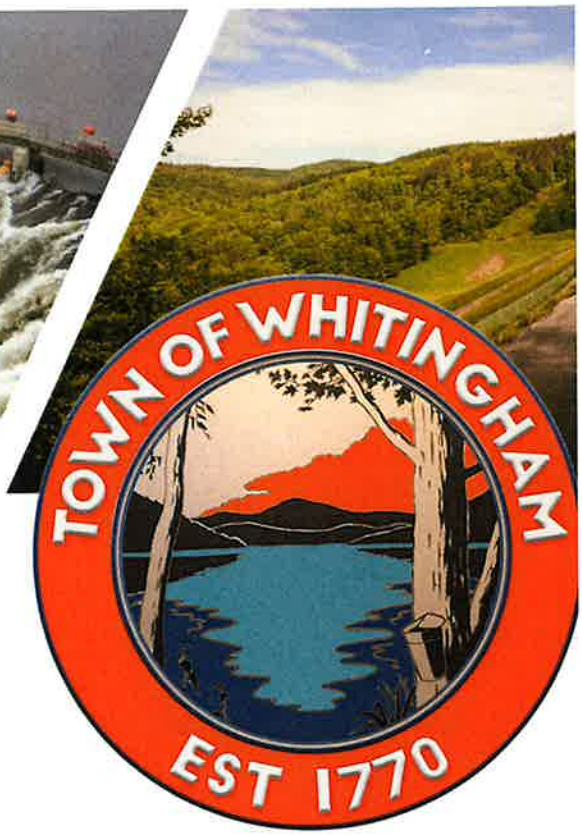

Town of Whitingham

2024 Local Hazard Mitigation Plan

Prepared for the Town of Whitingham
by Threat Owl LLC.

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CERTIFICATE OF ADOPTION

JUNE 26, 2024
TOWN OF Whitingham, Vermont Selectboard
A RESOLUTION ADOPTING THE Whitingham, Vermont 2024 Local Hazard Mitigation Plan

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

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

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

WHEREAS adoption by the Whitingham Selectboard demonstrates its commitment to hazard mitigation and achieving the goals outlined in the Town of Whitingham 2024 Local Hazard Mitigation Plan.

NOW THEREFORE, BE IT RESOLVED BY THE WHITINGHAM SELECTBOARD, VERMONT, THAT:

The Whitingham Selectboard hereby adopts the Town of Whitingham 2024 Local Hazard Mitigation Plan. While content related to Whitingham may require revisions to meet the plan approval requirements, changes occurring after adoption will not require the Whitingham Selectboard to re-adopt any further iterations of the plan. Subsequent plan updates following the approval period for this plan will require separate adoption resolutions.

ADOPTED by the Whitingham Selectboard on this 26th day of June 2024.

Scott M. Reed, Chair

James Weber, Vice Chair

Greg Brown, member

Craig Hammer, member

Travis Wheeler, member

ATTEST: By: _____ Gig Zboray, Selectboard Administrator.

INTRODUCTION AND PURPOSE

The purpose of this plan is to assist the Town of Whitingham including the Village of Jacksonville in identifying all the hazards facing the town and village, as well as to identify new and continuing strategies to reduce long term risks from identified hazards.

Hazard mitigation is any sustained action that reduces or eliminates risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and state agencies have come to recognize that it is less expensive to prevent damage from disasters than to repeatedly repair damage after a disaster has struck. This plan recognizes that communities also have opportunities to identify mitigation strategies and measures during all the other phases of Emergency Management – prevention, preparedness, response, and recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe and identify what local actions can be taken to reduce the severity of hazard-related damage.

Hazard mitigation strategies and measures alter the hazard by eliminating or reducing the frequency of occurrence; averting the hazard by redirecting the impact by means of a structure or land treatment; adapting to the hazard by modifying structures or standards; or avoiding the hazard by stopping or limiting development. Mitigation could include projects such as:

- **Flood Control Infrastructure:** Construction of dams, levees, and floodwalls to control riverine flooding. This can also include floodplain restoration projects to absorb excess water during floods.
- **Stormwater Management Systems:** Implementation of stormwater management techniques such as permeable pavements, retention basins, and green roofs to reduce urban flooding and erosion.
- **Wildfire Mitigation:** Clearing vegetation and creating defensible zones around communities at risk of wildfires. This can also include educational programs to raise awareness about fire-safe practices.
- **Hurricane Resistant Structures:** Construction of hurricane-resistant buildings and shelters in areas prone to hurricanes. These structures are designed to withstand high winds and flying debris.
- **Landslide Mitigation:** Implementation of stabilization measures on steep slopes, including retaining walls, rock bolts, and vegetation cover, to prevent landslides. This can also involve land-use planning to avoid construction in high-risk areas.
- **Infrastructure Elevation:** Raising roads, bridges, and utilities above expected flood levels to prevent damage during floods. Elevating critical infrastructure reduces the risk of disruptions after a flood event.
- **Public Education and Outreach:** Conducting public awareness campaigns to educate residents about disaster preparedness, evacuation routes, and safety measures. Informed communities are better prepared to respond to emergencies.
- **Ecosystem Restoration:** Restoring wetlands and natural buffer zones. Healthy ecosystems act as natural barriers against floods, storm surges, and erosion.

WINDHAM REGION GEOGRAPHY

Situated in Vermont's southeastern corner, the Windham Region consists of 23 towns in Windham County, the neighboring towns of Readsboro, Searsburg, and Winhall in Bennington County, and Weston in Windsor County. The region is bordered by Massachusetts to the south and New Hampshire to the east. At over 920 square miles (590,000 acres), the region accounts for roughly 9.6% of the State's total land area. The Windham Region has several distinctive identities, largely defined by the diverse natural environment.

The Region's topography is relatively flat or gently rolling land in the Connecticut River valley in the east, while the western part of the region is characterized by the Green Mountain ridges and peaks with narrow stream valleys. Stratton Mountain is the highest point in the region at 3,936 feet. The lowest point is along the Connecticut River in Vernon, at 200 feet.

In addition to the Connecticut River, other major rivers of the region are the Deerfield, Green, North, Saxtons, West, and Williams, all tributaries of the Connecticut. There are two major flood control reservoirs on the West River, Ball Mountain, and Townshend, and two major storage reservoirs for hydropower generation on the Deerfield River, Somerset and Harriman.

WHITINGHAM GEOGRAPHY

The Town of Whitingham is a rural Southern Vermont hill town amongst the Green Mountains. It is composed of 39.3 square miles, or 25,152 acres characterized by forested areas and the two compact Villages of Jacksonville and Whitingham. The Village of Jacksonville is technically an incorporated Village within the Town for electric power purposes, however, there is no separate village governance and for all intents and purposes the village is a part of the town.

For this reason, this is a single jurisdiction plan. Throughout the plan reference to "Town of Whitingham" should be taken to include the "Village of Jacksonville" along with the rest of Whitingham. Hazards experienced are the same in both the Town as a whole and Village specifically.

An additional concentration of seasonal residential development is located on the eastern shore of Sadawga Lake. Elsewhere homes are located along rural routes in a linear pattern. Whitingham is bordered to the north by the Town of Wilmington, to the east by Halifax and the west by Readsboro. The southern border is Massachusetts and meets the towns of Rowe and Heath. Routes 100 and 112 are the main paved state roads that meander through Whitingham.

Woodlands are predominant in Whitingham and cover a vast acreage of land. These lands provide the scenic backdrop for the town as well as provide wood products, game for hunting, maple products and recreation opportunities. Approximately 4,240 forest acres are in private non-industrial ownership and are actively managed under the Vermont Current Use Value Appraisal Program. The State of Vermont (Department of Fish and Wildlife) owns and manages Atherton Meadows, an 800-acre wildlife preserve in Whitingham. The highest elevation in town, between 2320 and 2340 feet is on the side of a mountain along Whitingham's western border in the Green Mountains. A gently sloping topography and several small lakes, ponds and wetlands make up the majority of the Whitingham landscape.

