remain competitive for federal and state mitigation dollars.

### 1.4 Benefits

Adoption and maintenance of this updated 2026 Hazard Mitigation Plan will:

1. Make certain funding sources available to complete the identified mitigation initiatives that would not otherwise be available if the plan was not in place (including continued eligibility for remaining FEMA Hazard Mitigation Assistance programs).
2. Ease the receipt of post-disaster state and federal funding because the list of mitigation initiatives is already identified and because Charleston maintains its enhanced 7.5% ERAF match rate (as demonstrated after the 2024 floods, towns without an approved plan face significantly higher local cost shares).
3. Support effective pre- and post-disaster decision making efforts, including access to real-time tools such as National Weather Service Flood Inundation Mapping (NWS FIM) and monitoring FEMA Special Flood Hazard Area (SFHA) updates for better flood risk awareness.
4. Lessen the town's vulnerability to disasters by focusing limited financial resources on specifically identified, community-prioritized initiatives.
5. Connect hazard mitigation planning to community planning where possible, including consistency with the Charleston Town Plan and regional efforts through NVDA and the Orleans-Essex REMC.

### 1.5 Local Hazard Mitigation Plan (LHMP) Goals

This 2026 Local Hazard Mitigation Plan update establishes the following general goals for the town and its residents. These goals continue to guide the plan while incorporating new emphasis on climate resiliency, community input from the 2025 resident survey, and guidance from the 2025 Vermont Municipal and Regional Hazard Mitigation Policy Guide:

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 residents and businesses of the damages 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—exacerbated by climate change—and the design, development, use, and maintenance of infrastructure such as roads, utilities, and stormwater management, as well as the planning and development of various land uses.
5. Maintain existing municipal plans, programs, and ordinances that directly or indirectly support hazard mitigation and climate resiliency.

6. Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into the multi-jurisdictional municipal comprehensive plan as described in 24 V.S.A. § 4403(5). This mechanism will be developed by the Selectboard, Planning Commission, NVDA, and Orleans-Essex REMC.
7. Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan, particularly the recommended mitigation actions, into municipal operating and capital plans and programs as they relate to public facilities and infrastructure within political and budgetary feasibility. The Planning Commission will review the plan annually 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 town budgets.
8. Ensure strong integration of hazard mitigation and climate resiliency strategies into the comprehensive 2026 Charleston Town Plan update, including a discussion of mitigation/resiliency, using this 2026 All-Hazards Mitigation Plan as a resource document.

## SECTION 2: PLANNING PROCESS

### 2.1 Planning Team & Participants

The work to update this plan was led by the planning team made up of municipal officials, school officials, local businesses, service agencies, and the regional planning organization (NVDA) with support from key state agencies. The team was selected through a review and update of the 2021 members, accounting for changes in positions and roles. In fall 2025, the Planning Commission and Selectboard reviewed the list and offered updates to ensure current representation. State and local emergency management officials were included, with some recommending additional colleagues for broader expertise. Representation also extended to town businesses, non-profits, and watershed-related organizations (e.g., NorthWoods Stewardship Center) to incorporate local knowledge, state technical support, and ensure diverse stakeholder involvement. Planning team members, for the most part, fulfill multiple roles in the community and represent a broad array of stakeholders.

2.1.1 Planning Team Membership

The following list presents the Planning Team members and their title:

- Patrick Austin, Charleston Selectboard Chair & Co-Road Commissioner
- Timothy Jenness, Charleston Selectboard & Co-Road Commissioner
- Terry Rollins, Charleston Selectboard & Co-Road Commissioner
- Wendell Hastings, Road Foreman
- John Kellogg, Charleston Planning Commission Chair
- Teri Gray, Town Clerk
- Colleen Kellogg, Asst. Town Clerk
- Duane Moulton, Charleston Fire Chief & Town EMD
- Molly Dockter, Emergency Planner, NVDA

- Patrick McLaughlin, HAZMAT Chief, State of Vermont
- Samantha Slayton, HAZMAT Compliance Officer, Vermont State HAZMAT Team
- Kevin Lacoss, Interim Chief, Newport City Fire Department
- Lt. Andrew Jensen, Vermont State Police Derby Barracks Station Commander
- Jeff Johansen, Newport Ambulance Service
- Mary Esposito, School Board Chair, Charleston Elementary School District
- Christopher Lawson, Charleston Elementary School Principal
- Tom Wagner, Charleston Planning Commission/Echo Lake Protective Association
- Maria Young, Director, NorthWoods Stewardship Center
- Phil Brooks, Chair, Orleans-Essex REMC

There is a current understanding of the need to integrate the content of this update and its goals, actions and reporting into the daily operational structure and awareness of all town officials so that mitigation planning establishes itself as a consistent topic of concern and discussion.

**2.2 Community and Stakeholder Outreach**

2.2.1 2025 Resident Survey Summary

The community survey was mailed with tax bills in July 2025 (tax deadline October 24th). Charleston has about 740 parcels; 13 responses were received and focused on flooding, power outages, lack of cell service, road access, emergency notification/communication, and mobility/support for vulnerable elderly and disabled residents.

2.2.2 Public Meetings and Neighboring Jurisdiction Coordination

All neighboring towns were sent notification via the town clerk of the plan's development and the subsequent draft and were given an opportunity to provide input through email and/or phone call to the town clerk. 13 responses were obtained from this solicitation.

2.2.3 Outreach Materials and Methods

- Survey mailed with July 2025 tax bills and posted on Charleston Coffee Facebook Group (included questions on priority hazards and vulnerable populations). (*See Appendix B*)
- Public meeting notices posted on town bulletin board, website, East & West Charleston Post Offices, Charleston Elementary, and Front Porch Forum.
- Email invitations to neighboring towns and stakeholders for draft review and comment.

**2.3 Coordination with State and Regional Plans**

2.3.1 Integration of 2023 Vermont SHMP and 2025 SEMP Revisions

The update coordinated closely with the 2023 Vermont State Hazard Mitigation Plan (SHMP), incorporating its updated hazard profiles, climate projections (e.g., 15% increase in precipitation intensity by mid-century), equity focus, and risk assessment tools. State/federal data sources were integrated throughout, including FEMA disaster history (data.gov), NFIP repetitive loss database, ANR river corridor maps, VTrans high-accident and fluvial erosion data, VDH public health resources, and EPA cold weather resilience guidance. This ensures alignment with state priorities and enhances local risk understanding.

### 2.3.2 Data Sources and Technical Resources Used

Following FEMA guidance in Local Mitigation Plan Review Tool Regulation Checklist, the plan was written using data sources that included:

- Surveys and warned, public meetings collecting public comment (issues raised were addressed in plan and the public meeting)
- 2019 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 and the 2025 revisions to the SHMP (provided key guidance language and definitions throughout the plan).
- Vermont Agency of Natural Resources (ANR) and Transportation (VTrans) (Provided key policy recommendations on environmental conservation, high accident locations, climate change, and fluvial erosion data).
- Vermont Departments of Health (VDH) and Environmental Conservation (DEC) (provided information related with public health services that could be impacted during a disaster and state support functions designated to both VDH and DEC. DEC also provided river corridor data for mapping purposes.
- FEMA Open Source (data.gov) Data for Disaster History and PA funding (provided comprehensive declared disaster by year and type as well as project descriptions and cost per event).
- FEMA NFIP “Bureau.Net” database (provided detailed information on repetitive loss properties and associated flood insurance claims).
- EPA’s Incident Action Checklist for cold weather resilience of water systems (provides a guidance tool for public works to cross-reference actions on the system).
- 2013 ACCD Mobile Home Resilience Plan (served as resource for future mitigation actions)

## 2.4 Planning Process Timeline

Based on the information obtained, input from town and state officials, the planning team, state and federal databases, local associations and NVDA, 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 and its distinct villages. From this, the specific risks, vulnerabilities, and mitigation strategies were developed and applicable, broken down to the specific entity impacted. NVDA’s role in assisting the entire region with all facets of planning provided crucial information and NVDA’s Emergency Management Planning representative provided guidance. While the REMC provides the best platform to engage representatives from various towns and agencies, all bordering towns were contacted with planning objectives and asked to provide input through a formal email invitation. Vermont Emergency Management (VEM) also provided information during the development of the plan. VEM also has

representation at the REMC meetings and will continue to provide input and guidance as the town moves forward with their mitigation strategies.

The community survey was mailed with tax bills in July 2025 with a tax deadline of October 24th. Charleston has about 740 parcels. 13 responses were received and focused on flooding, power outages, lack of cell service, road access, emergency notification and communication, and mobility of vulnerable elderly and disabled residents. All neighboring towns were sent notification via the town clerk of the plan's development and the subsequent draft and were given an opportunity to provide input through email and/or phone call to the town clerk. [XX responses were obtained from this solicitation.]

The draft plan was then revised based on input from planning team. The revised draft was made available for review at the town office and residents were informed via meeting minutes and the town bulletin board of the ability to review the draft and additional opportunity for formal comment and suggestions. [Insert any additional public comment received.] Edits were made to the plan following State recommendations and the final draft was resubmitted to VEM for formal review and approval pending municipal adoption. A resolution of adoption will occur following VEM review and "approval pending adoption" status. [Revise as needed]

The following summary represents the timeline for the planning process: [edit when complete]

- July 2025: Community Input Surveys mailed with tax bills to residents of Town
- Sept 2025: Workplan meeting with Charleston Planning Commission Chair and Town Clerk
- Oct 2025: Meeting with Town Road Foreman to discuss mitigation projects and progress on 2016 mitigation action items related to infrastructure.
- Fall 2025: All returned Community Input Surveys collected and reviewed by planning team lead
- 10/21/25: Planning Team Kick-off meeting. Planning team was approved by selectboard and updated hazards to be profiled were discussed. The public was notified and in attendance at this meeting, however, no comments were received.
- 12/09/25: Warned Community Meeting to review updated profiled hazards and draft sections I and II of the update. The public was notified and in attendance at this meeting, however, no comments were received.
- **Winter 2025/2026**: Mitigation Action Status Report sent to Town for required updates. Results captured and included as Appendix B.
- **Winter 2025/2026**: Updated Mitigation Actions for next planning cycle sent to planning team for review. Minor corrections were made based on feedback.
- **Spring 2026**: Proposed mitigation actions were discussed at warned community meeting. The public was notified and in attendance at this meeting, however, no comments were received.
- **Spring 2026**: Draft Sections III and IV sent to planning team for review and comment.
- **Spring 2026**: All neighboring towns received notice of availability of draft plan for review and comment via the town clerk. [Note comments received].
- **Spring 2026**: Draft plan submitted to VEM for review and approval.
- **Spring/Summer 2026**: VEM review and request for edits obtained

- **Summer 2026**: Plan revision made and resubmitted to VEM

## SECTION 3: PLAN UPDATE/CHANGES FROM THE PREVIOUS PLAN

### 3.1 Summary of Major Changes Since 2021 Plan

This 2026 update reflects evolving community priorities, recent 2023 and 2024 flood disasters impacting town roads, FEMA PA, and state/federal guidance. The plan was reviewed by the Planning Commission, Selectboard, and Orleans-Essex REMC through quarterly meetings, a 2025 resident survey (13 responses), and review of the 2023 SHMP and 2025 SEMP revisions.

Key changes since the 2021 plan include adding severe drought as a profiled hazard, driven by the significant 2025 impacts such as well depletion and agricultural losses, while strengthening the emphasis on equity for vulnerable populations, particularly elderly and disabled residents facing outages, shortages, or isolation during hazard events as identified in the 2025 resident survey. The update also integrates climate adaptation strategies to address the increasing frequency and intensity of storms and droughts, including the projected 15% rise in precipitation intensity by mid-century according to the 2023 Vermont State Hazard Mitigation Plan. Furthermore, this revision enhances alignment with the 2025 Vermont State Emergency Management Plan through improved local hazard identification and risk assessment, coordinated use of state resources such as VT-Alert for multi-channel communications and State EOC reporting of local storm and drought impacts, prioritized sheltering and support for vulnerable residents, and the adoption of multi-channel alert systems—including text notifications, Front Porch Forum, and neighborhood call trees—to better reach diverse and rural populations that experience persistent cell service gaps.

Based on reviewer feedback and the experience of town officials having used the plan for annual progress check-ins, the document was reorganized to eliminate repetition of data and activities, a qualitative risk ranking system was adopted and seen as more user-friendly for town and community, and the narrative Mitigation Actions layout was replaced with simplified table/checklist format for easier use during annual progress check-ins.

### 3.2 Status Report on 2021 Mitigation Actions (by hazard)

Table 3-1 provides a status report on the six mitigation actions from the 2021 Charleston All-Hazards Mitigation Plan (pages 48-52). It summarizes progress as of December 2025, based on town records, FEMA PA funding from recent disasters, and resident survey feedback. Actions are restated here for reference, but Specific Identified Tasks have been grouped by hazard for clarity and ease of use.

In cases where there was substantial overlap of Specific Identified Tasks across multiple Actions and Hazard, tasks were combined to reduce repetition and improve usefulness to the Planning Team and Annual Review participants. For example, notification of essential sheltering information in the event of Severe Winter storm was essentially the same task as in the case of Extreme Cold. Similarly, education for residents about how to reduce the dangers of winter

storms and extreme cold were similar and are combined for the progress update and identification of next steps.

Although some specific tasks identified in the 2021 plan were to be conducted by state or regional agencies, next steps noted here are focused on town level actions. With the replacement of the Local Emergency Planning Committee by the Regional Emergency Management Committee structure, references to LEPC responsibility have been replaced with REMC for the usefulness or current planning participants.

**Mitigation Actions from the 2021 LHMP**:

#1 Improve road infrastructure and municipal systems protection programs
#2 Maintain and improve resilience to severe winter storms
#3 Reduce impact of extreme cold durations
#4 Raise public awareness of hazards and hazard mitigation actions
#5 Continue fluvial geomorphology assessments in collaboration with DEC and develop strategies and regulatory actions in response to identified risk.
#6 Reduce risk and impact of a pandemic event.

*Table 3-1 Status Report on the 2021 Mitigation Actions – by Hazard*

| **Flooding / Fluvial Erosion** | | | | | |
|---|---|---|---|---|---|
| **Action (2021)** | **Task (2021)** | **Responsible Entity (2021)** | **Timeline (2021)** | **Progress 2021–2025 (as of December 2025)** | **Status/Next Steps** |
| 1 | Infrastructure Assessment for Storm Water Vulnerability | Town Road Foreman/Road Commissioners | 2021–2026 | Substantial progress: With NVDA, completed MRGP-compliant Road Erosion Inventory and townwide culvert inventory in 2024. VTrans provides storm data analysis for large structure replacement. With NVDA, monitor FEMA flood hazard map development to identify infrastructure in flood-prone areas. | When FEMA maps available, identify infrastructure in flood-prone areas to update Risk MAP (Mapping, Assessment, and Planning). Integrate available findings in 2026 Town Plan resiliency discussion. |
| 1 | Assessment for Fluvial Erosion, Landslide Vulnerability | Town Road Foreman/Road Commissioners | 2021–2026 | In progress: VTrans provides geomorphic and hydraulic analysis prior to large structure replacement. Town is aware of Flood Ready Atlas but currently relies | Seek instruction for town staff/officials in using FloodReady and other tools. Complete townwide assessment with NVDA/ANR support by 2030. |

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| | | | | on NVDA for river corridor and other mapping/data assessment capabilities. | |
| 1 | Culvert Upgrades | Town Road Foreman | 2021–2026 | Substantial progress: Multiple culverts replaced/upsized post-2023/2024 floods (DR-4720/DR-4810); annual Better Roads and Grant-in-Aid grant projects involve replacing poor condition/undersized culverts | Ongoing; prioritize remaining high-risk sites. |
| 1 | Continued Monitoring of Vulnerable Infrastructure | Town Road Foreman | 2021–2026 | Ongoing: Annual culvert inventory maintained; annual bridge inspection review with VTrans; post-flood inspections conducted. | Tie to annual budget and REMC coordination. |
| 1 | Road Improvements (general): Re-engineer certain sections to lower maintenance costs, improve snow plowing speeds and improve overall capability to handle | Town Road Foreman/Road Commissioners | 2021–2026 | In 2025, paved around town office and garage to eliminate erosion and improve highway dept functionality during flood emergencies | |

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| | projected traffic. | | | | |
| 1 | Specific Road Improvement: Twin Bridge (East end) – Water level rise during high rain events; culverts require further assessment and possible upgrade. Hudson Road (East end) – Build-up and ditching needed to prevent water pooling. Center School Road – Repave & upgrade ditches/culverts to handle stormwater. | Town Road Foreman/Road Commissioners | 2021–2026 | Substantial progress: Center School Road repaved using town funds in 2021, with culverts replaced and ditches reestablished with Grants-in-Aid funds. Culverts assessed and several replaced/upsized post-2023/2024 floods; drainage improvements completed on Hudson Road. | Ongoing monitoring; prioritize remaining sites in annual budget. Or will new sites take priority? |
| **Severe Winter Storms / Ice Storms** | | | | | |
| 2,3 | Maintain Existing Shelter Capacity | Town, EMD, NVDA, Amer Red Cross, Selectboard, NVDA, School, local/regional assistance organizations | 2021–2026 | Fire Station renovations include commercial kitchen, generator, and well. Ongoing: Primary shelter (Charleston Elementary) maintained; secondary options identified. | Update Town Shelter Inventory/Capacity with American Red Cross to identify needs and priorities. Secure backup power grant. |

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| 2 | Reduce risk of power failure due to ice storms | Town, EMD, NVDA, Amer Red Cross | 2021–2026 | In progress: VEC conducts regular tree trimming. Coordination of highway/CVFD with utilities for priority restoration and trees-on-line situations. Generators maintained at Town Office/Garage and Fire Station. | Ongoing generator maintenance. Equip school with generator. |
| 2,3 | Notification | Town, EMD, NVDA, Amer Red Cross | 2021–2026 | Ongoing: Alerts via Front Porch Forum, Charleston Coffee Facebook, and school contact system. Seeking training and approval to use VT-Alerts system. 2025 survey showed need for better reach to vulnerable residents. | Expand to include drought alerts. Expand training and use of VT-Alerts among Emergency Operations Center officials. Expand text notification capabilities. |
| 2 | Residential Programs: Educate and support residents on winter preparedness and resilience. | Town, EMD, NVDA, Amer Red Cross | 2021–2026 | In progress: Town office resource materials include winter driving and weatherization assistance. 2025 survey feedback incorporated for vulnerable households. | Expand to include generator safety and cold-weather kits. |
| 2 | Monitor roads for safe and effective plowing | Town, Road Foreman | 2021–2026 | Ongoing: Annual roadside mowing cuts back brush for safe plow passage. Road | Identify/assess plowing barriers post-winter as part of annual highway planning with VTrans. |

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| | | | | Commissioners remapped snowplow turnarounds on dead-end roads for safe access in 2025. Road monitoring protocols updated annually. | |
| 2 | Increase awareness of ICS structure and recommended practices | Town EMD, Selectboard | 2021–2026 | In progress: EMD/Fire Chief maintains ICS credentials. ICS training and awareness shared through REMC meetings and town outreach; incorporated into annual Local Emergency Management Plan. | Expand ICS training to town staff/officials/volunteers beyond EMD. |
| **Extreme Cold** | | | | | |
| 3 | Economic Resilience | Town EMD and Selectboard | Fall 2021 – Fall 2026 | In progress: Coordination with state programs for heating aid; no major new issues reported. | Monitor for 2026 winter trends. |
| 2,3 | Maintain Existing Shelter Capability | See above | | | |
| 2,3 | Notification (see above) | Fire Chief, Planning Commission, Town EMD/THO | Fall 2021 – Fall 2026 | Ongoing: Outreach on cold safety; 2025 survey feedback incorporated. | Expand to include pandemic isolation tips. |
| 2,3 | Education (see above) | | | | |

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| 3 | Assess Vulnerable Population | Town EMD/THO | Fall 2021 – Fall 2026 | In progress: 2025 survey identified vulnerable residents; list maintained for alerts. | Update annually with REMC. |
| **Public Awareness of Hazards / Education** | | | | | |
| 4 | Hazard Resilience for Property Owners | Selectboard, Fire Chief, NVDA, REMC, Amer. Red Cross | 2021–2026 | In progress: Stormwater mitigation resources provided with tax bills. | Use upcoming tax mailing to distribute drought resources |
| 4 | HMGP Awareness | Selectboard, Fire Chief, NVDA, REMC, Amer. Red Cross | 2021–2026 | Ongoing: HMGP/PA funding pursued post-2023/2024 floods. | Continue annual grant awareness. |
| 4 | School Programs | Selectboard, Fire Chief, NVDA, REMC, Amer. Red Cross | 2021–2026 | Ongoing: School emergency plans updated; drills conducted. | Tie to pandemic and drought scenarios. |
| 4 | Family Programs | Selectboard, Fire Chief, NVDA, REMC, Amer. Red Cross | 2021–2026 | Ongoing: Family preparedness info distributed. | Add drought water conservation tips. |
| 4 | Fire Prevention Programs | Selectboard, Fire Chief, NVDA, REMC, Amer. Red Cross | 2021–2026 | Ongoing: Annual fire safety outreach. | Link to drought fire risk. |
| 4 | Other Hazard Awareness Programs | Selectboard, Fire Chief, NVDA, REMC, Amer. Red Cross | 2021–2026 | Ongoing: General hazard info shared. | Include 2025 drought lessons. |
| **Fluvial Geomorphology / Erosion** | | | | | |
| 5 | Fluvial Geomorphic Assessments | NVDA, VT ANR, Selectboard, | 2021–2026 | Ongoing: Used for Risk MAP and culvert planning. | With NVDA, determine status of assessments and assemble data |

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| | | Planning Commission | | | accessible to the Town. Integrate into 2026 Town Plan. |
| 5 | Fluvial Erosion Hazard Mapping | NVDA, VT ANR, Selectboard, Planning Commission | 2021–2026 | In progress: Regional mapping includes assessment of waterways | With NVDA, determine status of mapping and how to access data for highway planning and Town Plan Update. |
| 5 | River Corridor Management Plans | NVDA, VT ANR, Selectboard, Planning Commission | 2021–2026 | Ongoing: Aligned with 2023 SHMP. | With NVDA, identify RCMPs related to Charleston. Support best practices for shoreland and riverfront by referring landowners to programs like LakeWise. Review Echo-Seymour LWAP recommendations as part of annual highway planning. |
| 5 | Fluvial Erosion Hazard Mitigation Implementation | NVDA, VT ANR, Selectboard, Planning Commission | 2021–2026 | Ongoing: Incorporated into road/culvert upgrades post-2023/2024 floods. | Determine status of Final Fluvial Erosion Hazard Map. Prioritize high-risk sites. |
| **Pandemic Risk Reduction** | | | | | |
| 6 | Work with facility leads on understanding risk factors and what can be done to mitigate and enhance training and skills for response | Selectboard, Planning Commission, ACCD, VDH | 2021–2026 | Ongoing as a lower priority. School and town LEMP coordinated. | Emergency planning shifted post-COVID. Continue annual review of training/response needs. COVID-era Emergency Operations Center log documents response for future. |
| 6 | Enhance awareness | Selectboard, Planning | 2021–2026 | Completed: Outreach | Shift focus to general health resilience. |

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| | and planning for COVID-19-related mandates, communication, isolation and | Commission, ACCD, VDH | | completed during pandemic; no ongoing mandates in 2025. | |
| 6 | Maintain process for funding acquisition related to COVID-19 | Selectboard, Planning Commission, ACCD, VDH | 2021–2026 | Completed: COVID-related funds all received, reported, and documented. Public building enhancements and safety equipment remain in use. | Shift focus to opportunities to strengthen local emergency services, water supply resources, and supports for vulnerable populations |
| 6 | Develop and maintain continuity of operations plans for critical positions | Selectboard, Planning Commission, ACCD, VDH, Road Foreman | 2021–2026 | Ongoing: Critical positions and contacts reviewed annually as part of Local Emergency Management Plan (LEMP). Road Foreman maintains informal mutual aid with neighboring towns | Develop formal mutual aid model for essential highway maintenance. |

**Extreme Cold**

| Action (2021) | Task | Responsible Entity | Timeline (2021) | Progress 2021–2025 (as of December 2025) | Status/Next Steps |
|---|---|---|---|---|---|
| | Reduce impact of extreme cold durations | Town, NVDA, School, local/regional assistance organizations | Fall 2021 – Fall 2026 | Ongoing: Information distributed on weatherization and fuel assistance; warming shelters promoted. | Develop annual winter safety flyer. |

**Public Awareness of Hazards / Education**

| Action (2021) | Task | Responsible Entity | Timeline (2021) | Progress 2021–2025 (as of December 2025) | Status/Next Steps |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| | Raise public awareness of hazards and hazard mitigation actions [Note: action rather than task] | Town EMD, Fire Chief, LEPC, NVDA | Spring 2021 – Fall 2026 | Ongoing: Annual outreach via town meetings, newsletter, and Front Porch Forum; 2025 survey included hazard education. | Expand to drought and communications gaps. |

**Fluvial Geomorphology / Erosion**

| Action (2021) | Task | Responsible Entity | Timeline (2021) | Progress 2021–2025 (as of December 2025) | Status/Next Steps |
|---|---|---|---|---|---|
| | Continue fluvial geomorphology assessments in collaboration with DEC and develop strategies and regulatory actions in response to identified risks [Note: action rather than task] | DEC, NVDA, ANR, Selectboard | Spring 2021 – Fall 2026 | In progress: NVDA provisional river corridor maps reviewed; minor erosion noted on Mad Brook post-2023/2024 floods. | Complete assessments with ANR support by 2027. |

## SECTION 4: COMMUNITY PROFILE

### 4.1 Community Overview and Demographics

4.1.1 Population Characteristics

**Population:** The Town of Charleston covers 24,662 contiguous acres. The 2020 U.S. Census reports a total population of 1,021 residents (51% male, 49% female), indicating a population density of about 1 person per 24 acres. Population grew slowly over the past 50 years, with a modest increase from 2010 to 2020. The median age is 53 years; 34% of residents are age 60 or older. This aging demographic along with 2025 resident survey feedback, underscores the need for hazard mitigation measures that support elderly, disabled, and vulnerable family households.

*Table 4-1 Town of Charleston, selected population characteristics, 2020 Census*

| Category | Number | % |
|---|---|---|
| Total Population | 1,021 | 100 |
| Median Age | 53 | – |
| Population age 60 years and over | 347 | 34 |
| Population under 20 years old | 174 | 17 |
| Population 20–39 | 184 | 18 |
| Population 40–59 | 316 | 31 |

4.1.2 Social Vulnerability Indicators

Charleston exhibits moderate to high social vulnerability in certain areas, particularly related to age and income. According to the CDC/ATSDR Social Vulnerability Index (SVI 2020, latest available), Orleans County ranks in the top quartile for vulnerability due to high percentages of elderly residents (≥65 years: ~25% county-wide) and low-income households (median household income ~$53,000, below state average). In Charleston specifically, ~34% of the population is 60+, and per capita income (~$30,500) remains below state levels. Disability prevalence is ~17% (ACS 2018–2022), higher than state average, with mobility and self-care challenges noted in the 2025 resident survey. Race/ethnicity is predominantly White (98%), with minimal language barriers (English primary for >99%). These factors increase vulnerability during hazards like flooding, extreme cold, and drought, where access to services, mobility, and financial resources are limited.

### 4.2 Housing and Economic Characteristics

**Housing:** The entire population of Charleston is housed, with more than half living in traditional nuclear families, a third living in non-family households, and about one-quarter living alone. The average family size is 2.7 and the average household size is 2.2. In 2022 the average annual household income was approximately $53,000 with per capita income around $30,500, both lower than state averages. About one-third of the Town's housing stock was built before 1950. Almost half was built between 1960 and 1990. About 12% has been built since 2000. Median house value in 2022 was $210,000. More than 80% of the housing is owner-occupied, with about 20% rented. Rental costs range from $700 to $1,600 per month.

*Table 4-2 Town of Charleston, selected housing unit data, 2020 Census Block Group 2*

| **Category** | **Number** | **%** |
|---|---|---|
| Total Housing Units | 670 | – |
| Occupied housing units | 419 | 62.5 |
| Vacant housing units | 251 | 37.5 |
| Owner-Occupied | 336 | 80.2 |
| Renter Occupied | 83 | 19.8 |
| Population in Renter-occupied | 179 | – |
| Households with individuals under 18 | 98 | – |

Population, age, housing unit, and income data in this section are from the U.S. Census Bureau 2020 Decennial Census and the American Community Survey 2018–2022 5-Year Estimates (latest available for small geographies like Charleston town). Social vulnerability indicators are from the CDC/ATSDR Social Vulnerability Index 2020 (county-level) and ACS 2018–2022 (town-level where available).

Mobile homes occupied by full-time and part-time residents continue to be a significant part of the housing mix (about 17% of overall housing units in the town, consistent with 2020 Census and recent ACS estimates for Orleans County rural areas). According to the 2020 U.S. Census and the most recent American Community Survey 5-year estimates (2018–2022), about one-third of the Town's housing stock was built before 1950 (~27% before 1940), and almost half was built between 1960 and 1990 (~45–50%). About 12% has been built since 2000.

- About 45% of housing is valued between $50,000 and $150,000 (with mobile homes often in the lower end).
- 13% between $150,000 and $200,000.
- 28% between $200,000 and $300,000.
- 8% above $300,000 (reflecting rising values in recent years).
- 43% of rental units cost between $500 and $750 per month.
- 50% cost between $750 and $1,000 per month.
- 7% cost between $1,000 and $1,500 per month (rents have seen modest increases due to regional trends, though still lower than state averages).

These figures reflect the rural, affordable character of Charleston's housing stock, with mobile homes playing a key role for full-time and seasonal residents. Town planning anticipates continued reliance on these affordable options, alongside concerns for maintenance and resilience in flood-prone or aging units. Housing values and rental costs are based on U.S. Census Bureau 2020 Decennial Census and American Community Survey 2018–2022 5-Year Estimates for Charleston town, Orleans County, VT; Vermont Housing Data/housingdata.org summaries. In the next planning cycle, town planning officials will explore feasibility of presenting some town level data based on Charleston grand list and parcel data.

**4.3 Land Use, Development Trends, and District**

### 4.3.1 Village and Rural Districts

West Charleston Village is described by the area on both sides of Vermont Route 105 from the junction of Routes 105 and 5A on the east to the Derby-Charleston border on the west. The Clyde River forms the northern boundary. The southern boundary is 1,000 feet in distance on a line perpendicular to the center line of Vermont Route 105. The eastern boundary is the Clyde River, north of Vermont 105 and Vermont 5A, south to a point 1,000 feet from the centerline of Vermont 105.

East Charleston Village is described by an area on both sides of Vermont Route 105 from Route 105/Ten Mile Square Road to a point approximately .9 of a mile west of the centerline of Church Hill Road. The northern boundary is 1,000 feet in distance measured on a line perpendicular to the center line of Vermont Route 105. The southern boundary is the Clyde River.

Pensioner Pond is described by the area lying within Route 105 to the north, Route 5A to the south, and to the south and east along Stumpf Brook to where it meets the Clyde River, and from that point to the intersection of Parlin Meadow Road and Vermont Route 5A.

Echo Lake is described by the area circumscribed by East and West Echo Lake Roads.

Rural: All other land within the Town is part of a Town-wide Rural District, which contains approximately 22,050 acres.

**Commercial:** Small scale enterprises flourish in Charleston, employing many Town residents. Many of these are directly tied to the Town's land and natural resources and depend on the preservation and stewardship of these features to thrive. The rise in remote work since 2020 has heightened resident concerns (noted in the 2025 survey) about gaps in cell service and high-speed internet—critical during hazard events for both remote workers and vulnerable households.

**Land Use and Development Trends Related to Mitigation:** Charleston's land use is primarily residential, agricultural, and forested, with limited commercial activity. The Town of Charleston covers 24,662 acres (38.5 square miles). Population density remains low at approximately 26.6 people per square mile (based on 2020 Census population of 1,021). Residences are concentrated primarily within the East and West Charleston Village areas, around the larger lakes (Pensioner Pond, Echo Lake), and along the larger state and Town roads (e.g., VT Route 105, TH 1–3), leaving much of the Town's acreage in an undeveloped, forested, or agricultural condition.

Nearly all land in Charleston is privately owned, with exceptions for a few small state-owned fishing access areas, Town-owned office and road maintenance facilities, and the municipal Town Forest. The Town Forest is located along the Class 4 Town Farm Road on the Charleston-Westmore town line and includes 184 acres within the Town of Charleston, as well as a contiguous 50 acres in Westmore.

Parcel sizes in Charleston range widely, from a fraction of an acre to over 1,100 acres, with approximately 74% of parcels being at least 50 acres in size—still above the statewide average (VNRC 2012 data, with similar trends persisting in recent Orleans County assessments).

### 4.3.2 Conservation and Use Value Appraisal Trends

As of 2025, approximately 9,800 acres (40%) are currently enrolled in the Use Value Appraisal (UVA) program, including about 50% of all parcels greater than 50 acres. This represents a modest increase of roughly 300 acres (1.5%) since 2003. Lands conserved by the Vermont Land Trust total approximately 3,300 acres (13%), consistent with prior estimates. One of the largest blocks of UVA and conserved acreage is found in the east corner of Town, made up of a dairy farm, the NorthWoods Stewardship Center, and multiple smaller private ownerships.

No significant new residential or commercial development has occurred in flood-prone or sensitive areas since 2021 maintaining the rural, low-density character. Recent conservation efforts (e.g., January 2025 completion of easements in East Charleston, including the Whitcomb-Bedell parcel at the Churchill Brook/Clyde confluence) have added protected riparian buffers and floodplain resilience.

This low-density, largely undeveloped land use pattern continues to limit structural vulnerability to flooding and other hazards, with the primary risks remaining to transportation infrastructure and private wells during drought events.

The following table from the 2021 LHMP reflects the most current land cover data from the 2016 VCGI dataset (no major changes in recent high-resolution updates):

*Table 4-3: Charleston Land Cover Types (Source: VCGI 2016)*

| | | |
|---|---|---|
| **Forested** | Mixed forest | 24.1% |
| | Evergreen forest | 23.3% |
| | Deciduous forest | 16.3% |
| | Forested wetland | 9.2% |
| | **Total forested** | **72.9%** |
| **Agricultural** | Hay/pasture | 7.8% |
| | Row crop | 6.8% |
| | **Total agricultural** | **14.6%** |
| **Other non-forested** | Water | 5.7% |
| | Transportation/utilities | 4.0% |
| | Non-forested wetland | 1.8% |
| | Residential | 0.6% |
| | Brush/transitional | 0.3% |
| | Commercial/industrial | 0.0% |
| | **Total other non-forested** | **12.4%** |

### 4.3.3. Future Development Trends

Charleston does not project significant growth in flood-prone areas. The in-process 2026 Town Plan update anticipates stable or slow population growth, with development favoring scattered, low-density patterns. No large-scale residential or commercial projects are anticipated in mapped flood hazard zones, due to the rural character, lack of zoning, and reliance on state regulations to discourage floodplain development. The town continues to encourage land use that preserves undeveloped rural settings, aligning with the 2023 SHMP emphasis on avoiding development in high-risk areas.

Increasing land values and development pressure have resulted in steady subdivision of large parcels over the past decade, though this trend has been moderated by enrollment in the Use Value Appraisal (UVA) program and conservation easements held by various organizations—most notably the Vermont Land Trust (VLT). These protections help maintain large contiguous blocks of undeveloped or agricultural land, supporting flood/drought resilience, wildlife habitat, and the town's rural character.

## SECTION 5: HAZARD IDENTIFICATION & RISK ASSESSMENT

### 5.1 Hazard Identification Overview

For this 2026 update, the planning team considered the continued inclusion or deletion of the 2021 profiled hazards by developing and researching the natural hazard categories outlined in the 2023 Vermont State Hazard Mitigation Plan (SHMP) and, for each, evaluating prior history, current trends (including climate projections), and available data to estimate risk. Some profiled hazards remain a significant risk for the town. However, other hazards, due to lack of occurrence frequency, risk, and/or vulnerability, have been removed in this update. The definitions of each hazard, along with historical occurrence and impact, are described below.

#### 5.1.1 Types of Natural Hazards Considered

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.

#### 5.1.2 2026 Profiled Hazards

**2026 Updated Profiled Natural Hazards:**

- Flooding (including fluvial erosion and severe storms)
- Severe Winter Storms (including ice storms and ice jams)
- Extreme Cold Events
- Pandemic Planning
- Severe Drought

### 5.2 Natural Hazards Overview and Historical Context

#### 5.2.1 Summary of Declared Disasters (State and County)

There have been 28 disasters and 5 emergencies declared in Orleans County from 1964 through 2025 (it is noted that “Hurricane Irene” was listed as an Emergency, and then “Tropical Storm Irene” was listed as a Disaster a few days later). The following discussion on natural hazards is based upon information from several sources. Often, extent data specific to Charleston is not available but when appropriate and available, nearby Newport City data can be used to capture the extent of natural hazard events for the town and villages. General descriptions are based upon the 2023 Vermont State Hazard Mitigation Plan (SHMP). According to NOAA Storm data, there were over 500 severe weather events from 1995-2025 in Orleans County. Climate change is exacerbating these trends, with Vermont experiencing a 21% increase in annual precipitation since 1900 and projections for an additional 15% increase in precipitation intensity by 2050,

leading to more severe flooding and stormwater challenges (Vermont Climate Assessment, 2021, incorporated in 2023 SHMP). Additionally, 2025 resident survey responses highlighted cell service gaps in rural areas, which can delay emergency notifications and response during hazard events.

### 5.3 Climate Change Considerations and Future Conditions

Climate Change Overview

"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 change. 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." (2023 SHMP, Section 4)

From 1962 to 2006, each five-year period resulted in 0–6 Major Disaster Declarations in Vermont. From 2007–2025, there have been 40. 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—rising over 2°F by 2050—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—nearly 6 inches annually since the 1960s, with an additional 15% rise in intensity projected by mid-century—may also result in increased flooding and fluvial erosion. Drier summers may increase the chance of drought and wildfire. A warmer climate may also result in the influx of diseases and pests that cold winters previously prevented. The severity of climate change is difficult to predict, though the effects may be mitigated somewhat if greenhouse gas emissions are reduced soon. In 2011, Governor Shumlin formed the Vermont Climate Cabinet. The Cabinet, chaired by the Secretary of Natural Resources, is a multidisciplinary approach to enhance collaboration between various state Agencies. Its primary objectives include providing the Governor with advisory information and facilitating climate change policy adoption and implementation. In 2013, the Vermont Agency of Natural Resources (ANR) released the Climate Change Adaptation Framework which addresses climate change exposures, vulnerability-specific elements within each of the natural resource sectors, and ongoing and proposed actions that can be or have been taken to prepare for the expected changes; this framework continues to inform ANR's resilience priorities, including post-2024 flood adaptations and municipal support tools. In line and in conjunction with the ANR report, the primary goal of a VTrans climate change adaptation policy is to minimize long-term societal and economic costs stemming from climate change impacts on transportation infrastructure, with ongoing updates integrated into the 2025 Climate Action Plan and Carbon Reduction Strategy.

In Charleston, these statewide trends are directly reflected in resident concerns documented in the 2025 community survey—particularly more intense flooding, unreliable cell service that delays emergency response, and the need for greater support for elderly and disabled residents during extreme weather events. The profiled hazards that follow—Flooding (including fluvial erosion and severe storms), Severe Winter Storms (including ice storms and ice jams), Extreme Cold Events, Pandemic Planning, and Severe Drought—have therefore been evaluated and updated with climate projections, post-2024 flood lessons learned, and local vulnerabilities in mind.

Future conditions are explicitly addressed throughout this plan to ensure long-term resilience. Climate change is expected to alter hazard frequency and intensity in Vermont, with the following key trends (2023 SHMP):

- Increased precipitation and flooding frequency: Annual precipitation has risen 21% since 1900, with heavy rain events intensifying by ~2% per decade; an additional 15% increase in intensity is projected by mid-century, leading to more frequent and severe flooding, flash floods, and fluvial erosion.
- Temperature trends: Overall warming of 2–6°F by mid-century will reduce prolonged extreme cold events but may increase erratic polar vortex disruptions, causing occasional intense Arctic air outbreaks with higher wind chills.
- Drought and other shifts: Warmer temperatures will increase evaporation and soil moisture deficits, potentially reducing summer precipitation by 15% and increasing drought frequency and duration.

- Equity and vulnerability: These changes will heighten risks for aging populations, rural communities with limited resources, and infrastructure (e.g., highways, power grids, private wells), as noted in the 2021 Vermont Climate Assessment and 2025 resident survey.