Surface waters are predominant landscape features in Whitingham. The Deerfield River is dammed for power generation forming Harriman and Sherman Reservoirs. Harriman Reservoir is over eight miles long, holds more than 38 billion gallons of water and is the largest body of water that lies entirely within the State of Vermont. Harriman Dam, a hydroelectric built in 1923 in Whitingham, was the largest earth-filled dam in the world at the time. Great River Hydro currently owns the Harriman Dam and 4,502 acres of forest land surrounding Harriman Reservoir.

The major surface waters in Whitingham include the East Branch of the North River, North Branch of the Deerfield River, Harriman Reservoir (Lake Whitingham), Sherman Reservoir, Sadawga Lake, Clara Lake, Shippee Pond, Pine Lake, Gates Pond, Jacksonville Pond, Laurel Lake, and Ryder Pond. The Deerfield River forms a natural western town boundary, and the East Branch of the North River is in the east-central section of Town. The headwaters for the East Branch of the North River are in several natural ponds within a two-mile radius north and northeast of Jacksonville (Ryder Pond, Laurel Lake, Gates Pond and Jacksonville Pond).

The climate is generally temperate with moderately cool summers and cold winters, as in the rest of Vermont. The weather is unpredictable, and large variations in temperature, precipitation, and other conditions may occur both within and between seasons.

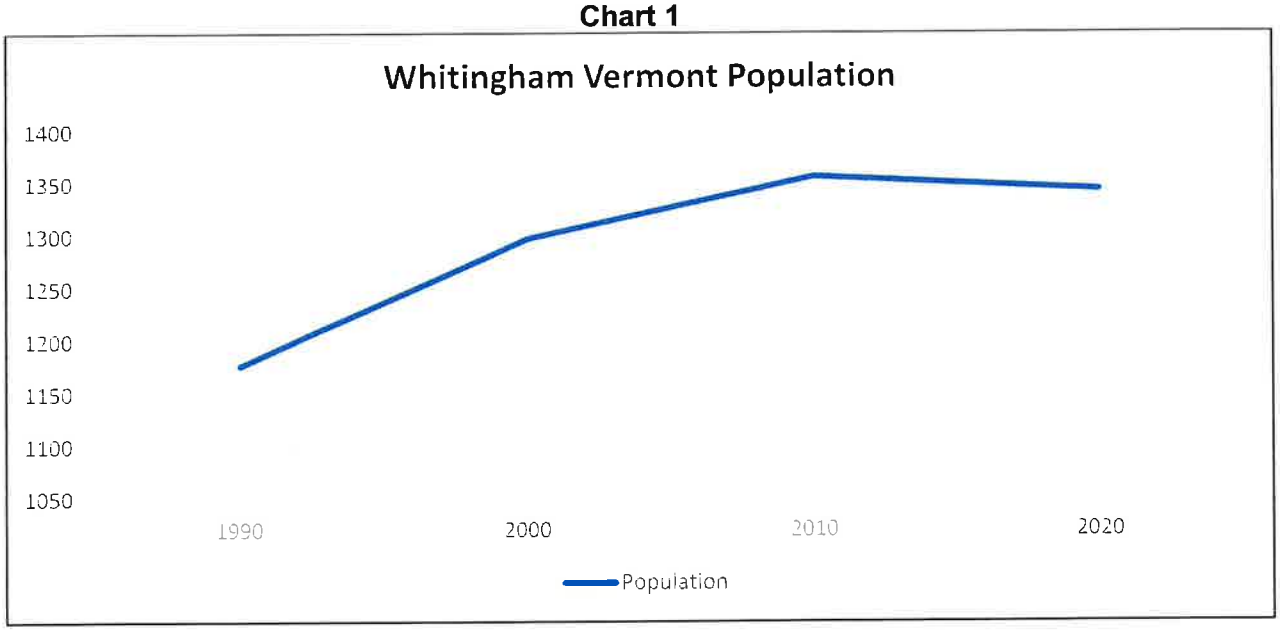
COMMUNITY PROFILE AND DEVELOPMENT

Since the 2018 Local Hazard Mitigation Plan, there have been no substantial changes in development within the town of Whitingham. According to the U.S. Census Bureau Building Permits Survey, since 2018, the town has issued 29 single-family building permits. Although building permits have been issued, there has been no new development in hazard prone areas. The population was 1,344 at the 2020 census. This is a slight decrease from the 2010 census. The surrounding community of Readsboro also saw a slight decrease, while other surrounding communities saw population growth. See table 1 and chart 1 for additional information.

Table 1

	1990	2000	2010	2020
Whitingham	1,177	1,298	1,357	1,344
Readsboro	762	805	763	702
Halifax	588	782	728	771
Wilmington	1,968	2,225	1,876	2,255
Heath, MA	716	805	706	723
Rowe, MA	378	351	393	424

Chart 1



Whitingham has a very small commercial and job sector. Most residents commute outside of town for work. According to the 2021 American Community Survey (ACS), the average commuting time for a working resident of Whitingham is 27.9 minutes. Single family residential is the primary type of development that has occurred for decades in the Town. Seasonal

housing has become a more prominent housing type/use than in previous decades prior to 1980. It accounts for approximately 33% of housing in the Town.

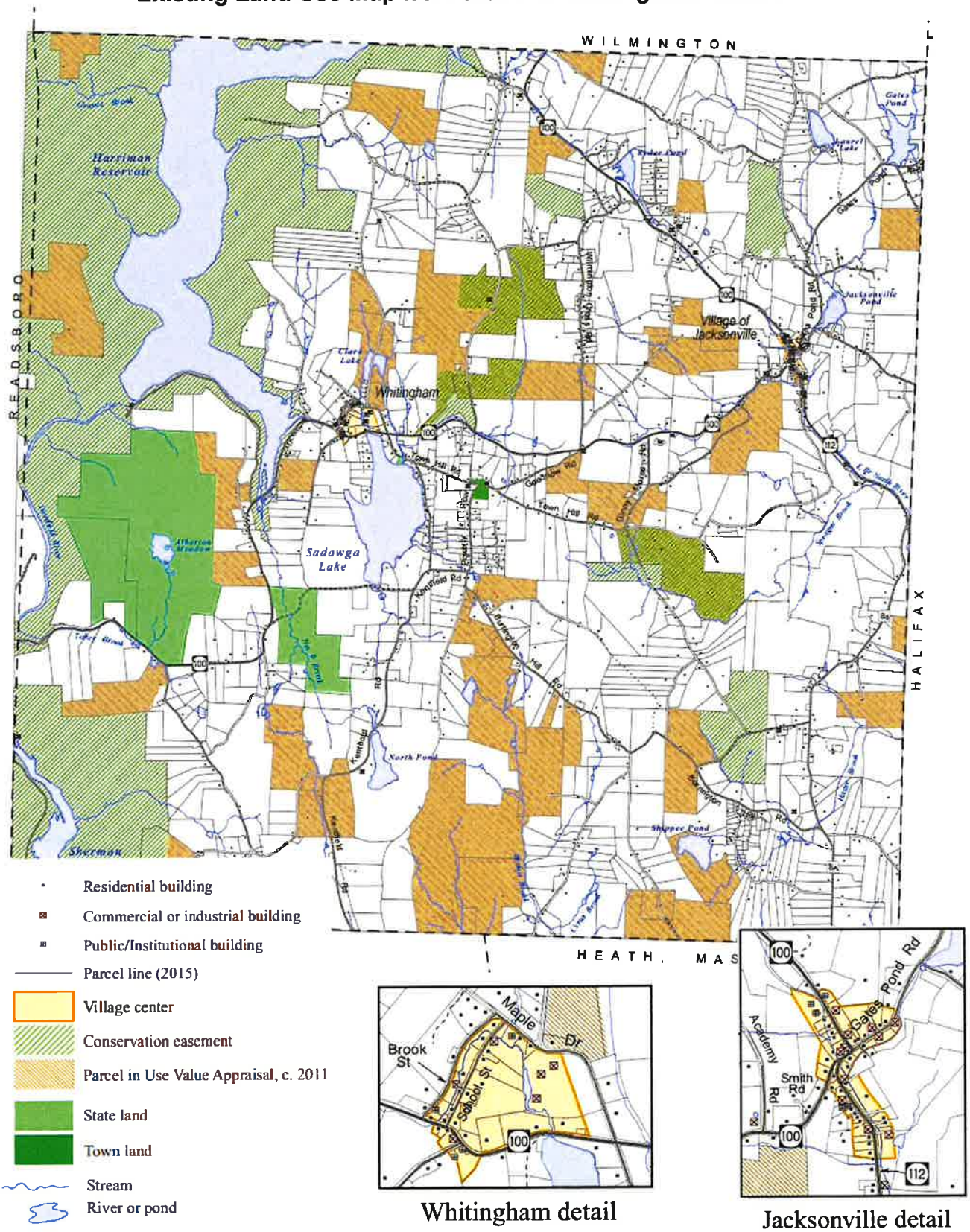
The Emergency Management Director, who is appointed by the Selectboard, coordinates emergency preparedness and response for the Town. Whitingham is served by two fire stations under the Whitingham Fire Department. The Department is composed of volunteer members. The Department serves the entire town and has mutual aid agreements with surrounding towns. Keene Mutual Aid serves as dispatch for the Department. Given the constraints imposed by a small volunteer Department, it has neither the financial nor the human resources to provide the level of fire protection that would be required by large-scale development. Members attend training courses sponsored by Vermont Fire Academy and the various mutual aid associations. There is a firehouse in Whitingham Village and another firehouse in Jacksonville Village.