The profiled hazards below have been evaluated and updated with these future conditions in mind, incorporating post-2024 flood lessons and local vulnerabilities.

The highest risk hazards listed above have been profiled to provide the basis of future mitigation strategies. However, lower risk natural hazards (tornado, high winds, extreme heat, hail, landslide, earthquake, naturally-occurring radiation, and wildfire) are omitted from full profiling because they do not currently pose enough risk to substantiate mitigation efforts at this time. Impacts from tropical storms/hurricanes are addressed under flooding. While the risk of a hazardous materials incident remains moderate due to border crossings, the town will focus on the five profiled natural hazards and pandemic planning for this update.

*Table 5-1: Summary of Vermont Emergency Declarations*

| Number | Year | Type |
|---|---|---|
| 3532 | 2024 | Pandemic (COVID-19 extension) |
| 3437 | 2020 | Pandemic (COVID-19) |
| 3338 | 2011 | Hurricane Irene |
| 3167 | 2001 | Snowstorm |
| 3053 | 1977 | Drought |

*Source: FEMA*

*Table 5-2: Summary of Orleans County Disasters (Green rows indicate town PA received)*

| DN | Date | Disaster Type | Incident Type | Title |
|---|---|---|---|---|
| 397 | 1973 | DR | Flood | SEVERE STORMS, FLOODING, & LANDSLIDES |
| 518 | 1976 | DR | Flood | SEVERE STORMS, HIGH WINDS & FLOODING |
| 1063 | 1995 | DR | Severe Storm(s) | EXCESSIVE RAINFALL, FLOODING |
| 1307 | 2000 | DR | Severe Storm(s) | TROPICAL STORM FLOYD |
| 1559 | 2004 | DR | Severe Storm(s) | SEVERE STORMS AND FLOODING |
| 1428 | 2002 | DR | Severe Storm(s) | SEVERE STORMS AND FLOODING |
| 1184 | 1997 | DR | Flood | EXCESSIVE RAINFALL, HIGH WINDS, AND FLOODING |
| 1101 | 1996 | DR | Flood | ICE JAMS AND FLOODING |
| 1228 | 1998 | DR | Severe Storm(s) | SEVERE STORMS AND FLOODING |
| 1715 | 2007 | DR | Severe Storm(s) | SEVERE STORMS AND FLOODING |
| 3167 | 2001 | EM | Snow | SNOW |
| 1995 | 2011 | DR | Severe Storm(s) | SEVERE STORMS AND FLOODING |
| 3338 | 2011 | EM | Hurricane | HURRICANE IRENE |
| 4178 | 2014 | DR | Flood | SEVERE STORMS AND FLOODING |
| 4207 | 2015 | DR | Severe Storm(s) | SEVERE WINTER STORM |
| 4163 | 2014 | DR | Severe Ice Storm | SEVERE WINTER STORMS |
| 4380 | 2018 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING |
| 4022 | 2011 | DR | Hurricane | TROPICAL STORM IRENE |
| 4066 | 2012 | DR | Severe Storm(s) | SEVERE STORM, TORNADO, AND FLOODING |
| 4356 | 2018 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING |
| 4140 | 2013 | DR | Flood | SEVERE STORMS AND FLOODING |
| 4474 | 2020 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING |
| 160 | 1964 | DR | Drought | DROUGHT & IMPENDING FREEZE |
| 164 | 1964 | DR | Flood | FLOODING |
| 4474 | 2020 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING (Oct 2019) |
| 4532 | 2020 | ED | Pandemic | COVID-19 |
| 4695 | 2023 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING (July 2023) |
| 4720 | 2023 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING (July 2023) |
| 4770 | 2024 | DR | Severe Storm(s) | SEVERE WINTER STORM (April 2024) |
| 4810 | 2014 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING (July 2024) |
| 4816 | 2024 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING (July 2024) |
| 4826 | 2024 | DR | Severe Storm(s) | SEVERE STORM AND FLOODING (July 2024) |

*Source: FEMA*

## 5.4 Profiled Hazard Profiles

5.4.1 Profiled Hazard: Flooding (including Fluvial Erosion and Severe Storms)

5.4.1.1 Description and Types

There are three main types of flooding that occur in Vermont: flooding from rain or snow melt, flash flooding, and urban flooding. Flooding has also been known to occur as a result of ice jams in rivers adjoining developed towns and cities. These events may result in widespread damage in major river floodplains or localized flash flooding caused by unusually large rainstorms over a small area.

The effects of all types of events can be worsened by ice or debris dams and the failure of infrastructure (especially culverts), private and/or beaver dams. Rain storms are the cause of most flooding in town. Winter and spring thaws, occasionally exacerbated by ice jams, are another significant source of flooding, especially when coupled with high rain levels. Much of this flooding is flash flooding, occurring within hours of a rainstorm or other event. Flash flooding, as opposed to flooding with a gradual onset, causes the largest amount of damage to property and infrastructure. 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, as evidenced by the catastrophic events of July 2023 and July 2024, which caused over $1.2 billion in statewide damages and highlighted vulnerabilities in river corridors and undersized infrastructure. 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. Climate change projections, including a 15% increase in precipitation intensity by mid-century, will further amplify these risks, underscoring the need for nature-based solutions and resilient land use planning (2023 SHMP, Section 4-1: Inundation Flooding & Fluvial Erosion)."*

5.4.1.2 Historical Events and Impacts

Vermont experienced major floods long before Federal disaster assistance became available. But in November of 1927, Vermont experienced catastrophic flooding. In the month before the flood, rains more than 150% of normal precipitation fell after the ground had frozen. The flood itself was precipitated by 10 inches of rain falling over the course of a few days. The flood inundated parts of many towns and damaged or destroyed numerous bridges in the county. As the history of the flooding cited above bears out, the geography and topography are right for a significant localized storm with extreme damage at almost any location in Vermont. Numerous floods have resulted in Presidentially declared disasters and an influx of federal disaster assistance. Of these disasters, the 1973 flood inflicted the most widespread damage, and the residual rains of Hurricane Belle in 1976 resulted in the second highest amount of federal disaster assistance in Vermont.

Widespread, steady rainfall from frontal systems, tropical cyclones, or "northeasters" can result in flooding of large areas. Extensive and disastrous floods are rare but can result from intense

spring rains combined with warm, humid winds that rapidly release water from the snowpack. Such was true for the devastating flood of March 11-12, 1936. During this flood, total rainfall and snowmelt ranged from 10 to 16 inches over the southeastern one-half of the State. Rainfall alone can cause disastrous flooding similar to that in November 1927. During that flood, rainfall totals of 5-9 inches were common, and much more occurred at higher altitudes. Intense rainfall caused extensive flooding on September 21, 1938, when the "great hurricane" reached landfall in the southern area of the State. Severe thundershowers more commonly cause localized street and cellar flooding.

The Clyde River and associated brooks did rise during both the May, 2011 storms (which is the time for record high levels for Lake Champlain at 103.27 feet on May 6th, 2011) and due to the extent of these storms, the town is confident that Irene produced the greatest rise and discharge rates in the river in recent history. The discharge rate for the Clyde River during Irene was close to 1200 cubic feet per second compared to the average for that time of year at 100 cubic feet per second. While the data is for the portion of the Clyde River at Newport, it does indicate the magnitude of water resulting from the rains Irene produced. June 2015 broke records across the state for the wettest on record. Montpelier had the wettest June on record with 9.05 inches of precipitation, beating the old record of 8.36 inches set in 2013, according the National Weather Service. Mount Mansfield also had record rain with 15.54 inches, topping the 15.28 inches that fell in 1998. During May of 2011, Charleston saw 7’’ of rain which is the most the town has seen in many years. Recent history, including the flooding events of 2011 and the records set in 2015 suggest that increases in total rain fall and severity in terms of rainfall per given unit of time are to be expected along the lines seen with the records seen across the state recently.

Recent history has intensified these trends, with Vermont enduring catastrophic 'anniversary floods' on July 10 in 2023, 2024, and 2025—each dumping 3–9 inches across the NEK and Orleans County, causing Clyde River peaks of 1,200–1,500 cfs and over $1.8 billion in cumulative statewide damages (FEMA DR-4720, DR-4816). The 2023 event alone inflicted $100 million in NEK fluvial erosion and road washouts, including impacts to Charleston's Town Highways, while 2024 and 2025 repeats stranded area residents and tested emergency communications amid cell service gaps noted in the 2025 survey. These recurring events, amplified by climate-driven precipitation intensity (up 21% since 1900 per 2023 SHMP), affirm the geography's vulnerability to localized extremes and the urgency of adaptive measures like culvert upgrades and mutual aid.

Tropical cyclones (storms) are officially ranked on one of five tropical cyclone scales, according to their maximum sustained winds and which tropical cyclone basin are located. Only a few scales of classifications are used officially by the meteorological agencies monitoring the tropical cyclones, but some alternative scales also exist, such as Accumulated cyclone energy, the Power Dissipation Index, the Integrated Kinetic Energy Index, and Hurricane Severity Index. Of most recent importance for Vermont was Tropical Storm Irene in 2011. Irene first struck the U.S. as a Category 1 hurricane in eastern North Carolina, then moved northward along the Mid-Atlantic Coast. Wind damage in coastal North Carolina, Virginia, and Maryland was moderate, with considerable damage resulting from falling trees and power lines. Irene made its final landfall as a tropical storm in the New York City area and dropped torrential rainfall in the Northeast that

caused widespread flooding. Irene resulted in the worst Vermont flooding in 83 years but Charleston, along with much of the surrounding towns were not of the hardest hit. During Irene (August 20th-29th, 2011) Charleston received 3'' of rain (NOAA). By comparison, the following chart shows the three highest recorded rain and wind events for Vermont towns during Irene.

*Table 5-3: 2011 "Irene" Discharge Rates for Clyde River*

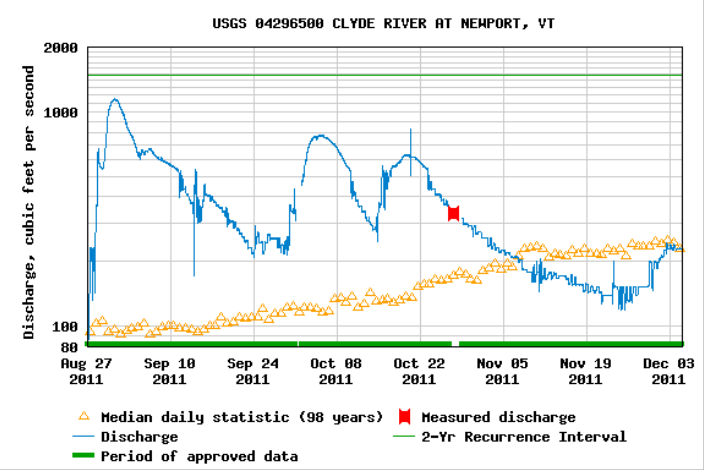
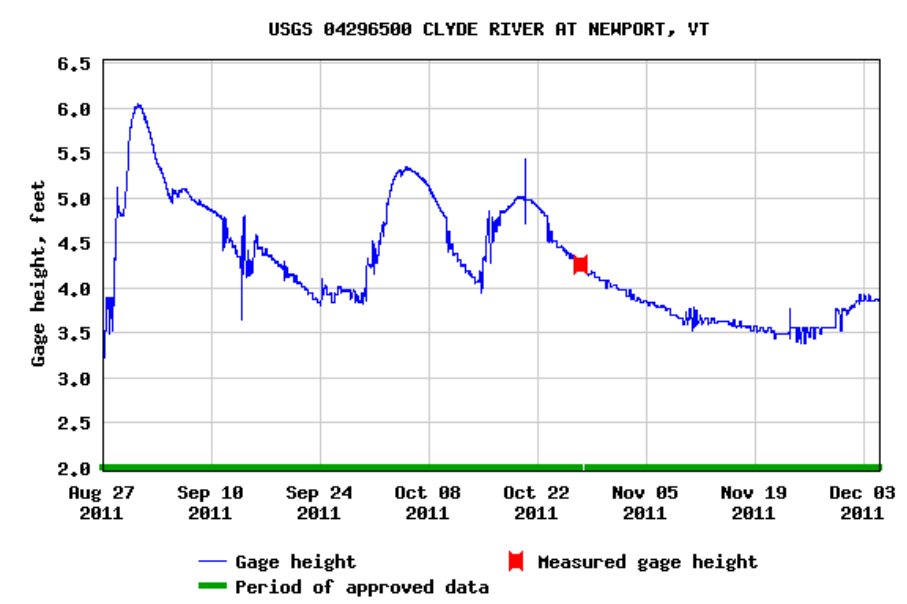


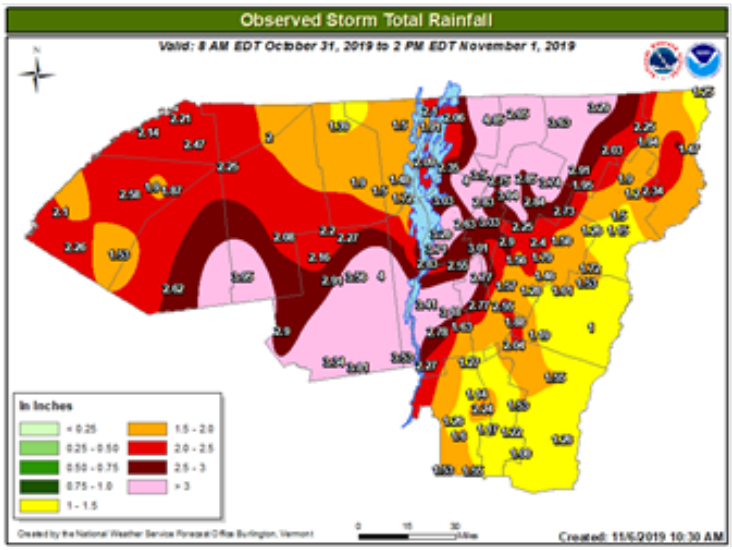

*Table 5-4: 2011 "Irene" Gage Height for Clyde River*




The "Halloween" storm of 2019 (DR-4474) proved to be a most damaging flood event for many areas of the County in recent memory**. While later events in 2023 and 2024 surpassed it in scale (see below), this powerful storm system tracked across the eastern Great Lakes late on October 31st, 2019 and produced an axis of 3 to 5 inches of rain, which caused significant flooding across our region. Record rainfall occurred at Burlington, Vermont with 3.30 inches on October 31st, along with a record high temperature of 71 degrees. In addition, very gusty southwest winds developed behind this potent storm, which generated scattered to widespread power outages. Surface wind gusts measured up to 65 mph across northern New York and parts of Vermont, with gusts over 100 mph at the summits. The heavy rainfall washed out numerous

roads and culverts from Essex County, New York into parts of central and northern Vermont, while 10 rivers reached flood stage with 8 reaching moderate to major levels. A new record high level of 14.72 feet was attained at North Troy on the Missisquoi River. Extensive flooding was observed in the following river basins: Missisquoi, Lamoille, Winooski, and Ausable, while flash flooding with very sharp rises of smaller streams and rivers occurred across the higher terrain of the eastern Adirondacks into central and northern Green Mountains of Vermont, including the Champlain Valley. Observed total rainfall recordings were 5.26 inches in East Berkshire, 4.85 inches in Enosburg Falls, 4.80 in Fletcher, 4.32 Westford, and 4.0 inches in Elizabethtown, New York. Table 5-X below shows the storm total precipitation from 31 October at 8 AM to 1 November 2019 at 2 PM.**

*Table 5-5: Observed storm total rainfall from 8 AM EDT on 31 Oct. to 2 PM EDT on 1 Nov. 2019*

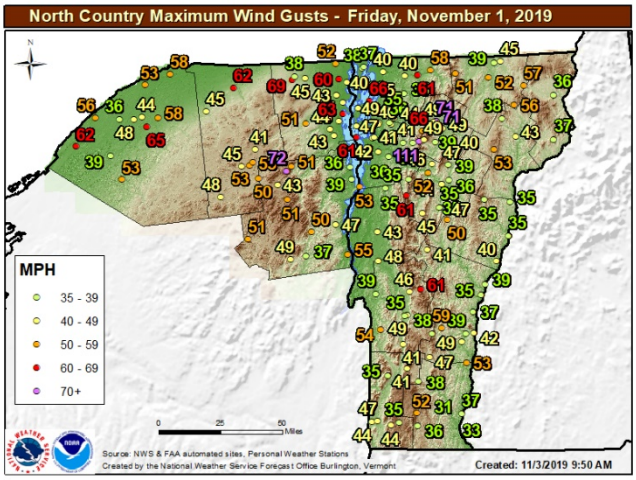



The second significant impact from this powerful storm was the high winds, which caused scattered to widespread power outages across northern New York into Vermont. The core of the strongest winds occurred early morning on November 1st across New York and spread into Vermont during the daytime hours. At the peak, over 120,000 customers were without power across the region. Given how saturated the soils were from the recent heavy rainfall, shallow rooted trees were easily uprooted, exacerbating power outages. A few peak wind gusts included 69 mph at Ellenburg, 65 mph in Potsdam and 62 mph in Malone, New York, while a gust to 71 mph was measured in Johnson, 66 mph at Burton Island and 111 mph at Mount Mansfield in Vermont. Figure 5-X below shows a map of observed peak wind gusts across the North County on 1 November 2019. Charleston did sustain wind damage that was addressed by electric and telephone service providers.

Subsequent floods in 2023 (DR-4720) and 2024 (DR-4816/DR-4810) have since eclipsed the 2019 event as the most damaging in the region, with cumulative statewide damages exceeding $1.5 billion—far surpassing the ~$3 million initial estimate for 2019 public infrastructure alone. The July 10–11, 2023, "Great Flood" brought 4–6 inches to Orleans County, peaking the Clyde River at ~1,500 cfs (higher than Irene's 1,200 cfs) and causing $100+ million in NEK damages, including washouts on Charleston's Town Highways 1 and 2 that required FEMA PA funding for repairs. Anecdotes from residents described it as "worse than Irene," with 150+ swift-water

rescues and days-long road closures stranding vulnerable households amid cell service gaps. The 2024 repeat (July 9–11) added 4–7 inches, ~1,400 cfs peaks, and $500+ million statewide, focusing on fluvial erosion (75% of costs per SHMP) in rural areas like Pensioner Pond; Charleston saw debris cleanup on TH 2/3 via REMC mutual aid, with no major property losses but heightened concerns for emergency access. These "anniversary" events, amplified by 21% higher precipitation since 1900 (2023 SHMP), affirm increasing flood risks and the need for culvert upgrades and resilient communications.

*Table 5-5: Maximum Wind Gust Map for 11/1/2020*




**Inundation and Floodplains** 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 of time 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.

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. The 2023 Vermont State Hazard Mitigation Plan contains the following on inundation:

*"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. Furthermore, precipitation trend analysis suggests that intense local storms are occurring more frequently, with annual precipitation increasing by 21% since 1900 and heavy rain events intensifying by 2% per decade (Vermont Climate Assessment, 2021). 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 floodplains or within stream corridors, as evidenced by over $2 billion in damages from the 2023 and 2024 floods alone. 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, projected to increase by an additional 15% in precipitation intensity by mid-century. While flooding will continue, planning and other mitigation measures—such as nature-based solutions and updated floodplain mapping—can help minimize damages.*

*All of Vermont's major rivers have inhabited floodplains. 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 (2023 SHMP, Section 4-1: Inundation Flooding)."*

#### 5.4.1.3 Designated Hazard Area

All of the planning area has the potential to be affected by flooding. Although the town experienced relatively limited damage during Tropical Storm Irene in 2011, Charleston has not remained insulated from flood impacts in recent years. The catastrophic July 2023 (DR-4720) and July 2024 (DR-4810/DR-4816) floods caused road washouts, culvert failures, and fluvial

erosion along the Clyde River and tributaries, requiring FEMA Public Assistance for emergency repairs and highlighting vulnerabilities noted in the 2025 resident survey (e.g., highway access disruptions and communication gaps for vulnerable residents).

FEMA's current Flood Hazard Boundary Map of Charleston, published in 1974, delineates areas of concern along the Clyde River, Mad Brook, Pensioner Pond, Toad Pond, and Echo Lake. These maps are now over 50 years old and are currently under revision through FEMA's Risk MAP program. During this multi-year update process, the Northeastern Vermont Development Association (NVDA) has provided the Town with provisional river corridor and updated floodplain maps to better reflect current conditions and climate-adjusted risks. There is limited development in mapped flood hazard areas, including a few residences and hay barns. There are no repetitive loss structures in the Town. Portions of Mad Brook and the Clyde River (and tributaries) have some fluvial erosion potential, with minor increases noted since the 2023 and 2024 events. With very little floodplain development in Charleston, the greatest danger during flood events remains to Town highway infrastructure. All 41 culverts on Hudson Road and Twin Bridge Road are located within mapped floodplains.

During 2017–2018, the Town completed two FEMA 404 Hazard Mitigation Grant Program projects on highways that had seen repeated washout and closure during Tropical Storm Irene and other storms. The first replaced double culverts with a precast box culvert and natural stream bed over Mad Brook on Cole Road, a town-to-town connector. The second rebuilt the road surface and upgraded the ditch and culvert network on Hudson Road, a Class 2 highway and major state highway connector adjacent to the Clyde River floodplain. Both projects prevent or reduce damages from future disasters, lower long-term highway repair costs, and mitigate stormwater and pollutant discharge into the watershed. These projects were made possible because the Town adopted a Local Hazard Mitigation Plan in 2016. Building on these efforts, in 2025 the town paved access areas around the town office and highway garage to reduce erosion from heavy rains, improving operational resilience during floods.

Following the 2023 (DR-4720) and 2024 (DR-4810/DR-4816) floods, the Town received FEMA Public Assistance and Hazard Mitigation Grant Program funding for additional resilience improvements, including upgrades to numerous culverts throughout town to better handle increased flow and reduce erosion risks, as well as stabilization of steep Hinton Hill Road with Sta-Mat surfacing to improve drainage and prevent washouts. As well, the VT Agency of Transportation Better Roads and Grants-in-Aid Programs continue to provide grants and technical assistance to help the Town avoid erosion and flash floods resulting from road design and construction

**Fluvial Erosion**

Erosion occurs on a consistent, but small-scale, basis within the riparian corridor of the town's 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. Most flood damage is associated with fluvial erosion rather than inundation. The 2023 Vermont State Hazard Mitigation Plan contains the following on 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 (2023 SHMP, Section 4-1: Inundation Flooding & Fluvial Erosion)."*

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 FloodReady and Vermont Natural Resources Atlas websites in addition to recent NVDA work for mapping river corridors for towns in the NEK.

The Vermont Agency of Transportation (VTrans) applies the term "scour critical" to stream crossing structures especially vulnerable to streambed scour—the undermining of bridge supports by water action and erosion. A spreadsheet database is maintained by VTrans and continually updated by the Bridge Inspection Program. Structures inspected are only those of 20 feet or longer owned by a municipality or the state. The scour critical rating is based on the structure itself, and does not consider debris jams, outflanking, channel change, or other issues commonly associated with fluvial erosion. However, since 2023, VTrans has begun integrating DEC river corridor data into inspections to better account for climate-amplified erosion risks (2023 SHMP). Water supply source and distribution systems are also endangered by fluvial erosion. Many water distribution systems involve buried pipes that cross streams, which are vulnerable to fluvial erosion. The 2023 and 2024 floods (DR-4720/4810) highlighted these risks statewide, with recommendations for geomorphic assessments of high-risk crossings (2023 SHMP). In December 2014, the Vermont Department of Environmental Conservation (DEC) released the "Flood Hazard Area and River Corridor Protection Procedures" guide, outlining specific actions and considerations. The underlying Rule was amended in 2021 to strengthen "no adverse impact" standards, including compensatory storage in flood fringes. Erosion of

stream banks was a concern but is less-so now. A FEMA study has shown limited but increasing increase in velocities resulting from over-bank events which are more frequent and have subsequently caused minor channel migration in NEK streams like the Clyde River (USGS SIR 2025-5016).

Charleston remains committed to enhancing awareness and incorporating recommendations in future planning and mitigation work. The Clyde River Stream Geomorphic Assessment is part of an ongoing partnership between the NorthWoods Stewardship Center and the State of Vermont to identify sources of nonpoint source pollution in the four main Vermont tributaries draining into Lake Memphremagog, a lake receiving high nutrient and sediment loads. Located in northeastern Vermont, the Clyde River Watershed encompasses 144 square miles of land noted for its remoteness and wildness. Although recognized for their natural beauty, relatively intact wetlands, and abundant recreational and fishing opportunities, the Clyde River, its tributaries, and associated lakes also face a number of water quality threats resulting from a variety of sources within the watershed. While it is important to address these threats, it is equally important to identify and prevent degradation of areas with excellent water quality. In streams, water quality is influenced by inputs from the watershed as well as the health of the stream itself.

Assessments on 83 miles of the Clyde River and its tributaries were completed; from these, 17.5 miles were chosen for more detailed Phase 2 Stream Geomorphic Assessments. The results of these assessments indicate that many streams in the Clyde River Watershed are in good or reference condition. However, there are areas in the watershed which have lost their protective riparian buffers, are receiving inputs of sediment and nutrients from urban and agricultural development and are eroding and sending nutrients downstream. The Phase 2 reaches most profoundly affected by these stressors were rated in fair or poor condition and totaled 1.6 stream-miles. The Phase 2 assessments highlighted several potential stream restoration sites, including reaches in Newport (reach M01), West Charleston (reach M08), East Charleston (reaches M15, M16 and an unnamed tributary to M15), and the lower reach of Cold Brook in Brighton (reach T4.01). These reaches contain areas of actively eroding streambanks and significant areas without riparian buffers. These reaches would benefit from buffer enhancement projects such as tree or shrub plantings. Dropping only 40 feet in elevation from its beginning at Island Pond (Reach M21) to Pensioner Pond (Reach M12), the Clyde River is a slow, low gradient river snaking its way through broad valleys, vast wetlands, and floodplain forests. The river receives inputs from numerous cold-water mountain tributaries during this 11.8-mile (16.5 river miles) stretch, most notably the Pherrins River (Reach T6), Oswegatchie Brook (T5), Cold Brook (T4), Webster Brook (not assessed), Mad Brook (T2), and outflows from Seymour and Echo Lakes (T1). Below Pensioner Pond and the Great Falls Dam above West Charleston, the river changes dramatically, cascading over several bedrock ledges before entering Charleston Pond. Below Charleston Dam, the Clyde becomes a whitewater river, encountering more small bedrock ledges, flowing over cobble and boulder stream beds, and finally leveling off downstream of West Charleston village. The river elevation drops 140 feet from Pensioner Pond (Reach M12) to West Charleston (Reach M09), a distance of only 0.68 river miles, excluding the pond lengths. After West Charleston village, the Clyde River transitions again to a low-gradient river, meandering through fields and forests before entering Little Salem

Pond and Lake Salem (Reach M06). The river elevation drops 40 feet in these 1.7 miles (2.3 river miles). After exiting these lakes, the Clyde again changes to a fast-flowing and high-gradient river, traveling through a confined valley within the town of Derby and dropping 80 feet in 3.6 miles (3.9 river miles) between Lake Salem and Clyde Pond (Reach M03). Upon leaving Clyde Pond, the river passes over the Clyde Pond Hydroelectric Dam and becomes a fast and cascading stream, dropping 190 feet in only 1.1 miles before leveling off in Newport and entering Lake Memphremagog. The Clyde River flows through five lakes along its course. Its flows are affected by three man-made grade controls: Great Falls Dam below Pensioner Pond, Charleston Dam at Charleston Pond, and the Clyde Pond Dam in Newport. Salem Lake and Little Salem Pond are undammed, but all of these ponds and lakes capture sediment originating from upstream sources. Based on the intensity of channel and floodplain modifications, as well as the overall stream condition observed during the field assessments, reaches conditions were defined as reference, good, fair, and poor. Vermont ANR Stream Geomorphic Assessment Protocols describe these conditions below (State of Vermont 2007b):

**In Regime:** A stream reach in reference and good condition that is in dynamic equilibrium which may involve localized, insignificant to minimal change to its shape or location while maintaining the fluvial processes and functions of its watershed over time and within the range of natural variability.

**In Adjustment:** A stream reach in fair condition that has experienced major change in channel form and fluvial processes outside the expected range of natural variability; and may be poised for additional adjustment with future flooding or changes in watershed inputs that could change the stream type.

**Active Adjustment and Stream Type Departure:** A stream reach in poor condition that is experiencing extreme adjustment outside the expected range of natural variability for the reference stream type; likely exhibiting a new stream type; and is expected to continue to adjust, either evolving back to the historic reference stream type or to a new stream type consistent with watershed inputs and boundary conditions. There are five stages in channel evolution. Streams in stable condition that are not out of balance due to in-stream or upstream stressors are in Stage I. These streams are in good to reference condition and have the ability to regularly flood in order to disperse sediment and energy. Reaches in fair or poor condition are currently evolving to regain balance; these streams will be in various stages of channel evolution. Streams in Stage II have eroded their beds and may have lost the ability to access their floodplains. These reaches have increased power, increased ability to erode, and decreased ability to store sediment within the reach. Instead, much of the sediment may be sent downstream to affect downstream reaches or lakes. In Stages III and IV, the stream is widening and migrating as it re-establishes meanders and a new floodplain at a lower elevation. Erosion may be severe at these stages as the stream attempts to establish its equilibrium. Finally, Stage V represents a new equilibrium and a reestablished floodplain at a lower elevation. Most assessed reaches in the Clyde River watershed were stable and in good to reference condition. Although some reaches rated in good condition contained areas of erosion and unstable banks, they lacked the widespread instability resulting from extensive modifications to the channel and watershed. Four reaches were in fair condition, and one reach was in poor condition. These reaches were unstable, have lost floodplain function, and may be

responsible for sending large amounts of sediment and nutrients downstream. While this information provides a foundation for the town to understand erosion characteristics, continued analysis in conjunction with ANR and the NorthWoods Stewardship Center is needed. (Source: Restoring Water Quality in the Lake Memphremagog Basin: Clyde River Phase I and II Stream Geomorphic Assessments, 2016). The 2011 flooding events did result in enhanced erosion, and post-2023/2024 floods (DR-4720/4810) have caused minor additional channel shifts in reaches like M08 and M15, per ANR/NVDA provisional maps and USGS data (2023 SHMP; USGS SIR 2025-5016). Further monitoring is ongoing to quantify these changes.

Building on the Geomorphic Assessment, recent local efforts include the Jan 30, 2025 completion of three conservation easements in East Charleston (e.g., Whitcomb-Bedell parcel at Churchill Brook/Clyde confluence) for flood resilience and habitat, funded by VHCB/GLFC. Ongoing Clyde Salmon Restoration (VTFWCG, 2024: 136 adults processed) enhances spawning above dams, while NorthWoods' 2023 Phragmites control in Echo Lake reduces erosion loads, and MWA's 2024 VHCB grants ($105K) target riparian buffers on lower Clyde tributaries. These align with 2023 SHMP priorities and inform Charleston's culvert upgrades post-DR-4720/4810.

In summary, flooding is a significant hazard in Charleston, a fact that is unlikely to change. Protecting river systems as a preventative measure, protecting property and human health and safety from flooding and flood-related damage remains important facets of mitigation planning for most Vermont communities including Charleston.

**5.4.2 Profiled Hazard: Severe Winter Storms** (including Ice Storms and Ice Jams)

5.4.2.1 Description

Winter storms impact the entire planning area and can include snowstorm, cold, blizzard and ice. 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.*

*Climate change is expected to alter the frequency and intensity of winter storms in Vermont. While total annual snowfall may decrease due to warmer temperatures, extreme snow events could become more intense in the short term, with increased variability leading to more frequent ice storms and mixed precipitation. Projections indicate a 15% increase in precipitation intensity by mid-century, exacerbating ice buildup and related hazards (Vermont Climate Assessment, 2021). These changes will heighten vulnerabilities to power outages and*

*transportation disruptions, particularly for rural communities and aging populations reliant on reliable infrastructure."*

Winter storm frequency and distribution vary from year to year depending on the climatological patterns but snowfall in the town is significantly higher than the national average.

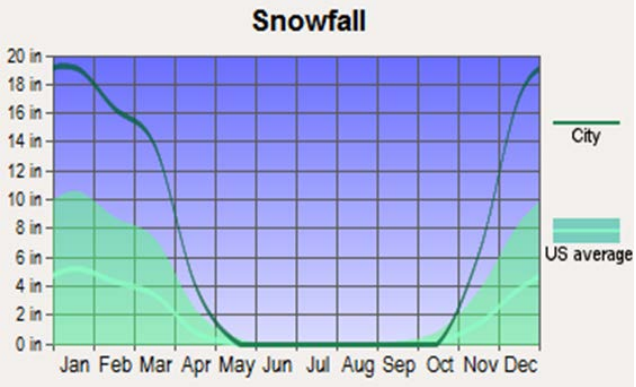
5.4.2.2 Historical Events and Future Conditions

County-wide, the winter of 2010–2011 remains the third snowiest on record for Orleans County with a total of approximately 124 inches, behind the record of 145 inches set in 1970–1971 and 131 inches in 2007–2008. The potential for a major snowstorm that exceeds the capabilities of the town exists every year, but with the recent increase in snowfall totals, storm intensity, and durations of extreme cold—exacerbated by climate variability—the town recognizes the need for enhanced consideration in mitigation planning. NOAA's National Centers for Environmental Information (NCEI) continues to produce the Regional Snowfall Index (RSI) for significant snowstorms impacting the eastern two-thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5 (similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes), factoring in snowfall amounts, areal extent, and population affected to quantify societal disruptions. NCEI has analyzed and assigned RSI values to over 600 storms dating back to 1900, providing a century-scale historical perspective useful for emergency managers, media, and the public. The RSI and Societal Impacts section details regional RSI values, along with cumulative area and population affected above region-specific thresholds—for the Northeast, these are 4 inches, 10 inches, 20 inches, and 30 inches of snowfall. Notable storms in the Northeast region affecting Charleston include 2010, 2012, and 2015, with high RSI rankings based on severity. Since 2000, the Northeast has seen one Category 4 event (January 2016 winter storm Jonas, RSI 18.89), six Category 3 events (including the February 2021 nor'easter, RSI 11.23), ten "significant" (Category 2) storms (e.g., December 2020 nor'easter, RSI 6.89; January 2022 nor'easter, RSI 7.45), and numerous "notable" (Category 1) events through 2025. Recent winters (2020–2025) have featured four RSI-ranked storms impacting Vermont, including two Category 3 events in 2021 and 2022, underscoring the trend toward more frequent high-impact winter weather.

*Table 5-6: 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 |

*Table 5-7: Charleston Snowfall vs. U.S. Average*




The Town has seen damage from declared snow disasters in the past, primarily dealing with debris removal from downed trees. In any Vermont community, this potential exists every winter. While there is no consistent long-term record of snowfall specifically for Charleston, nearby Newport City data continues to serve as a reliable proxy for the extent to which snow can impact the area. Recent notable events include the January 2019 nor'easter (28–32 inches across Orleans County) and the December 2020 storm that contributed to an RSI Category 2 ranking for the region.

Historic January snowfall totals in Newport remain led by 1987 (47.5 inches), followed by 1978 and 1979 (46.5 inches and 45.8 inches). Average monthly snowfall (1981–2010 normals, updated in NOAA/NCEI) is approximately December 26.2 inches, January 22.6 inches, February 16.9 inches, and March 18.3 inches. The greatest 24-hour maximum remains February 14–15, 2007 with 23.5 inches. From 2011 to 2025, Orleans County recorded at least seven additional significant winter weather events in the NOAA Storm Events Database, including multiple heavy snow and ice storm episodes in 2015, 2019, 2021, 2022, and 2024.

Specific past events affecting Charleston include:

- February 5, 2001 – a winter storm with 10–14 inches across Orleans County caused barn roof collapses in neighboring towns and minor damage in Charleston.
- March 5–7, 2001 (EM-3167) – a declared snow emergency brought 12–30 inches region-wide; Charleston received FEMA Public Assistance funds for debris removal and emergency protective measures, with approximately $75,000 in documented regional property damage.

There are no standard loss estimation models or methodologies for winter storm hazards. Potential losses from winter storms are, in most cases, indirect (power outages, transportation disruptions, roof collapses, and health impacts on vulnerable residents) and therefore difficult to quantify precisely. The 2023 Vermont State Hazard Mitigation Plan notes that, while total seasonal snowfall is projected to decrease over the coming decades due to warming temperatures, short-term variability will continue to produce intense individual storms and ice events, with precipitation intensity increasing and more winter precipitation falling as rain rather than snow. This shift heightens risks of ice jams, flash flooding during mid-winter thaws,

and prolonged power outages—concerns echoed in Charleston's 2025 resident survey regarding communications gaps and support for elderly/disabled households during extended outages.

**Ice Storm**

Major Ice Storms occurred in January 1998 and again in December 2014. While both Morgan and Brownington received heavy damage to forest stands, Charleston did not sustain any significant damage in the 1998 event. Known as the North American Ice Storm of 1998, a series of surface low pressure systems passed in this atmospheric circulation between January 5 and January 10, 1998. For more than 80 hours, steady freezing rain and drizzle fell over an area of several thousand square miles of the Northeast, causing ice accumulation upwards of 2'' in some areas. Charleston and the surrounding area received .5 to 1 inch of ice. The ice storm that hit Vermont on Thursday, January 8, 1998 was one of the worst weather calamities in Vermont history. It took Green Mountain Power seven days, one hour, and 29 minutes to restore power to all its customers. The power company supplying Charleston during the 1998 Storm is no longer operating and the Vermont Electric Cooperative has been supplying the town for about 15 years. With a previous generator grant application, the town has captured a recent history of outages with the greatest duration lasting four days but not due to an ice event. While there is evidence that supports an increase in weather and precipitation severity, the incidence of ice storms remains fairly spaced out. The town expects to have another ice storm but unlike rain and snow events, the occurrence of a major ice storm is not expected every year. There has been no major ice event in northern Vermont since the last approved plan, though a significant statewide ice storm on March 30–31, 2025 impacted central and southern counties with up to 0.75 inches of ice accumulation, causing widespread power outages for over 14,000 customers and tree damage; Orleans County, including Charleston, experienced only minor sleet and freezing drizzle with no reported significant impacts (www.weather.gov/btv).

### 5.4.3 Profiled Hazard: Extreme Cold

#### 5.4.3.1 Description

*"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. 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 Arctic air to flow southward along a jet stream. 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.*

*Climate change is altering the frequency and intensity of extreme cold events in Vermont. While overall winter temperatures are projected to rise by 2–6°F by mid-century, leading to fewer prolonged cold snaps, the polar vortex disruptions may become more erratic, resulting in occasional intense outbreaks of Arctic air with rapid onset and higher wind chills. These events will compound vulnerabilities for aging populations, rural communities with limited heating access, and infrastructure like highways and power grids, as noted in the 2021 Vermont Climate Assessment. Increased precipitation intensity (up to 15% by 2050) during cold periods could also exacerbate ice formation on roads and utilities, heightening slip-and-fall risks and outage durations (2023 SHMP, Section 4-8).”*

5.4.3.2 Historical Events & Future Conditions

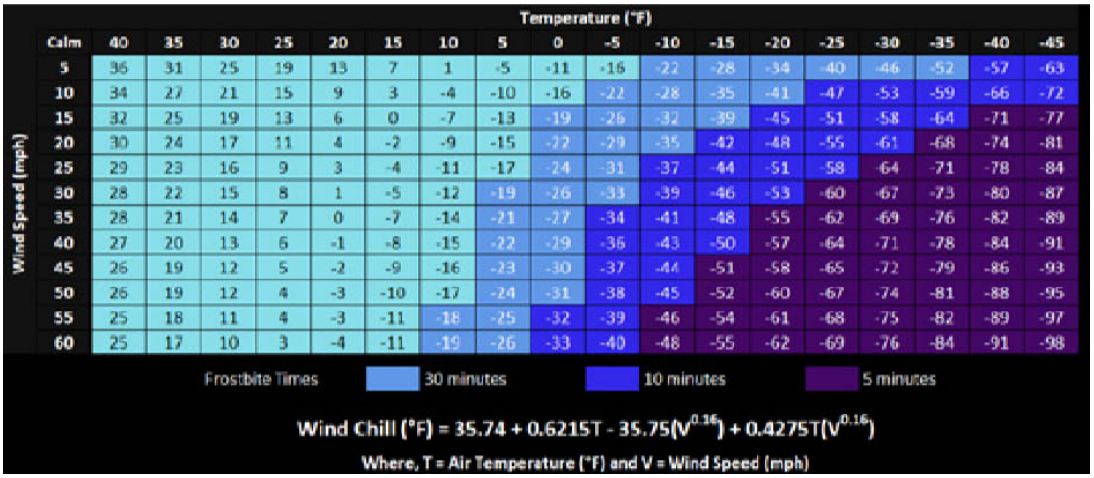
While there is no historical evidence to support a concern over the consequences of extremely hot temperatures on human health and safety in Charleston, high temperatures can contribute to severe storms, as evidenced by the September 11, 2013, event where record heat fueled damaging hail and winds across the NEK and parts of Vermont and New York. Recent heat waves, such as the June 23–24, 2025, outbreak with highs exceeding 90°F statewide and dew points in the upper 70s°F, have similarly increased thunderstorm risks, though direct health impacts remain limited due to the region's cooler climate and low population density (NWS Burlington, 2025). Recent extremes in cold temperatures remain a concern and impact the entire planning area and region. The winter of 2015 (January–March) tied the coldest on record (1923) for Vermont, with a mean temperature of 7.8°F, according to NOAA’s National Centers for Environmental Information (NCEI) dataset dating to 1895. The National Weather Service maintains the following recent temperature records for nearby Newport City:

- Highest: 95°F, August 2001
- Lowest: -38°F, February 1933

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 outages, fuel oil delivery disruptions) and societal (ability to purchase heating fuel) factors. January 1994 had the coldest mean temperature on record since 1930 at 2.7°F, and January remains the statistically coldest month in all of Vermont. Since 1930, January has produced temperatures in the negative 20s and 30s consistently for Orleans County, with record cold temperatures occurring in 1957 and 1933 (-38°F). While temperatures for the town remain within averages seen in the last 90 years, and the intensity of extreme winter cold is projected to decrease overall due to a 3°F rise in average temperatures since 1900 (NOAA NCEI State Climate Summary, 2021), dangerously cold temperatures—compounded by recent events like the February 2021 nor'easter (RSI Category 3) and January 2022 cold snap—are expected every winter, with survey-noted vulnerabilities for elderly and disabled residents during outages.