Emergency medical services are provided by Deerfield Valley Rescue (DVR). DVR is based in Wilmington and maintains an ambulance at the Jacksonville Firehouse. DVR is a non-profit organization funded through subscriptions and donations. DVR provides Whitingham and surrounding towns with ambulance service, medical care, transport to and from area hospitals and large regional hospitals. It is primarily staffed by trained volunteers; however, two full-time personnel are employed. The statewide 911 locatable address system provides dispatch service for fire, emergency, and ambulance calls.

The Twin Valley Middle High School, the Whitingham Municipal Center in Jacksonville, and the Jacksonville Fire Department are the three designated emergency shelters in Whitingham. The school is a designated Red Cross shelter. The Municipal Center is only set up to be a cooling/warming or day shelter. All three shelters are equipped with generators. The nearest hospitals in order of proximity to Whitingham are the Southwestern Vermont Medical Center in Bennington, Brattleboro Memorial Hospital in Brattleboro, Grace Cottage in Townshend, and Dartmouth- Hitchcock Medical Center in Keene, NH, (Cheshire Medical Center) and Lebanon, NH. The Vermont State Police provide police protection by default.

The Jacksonville Fire House is the Local Emergency Operations Center. For emergency communications, Whitingham maintains a two-way radio system. Additionally, Keene Mutual Aid has an antenna on Town Hill.

Existing Land Use Map from the 2018 Whitingham Town Plan



Whitingham detail

Jacksonville detail

PLANNING PROCESS

The Town actively invited and involved stakeholders, including residents, local business, and government agencies, in the planning process. The Town ensured each meeting was publicly posted, and invitations, including the meeting agenda and presentation, were sent in advance to various stakeholders.

The Town and Threat Owl LLC. documented the formation of the planning committee, posted meeting information in various locations, recorded details of public meetings, including attendance records and summaries of discussions, and documented feedback and suggestions from stakeholders.

Plan Developers

Shawna Pinette, Threat Owl LLC., assisted the Town of Whitingham with updating its Local Hazard Mitigation Plan.

Planning Committee Members

The following individuals, see table 2, were directly involved in the planning process of updating the Hazard Mitigation Plan. Members attended meetings, received emails, reviewed the planning scope and process, developed the outreach plan, cross-referenced supporting documents, reviewed programs that support hazard mitigation, identified and prioritized hazards, reviewed and updated hazard mitigation projects, acted as subject matter experts for their area of expertise and reviewed and edited the draft plan.

Table 2

Contributors (2011)	**Affiliations**
Bonnie Jo Radasch	Administrative Assistant for Whitingham
Brad Lackey	Planning Commission
Almira Aekus	Town Clerk
Stanley Janovsky	Fire Chief and Road Commissioner
Alan Twitchell	EMD
Dinah Reed	Windham Regional Commission
Contributors (2018)	**Affiliations**
Karl Twitchell	Selectboard
Keith Bronson	Selectboard
Stanley Janovsky	Road Commissioner and Fire Chief
Robin Kingsley	Selectboard
Gig Zboray	Selectboard Office Administrator
Alyssa Sabetto	Windham Regional Commission
Contributors (2023/2024)	**Affiliations**
Scott M. Reed	Selectboard
James Weber	Selectboard and Fire
Greg Brown	Selectboard
Craig Hammer	Selectboard
Gig Zboray	Selectboard, EMD, THO, ZA, Flood Plain Admin.
Almira Aekus	Clerk/Treasurer
Stanley Janovsky, Jr.	Road Commissioner and Fire Chief

Brad Lackey	Planning Commission
Karen Boisvert	Readsboro, Administrative Assistant
Peter Barus	Planning Commission
Keith Thompson	Planning Commission
Dennis Pike	Fire Wardens and EMS

Planning Process and Plan Development

Threat Owl LLC. and the Town of Whitingham exchanged numerous emails and conducted multiples meetings to develop the 2023 Hazard Mitigation Plan. Below is the planning process:

1. Town of Whitingham published Request for Proposal (RFP) on 23 March 2023
2. Threat Owl LLC. submitted an RFP response on 14 April 2023
3. *Town of Whitingham awarded Threat Owl LLC. the Hazard Mitigation Plan Update bid on 17 May 2023
4. *Town of Whitingham and Threat Owl LLC. signed the agreement of services on 31 May 2023
5. Town of Whitingham and Threat Owl LLC. reviewed and updated the Hazard Mitigation Planning Committee on 4 June 2023
6. ***MEETING:** Threat Owl LLC. conducted a "Hazard Mitigation Kickoff Meeting" on 14 June 2023 with the Planning Team to provide an overview of the planning process.
    a. Meeting minutes were sent following the meeting.
7. Town of Whitingham and Threat Owl LLC. reviewed outreach plan ideas via email on 27 June 2023
8. Town of Whitingham and Threat Owl LLC. developed outreach plan and reviewed via email on 4 July 2023
9. Town of Whitingham and Threat Owl LLC. reviewed VEM's Draft State Hazard Mitigation Plan via email on 5 July 2023
10. Town of Whitingham and Threat Owl LLC. discussed July 2023 Flooding Emergency for possible inclusion in the Plan on 11 July 2023
11. ***MEETING:** Threat Owl LLC. conducted a "Hazard Review Meeting" on 2 August 2023 with the Planning Team to review and update the Hazard Ranking
    a. Meeting minutes were sent following the meeting.
    b. Resident attended the meeting and provided input into the hazard review rating.
12. Town of Whitingham and Threat Owl LLC. reviewed and updated Hazard Assessment via email on 15 August 2023
13. ***MEETING:** Threat Owl LLC. conducted a "Town Capabilities Review Meeting" on 31 August 2023 with the Planning Team to review town programs that support hazard mitigation.
    a. Meeting minutes were sent following the meeting.
14. Town of Whitingham and Threat Owl LLC. reviewed Town Plans that support the Hazard Mitigation Plan via email on 31 August 2023 and 1 September 2023
15. ***MEETING:** Threat Owl LLC. conducted a "Hazard Mitigation Projects Review Meeting" on 13 September 2023 with the Planning Team to review and update town hazard mitigation projects.
    a. Meeting minutes were sent following the meeting.
16. Town of Whitingham and Threat Owl LLC. developed educational materials and reviewed via email on 20 September 2023
17. Town of Whitingham and Threat Owl LLC. reviewed and submitted the VEM HMP quarterly report via email on 27 September 2023
18. Town of Whitingham and Threat Owl LLC. reviewed a FEMA buyout project on 10 October 2023 via email.

19. *The Town of Whitingham and Threat Owl LLC. provided a draft copy of the Plan to the Planning Team and stakeholders for review and input on 6 November 2023 via email.
    a. Input was provided from the town of Whitingham Selectboard Administrator/Zoning and Flood Plain Administrator / Health Officer and Emergency Management Director
20. *The Whitingham Planning Commission reviewed the draft plan on 12 December 2023.
21. *The Town of Whitingham sent a draft copy of the Plan to surrounding communities and regional partners for review and input on 2 January 2024.
    a. The Windham Regional Planning Commission reviewed the plan and provided feedback for formatting edits.
    b. The Town of Readsboro reviewed the plan and had no edits.
22. *The Town of Whitingham posted a draft copy of the Local Hazard Mitigation Plan on the town's website for public input

*Indicates a meeting or opportunity for the public/residents to provide input into the planning process. Public input, provided during the meetings or via email, was captured and incorporated accordingly into the plan update.

Please refer to Appendix A for examples of meeting agenda, slides, and minutes.

Stakeholder Engagement and Outreach

To ensure FEMA requirements were met, and to ensure the various stakeholders were allowed an opportunity to participate in the planning process, the Town conducted numerous outreach methods. Feedback from the planning committee, the public and various stakeholders was captured in meeting minutes and the Plan was amended accordingly. The stakeholder engagement and outreach considered neighboring communities, local government, vulnerable populations, different geographical areas, and various community and public support sectors. The following methods were used for each Hazard Mitigation Planning Meeting:

- Stakeholder input, including the public, was achieved through public meetings, survey requests for meeting time preference, and opportunities for public comment. The Plan update included public meetings, hard copy and electronic copy public notices, and email exchanges. Any input collected during these opportunities was captured by Threat Owl through meeting minutes. Additionally, the input or recommendations was directly incorporated into the 2024 Plan update.
- Developed a Contact List that included representatives from:
    - Local Public works/highway
    - Local floodplain administration
    - Regional planning (Windham Regional Planning Commission)
    - Local zoning
    - Local planning commission
    - Local health
    - Local selectboard
    - Local finance
    - Local EMS
    - Local school
    - Building inspection (State Fire Marshall)
    - Neighboring Communities:
        - Wilmington
        - Halifax

        - Readsboro
    - Utilities (Jacksonville Electric)
    - Communications (Keene Mutual Aid)
    - Food (DV Food Pantry)
    - Transportation (Mover Bus Co.)
    - Community-based Organizations and Vulnerable Populations
        - CARE
        - Meals on Wheels
        - SASH
        - Visiting Nurse of VT and NH
- An email, which included a meeting Zoom link, meeting agenda, and meeting slides, were sent to all members on the Contact List prior to each meeting.
- The meeting information (Date/time, Zoom Link, Agenda) were posted electronically on the Town's website.
- The meeting information (Date/time, Zoom Link, Agenda) were posted electronically on the Town's social media sites.
- The meeting information (Date/time, Zoom Link, Agenda) were posted via hard copy in municipal buildings and non-municipal buildings (e.g., local post office)

Please refer to Appendix B for examples of outreach.

EXISTING DOCUMENT REVIEW AND INCORPORATION

The following documents (see table 3) were reviewed, referenced, and incorporated, when applicable, during the Whitingham Hazard Mitigation Plan update process:

Table 3

Document Name	Review and Incorporation
Town Plan	Plan for coordinated town-wide planning for land use, municipal facilities, etc. Flood resilience is addressed. Referenced during the capabilities meeting.
Local Emergency Operations Plan	Municipal procedures for emergency response. Referenced during the capabilities meeting.
Road Standards	Design and construction standards for roads and drainage systems. Referenced during the capabilities and mitigation projects meeting.
Zoning Regulation	Regulates the division of land, standards for site access and utilities. Referenced during the capabilities and mitigation projects meeting.
Flood Hazard Area Regulations	Regulates development in FEMA identified SFHAs. Referenced during the capabilities and mitigation projects meeting.
National Flood Insurance Program (NFIP)	Provides the ability for residents to acquire flood insurance. Referenced during the capabilities and mitigation projects meeting.
Maintenance Programs	Bridge & Culvert Inventory. Referenced during the capabilities and mitigation projects meeting.
Wetland protection – VT Wetland Rules	Protected by the 1990 Vermont Wetland Rules. Referenced during the capabilities and mitigation projects meeting.
Local Hazard Mitigation Plan	Provided a foundation for the 2023 update. Referenced throughout the entire planning process.
State of Vermont Hazard Mitigation Plan	Provided context for state-wide planning. Referenced throughout the entire planning process.
State of Vermont Hazard Mitigation Website	Provided educational and guidance materials. Referenced throughout the entire planning process.
2017 River Corridor Plan for the East Branch of the North River	Geomorphic Assessments for the East Branch North River watershed. Referenced during the capabilities meeting.

For Whitingham to succeed in reducing long-term risk, information from this Plan should be integrated throughout town operations. Integration actions include:

- The mitigation goals and risk assessment information can be incorporated into the next Town Plan update and into future zoning regulation updates
- The proposed mitigation actions can be incorporated into the future capital improvement plan updates
- The risk assessment information can be incorporated into future training plans and budgets

The previously adopted local hazard mitigation plan was not integrated into other planning mechanisms.

RISK ASSESSMENT

The risk assessment portion of a Hazard Mitigation Plan contributes to the decision-making process for allocating available resources to mitigation projects. 44 CFR Part 201.6(c)(2) of FEMA's mitigation planning regulations requires local municipalities to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Methodology

To better align with surrounding communities and the State of Vermont, the Planning Committee implemented the State's Hazard Impact formula. The newly implemented formula did change the town's hazard ranking, however, the Planning Committee found it to be a better reflection of the hazards impacting the community. The changes to the community profile, potential impacts of climate change, historical data and social and economic challenges also contributed to the hazard ranking changes. The Planning Committee discussed how the town may be more vulnerable to certain hazards due to climate change, land use, and demographics. Climate change will exacerbate vulnerabilities for the town with increased frequency and severity of weather events and altered weather patterns. Changing demographics can significantly impact the town's vulnerability to hazards. Aging population, increased density population, increased socioeconomic disparities, cultural and linguistic diversity, population growth and urbanization, transient and migrant populations, and increased number of persons with disabilities, access and functional needs exacerbates vulnerabilities. The Planning Team made decisions by majority consensus.

Hazards ranking is determined by multiplying the probability of occurrence by an average score for potential impact to the Built and Natural Environments, People, and Economy (see table 4).

The Built Environment is comprised of the manmade structures and infrastructure in our communities, including municipal water systems, dams, homes, bridges, roads, wastewater treatment plants, electrical and communication systems, libraries, medical facilities, fire stations, and town halls. Features of the built environment can be both functionally and culturally valuable to the people living there. After a disaster, the impacts to the built environment are some of the most visible.

Natural Environment encompasses natural resources and ecosystems, but also the natural features integrated with our communities including urban trees and agricultural land. Water, soil, air, forest products, fish and wildlife are all natural resources. Ecosystems include lakes, forests, meadows, and rivers. Ecosystem services are the processes of the natural environment producing benefits to humans such as flood control and water filtration by wetlands. In the absence of human intervention, the natural environment can withstand natural disturbances, and depends on natural hazards to maintain normal ecosystem function. It is due to human dependence on the natural environment for food, water quality, and other natural resources, and human influence on the natural environment, particularly climate change impacts on ecosystem health, that we are concerned with hazard impacts to the environment.