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 of time:

*Table 5-8: NOAA Wind Chill Chart*



| Wind Speed (mph) \ Temperature (°F) | Calm | 40 | 35 | 30 | 25 | 20 | 15 | 10 | 5 | 0 | -5 | -10 | -15 | -20 | -25 | -30 | -35 | -40 | -45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | | 36 | 31 | 25 | 19 | 13 | 7 | 1 | -5 | -11 | -16 | -22 | -28 | -34 | -40 | -46 | -52 | -57 | -63 |
| 10 | | 34 | 27 | 21 | 15 | 9 | 3 | -4 | -10 | -16 | -22 | -28 | -35 | -41 | -47 | -53 | -59 | -66 | -72 |
| 15 | | 32 | 25 | 19 | 13 | 6 | 0 | -7 | -13 | -19 | -26 | -32 | -39 | -45 | -51 | -58 | -64 | -71 | -77 |
| 20 | | 30 | 24 | 17 | 11 | 4 | -2 | -9 | -15 | -22 | -29 | -35 | -42 | -48 | -55 | -61 | -68 | -74 | -81 |
| 25 | | 29 | 23 | 16 | 9 | 3 | -4 | -11 | -17 | -24 | -31 | -37 | -44 | -51 | -58 | -64 | -71 | -78 | -84 |
| 30 | | 28 | 22 | 15 | 8 | 1 | -5 | -12 | -19 | -26 | -33 | -39 | -46 | -53 | -60 | -67 | -73 | -80 | -87 |
| 35 | | 28 | 21 | 14 | 7 | 0 | -7 | -14 | -21 | -27 | -34 | -41 | -48 | -55 | -62 | -69 | -76 | -82 | -89 |
| 40 | | 27 | 20 | 13 | 6 | -1 | -8 | -15 | -22 | -29 | -36 | -43 | -50 | -57 | -64 | -71 | -78 | -84 | -91 |
| 45 | | 26 | 19 | 12 | 5 | -2 | -9 | -16 | -23 | -30 | -37 | -44 | -51 | -58 | -65 | -72 | -79 | -86 | -93 |
| 50 | | 26 | 19 | 12 | 4 | -3 | -10 | -17 | -24 | -31 | -38 | -45 | -52 | -60 | -67 | -74 | -81 | -88 | -95 |
| 55 | | 25 | 18 | 11 | 4 | -3 | -11 | -18 | -25 | -32 | -39 | -46 | -54 | -61 | -68 | -75 | -82 | -89 | -97 |
| 60 | | 25 | 17 | 10 | 3 | -4 | -11 | -19 | -26 | -33 | -40 | -48 | -55 | -62 | -69 | -76 | -84 | -91 | -98 |

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T = Air Temperature (°F) and V = Wind Speed (mph)

In anticipation of extreme cold temperatures, the National Weather Service may issue the watches, warnings, or advisories, which are aimed at informing the general public as well as the agricultural industry. While the NOAA wind chill chart remains relevant and actively in use as of 2025 for calculating apparent temperature and assessing frostbite risk from combined wind and cold, the NWS has updated its cold weather alerts for extreme cold temperatures.

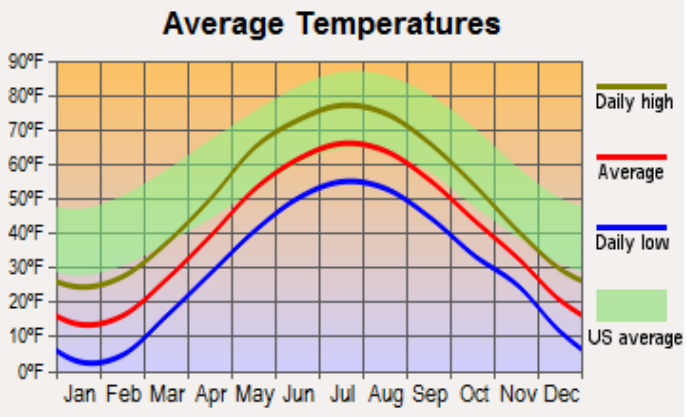
As of October 1, 2024, the National Weather Service (NWS) implemented a nationwide Hazard Simplification initiative to consolidate and streamline cold weather products for better public communication. This change retires separate Wind Chill Warnings, Watches, and Advisories, replacing them with broader Cold Weather Advisories, Extreme Cold Watches, and Extreme Cold Warnings. These new products use wind chill values internally for thresholds but emphasize that "cold is cold" regardless of wind, addressing misconceptions. Freeze-related products (for agricultural and plant impacts) remain unchanged. The updated alerts, aimed at informing the general public as well as the agricultural industry, are as follows (criteria may vary slightly by NWS office/location, e.g., Northeast thresholds like -20°F for advisories):

- **Extreme Cold Warning:** Dangerously cold wind chill values or temperatures (typically -20°F or lower in the Northeast) are expected or occurring, posing high risk of frostbite or hypothermia within minutes; take immediate action to limit outdoor exposure.
- **Extreme Cold Watch:** Dangerously cold wind chill values or temperatures (typically -20°F or lower) are possible within the next 24–36 hours; prepare by checking heating systems and emergency supplies.
- **Cold Weather Advisory:** Seasonably or moderately cold wind chill values or temperatures (typically -10°F to -19°F in the Northeast) are expected or occurring, creating hazardous conditions but not at extreme levels; dress in layers and limit time outdoors.
- **Hard Freeze Warning:** Temperatures are expected to drop below 28°F for an extended period of time (several hours), killing most types of commercial crops and residential plants; protect sensitive vegetation.

- **Freeze Warning:** Temperatures are forecasted to go below 32°F for a long period of time (several hours), killing some types of commercial crops and residential plants; cover or bring in tender plants.
- **Freeze Watch:** Potential for significant, widespread freezing temperatures (below 32°F) within the next 24–36 hours; monitor forecasts and prepare protective measures.

These updates align with NWS priorities for clearer messaging, especially for vulnerable populations like the elderly and those without reliable heating. For Charleston, VT (Northeast region), thresholds are generally set at wind chill ≤ -20°F for Extreme Cold products and ≤ -10°F for Cold Weather Advisories, per NWS Burlington criteria. Always check local NWS forecasts for precise details.

*Table 5-9: Charleston Temperature Ranges vs. National Average*




### 5.4.4 Profiled Hazard: Pandemic Planning

5.4.4.1 Description and Historical Context

Pandemic planning in Vermont has continued to evolve in the wake of the COVID-19 experience, with renewed emphasis on integrating public health resilience into all-hazards frameworks. The H1N1 outbreak in 2009–2010 initially spurred statewide preparedness, but focus waned from 2010 to 2019 amid the absence of major U.S. events. The COVID-19 pandemic in 2020 dramatically reversed this trend, exposing rural vulnerabilities like Charleston's dispersed population and limited healthcare access, while delivering severe economic shocks—statewide unemployment peaked at 20% in April 2020, with NEK tourism and small businesses hit hardest by border closures and supply chain disruptions.

COVID-19, caused by the SARS-CoV-2 virus, is highly contagious and can spread asymptomatically. On March 13, 2020, President Trump declared a nationwide emergency under Section 501(b) of the Stafford Act, enabling streamlined federal support. Vermont received a major disaster declaration (FEMA-4532-DR-VT) on April 8, 2020, covering the period from January 20, 2020, to May 11, 2023. This authorized Public Assistance (PA) Category B funding at a 75% federal cost share for emergency protective measures, including direct federal assistance to state, local governments, and eligible nonprofits. The declaration supported over

1,000 PA projects statewide, with Vermont allocating $400 million in economic relief (e.g., Operational Relief Grants for childcare and small businesses) from federal CARES Act funds.

Early 2020 saw a rapid pivot to core pandemic tenets: hospital surge planning, PPE stockpiling, and public guidance on isolation, masking, and quarantine. Economic mitigation—workforce reductions, school closures, and business shutdowns—required balancing infection control with livelihoods, including out-of-state travel restrictions to curb resource strain. The 2025 revisions to the State Emergency Management Plan (SEMP) now embed these lessons across five mission areas (Prevention, Protection, Mitigation, Response, Recovery), with enhanced annexes for human-caused and technological hazards like supply chain failures and misinformation, informed by COVID-19 after-action reviews.

While the Northeast Kingdom, including Orleans County, experienced lower per capita infection rates than urban areas like Burlington (due to rural isolation and compliance with measures), every community faced border enforcement, protocol implementation, and economic fallout. Charleston received PA funding under DR-4532 for emergency protective measures, such as community testing sites and senior support services, including XXXXX. Statewide, COVID-19 tallied ~170,000 cases, ~1,300 deaths, and high recovery rates (>99%) by mid-2025, with Orleans County reporting ~5,000 cases and ~50 deaths cumulatively—Charleston itself saw fewer than 50 confirmed cases, reflecting its small population but underscoring vulnerabilities for elderly residents (per 2025 survey). As of December 2025, cases remain low (e.g., 0 new deaths weekly), with wastewater monitoring and vaccination (24% uptake in 2024–2025) guiding ongoing vigilance.

The 2023 State Hazard Mitigation Plan (SHMP) and 2025 SEMP revisions elevate pandemics as a priority hazard, advocating equity-focused strategies like regional mutual aid (e.g., Orleans-Essex REMC protocols refined post-COVID) and tools for vulnerable populations. Charleston integrates these into local planning, emphasizing communications enhancements to address survey-noted gaps during isolation events.

### 5.4.5 Profiled Hazard: Severe Drought

#### 5.4.5.1 Description

The 2023 Vermont State Hazard Mitigation Plan (SHMP) addresses drought as a moderate but increasing hazard, particularly in the context of climate change:

*"Drought is a prolonged period of abnormally low precipitation that leads to a deficiency of surface and subsurface water supplies, resulting in water shortages that stress ecosystems, agriculture, water resources, and human health. In Vermont, droughts typically occur every 5–10 years and are classified using the U.S. Drought Monitor (USDM) scales from D0 (abnormally dry) to D4 (exceptional drought). Historical events like the 1964 and 1977 droughts caused widespread agricultural losses, low streamflows, and water restrictions. Climate projections indicate warmer temperatures (2–6°F rise by mid-century) will exacerbate evaporation and soil moisture deficits, potentially reducing summer precipitation by 15% and increasing drought frequency and duration. This heightens risks to rural communities, where private wells and small farms are vulnerable, and underscores the need for proactive monitoring and resilience strategies (2023 SHMP, Section 4-6: Drought)."*

5.4.5.2 Historical Events and Future Conditions

Vermont has a long history of droughts, with records dating to 1895 showing cycles every 5–10 years. The driest water years (October–September) include 1923–24 (statewide precipitation 70% of normal), 1976–77 (second driest at 75% normal), and 1964 (third at 78% normal). More recently, moderate droughts (D1–D2) struck in 2020 (summer D2 in NEK), 2023 (D1–D2 affecting 60% of VT), and 2025 (ongoing D2–D3 as of November 25, 2025, with 41% of the state in drought and 49% abnormally dry—the driest August on record since 1895, 1.82 inches below normal). In Orleans County, including the NEK, these events have been recurrent, with 2025 marking the third consecutive severe weather year (floods in 2023/2024 followed by drought). Locally, Charleston lacks dedicated gauges, but proxy data from Newport City shows 2025 summer precipitation at ~60% of normal (4.5 inches vs. 7.5-inch average), leading to low levels in Pensioner Pond and Echo Lake. Frequency has increased: 3 moderate droughts in Orleans County since 2020, up from 2 in the prior decade, aligning with SHMP projections of heightened variability.

Likelihood in Charleston remains moderate (10–20% annual probability of D1+), but climate trends suggest rising odds (up 20–30% by 2050 per SHMP), driven by warmer, drier summers reducing soil moisture and streamflows in low-gradient rivers like the Clyde.

Drought poses cascading risks to Charleston's rural economy and vulnerable residents. Primary impacts include water shortages for private wells (approximately 95–98% of households rely on them), straining emergency services and daily needs—2025 saw voluntary restrictions in NEK towns, with some Charleston wells dropping 10–15 feet. Agriculture, vital to small farms (e.g., dairy/hay in rural districts), faces crop failures and livestock stress; statewide, 2025 losses reached $14 million, with NEK hay yields down 30% or more. Secondary effects include heightened wildfire risk in forested areas (e.g., Echo Lake vicinity; 2025 fire bans issued), ecosystem degradation (e.g., wetland drying in Pensioner Pond), and health concerns for elderly/disabled (dehydration/heat, per 2025 survey). Economic ripple: Reduced tourism (fishing/recreation) and remote work disruptions from power fluctuations. Infrastructure like highways (TH 1–3) sees dust/erosion issues, compounding flood vulnerabilities.

The 2023 SHMP prioritizes drought mitigation through a statewide drought plan (Year 1 goal: water monitoring predictors for early alerts), agricultural resilience (e.g., irrigation grants via MVI tool), and equity for rural/low-income areas—aligning with Charleston's goals for vulnerable support and communications. Local integration includes NVDA's provisional maps for water resource planning and REMC mutual aid for supply sharing, emphasizing low-cost measures like rainwater harvesting to build long-term equity and sustainability.

The 2025 drought, classified as severe (D2) across 78% of Vermont by September (with Orleans County at D2–D3), has amplified water supply anxieties, particularly in rural Orleans County where over 400 statewide reports of dry wells and shortages were logged by late September—many from the NEK, including Glover (near Charleston) where residents reported complete well failures and business closures like the Busy Bee Diner due to no water. In Charleston, anecdotal reports from the 2025 resident survey highlighted fears of well depletion affecting elderly and low-income households (e.g., "Our well is half empty—worried about winter meds and heat"), with sediment in taps signaling contamination risks from dropping levels. Statewide, the

Vermont Agency of Agriculture's 2025 Drought Impact Survey (open through December 15) captured $13.5 million in agricultural losses, with 59% of NEK farmers calling it "the worst ever," echoing survey calls for better emergency water distribution and communications to vulnerable families during shortages.

**5.5 Designated and Non-designated Hazard Areas**

**Flood Hazard Areas:** FEMA's current Flood Hazard Boundary Map of Charleston, published in 1974, delineates areas of concern along the Clyde River, Mad Brook, Pensioner Pond, Toad Pond, and Echo Lake. These maps are now over 50 years old and are currently under revision through FEMA's Risk MAP program. During this multi-year update process, the Northeastern Vermont Development Association (NVDA) has provided the Town with provisional river corridor and updated floodplain maps to better reflect current conditions and climate-adjusted risks. There is limited development in mapped flood hazard areas, including a few residences and hay barns. There are no repetitive loss structures in the Town. Portions of Mad Brook and the Clyde River (and tributaries) have some fluvial erosion potential, with minor increases noted since the 2023 and 2024 events. With very little floodplain development in Charleston, the greatest danger during flood events remains to Town highway infrastructure. All 41 culverts on Hudson Road and Twin Bridge Road are located within mapped floodplains. During 2017–2018, the Town completed two FEMA 404 Hazard Mitigation Grant Program projects on highways that had seen repeated washout and closure during Tropical Storm Irene and other storms. The first replaced double culverts with a precast box culvert and natural stream bed over Mad Brook on Cole Road, a town-to-town connector. The second rebuilt the road surface and upgraded the ditch and culvert network on Hudson Road, a Class 2 highway and major state highway connector adjacent to the Clyde River floodplain. Both projects prevent or reduce damages from future disasters, lower long-term highway repair costs, and mitigate stormwater and pollutant discharge into the watershed. These projects were made possible because the Town adopted a Local Hazard Mitigation Plan in 2016. In 2026, the town will apply for a VTrans engineering and structures grant for a project to replace a 48" culvert on Allyn Brook over Hinton Hill Rd, which has been a site of repeated erosion on washout in 2023 and 2023 storms, with a larger structure sized to the stream channel. As well, the Better Roads and Vermont Grants-in-Aid Programs provide annual grants and technical assistance to help the Town avoid erosion and flash floods resulting from road design and construction.

**Fluvial Erosion Hazard Areas:** About two-thirds of Vermont's flood-related losses occur outside of mapped floodplains, and this reveals the fundamental limitations of the FEMA FIRMs. A mapped floodplain makes the dangerous assumption that the river channel is static, that the river bends will never shift up or down valley, that the river channel will never move laterally, or that riverbeds will never scour down or build up. River channels are constantly undergoing some physical adjustment process. This might be gradual, resulting in gradual stream bank erosion or sediment deposit – or it might be sudden and dramatic, resulting a stream bank collapse. The losses experienced during the May 2011 storms, Tropical Storm Irene, and the 2023/2024 floods 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 are particularly vulnerable to erosion damage by flash flooding, bank collapse, and stream channel dynamics. The Vermont Department of Environmental Conservation,

Agency of Natural Resources, has identified river corridors, which consist of the minimum area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition. In other words, the river corridor provides "wiggle room" for a stream as its channel changes over time. Keeping development out of the river corridors therefore reduces vulnerability to erosion.

The town remains relatively free of concern related to stream bank scouring as there are no high-risk areas in terms of environmental or economic risk. While portions of the Mad Brook continue to have some fluvial erosion potential, the town has not seen any major increase in erosion since 2011, when repeated flooding inundated much of the state. However, the town remains cautious and realizes that severe weather can alter focus quickly. With the recent emphasis on climate change and subsequent weather-related disasters, the town remains committed to aligning with all applicable and logistically feasible recommendations and considerations resulting from the work of State agencies, including updated river corridor protections in the 2023 SHMP and provisional NVDA maps incorporating 2023/2024 flood data.

**Repetitive Loss Properties:** The town has no repetitive loss properties.

**Non-designated Hazard Areas**

**1998 Ice Storm Damage:** The most notable ice storm to affect the region was the North American Ice Storm of January 5–10, 1998, which deposited 0.5–1 inch of ice in Charleston and surrounding areas. While Morgan and Brownington sustained heavy forest damage, Charleston experienced mainly power outages lasting several days. A smaller ice event occurred in December 2014 with minimal local impact. No major ice storm has struck the NEK since the 2021 plan, though the 2023 SHMP notes climate-driven winter variability may increase mixed-precipitation events in the future. The Town continues coordination with the Orleans-Essex REMC for outage response and generator support.