People refers to both the life and well-being of those who live in, work in, or visit Vermont. Hazard mitigation planning centers around protecting life and property. Hazards can be deadly, but there are many other impacts of hazards that need to be accounted for. A few examples of potential hazard impacts to people are loss of housing, loss of childcare, displacement, food insecurity, unemployment, illness, psychological trauma, depression, and loss of life.

Economy captures the economic impacts of hazards that can lead to short and long-term

financial hardships. Hazards can cause agricultural losses, decline in tourism, damages to storefronts and goods for sale, loss of employers and jobs, and disruption in supply chains. There is also the substantial cost of paying for recovery from hazard events for the state, municipalities, individuals, nongovernmental organizations, and businesses.

Table 4

Hazard Assessment Ranking Criteria		
	Frequency of Occurrence: The probability of a plausibly significant event impacting the community or regional scale is based on previous occurrences and climate change projections.	**Potential Impact:** Severity and extent of damage and disruption to built and natural environments, people, and the economy
1	Unlikely: <1% probability of occurrence per year	Negligible: isolated occurrences of minor built or natural environmental damage, potential for minor injuries, health, or well-being impacts, or minimal economic disruption.
2	Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years	Minor: isolated occurrences of moderate to severe built or natural environmental damage, potential for injuries or health or well-being impacts, minor economic disruption.
3	Likely: >10% but <75% probability per year, at least 1 chance in next 10 years	Moderate: severe built or natural environmental damage on a community scale, injuries, fatalities or impacts to individual and community well-being, short-term economic impact.
4	Highly Likely: >75% probability in a year	Major: severe built or natural environmental damage on a community or regional scale, multiple injuries or fatalities or severe long-term impacts to individual and community well-being, significant long-term economic impact.

The Planning Committee reviewed the 2018 Hazard Assessment and reviewed the State of Vermont Hazard Assessment. After much discussion, the Planning Committee ranked hazards using the State formula. Please refer to Table 5 for the hazard assessment.

Table 5

Hazard Assessment

Hazard Impacts	Probability	Potential Impact					Score
		Built Environment	People	Economy	Natural Environment	Average:	
luvial Erosion	4	4	4	4	4	4	1
nundation Flooding / Flooding	4	4	4	4	2	3.5	1
Wind	4	3	2	2	2	2.25	
Winter storm (Snow, Ice, Cold and Hail)	4	3	3	2	1	2.25	
Wildfire	3	3	3	3	3	3	
Heat	4	1	3	2	2	2	
nfectious Disease Outbreak	3	1	4	4	1	2.5	7.
nvasive Species	3	2	1	3	3	2.25	6.7
andslides impacts addressed in fluvial erosion)	3	3	2	1	2	2	
ornado/Microburst impacts addressed in wind category)	2	3	3	3	3	3	
ce Jams impacts addressed in flooding category)	3	2	2	2	2	2	
Hurricanes impacts addressed in flooding/wind ategory)	2	3	3	2	3	2.75	5.
Drought	2	1	2	2	3	2	
arthquake	2	2	2	2	2	2	
Dam Failure impacts addressed in flooding category)	1	2	2	2	2	2	
Beaver Dams impacts addressed in flooding category)	2	1	1	1	1	1	
sunami negligible impact)	0	0	0	0	0	0	
Volcanic Eruption negligible impact)	0	0	0	0	0	0	
Human-made Hazards							
Power Failure	3	2	2	2	2	2	
Structure Fire	3	2	2	2	2	2	
Highway Accidents	3	2	2	1	2	1.75	5.2
Hazardous Material Spill	2	2	1	1	2	1.5	
Terrorism	1	3	3	3	3	3	
Radiological Incidents	1	2	2	2	2	2	
School Safety Issues	1	1	4	2	1	2	
Water Supply Contamination	1	2	2	2	2	2	
Air Crash	1	1	1	1	1	1	
Railroad Accidents	0	0	0	0	0	0	

Climate Change Note: Warming temperatures, shrinking winters, and increasing incidence of intense storm events are beginning to have a significant impact on Vermont's economy, people and environment and require immediate attention across all planning efforts at the local, regional, state, federal and global levels. Accordingly, and as a guiding principle of this Plan, we have aimed to recognize and include the impacts of climate change throughout Plan development, most notably reflected in the hazard profiles and mitigation actions. Both direct and indirect impacts of climate change are addressed within pertinent hazard profiles, as well as the potential for compounding impacts.

As stated above, historical data, including disaster declarations was reviewed when ranking hazards. The following chart details declared disasters for Windham County, Vermont.

Disaster Declarations for Windham County, VT

Disaster Number	Incident Begin Date	Incident End Date	Declaration Date	Incident Type	Title	Disaster Close Out Date
4762	Dec 18, 2023	Dec 19, 2023	Mar 2, 2024	Severe Storm	Vermont Severe Storms and Flooding	
4720	Jul 7, 2023	Jul 21, 2023	Jul 14, 2023	Severe Storms, Flooding, Landslides and Mudslides	Vermont Severe Storms, Flooding, Landslides, and Mudslides	
3595	Jul 9, 2023	Jul 17, 2023	Jul 10, 2023	Flooding	Vermont Flooding	
4621	Jul 29, 2021	Jul 30, 2021	Sep 29, 2021	Severe Storm and Flooding	Vermont Severe Storm and Flooding	
3567	Aug 22, 2021	Present	Aug 22, 2021	Tropical Storm	Vermont Tropical Storm Henri	
4532/ 3437	Jan 20, 2020	May 11, 2023	Apr 8, 2020 March 13, 2020	Biological	Vermont Covid-19 Pandemic	
4356	10/29/2017	10/30/2017	01/02/2018	Severe Storm and Flooding	SEVERE STORMS AND FLOODING	
4043	5/20/2011	5/20/2011	11/8/2011	Severe Storm(s)	SEVERE STORMS AND FLOODING	
4022	8/27/2011	9/2/2011	9/1/2011	Hurricane	TROPICAL STORM IRENE	
3338	8/26/2011	9/2/2011	8/29/2011	Hurricane	HURRICANE IRENE	3/10/2014
1816	12/11/2008	12/18/2008	1/14/2009	Severe Ice Storm	SEVERE WINTER STORM	10/15/2014
1698	4/15/2007	4/21/2007	5/4/2007	Severe Storm(s)	SEVERE STORMS AND FLOODING	3/13/2013
1559	8/12/2004	9/12/2004	9/23/2004	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
1488	7/21/2003	8/18/2003	9/12/2003	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
3167	3/5/2001	3/7/2001	4/10/2001	Snow	SNOW	2/28/2005
1336	7/14/2000	7/18/2000	7/27/2000	Severe Storm(s)	SEVERE STORMS AND FLOODING	6/30/2008
1307	9/16/1999	9/21/1999	11/10/1999	Severe Storm(s)	TROPICAL STORM FLOYD	6/30/2008
1124	6/12/1996	6/14/1996	6/27/1996	Flood	EXTREME RAINFALL AND FLOODING	2/23/2005
1101	1/19/1996	2/2/1996	2/13/1996	Flood	ICE JAMS AND FLOODING	2/17/2005
518	8/5/1976	8/5/1976	8/5/1976	Flood	SEVERE STORMS, HIGH WINDS & FLOODING	4/16/1981
397	7/6/1973	7/6/1973	7/6/1973	Flood	SEVERE STORMS, FLOODING, & LANDSLIDES	11/12/1976
277	8/30/1969	8/30/1969	8/30/1969	Flood	SEVERE STORMS & FLOODING	5/26/1972

HAZARD PROFILES

The following sections include a narrative with Description and Extent, Geographic Areas of the Hazard, History, Probability of Future Events and Town Vulnerability.