**High Winds and Lightning:** Ridgeline and hilltop homes located amid mature forests are the most vulnerable to damage from falling trees and tree limbs, however high winds and lightning can occur anywhere in Charleston and are not limited to designated hazard areas. High tension line runs along VT Route 105 and VTrans works to keep limbs trimmed. Winds accompanying thunderstorms or nor'easters frequently cause tree fall and power outages; notable recent events include the October 2019 Halloween storm (gusts 65–71 mph regionally) and wind damage during the 2023/2024 summer floods. Lightning strikes remain infrequent but pose fire risk in rural/wooded areas. The 2025 resident survey highlighted concerns about prolonged outages affecting vulnerable residents. The Town relies on Vermont Electric Cooperative trimming programs. The 2023 SHMP anticipates slightly more intense thunderstorms due to increased precipitation trends.

**Previous FEMA-Declared Natural Disasters, Non-declared Disasters and Snow Emergencies**

Since 2007, the town has had $1,000,000+ in road expenses resulting from washouts and flooding (updated to include 2023–2025 events). Of pre-2021 amounts, $587,000 was documented, with $64,000 (10.9%) paid by the town; the remainder was covered by FEMA and ERAF. In 2010, the town made a significant repair to Dane Hill Road. Beginning at Route 105, the

first ¾ mile were completely rebuilt. The $78,000 project was paid for by the Vermont Department of Public Safety ($35,000), Better Back Roads ($12,000), and a Vermont Structures Grant ($27,000), with the remainder paid for by the town. This project was not caused by a declared disaster but due to the volume of traffic and impact on the road resulting from being on such a steep slope. The resulting repair has substantially protected the town from future expenditures associated with minor repairs to this location.

Charleston has received public assistance funding from FEMA for the following natural disasters:

*Table 5-10 Town of Charleston, FEMA-declared disasters and snow emergencies*

| FEMA ID# | Type of Event | Total Repair Estimates | Project Worksheet/ Project # |
|---|---|---|---|
| DR-1715 | Flooding | $61,719.00 | 30, 31 |
| DR-1995 | Flooding | $213,712.00 | 064, 116, 119, 134, 135, 141, 142, 156, 162, 173, 174, 223, 308, 378, 379, 384, 385, 390, 391, 394, 410, 411 |
| DR-4022 | Flooding | $187,394.00 | 016, 310, 784, 851, 852, 854, 855, 858, 866 |
| DR-4140 | Flooding | $76,598.00 | 0095, 0134, 0135 |
| DR-4178 | Flooding | $18,851.00 | - |
| DR-4532 | Pandemic | $3,849.00 | 00051 |
| DR-4720 | Flooding | $386,443.08 | 748982, 732375, 731093, 731079 |
| DR-4810 | Flooding | $472,557.91 | 962567, 812606, 807659, 807651, 807647, 806682 |

*Source: Town Records, Project Worksheets, financial report forms, and award letters.*

The Town of Charleston was reimbursed at a rate of 75% by FEMA for eligible repair costs. In disasters since 2014, the state contributed an additional 7.5% through ERAF for towns with approved Local Hazard Mitigation Plans, resulting in a 17.5% local share (current as of 2025). Funds provided in response to these natural disasters were used for gravel, ditching, culverts, road repair, and additional secondary costs associated with these activities. Non-declared disasters (e.g., snow and rainstorms) 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. Without adequate provisions, 48 hours of extremely cold temperatures could create a serious health hazard, as noted in resident feedback from the 2025 survey.

## 5.6 Hazard Assessment and Risk Analysis

### 5.6.1 2014 Quantitative Risk Reference (Historical)

Although estimating the risk of future events is far from exact science, the Planning Team used best available data and best professional judgment to conduct a Hazards Risk Estimate analysis in 2014. This analysis assigned numerical values to a hazard's affected area, expected

consequences, and probability, and assigned each type of hazard a "Total Risk Rating." Four natural hazards received the highest risk ratings out of a possible high score of 80:

- Severe Winter Storm (32)
- Flooding (36)
- Extreme Cold (32)
- Pandemic (18)
- In 2014 Drought received a total risk rating of 5 and was not a profiled hazard in previous plans.

### 5.6.2 2026 Qualitative Risk Assessment

Encouraged by FEMA, the current practice is to use a qualitative scale, which replaces or supplements numeric scales in earlier plans to make assessments more accessible for small towns like Charleston. Vermont uses a qualitative ranking system for hazards, categorizing elements like probability (High: >1 event per year; Medium: 1 per 1–10 years; Low: <1 per 10 years), impact (High: major life/property loss; Medium: moderate; Low: minor), and extent (Large: statewide/regional; Medium: county/local; Small: isolated).

For this update, the planning team has tried to retain the 2014 assessment for historical reference while updating the hazard assessment to reflect recent frequency and impact using qualitative criteria and the growing risk posed by drought.

**Natural Hazards:** The following hazard assessment and risk analysis is based on the 2014 methodology used in the previous plan, which ranked hazards by criteria such as geographic extent, probability of occurrence, impact on population/property, and % of developed area affected. Table 5-11 below retains the 2014 snapshot for historical reference. Since 2021, severe drought has been added as a profiled hazard due to increasing frequency and impacts, as evidenced by the 2025 drought (D2–D3 in Orleans County), which caused statewide agricultural losses of $14 million and over 400 reports of dry wells/shortages, amplifying water supply concerns for Charleston's rural residents and farms (Vermont Agency of Agriculture 2025 Drought Impact Survey). The 2023 Vermont State Hazard Mitigation Plan (SHMP) ranks drought as moderate but rising in priority, with climate projections showing 15% reduced summer precipitation by mid-century, affecting 100% of Charleston's developed area through groundwater depletion and ecosystem stress.

*Table 5-11 Natural hazards risk estimation matrix, Charleston (2014, for reference)*

**Charleston Natural Hazard Risk Analysis:**
**NATURAL HAZARDS**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | 3 | 2 | 1 | 0 | 1 | 1 | 0 | 4 | 4 |
| **Consequences** | | | | | | | | | | | |
| *Health & Safety Consequences* | | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Key: | 0 = No health and safety impact | | | | | | | | | | |
| | 1 = Few injuries or illnesses | | | | | | | | | | |
| | 2 = Few fatalities or illnesses | | | | | | | | | | |
| | 3 = Numerous fatalities | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 3 | 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 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 0 | 1 | 1 |
| | | | | | | | | | | | |
| *Environmental Damage* | | | | | | | | | | | |
| Key: | 0 = Little or no environmental damage | | | | | | | | | | |
| | 1 = Resources damaged with short-term recovery | | | | | | | | | | |
| | 2 = Resources damaged with long-term recovery | | | | | | | | | | |
| | 3 = Resource damaged beyond recovery | 2 | 2 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 |
| | | | | | | | | | | | |
| *Economic Disruption* | | | | | | | | | | | |
| Key: | 0 = No economic impact | | | | | | | | | | |
| | 1 = Low direct and/or indirect costs | | | | | | | | | | |
| | 2 = High direct and low indirect costs | | | | | | | | | | |
| | 2 = Low direct and high indirect costs | | | | | | | | | | |
| | 3 = High direct and high indirect costs | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 3 | 2 | 2 |
| | | | | | | | | | | | |
| ***Sum of Area & Consequence Scores*** | | 5 | 9 | 5 | 5 | 3 | 4 | 6 | 6 | 8 | 8 |
| | | | | | | | | | | | |
| **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 | 1 | 4 | 3 | 3 | 1 | 2 | 2 | 3 | 4 | 4 |
| | | | | | | | | | | | |
| **TOTAL RISK RATING** | | | | | | | | | | | |
| | Total Risk Rating = | **5** | **36** | **15** | **15** | **3** | **8** | **12** | **18** | **32** | **32** |
| | Sum of Area & Consequence Scores | | | | | | | | | | |
| | x Probability of Occurrence | | | | | | | | | | |

The 2014 numeric risk estimation (Table 3-2 in the 2021 Plan Update) is retained as a historical reference. For the 2026 update, a qualitative scale (High/Medium/Low) is used, consistent with the 2023 SHMP and FEMA's 2022 Local Mitigation Planning Policy Guide, to make ongoing assessment and annual review more practical for a small town.

*Table 5-12 Natural hazards Summary, Charleston (2026)*

| Hazard | Geographic Extent | Probability | Impact | % Developed Area Affected |
|---|---|---|---|---|
| Flooding | Medium | High | High | 10–20% |
| Severe Winter Storm | Large | High | Medium | 100% |
| Extreme Cold | Large | Medium | Medium | 100% |
| Pandemic | Large | Low | High | 100% |
| Severe Drought (Added 2026) | Large | Medium | Medium | 100% |

**Hazard Summary**

According to the risk estimation analysis, the highest rated hazards for Charleston are:

- Flooding
- Winter Storm
- Extreme Cold
- Pandemic
- Drought (newly profiled)

Flooding remains the highest rated hazard for Charleston due to previous damage events and subsequent costs to repair. Within each of the highest rated hazards, there exists the potential for secondary consequences, including increased financial demand on residents because of an event. While winters in Vermont are characterized by cold weather, recent increases in extreme weather events, including extremely cold temperatures, increase the costs of heating energy and this is a challenge that the state and local communities are being forced to address. Along these lines, the cases of COVID-19 were minimal in the planning area but the financial impact of protective measures implemented on a state-level impacted the planning area as it did many of the surrounding communities. Recovery from the pandemic will be a long road for some and the consequences for residents and the town have the potential of being severe. The addition of drought as a profiled hazard reflects recent 2025 conditions (severe D2–D3 in the NEK) and climate trends that threaten water supplies and agriculture, particularly for vulnerable households. The next planning cycle will give the planning team an opportunity to assess and work to mitigate these consequences.

## SECTION 6: VULNERABILITY ASSESSMENT

### 6.1 Overview of Vulnerability

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 low. There are roads, bridges, and culverts vulnerable to flooding and those are identified below. Loss of equipment function for the highway department is a vulnerability for the town but the risk is not due or predicted to be a result of a disaster, merely the required maintenance expected of highway-related machinery. For this section of the plan, the planning team looked at prior history, worst-case scenarios, and recent events (including the 2023/2024 floods and 2025 drought). The primary vulnerability for the entire planning area remains transportation-related infrastructure damage due to flooding, with growing concerns for water supply during drought.

**Current Capabilities & Gaps**

The Town of Charleston relies on existing local authorities (Selectboard, Planning Commission, Highway Department, Emergency Management Director, Fire Chief), staff (3 FTE highway crew, volunteer fire department), and partnerships (NVDA, Orleans-Essex REMC, VEM) to implement mitigation. Funding sources include FEMA PA/HMGP, Better Roads Program, Grants-in-Aid Program and town budget. Technical resources include VTrans culvert inventory (vtculverts.org), NVDA provisional maps, and ANR river corridor data. Gaps include no municipal water/sewer, limited local zoning/enforcement, aging volunteer fire membership, and occasional challenges with remote communications during outages. These gaps are being addressed through regional mutual aid, grant applications, and Town initiatives where feasible.

### 6.2 Repetitive Loss Properties

The town has no repetitive loss properties. According to FEMA NFIP records (OpenFEMA Multiple Loss Properties dataset, updated 2025), Charleston has no properties identified as repetitive loss (RL) or severe repetitive loss (SRL). This remains unchanged since the 2021 plan, with no new claims reported in the 2023, 2024, or 2025 flood events.

### 6.3 Socially Vulnerable Populations

Charleston has moderate to high social vulnerability, particularly for aging and low-income residents in remote areas. Approximately 34% of the population is age 60+, with ~17% reporting disabilities (ACS 2018–2022), higher than state averages. Median household income (~$53,000) and per capita income (~$30,500) are below state levels, increasing financial strain during disasters. Hazards like flooding (road closures), extreme cold (outages, heating costs), and drought (well depletion) disproportionately affect these groups due to limited mobility, access to services, and resources, as highlighted in the 2025 resident survey. The plan prioritizes equity by focusing on communications improvements, emergency access, and support for vulnerable households.

### 6.4 Critical Facilities and Infrastructure

### 6.4.1 Critical facilities Inventory

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 Charleston Base Map shows the geographic distribution of some critical facilities and utilities. Table 6-2 identifies critical facilities in Charleston, excluding critical facilities designated as hazardous materials storage sites.

Critical facilities include the Town Office (EOC and primary shelter), Charleston Elementary School (alternate shelter), Charleston Volunteer Fire Department, and highway infrastructure (roads, culverts, bridges).

*Table 6-1 Critical facilities in the Town of Charleston*

| Facility Type | Number of Facilities |
|---|---|
| Education Facility | 1 |
| Fire Station | 1 |
| Emergency Shelters | 2 |
| Emergency Operations Center | 1 |
| Government and Military | 1 |

### 6.4.2 Transportation Infrastructure

**Town Highways**

The following is a statistical overview of roads in the Town of Charleston. These tables show the range of road types within the town, from highways to unpaved roads. The different road types have different hazard vulnerabilities. Unpaved roads are more vulnerable to being washed out in a flood or heavy storm, while traffic incidents are more likely to occur on large, arterial roads.

*Table 6-2 Town highway mileage by class, Town of Charleston*

| Class 1* | Class 2 | Class 3 | Class 4* | State Hwy | Legal Trail* | Interstate | Total 1, 2, 3, State Hwy |
|---|---|---|---|---|---|---|---|
| **0** | **10.15** | **30.17** | **7.88** | **13.91** | **7.00** | **0** | **54.23** |

*Source: Charleston Town Highways Map 2025, 2026 Mileage Certificate, and February 26 reclassification of 0.04 miles Class 3 to Legal Trail (not yet shown on Town Highway Map)*
**Not included in Total*

**Bridges**

There are a variety of bridges, culverts and dams located in the municipality. The following bridges are contained in an inventory maintained by VCGI, VTrans and the NVDA and represent those of greatest concern for the town. This analysis does not take into account the fluvial geomorphology or the elevation of the bridge above the floodplain. For example, a slab bridge

on Hudson Rd (Charleston BR#5) was identified as functionally deficient, with a rating of "3 – Scour Critical." This bridge was replaced in September of 2018 with a precast concrete box culvert with associated repair/shaping of the streambank and scour hole. A VTrans structures grant and preceding VTrans engineering grant supported the project, and all work was done incompliance with applicable standards and Vermont Stream Alteration requirements.

Bridge #19 on Westmore Rd was listed in the 2021 plan as having identified need. It sustained damage during 2024 storms and repairs were made using FEMA PA assistance. Post-flooding, two town bridges, one on Hudson Rd and another on Mad Brook Rd showed identified need and are slated to receive similar repairs in 2026 using Town funds. Both will consist of concrete work to restore integrity of the abutment where it meets the bridge footing, and a state river permit has been obtained.

*Table 6-3 Inventoried bridges in the Town of Charleston with identified need*

| Class | # | Bridge Type | Deficiency | Bridge Features | Scour Critical | Located in Floodplain |
|---|---|---|---|---|---|---|
| Town Short | 7 | slab | unknown | Mad Brook | no | no |
| town short | 16 | slab | unknown | Hudson | no | yes |

*The entire Bridge Inventory with maps for the town can be found on the state site: https://vtculverts.org/bridges#list*

**Culverts**

It is the responsibility of a property owner to buy, install, and maintain driveway culverts. For any driveway entering a town highway, property owners must consult with the Road Foreman, who will determine the required culvert specifications (never smaller than 15 inches in diameter per state standards). If a property owner fails to install the appropriately sized culvert, the town highway crew may cut a ditch across the driveway to maintain proper road drainage. (*adopted June 11, 2015*).

The Town maintains a culvert inventory that assesses over 800 culverts with data on length, overall condition, size, and location. This data guides the town's culvert maintenance and replacement plan. All culverts removed from the Town roads become the Town's property. Usable culverts will be reused on Class 4 roads. Less useful culverts are sold on a first come first serve basis and others are sold as scrap metal. Guardrails are placed on an as-needed basis or as required by the state. A supply of beam rail and posts are stored at the Town Pit on Ten Mile Square Road. Culverts located in the 100-year floodplain are listed below.

*Table 6-4: Charleston culverts located in 100-year floodplain*

| |
|---|
| *All (48) culverts on Hudson Road are in the 100-year Floodplain.* |
| *All (4) on Twin Bridges* |

*Source:* The entire Culvert Inventory with maps for the town can be found on the state site: https://vtculverts.org/map.

6.4.3 Key Updates to Critical Facilities and Transportation

Since 2021, the Town installed a standby generator to maintain essential services and offer warming/cooling center at the Town Office and Highway Garage. The Fire Department completed upgrades to the fire station in 2023 including a commercial kitchen, standby generator, and drilled well to increase firefighting/emergency response and shelter capabilities and providing a potable water fill-up station during 2025 drought conditions.

FEMA PA funded repairs and upsizing of dozens of culverts following 2023 (DR-4720) and 2024 (DR-4810) floods, as well as stabilizing Hinton Hill Road with Sta-Mat surfacing to improve storm resiliency and repairs to the abutment of Bridge 19 on Westmore Rd over Mud Brook. Townwide culvert inventory has been updated at VT Culverts with no new critical facilities added.

6.4.4 Other Infrastructure (Dams, Utilities)

**Dams**

The National Dam Inventory shows two structures in the town. The first is the West Charleston Hydroelectric Plant, federally licensed as the Clyde River Hydroelectric Project (FERC Project No. 2306). The facility ceased operation in 1998 due to poor condition. Great Bay Hydro Corporation, a private energy company based in Portsmouth, NH, acquired the facility from Citizens Utilities in 2004 and continues to own and hold the license as of 2025, though the project remains non-operational (no generation since 1998). As of 2026, Relevate Power owns and manages Great Bay Hydro. The second and upstream from Great Bay Hydro's operation is the two-turbine Barton Village Hydropower Project (FERC No. 7725), operated by Barton Village Inc. (Barton Village Electric Department). The plant operates in "run-of-river" mode. Originally constructed in the 1890s, the current facility is between 65 and 75 years old and remains active, serving more than 2,000 customers in Barton, Westmore, West Charleston, Brownington, Evansville, and Sutton.

**Water, Wastewater and Natural Gas Service Areas**

The Town currently has no water, wastewater, or natural gas service areas. Water and sewer systems are the sole responsibility of the property owner and they are required to meet state and federal regulatory standards.

**Electric Power Transmission Lines and Telecommunications Land Lines**

High-tension electric transmission run through the Town of Charleston, running along VT RT 105.

**6.5 Vulnerability by Hazard (summary ratings)**

Of the five profiled hazards, the following vulnerability rating (high, moderate, low) is given below. This vulnerability rating is based on the disaster case history for the town, recent financial impacts, and potential effects on vulnerable populations (e.g., elderly, disabled, low-income households) as identified in the 2025 resident survey.

**Severe Winter Storms** (including ice storms and ice jams)**: Moderate**

Summary: While all structures are vulnerable to major snow/ice loads, there is little evidence to support concern over structure failure due to snow/ice on roofs, 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 severe 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 Cold Events: Moderate**

Summary: Recent evidence shows that greater extremes in temperature and overall weather fluctuation are occurring with increased frequency. A long-duration cold snap can cause significant damage to structures due to bursting pipes and the residential health and safety considerations include factors related to financial resources, fuel supply, sheltering, provisions, and employment. Vulnerability remains moderate for the entire town, with special concern for elderly and disabled residents during outages or fuel shortages.

**Flooding** (including fluvial erosion and severe storms)**: High**

Summary: The town is vulnerable to flooding, and this is specific to transportation routes and infrastructure more-so than buildings and people in Charleston. However slight in terms of probability, a dam failure would have catastrophic implications on homes, buildings, people, and equipment. The magnitude of financial resources devoted to flood-related damage in the town equates to high vulnerability. Flooding impacts the planning area by inundation damage to structures (considered well-below the FEMA flood hazard elevation) and roadway drainage structures. Most of the damage is to road surfaces, drainage structures (culverts, ditching), and driveways. Roadways are also an issue for municipal road crews in each jurisdiction when they become inundated and cut off traffic. The 2023 and 2024 floods (DR-4720 and DR-4810/DR-4816) caused significant highway/culvert damage requiring FEMA PA funding, reinforcing high vulnerability.

**Pandemic Planning: Moderate**

Summary: While Vermont has remained relatively insulated from the worst-case infection rates seen elsewhere, the COVID-19 pandemic (DR-4532) delivered significant financial impacts for the region and state. The federal public health emergency ended in May 2023, and as of 2025, the Vermont Department of Health monitors COVID-19 through wastewater, emergency department visits, and outbreaks rather than routine case/death reporting. There are several

important considerations for the town and villages to take on, including how a major storm event could compromise response (e.g., sheltering operations and resource allocation). The 2025 SEMP revisions continue to emphasize equity and regional mutual aid for future pandemics.

**Severe Drought: Moderate**

Summary: With no municipal water system, approximately 95–98% of households rely on individual private wells or springs, making the town particularly vulnerable to groundwater depletion. The 2025 drought (severe D2–D3 in Orleans County) amplified water supply concerns, with resident survey reports of well-level drops (10–15 feet) and fears for elderly/low-income households. Statewide agricultural losses reached $14 million, with NEK hay yields down 30% or more. Vulnerability is moderate but rising due to climate trends (15% reduced summer precipitation projected by mid-century), with secondary risks to agriculture, ecosystems, and health (dehydration). The 2023 SHMP prioritizes monitoring and equity-focused strategies for rural areas.

Table 6-5: Vulnerability Summary by Hazard

| Hazard | Vulnerability | Extent | Impact | Probability |
|---|---|---|---|---|
| Flood | Culverts, bridges, road infrastructure. 0 critical or public infrastructure in SFHA/.2% FHA | The greatest 24-hour rainfall record for immediate region occurred in late October 31st, 2019 at 3''. The greatest level of precipitation in any month occurred in August 2011 at 11''. No detailed data was available for fluvial erosion damage in town in terms of numbers of acres lost during each event. The 2023 and 2024 floods (DR-4720 and DR-4810/DR-4816) brought 4–7 inches regionally, with repeated washouts reinforcing infrastructure vulnerability. | The 2011 flood events (DR-1995 at $213,712 and DR-4022 at $187,394) were the most destructive and costly for the town. The 2023/2024 floods added significant highway/culvert damage requiring FEMA PA funding (e.g., $472,557.91 under DR-4810), with no major property loss but heightened risks to emergency access and vulnerable residents during road closures. | High |
| Extreme Cold/Snow/Ice Storm | The entire planning area is vulnerable, including road infrastructure, town and privately-owned buildings, utility infrastructure. | Snowfall has varied, from a few inches to over a foot or more. Heavy snow and wind may down trees and power lines. Snow/ice contributes to hazardous driving conditions. No major ice storm since 2014, but recent winters (e.g., 2025 events) have shown increased outage durations. | 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. Collapse of a house roof may be at a 50% loss. For car crashes due to poor driving conditions: minimal damage to vehicle to totaled vehicle and operator injury. Health impacts could vary significantly. Loss of energy or communication capabilities may occur and impede recovery. Special populations (aging, disabled) are more vulnerable during prolonged outages. | High |
| Pandemic | The entire planning area is vulnerable in both health and | COVID-19 has far exceeded severity of 2009–2010 H1N1 Pandemic. The federal public health emergency ended in May 2023; as of 2025, monitoring focuses on | COVID-19 has resulted in the greatest infectious disease-related financial consequence for the planning area in history. Significant economic disruption | Medium (low current activity |

| | | | | |
|---|---|---|---|---|
| | financial stability. | wastewater and emergency department visits with low ongoing activity. | from protective measures and recovery; potential for compounding with other disasters (e.g., storm during response). The 2025 SEMP revisions emphasize equity and mutual aid for future events. | but ongoing risk for future pandemics) |
| Drought | The entire planning area is vulnerable, with no municipal water system with all households on private wells/springs, making groundwater depletion a primary concern. | The 2025 drought reached severe levels (D2–D3 in Orleans County by September), the driest August on record since 1895 (1.82 inches below normal statewide), with NEK wells dropping 10–15 feet and widespread reports of shortages. | Water shortages, well depletion, agricultural losses (NEK hay yields down 30%+), ecosystem stress, and health risks (dehydration for elderly/disabled residents). Statewide 2025 losses reached $14 million; resident survey highlighted fears for vulnerable households and winter supply. | Medium (increasing due to climate trends; recurrent moderate droughts since 2020) |

### 6.6 Estimating Potential Losses

As of 2025, 12 residences and 0 commercial/industrial structures are located within the 100-year floodplain (SFHA) per the current 1974 FEMA Flood Hazard Boundary Map (under revision via Risk MAP). Assuming most recent median grand list value, the estimated potential losses due to a major flood event inundating the floodplain are less than 1%. This estimate only takes structures into account; it does not account for personal property or business losses. The town has no repetitive loss properties, and no new vulnerabilities arising since the last approved plan (2021), though recent 2023/2024 floods (DR-4720 and DR-4810/DR-4816) reinforced highway infrastructure risks.

## SECTION 7: MITIGATION STRATEGY

### 7.1 Priority Changes (2021-2026)

Major Priority Changes from 2021 Plan:

- New Hazard Profiled: Severe Drought added due to 2025 D2–D3 event (400+ dry well reports statewide; NEK hay yields down 30%), addressing survey concerns on water supply for rural households.
- Enhanced Focus on Vulnerable Populations: Incorporated 2025 survey feedback on communications gaps, emergency access, and support for elderly/low-income residents during floods, storms, and droughts.
- Updated Integration: To be aligned with 2026 Town Plan resiliency discussion, VT ANR maps for flood erosion risks, and 2023 SHMP equity tools such as the Municipal Vulnerability Index (MVI) for transportation vulnerabilities).
- Refined Actions: Prioritized culvert upgrades post-2023/2024 floods (DR-4720/DR-4810) and low-cost resilience (e.g., rainwater harvesting for drought).

*Table 7-1: Summary of Priority Changes (2021 to 2026)*

| Priority Area | 2021 Focus | 2026 Update | Rationale |
|---|---|---|---|
| Profiled Hazards | 4 (Winter Storm/Ice, Flooding, Extreme Cold, Pandemic) | 5 (Added Severe Drought) | 2025 drought impacts (well depletion, agriculture losses); 2023 SHMP rising priority. |
| Vulnerable Populations | General mention (e.g., elderly in cold events) | Equity-focused (e.g., communications, access during all hazards) | 2025 survey (13 responses); 2023 SHMP equity requirements. |
| Infrastructure | Roads/culverts (post-Irene) | Enhanced post-flood upgrades + drought resilience | DR-4720/4810 repairs ($386K/$472K PA); NVDA Provisional flood map. |
| Climate Adaptation | Limited (fluvial erosion) | Integrated projections (e.g., precipitation intensity) | 2023 SHMP/2025 SEMP; 2026 Town Plan resiliency discussion. |

The Planning Commission will review these changes annually and document updates in the next cycle (2031).

### 7.2 Current Capabilities and Mitigation Progress

The Town of Charleston has developed significant capabilities to implement hazard mitigation through existing plans, programs, and partnerships. The following categories of mitigation actions are used to organize strategies and actions in this plan:

- **Local Plans and Ordinances**: Policies, regulations, and comprehensive plans that guide development and risk reduction.
- **Structure and Infrastructure Projects**: Physical projects to protect or relocate at-risk assets (e.g., culvert upgrades, road stabilization).
- **Natural Systems Protection**: Actions that preserve or restore natural features to reduce hazard impacts (e.g., riparian buffers).
- **Education and Awareness Programs**: Efforts to inform residents and stakeholders about risks and preparedness.
- **Preparedness and Response Actions**: Measures to improve readiness and response during events.

**Progress Since the 2021 Plan** Since adoption of the 2021 plan, the Town has made notable progress, including:

- FEMA PA-funded repairs and upsizing of numerous culverts and restoring ditches following the 2023 (DR-4720) and 2024 (DR-4810/DR-4816) floods.
- Stabilization of Hinton Hill Road with Sta-Mat surfacing to improve drainage.

- Abutment repair to Bridge 19 on Westmore Rd, a major town-to-town connector between VT Route 105 and VT Route 5A.
- Continued participation in the Better Roads and Grants-in-Aid Programs for erosion and flash flood prevention, including upgrades to Ten Mile Square Rd, Westmore Rd, East Echo Lake Rd, Mad Brook Rd during 2021-2025. If grants are awarded, these programs will support culvert and flood-resilience upgrades to Mill St and Hinton Hill Rd in 2026.
- Coordination with Orleans-Essex REMC for mutual aid and drought response (2025 event).
- Incorporation of a resiliency discussion in the 2026 Town Plan update.

These accomplishments demonstrate the Town's commitment to building resilience through existing resources and partnerships. The Planning Commission will continue to review capabilities annually to ensure ongoing alignment with state and federal requirements.

### 7.3 Existing Charleston Town Goals and Policies that Support Hazard Mitigation

This section demonstrates how existing Charleston Town goals, policies, plans, and programs support hazard mitigation and reduce risk from natural and human-caused hazards. These commitments align with the 2026 Town Plan (including its new resiliency discussion), the 2023 Vermont State Hazard Mitigation Plan (SHMP), the 2025 SEMP revisions, and FEMA requirements under 44 CFR §201.6. They are not new actions but existing frameworks that guide the Town's ongoing resilience efforts.

Community Goals and Policies

- Continue supporting state standards for water/sewer sources and public health protection, including private well safety and emergency water access.
- Maintain a capital improvement program to ensure orderly development and protect infrastructure from hazards (e.g., roads, bridges, culverts).
- Solicit resident input on planning issues through formal meetings, advertised opportunities, and coordination with regional partners (NVDA, Orleans-Essex REMC).
- Rely on state regulations for land use, with no local zoning at this time; focus on capital budgeting for roads, town facilities, and emergency services.
- Protect natural resources (surface/groundwater, wetlands, wildlife habitat) through state enforcement of health ordinances and conditions on development permits.
- Participate in regional efforts to identify conservation priorities and link local land protection to broader watershed and climate resilience initiatives.

Integration with Other Plans

The Town integrates hazard mitigation into the 2026 Town Plan update (new resiliency discussion), capital expense budget, and road maintenance program. The Selectboard and Planning Commission review this LHMP annually to ensure alignment. Regional coordination with NVDA and REMC supports mutual aid, emergency planning, and funding opportunities (e.g., Better Roads Program, FEMA PA/HMGP).

Existing Actions Supporting Mitigation

The Town has a strong track record of addressing transportation vulnerabilities through systematic road and culvert improvements. Using Better Roads, Grants-in-Aid, Structures Grants, and FEMA HMGP/PA funding, the Town has enhanced resilience, particularly after Tropical Storm Irene and recent 2023/2024 floods (DR-4720, DR-4810/DR-4816). Road projects focus on runoff management and culvert sizing to handle increased storm intensity. The Town will continue to earmark funds for at least one major problem area each year and maintain an updated culvert inventory. In 2025, the Town also addressed drought concerns through resident survey feedback and coordination with REMC for emergency water sharing.

**Table 7-2: Existing Municipal Actions and Protections Supporting Hazard Mitigation**

| Category | Type of Existing Protection | Description / Details / Comments | Current Status / Issues (2026) |
|---|---|---|---|
| **Emergency Response** | Police Services | Vermont State Police | Ongoing; no local force, mutual aid effective. |
| **Emergency Response** | Fire Services | Charleston Volunteer Fire Department (20 active members); mutual aid with Northeast International Mutual Aid (19 departments). Water access issues on some roads. | Aging membership; need for new volunteers remains. Post-2023/2024 floods, improved coordination with REMC for response. |
| **Emergency Response** | EMS Services | Newport Ambulance (Morgan substation serves area quickly) | Ongoing; effective coverage. |
| **Municipal Services** | Highway Services | Town Highway Department (3 FTE); Access culvert requirements for property owners, ongoing work with residents for culvert/ditching. Culvert inventory maintained. | Ongoing; major focus post-2023/2024 floods (DR-4720/4810) with FEMA PA-funded repairs/upgrades. |
| **Municipal Services** | Water / Sewer | None (private wells/springs only) | Ongoing vulnerability to drought (2025 event); well monitoring recommended. |
| **Municipal Services** | Planning and Zoning | No local zoning; rely on state regulations. | Ongoing; no change. |
| **Municipal Services** | Residential Building Code / Inspection | No local code | Ongoing; state standards apply. |
| **Emergency Plans** | Local Emergency Management Plan (LEMP) | Updated 2025; sheltering and vulnerable populations addressed. | Ongoing; revised & readopted annually, aligned with 2025 SEMP revisions. |

| | | | |
|---|---|---|---|
| **Emergency Plans** | School Emergency/Evacuation Plan(s) | NCSU implemented E3 alert system, all schools in the process of creating a state-mandated EOP, drills per state requirements | Ongoing; supervisory union template in use. |
| **Emergency Plans** | Dam Emergency Plans | Great Bay Hydro previously shared comprehensive plan; invitation to LHMP planning team for collaboration. | Ongoing; no major incidents since 2021. Establish contact with new ownership for plan sharing. |
| **Shelters** | Primary Shelter | Charleston Elementary School; ARC inventory as warming shelter. | Ongoing; work with ARC for training/supplies. |
| **Shelters** | Secondary Shelter | Town Office; Fire Station | Ongoing. Backup generators at both. |
| **Replacement Power** | Backup Generator | Installed 2023 with ARPA funds to power Town Office & Highway garage. | Complete. Standby generators at both facilities. |
| **Municipal Plans** | Town Comprehensive Plan | Approved 2019. 2026 update with resiliency section in process. | Ongoing; 2026 update to incorporate flood/drought mitigation. |
| **Municipal Plans** | Road Inventory and Capital Budget Plan | Road Erosion Inventory completed 2024. Capital Budget Plan updated 2025 to allocate surplus highway funds. | Ongoing; updated post-2023/2024 floods. |
| **Municipal Plans** | Hazard-Specific Zoning | Utilize current state regs | Ongoing; no local zoning. |
| **Municipal Plans** | Highway Access (Curb Cut) Policy | Application process, review by Highway Dept. Foreman, Selectboard approval | Ongoing. |
| **Municipal Plans** | Participation in NFIP and Flood Hazard Ordinance | No participation; elects not to encourage development in floodplain. | Ongoing; no repetitive loss properties. SFHA mapping update in progress via Risk MAP. |
| **Municipal Plans** | Culvert and Bridge Inventory | Worked with NVDA on culvert inventory update 2025 (vtculverts.org). Bridge needs reviewed annually with VTrans. | Ongoing; updated post-2023/2024 floods. Abutment repairs planned for 2026. |

### 7.4 All-Hazards Mitigation Goals

This All-Hazards Mitigation Plan establishes the following general goals for the town as a whole 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 residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local Hazard 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 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 next formal update of the town plan, where a discussion of mitigation planning will be integrated into the plan.
7. Develop a mechanism for formal incorporation of this Local Hazard Mitigation Plan, particularly the recommended mitigation actions, into municipal operating and capital plans & programs as they relate to public facilities and infrastructure within political and budgetary feasibility. The Planning Commission and Selectboard 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.

### 7.5 Mitigation Actions

7.5.1 Actions by Hazard

#### 7.5.1.1 Severe Winter Storm / Ice

| **Mitigation Strategy** | Continue to promote best practices in Charleston Flood Hazard Areas, as well as update the Town Plan to reflect current and future flood risks. | | | | |
|---|---|---|---|---|---|
| **Mitigation Actions** | | | | | |
| **Action** | **Responsible Party** | **Timeline** | **Estimated Cost** | **Funding Source** | **Status** |
| Identify and map all flood hazard areas. | Planning Commission / Selectboard | Short-term, pending FEMA map update | Low | Town budget | Ongoing |
| Educate residents on flood risks and mitigation measures. | Emergency Management Director | Ongoing | Low | State grants | Ongoing |
| Upgrade culverts and bridges in high-risk areas. | Highway Department | Medium-term | High | FEMA HMGP | Completed for some; ongoing |

#### 7.5.1.2 Flooding / Fluvial Erosion

| **Mitigation Strategy** | Encourage development outside of flood hazard areas. | | | | | |
|---|---|---|---|---|---|---|
| **Mitigation Actions** | | | | | | |
| **Action** | **Responsible Party** | **Timeline** | | **Estimated Cost** | **Funding Source** | **Status** |
| Review and update land use priorities to include river corridor protections. | Planning Commission | Short-term | | Low | Town budget | Pending, with plan update |
| Implement stormwater management practices in developed areas. | Highway Department | Ongoing | | Medium | Better Roads, Grants-in-Aid Programs | Ongoing |

#### 7.5.1.3 Extreme Cold Temperature

| **Mitigation Strategy** | Promote energy efficiency programs and provide assistance to low-income residents for heating costs during extreme cold events. |
|---|---|
| **Mitigation Actions** | |

| Action | Responsible Party | Timeline | Estimated Cost | Funding Source | Status |
|---|---|---|---|---|---|
| Distribute information on weatherization and fuel assistance. | Emergency Management Director | Short-term | Low | State programs | Ongoing |
| Establish warming shelters for vulnerable populations. | Selectboard / REMC | Medium-term | Low | Town budget / Grants | Planned |
| Coordinate with utilities to prioritize power restoration in cold snaps. | Emergency Management Director | Ongoing | Low | Utility partnerships | In progress |

#### 7.5.1.4 Pandemic / Epidemic

| **Mitigation Strategy** | Develop and maintain a pandemic response plan, including coordination with regional health authorities and public education on prevention measures. | | | | |
|---|---|---|---|---|---|
| **Mitigation Actions** | | | | | |
| **Action** | **Responsible Party** | **Timeline** | **Estimated Cost** | **Funding Source** | **Status** |
| Update emergency operations plan for health crises. | Emergency Management Director | Short-term | Low | Town budget | Completed |
| Stockpile PPE and establish regional testing sites. | Selectboard / REMC | Medium-term | Medium | FEMA / State grants | Ongoing |

#### 7.5.1.5 Severe Drought

| **Mitigation Strategy** | Develop and maintain a drought resilience plan for the community, including monitoring of private wells, promotion of water conservation practices, coordination with regional partners for emergency water supply, and public education on drought preparedness and long-term adaptation measures. |
|---|---|
| **Mitigation Actions** | |

| Action | Responsible Party | Timeline | Estimated Cost | Funding Source | Status |
|---|---|---|---|---|---|
| Update emergency operations plan to include drought annex (e.g., well monitoring protocols, emergency water distribution procedures, and coordination with ANR/DEC for reporting). | Emergency Management Director (EMD) | Short-term | Low | Town budget / VEM grants | In progress (post-2025 drought) |
| Develop and distribute resident guidance on private well monitoring, water conservation (e.g., low-flow fixtures, rainwater harvesting for non-potable), and drought preparedness (including reporting dry wells via DEC Drought Reporter). | EMD / Planning Commission | Ongoing | Low | Town budget / ANR or Health Department resources | Planned |
| Coordinate with regional partners (Orleans-Essex REMC, VAAFM, and neighboring towns) for mutual aid in emergency water supply (e.g., identifying water haulers, bulk water points, and support for vulnerable households). | Selectboard / REMC | Medium-term | Low to Medium | Mutual aid agreements / State grants (e.g., VAAFM or FEMA HMGP) | Ongoing |
| Promote agricultural resilience measures (e.g., soil health practices like cover cropping, efficient irrigation where feasible, and reporting impacts via | Planning Commission / EMD (in coordination with VAAFM) | Ongoing | Low | State programs (e.g., VAAFM grants, NRCS EQIP) | In progress |

| | | | | | |
|---|---|---|---|---|---|
| VAAFM's Agriculture Drought Impact Survey) and connect small farms to available assistance programs. | | | | | |
| Explore low-cost, household-level solutions such as rainwater harvesting systems for non-potable uses and advocate for state/federal support for well deepening or alternative water sources in chronic shortage areas. | Selectboard / EMD | Medium-term | Low to Medium | Grants (e.g., VHCB, FEMA HMGP, or USDA Rural Development) | Planned |

These actions are realistic for a small rural town like Charleston, emphasizing low-cost, equity-focused measures (e.g., prioritizing support for vulnerable populations during shortages) and leveraging existing state resources (e.g., DEC Drought Reporter for monitoring, VAAFM surveys and assistance for agriculture, and REMC for regional coordination). They build on 2025 drought lessons (e.g., well-level drops of 10–15 feet, agricultural losses with NEK hay yields down 30%+), aim to reduce future impacts, and maintain eligibility for funding through alignment with the 2023 SHMP and 2025 SEMP revisions. The Planning Commission will review progress annually during June meetings.

**7.6 Implementation, Prioritization and Monitoring**

The Town of Charleston will implement the mitigation actions listed in Section 7.5 through existing capabilities, partnerships (NVDA, Orleans-Essex REMC), and available funding (FEMA PA/HMGP, Better Roads Program, Grants-in-Aid program, VTrans TA grants, town budget). The Planning Commission, in coordination with the Selectboard and Emergency Management Director, will oversee implementation. Progress will be reviewed annually during June Planning Commission and Selectboard meetings and updated in the next plan cycle (2031).