Fluvial Erosion/Landslide and Inundation Flooding

Description and Extent

Fluvial erosion is streambed and streambank erosion. Erosion starts when the flow energy of the water exceeds the resistance of the material of the riverbed and banks. Fluvial erosion destabilizes slopes through undercutting, increasing slope steepness, removing supportive material, saturating the slope, increasing pore water pressure, and potentially removing vegetation. These processes collectively reduce the stability of the slope, making it more prone to landslides. A landslide is the movement of rock, earth, or debris down a slope due to gravity. Landslides can vary in size and speed and can be triggered by natural events or human activities. Inundation flooding is an overflow of water onto normally dry land. Inundation flooding occurs when water rises in an existing waterway, such as a river, lake, or stream. Fluvial erosion and inundation flooding occur naturally, and may be exacerbated by rainfall, snowmelt, ice jams, failure of infrastructure and/or human alterations to a river, floodplain, or watershed.

Impact/Extent

The extent of fluvial erosion and flooding can vary from a minor event due to a typical rain event or could be a major event because of rapid snow melt in spring, rain on frozen ground, or because of a tropical depression or storm. The highest recorded measurement on the North River at the nearest stream gauge to Whitingham (at Shattuckville, MA) was 18.17 feet, which was measured on August 28, 2011, during TS Irene[1]. The largest area of fluvial erosion is on Holbrook Road. This slide is about 100' feet wide. There are 12-15 homes that are on the road, seven are above the slide and are directly affected when damage occurs at the location of the slide.

Table 6a and 6b highlight precipitation frequency (PF). The PF estimates in this table are based on frequency analysis of partial duration series (PDS)[2].

[1] http://waterwatch.usgs.gov/index.php

[2] https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=vt

Table 6a – PDS-based depth-duration frequency curves

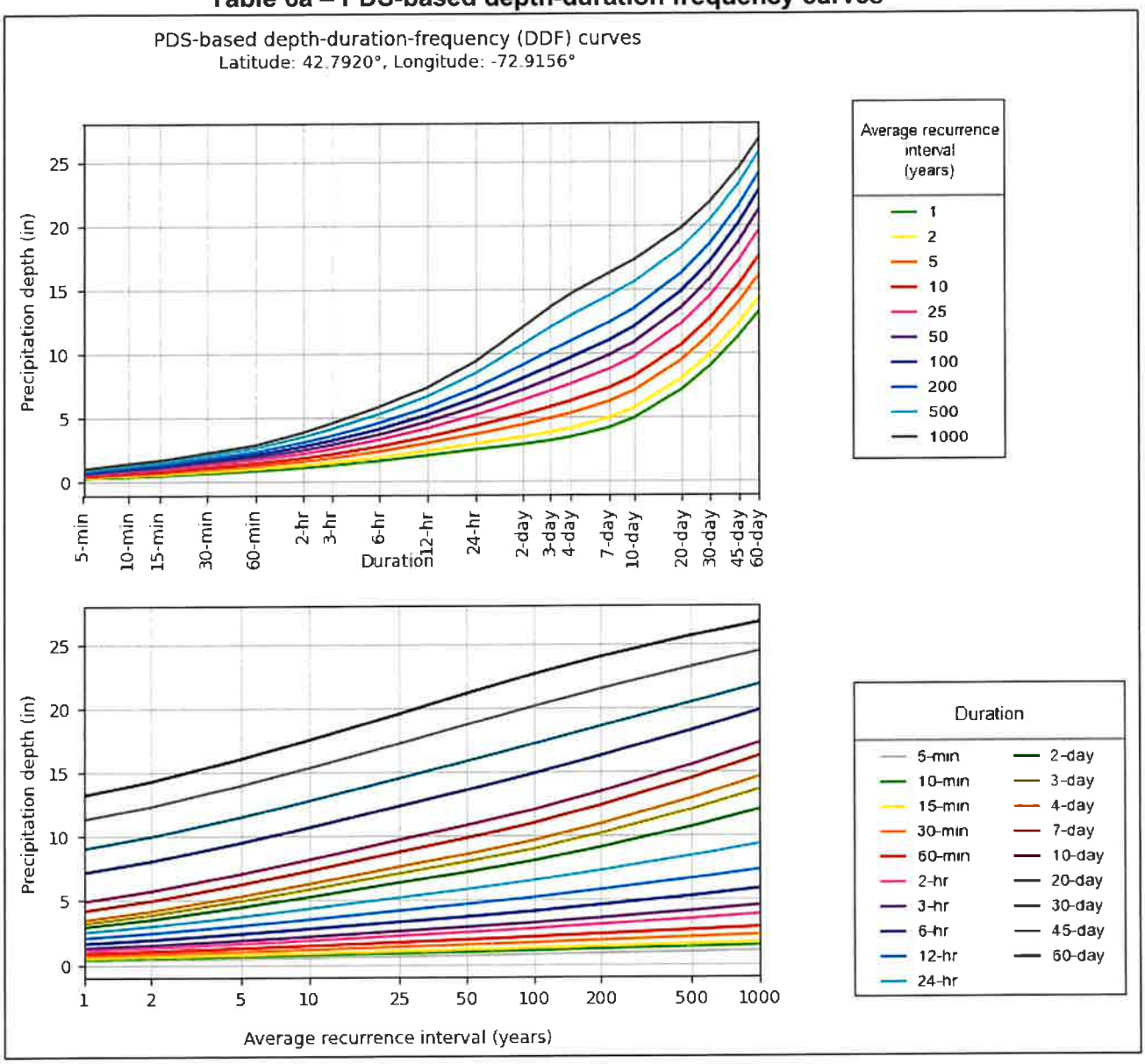


Table 6b – PDS-based precipitation frequency estimates

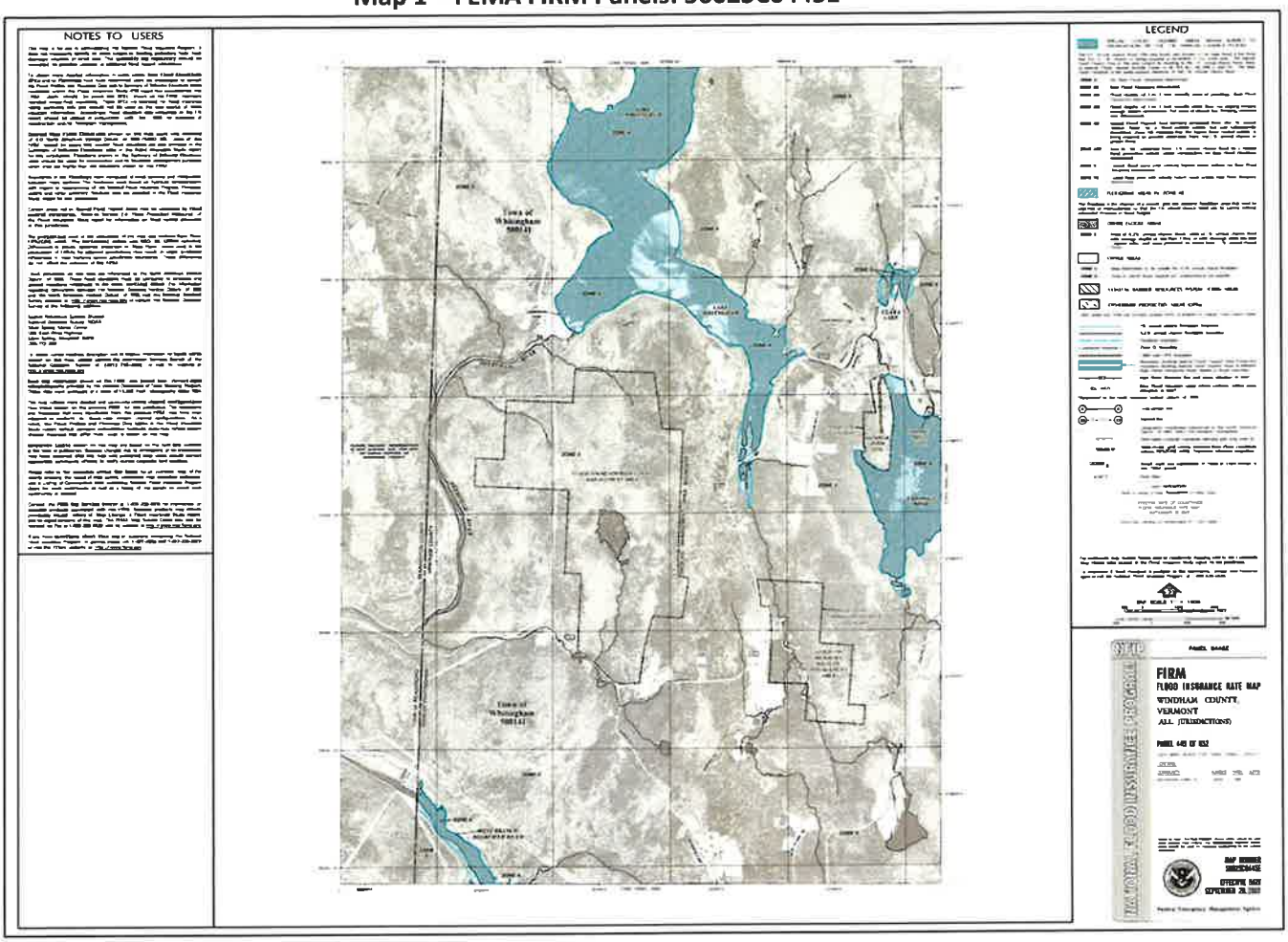
PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.303 (0.240-0.380)	0.353 (0.279-0.443)	0.435 (0.343-0.548)	0.503 (0.394-0.638)	0.597 (0.451-0.781)	0.668 (0.493-0.890)	0.741 (0.528-1.02)	0.819 (0.554-1.15)	0.927 (0.603-1.34)	1.01 (0.640-1.49)
10-min	0.429 (0.340-0.538)	0.500 (0.396-0.628)	0.616 (0.486-0.776)	0.712 (0.557-0.900)	0.845 (0.638-1.11)	0.946 (0.698-1.26)	1.05 (0.748-1.44)	1.16 (0.787-1.63)	1.31 (0.854-1.90)	1.43 (0.907-2.12)
15-min	0.505 (0.400-0.633)	0.588 (0.465-0.739)	0.724 (0.570-0.912)	0.838 (0.657-1.06)	0.994 (0.751-1.30)	1.11 (0.822-1.48)	1.24 (0.880-1.70)	1.36 (0.925-1.92)	1.54 (1.00-2.24)	1.69 (1.07-2.49)
30-min	0.687 (0.544-0.861)	0.801 (0.633-1.00)	0.987 (0.778-1.24)	1.14 (0.894-1.44)	1.35 (1.02-1.77)	1.52 (1.12-2.02)	1.68 (1.20-2.30)	1.86 (1.26-2.61)	2.09 (1.36-3.03)	2.28 (1.44-3.36)
60-min	0.869 (0.688-1.09)	1.01 (0.801-1.27)	1.25 (0.984-1.57)	1.44 (1.13-1.83)	1.71 (1.29-2.24)	1.92 (1.41-2.55)	2.13 (1.51-2.91)	2.34 (1.59-3.30)	2.64 (1.71-3.82)	2.86 (1.81-4.23)
2-hr	1.10 (0.879-1.37)	1.29 (1.03-1.61)	1.61 (1.27-2.01)	1.86 (1.47-2.34)	2.22 (1.69-2.89)	2.49 (1.85-3.30)	2.77 (1.99-3.79)	3.08 (2.09-4.30)	3.52 (2.29-5.07)	3.88 (2.46-5.68)
3-hr	1.27 (1.02-1.58)	1.49 (1.19-1.85)	1.86 (1.48-2.31)	2.16 (1.71-2.70)	2.57 (1.96-3.35)	2.89 (2.15-3.82)	3.22 (2.32-4.40)	3.59 (2.44-4.99)	4.12 (2.69-5.92)	4.56 (2.90-6.67)
6-hr	1.62 (1.30-2.00)	1.91 (1.53-2.35)	2.37 (1.90-2.94)	2.76 (2.20-3.43)	3.29 (2.53-4.25)	3.69 (2.77-4.86)	4.11 (2.99-5.60)	4.59 (3.14-6.35)	5.29 (3.46-7.54)	5.86 (3.74-8.51)
12-hr	2.06 (1.66-2.52)	2.42 (1.95-2.96)	3.00 (2.42-3.69)	3.49 (2.80-4.32)	4.16 (3.21-5.34)	4.67 (3.52-6.10)	5.20 (3.79-7.02)	5.80 (3.98-7.96)	6.65 (4.37-9.42)	7.35 (4.70-10.6)
24-hr	2.49 (2.03-3.03)	2.95 (2.40-3.60)	3.71 (3.01-4.53)	4.33 (3.49-5.32)	5.19 (4.03-6.62)	5.84 (4.43-7.58)	6.52 (4.78-8.75)	7.29 (5.02-9.96)	8.42 (5.55-11.8)	9.35 (6.00-13.4)
2-day	2.89 (2.37-3.50)	3.48 (2.85-4.21)	4.45 (3.63-5.40)	5.25 (4.26-6.40)	6.35 (4.97-8.07)	7.17 (5.48-9.30)	8.05 (5.96-10.8)	9.10 (6.29-12.4)	10.7 (7.07-14.9)	12.0 (7.75-17.1)
3-day	3.18 (2.62-3.83)	3.85 (3.16-4.63)	4.93 (4.04-5.96)	5.83 (4.74-7.08)	7.07 (5.55-8.96)	7.98 (6.13-10.3)	8.98 (6.69-12.1)	10.2 (7.05-13.8)	12.0 (7.96-16.8)	13.6 (8.77-19.3)
4-day	3.44 (2.84-4.13)	4.15 (3.42-4.99)	5.31 (4.36-6.40)	6.27 (5.12-7.60)	7.60 (5.98-9.60)	8.58 (6.60-11.1)	9.64 (7.20-12.9)	10.9 (7.58-14.7)	12.9 (8.56-17.9)	14.6 (9.43-20.6)
7-day	4.17 (3.46-4.98)	4.96 (4.11-5.92)	6.23 (5.14-7.47)	7.29 (5.98-8.78)	8.75 (6.91-11.0)	9.83 (7.59-12.6)	11.0 (8.21-14.6)	12.4 (8.62-16.6)	14.5 (9.63-20.0)	16.2 (10.5-22.8)
10-day	4.90 (4.08-5.83)	5.72 (4.78-6.81)	7.06 (5.84-8.42)	8.16 (6.72-9.80)	9.69 (7.67-12.1)	10.8 (8.37-13.8)	12.0 (8.98-15.8)	13.4 (9.39-17.9)	15.5 (10.4-21.3)	17.2 (11.2-24.1)
20-day	7.16 (6.00-8.45)	8.04 (6.73-9.50)	9.48 (7.90-11.2)	10.7 (8.84-12.7)	12.3 (9.80-15.2)	13.6 (10.5-17.0)	14.9 (11.1-19.2)	16.3 (11.4-21.5)	18.2 (12.2-24.9)	19.8 (12.9-27.5)
30-day	9.02 (7.59-10.6)	9.95 (8.36-11.7)	11.5 (9.61-13.6)	12.7 (10.6-15.1)	14.5 (11.6-17.7)	15.8 (12.3-19.7)	17.2 (12.8-22.0)	18.6 (13.1-24.4)	20.4 (13.7-27.7)	21.8 (14.2-30.2)
45-day	11.3 (9.55-13.2)	12.3 (10.4-14.4)	14.0 (11.7-16.4)	15.3 (12.8-18.1)	17.2 (13.8-20.9)	18.7 (14.5-23.1)	20.1 (14.9-25.5)	21.5 (15.2-28.1)	23.2 (15.8-31.3)	24.4 (15.9-33.7)
60-day	13.2 (11.2-15.4)	14.3 (12.1-16.7)	16.0 (13.5-18.8)	17.5 (14.8-20.6)	19.5 (15.6-23.6)	21.1 (16.4-25.9)	22.6 (16.8-28.4)	24.0 (17.0-31.3)	25.6 (17.3-34.5)	26.7 (17.4-36.7)