Table 7-3 below, the Mitigation Actions Tracking Matrix (with priority, responsible party, timelines, cost, funding) and Annual Review Checklist Template, serves as the primary tool for tracking progress on all mitigation actions from the 2026 update. It includes:

- Current status as of December 2025 (baseline for the 2026 plan adoption).
- Blank columns for annual reviews (Status and Notes) to be filled during June Planning Commission reviews.

Note on Drought actions: Drought was not a profiled hazard in the 2021 plan, so no prior actions existed for status reporting. Drought actions are now included and will be tracked going forward toward the next five-year update (2031). Progress on all actions will be documented annually and summarized in the next plan update.

**Table 7-3: Mitigation Actions Tracking Matrix**

| # | Hazard | Mitigation Action | Responsible Party | Priority | Timeline | Estimated Cost | Funding Source | Status Dec 2025 | Status Annual Review | Notes Annual Review |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Flooding | Review and update culvert inventory; prioritize upgrades for increased flow | Highway Dept / Planning Commission | High | Ongoing | Medium–High | Better Roads / FEMA PA/HMGP | Ongoing (post-2023/2024 floods) | | |
| 2 | Flooding | Incorporate river corridor protections into road maintenance and capital planning | Selectboard / NVDA | High | Short-term (1–2 years) | Low | Town budget | In progress | | |
| 3 | Flooding | Educate residents on flood risks and mitigation measures | Emergency Management Director (EMD) | Medium | Ongoing | Low | State grants / REMC | Ongoing | | |
| 4 | Severe Winter Storms | Maintain and update snow removal and ice management protocols | Highway Dept / Selectboard | High | Ongoing | Low | Town budget | Ongoing | | |
| 5 | Severe Winter Storms | Identify and map areas prone to ice jams and high snow accumulation | Planning Commission / REMC | Medium | Short-term | Low | Town budget / State grants | In progress | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | Severe Winter Storms | Educate residents on winter safety, including generator use | EMD | High | Ongoing | Low | REMC / Health Dept | Ongoing | | |
| 7 | Severe Winter Storms | Upgrade critical infrastructure to withstand ice and snow loads | Highway Dept | High | Medium-term | High | FEMA HMGP / Better Roads | Ongoing | | |
| 8 | Extreme Cold Events | Distribute information on weatherization and fuel assistance | EMD | High | Ongoing | Low | State programs | Ongoing | | |
| 9 | Extreme Cold Events | Establish and promote warming shelters for vulnerable residents | Selectboard / REMC | Medium | Short-term | Low | Town budget / Grants | Planned | | |
| 10 | Extreme Cold Events | Coordinate with utilities for priority power restoration | EMD | High | Ongoing | Low | Utility partnerships | In progress | | |
| 11 | Pandemic Planning | Update emergency operations plan to include pandemic annexes | EMD | High | Short-term | Low | Town budget | Completed (post-COVID) | | |
| 12 | Pandemic Planning | Stockpile PPE and coordinate testing/vaccination sites as needed | Selectboard / REMC | Medium | Ongoing | Medium | State/Federal grants | Ongoing | | |
| 13 | Pandemic Planning | Conduct community outreach on | Planning Commission | Medium | Ongoing | Low | Health Department | In progress | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | prevention and response | | | | | | | | |
| 15 | Severe Drought | Monitor private well levels and provide drought preparedness guidance | EMD | High | Ongoing | Low | Town budget / ANR | In progress (post-2025 drought) | | |
| 16 | Severe Drought | Explore low-cost rainwater harvesting and water sharing options | Selectboard / REMC | Medium | Medium-term | Low | Grants (e.g., VHCB) | Planned | | |
| 17 | Severe Drought | Coordinate with regional partners for emergency water supply | REMC | High | Ongoing | Low | Mutual aid | Ongoing | | |
| 18 | All-Hazards (Communications) | Evaluate emergency notification platforms (VT-Alert, Front Porch Forum, text systems, Facebook, school alerts, neighborhood call trees); identify gaps (cell coverage issues); train local officials (EMD, Selectboard, Fire | EMD, with Selectboard, Fire Chief, Planning Commission, REMC support | High | Ongoing over next plan cycle (2026–2031): Evaluation & training in 2026–2027; full implementation | Low–Medium. Free training via VEM. Possible minor costs for materials/tools from Town budget | Town budget; VEM free training; potential REMC or state grants | In progress. Survey identified gaps. Some platforms used informally | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Dept) on multi-channel use and best practices; implement improvements and test annually to enhance reach to diverse/vulnerable populations. | | | & annual testing 2027–2031 | | | | | |
| 19 | All-hazards (Sheltering) | Evaluate/refresh American Red Cross Shelter Fundamentals training for local officials/staff; confirm completion/certification and identify any gaps in shelter operations knowledge; coordinate with VEM/Orleans-Essex REMC for free/in-person sessions as available. | EMD, with Selectboard support | Medium | Over next plan cycle: Evaluation & any needed refresh/training. Confirm annually thereafter | Low. Free/online via ARC or VEM-sponsored regional sessions | Town budget (minimal), VEM/ARC free resources | Existing coordination with ARC noted; no recent training refresh documented | | |
| 20 | All Hazards (Communication | Develop and document internal/external alternate | EMD, with Selectboard, Road Foreman, | High | Over next plan cycle: | Low-Medium. Research free via | Town budget; VEM/REMC guidance for | Survey identified cell gaps; | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | s Continuity) | communications methods for when normal methods (cell, internet, VT-Alert) fail; evaluate options including satellite phones, Starlink or portable hotspots for EOC/town office, rally points for in-person coordination, and physical message boards at the LEMP-designated public notice locations (Town Clerk's Office, East & West Charleston Post Offices, West Charleston Corner Store and Charleston Elementary; test protocols annually and integrate into LEMP updates. | and Orleans-Essex REMC input | | Research in 2026-2027; develop protocols & initial testing 2027-2028; annual testing/integration into LEMP thereafter | VEM/REMC; potential equipment grants or low-cost purchases like handheld radios | free resources; potential FEMA HMGP or state grants for equipment | some informal backups (Front Porch Forum, Facebook) used; no formal alternate plan documented | | |

**Instructions for Use:**

- Annual Review (June): Copy the table, fill in the two blank columns with updated Status (e.g., "Completed," "Ongoing," "Delayed") and Notes (e.g., progress details, challenges, next steps).

- Documentation: Retain completed annual versions as attachments or in the plan appendix for the next five-year update (2031).
- Drought-specific note: As this is the first cycle including drought, 2025 status reflects baseline post-2025 event progress. Future reviews will capture full multi-year trends.

## SECTION 8: PLAN ADOPTION & MAINTENANCE, AND APPENDICES

### 8.1 Plan Adoption

Formal adoption will occur at warned, documented meetings for each respective Jurisdiction. Following adoption, the town will continue to maintain web-presence of the mitigation plan with an opportunity for community input.

### 8.2 Plan Maintenance and Update Process

8.2.1 Annual Review Procedure

The previous plan required an annual progress review by the Planning Commission in March. However, because March Town Meeting often coincides with turnover on the Town Selectboard and a subsequent period of reorganization, the Planning Commission and Selectboard determined during the last planning cycle that the June Planning Commission meeting is a more appropriate time to conduct the annual public review.

The Planning Commission will review this plan and Table 7-3 annually in June to assess progress, update status, and identify new funding opportunities. Public input will be solicited through posted notices, Front Porch Forum, and annual town meetings. Updates will be documented and shared with the Selectboard and REMC.

The town's Selectboard chair is the project lead and will work in conjunction with the Selectboard, town clerk, residents, 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 Tracking Matrix provided in Table 7-3. The Town Clerk will assure that all road improvement projects are tracked in collaboration with the Road Foreman. While mitigation actions are, by default, often addressed at monthly Selectboard meetings. The town will schedule one meeting annually to formally assess the plan after the annual progress report has been completed. Once the plan is approved by FEMA, the calendar will begin for annual review.

Table 3-1 will be used annually during the June Planning Commission review. Fill in the "Progress 2021–2025" column with completed work, and use "Status/Next Steps" for ongoing or future actions.

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

- Status of recommended mitigation actions for the five-year planning period
- Identification of barriers or obstacles to successful implementation or completion of
- Mitigation actions, along with possible solutions for overcoming risk
- Identification of a lead person to take ownership of, and champion the Plan if different from Selectboard Chair
- An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, 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

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.

*8.2.2 Five-Year Plan Update Cycle*

The Plan update will be led by the Selectboard 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 include 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 specific actions that the town has accomplished related to implementation, keeping a narrative list with dates on all actions relatable to mitigation (e.g. school drills, LEMP updates, Fire Safety Awareness, meetings, etc.), will provide the town the bulk of information required in the update process. The Planning Process Timeline in 2.4 provides steps for reviewing the plan, updating/collecting data, working with the planning team, soliciting stakeholder input, and preparing the draft for review and approval.

*Table 8-1 Annual Plan Maintenance Schedule (integrated with Emergency Planning)*

| | |
|---|---|
| After Town Meeting | Review Local Emergency Operations Plan (LEMP) for out-of-date info |
| By June 1st | Formally adopt LEMP and send to state |
| June Planning Commission & Selectboard Meetings | LHMP progress check-in using tables 3-1, 7-5; note any planning team changes; review plan expiration date and 6-month lead time for the 5-year update. Follow-up with public meeting for reporting. |
| Fall | After construction season, review Capital Budget Plan for annual town budget. Prepare summary of Hazard Mitigation progress to share in Town Meeting/Town Report |
| Throughout | Note any infrastructure projects, drills, safety actions in "Mitigation File" |

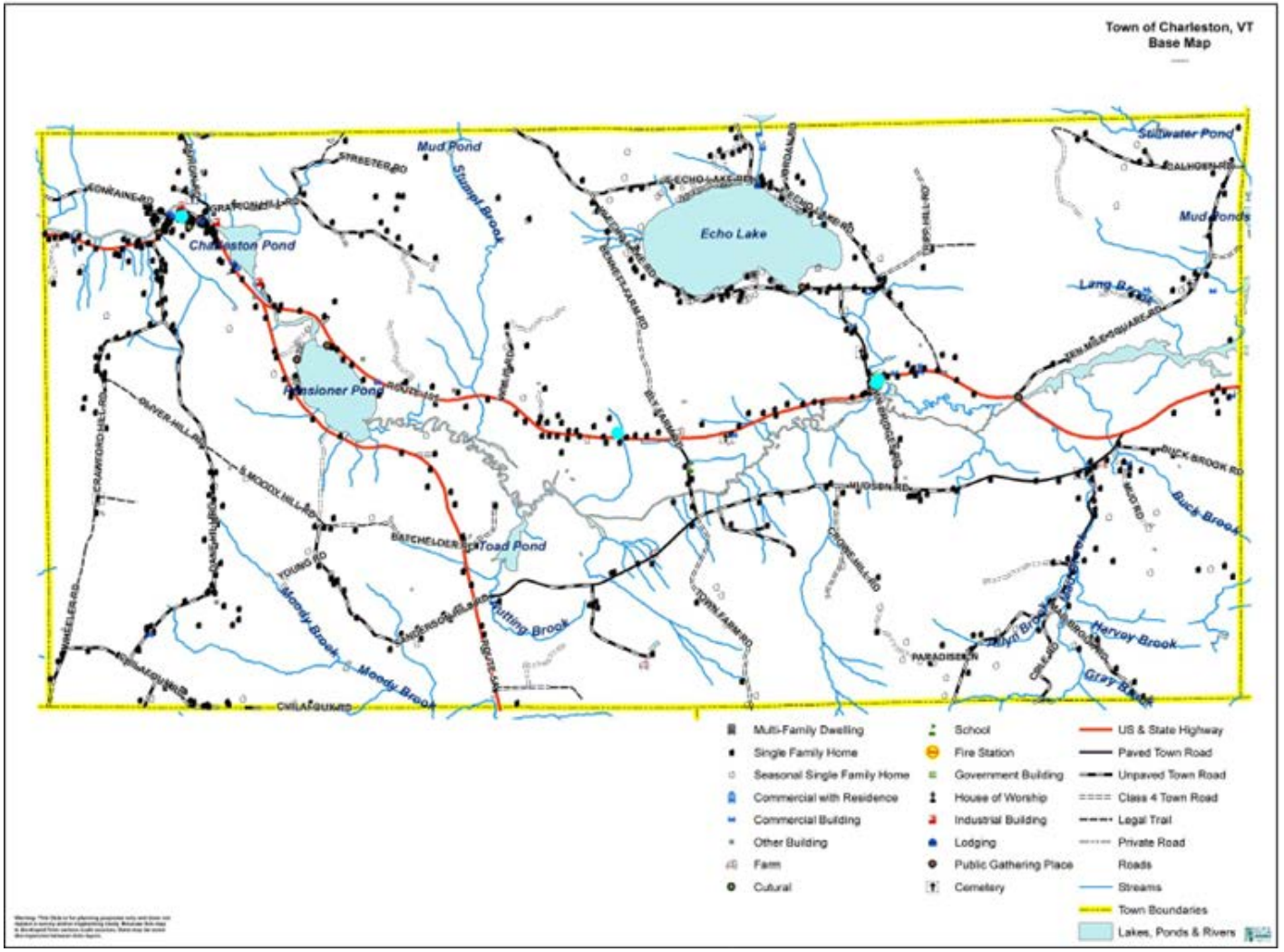
**8.3 Public Involvement in Maintenance**

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. The update will occur at Selectboard meeting following the update of the Local Emergency Management Plan (LEMP). At town meeting, the town will present mitigation information and provide the public an opportunity to increase understanding and involvement with planning for review and any significant risks and/or mitigation actions that have an impact on surrounding towns. Following adoption, the town will continue to maintain web-presence of the mitigation plan with an opportunity for input with an opportunity for community input available on its website. Public input on the annual progress review will be solicited through posted notices, Front Porch Forum, and annual town meetings.

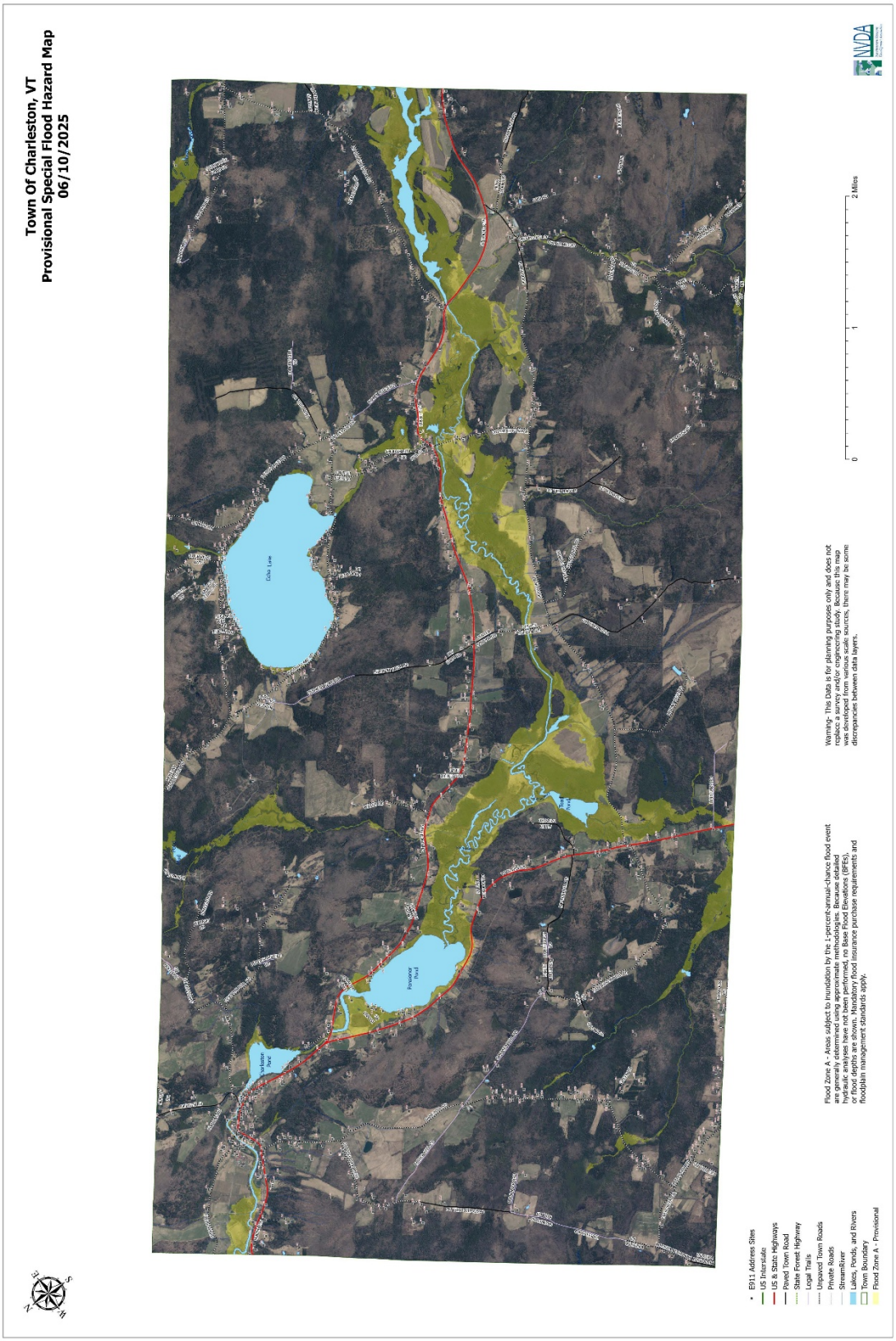
## 8.4 Appendices

### 8.4.1 Appendix A: Charleston Base Map

Note: Charleston is awaiting FEMA digital flood data for Charleston. Charleston has not been enrolled in the Flood Insurance program, so their maps are the old 11"X 17" which are not included in this plan.



## 8.4.2 Appendix B: Town of Charleston Provision Flood Hazard Map (2025)



### 8.4.3 Appendix C: Community Input Survey

**Charleston Local Hazard Mitigation Plan (LHMP)**
**Community Outreach Form**

**A FEMA-approved plan is required before any FEMA funding can be awarded to the town. Please send your comments and help Charleston stay eligible for FEMA assistance.**

**Natural hazards** identified in our current plan include: severe winter storms; extreme cold; flooding; erosion around lakes/rivers/streams; or a pandemic. Risks associated with these emergencies include: power outages; property damage; sustained high heating costs; damage to roads, bridges, and culverts; isolation from food and essential services; and the ability of critical facilities like schools, shelters, fire, and emergency services to respond in a severe emergency.

Our town planners **need your help** to understand **your greatest emergency concerns** to ensure our plan reflects Charleston's needs and priorities. Thank you.

**1. As a Charleston resident, business owner, employee, etc., what are your primary concerns about emergency events in the town?**

**2. What should our community focus on both financially and for health and safety to be better prepared for the next emergency event?**

**3. What other concerns do you have about emergencies, hazards, and emergency responses in our town?**

Your name & Community Affiliation:

*(e.g., resident, business owner, seasonal resident, employee—whatever fits you best)*

**Thank you for returning this form to the Town Clerk's Office in person or by mail, or email your comments to charlestonadmin@comcast.net**

### 8.4.4 Appendix D: Community Input Survey Summary of Responses

**2025 Community Survey about Emergency Concerns**
Summary Prepared for Selectboard Discussion

**Q1: Primary Concerns**

- Flooding (dominant, recurrent)
- Power outages (no backups)
- No cell service
- Roads quickly impassable (Church Hill, East Echo Lake, Winape Hills, Inlet Bridge)
- Vulnerable elderly/disabled cannot evacuate
- Lack of known emergency plan/communication

**Q2: How to Better Prepare**

- Upgrade culverts, roads, bridges, drainage
- Neighborhood call trees & area-based volunteer groups
- Identify/check on vulnerable residents
- Emergency shelter (use school), food, charging stations, transport
- Fund & equip Charleston Volunteer Fire/EMS
- Pursue FEMA grants for repeat damage

**Q3: Other Concerns**

- Survival of North Country Hospital (Medicaid cut fears)
- Persistent lack of cell service
- Reliable local alerts without relying on Facebook
- Medical emergencies, need town response team, food bank, volunteer help crew

**Core Issues: Recurrent flooding and isolation (roads, power, cell); lack of safety net for elderly/disabled; hospital at risk.**