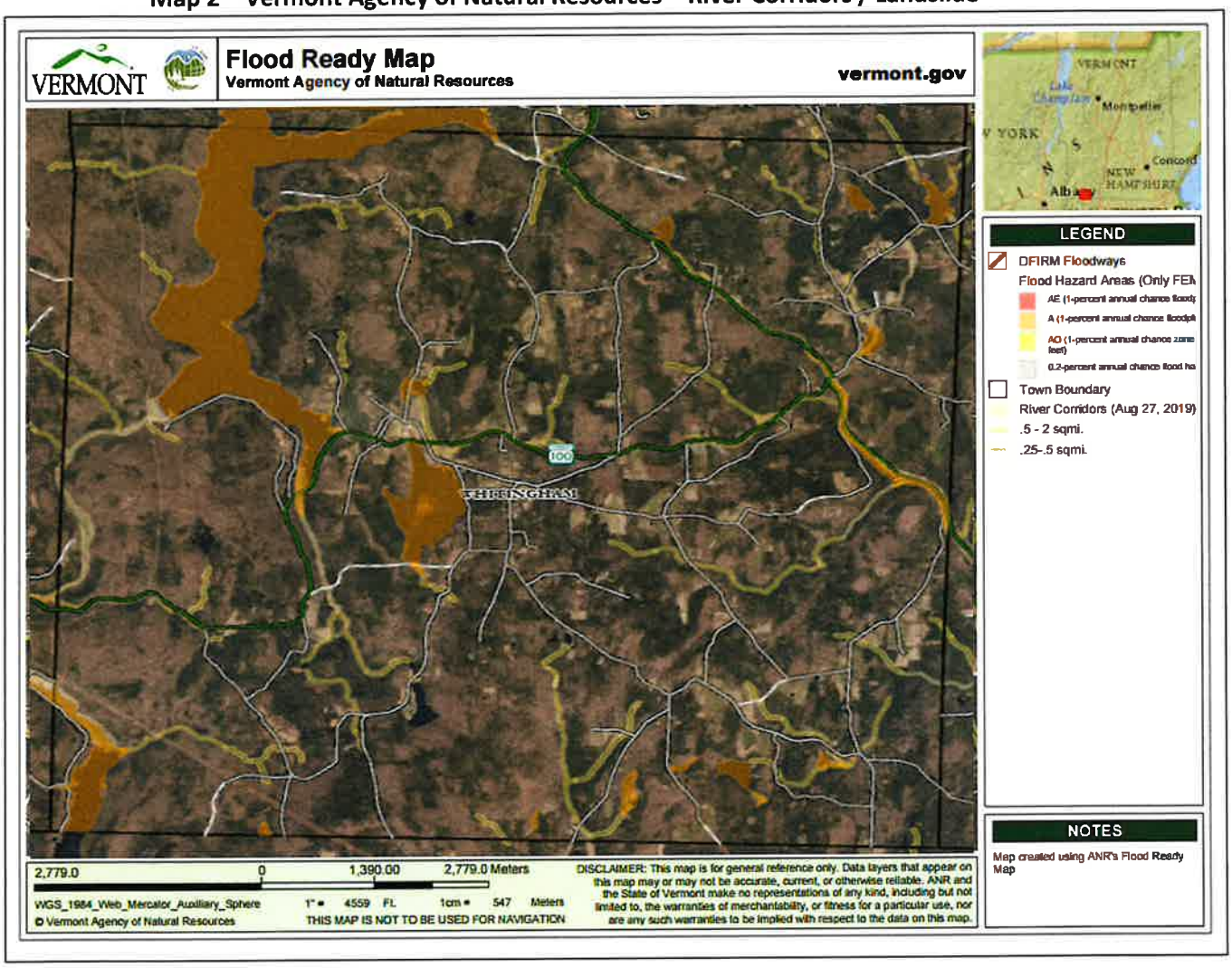
Geographic Areas of the Hazard

The Flood Insurance Rate Maps (FIRM) Special Flood Hazard Areas (SFHA) illustrate the floodplain and potential inundation by the 1% chance flood (100-year flood). Potential Fluvial erosion impact areas are mapped using the Agency of Natural Resources' River Corridor and the Vermont Floodready database.

Map 1 – FEMA FIRM Panels: 50025C0445E



Map 2 – Vermont Agency of Natural Resources – River Corridors / Landslide



In additional to the FIRM and VANR Maps, the town has noted fluvial erosion and flooding occurring in the following locations:

- Holdbrook Road (fluvial erosion and landslide)
- Fowler Road (fluvial erosion)
- Burrington Hill Road (fluvial erosion)
- Jacksonville Village (flooding and fluvial erosion)

History

See appendix C.

Probability of Future Events
According to the 2018 National Climate Assessment, significant trends in average precipitation have been detected. The Northeast region of the United States has seen an 8% increase in [3]precipitation totals since 1991. Due to greenhouse gas emissions, the US, specifically the Northeast region, is expected to see higher annual precipitation in the winter and spring and will also see heavier rainfall events. In Vermont, average annual precipitation has risen 0.7" per decade since 1895 and 1.5" per decade since 1960[4]. The projected increase in frequency and magnitude of precipitation will potentially lead to more frequent and more severe inundation flooding and fluvial erosion.

Town Vulnerability
The entire town of Whitingham is susceptible to the impacts caused by ice jams, fluvial erosion and inundation flooding. The people, built environment, natural environment, and the economy are vulnerable to the impacts. Whitingham regulates development in the SFHA and plans to adopt river corridor protections, therefore change in development and land use is not expected to increase impacts of inundation flooding and fluvial erosion on current or future assets. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: Fluvial erosion and flooding events can cause injuries or fatalities to people who do not evacuate in time. Delayed evacuation can be caused by no-noticed events, or by individuals who are hesitant to leave their houses. The elderly, the homeless, residents with special needs and those without proper transportation may potentially be impacted more than other residents.

Built environment: Fluvial erosion and flooding events can cause damage to town and private property, including roads, culverts, driveways, bridges, wells, sewage facilities/septic systems, and buildings.

Natural environment: Fluvial erosion and flooding events can cause damage to the environment and fragile ecosystems. Vulnerabilities and impacts include algae blooms (harmful to the environment, and toxic to animals/people), transportation of invasive species, soil and bank erosion, and pollution.

Economy: Fluvial erosion and flooding events can cause major economic impacts to the town. Impacts include disruption or closure of impacted businesses, homelessness due to house damage, and recovery costs, including employee overtime, time and equipment spent on the repairs.

There are approximately 36 buildings within FEMA-designated Special Flood Hazard Areas (SFHAs). There are 55 structures that lie in the River Corridor. Some of these structures may lie in both SFHA and River Corridor. The affected structures are clustered in the Villages of Whitingham and Jacksonville. Outside of the villages, there are two affected structures on Lake Sadawga and several along Route 112 south of Jacksonville. Outside of this, there are no structures in Whitingham that are in either the River Corridor or the Floodplain. Vulnerabilities outside of the villages, to flooding, are primarily roads and other associated infrastructure.

[3] https://nca2014.globalchange.gov/report/our-changing-climate/precipitation-change
[4] https://statesummaries.ncics.org/chapter/vt/

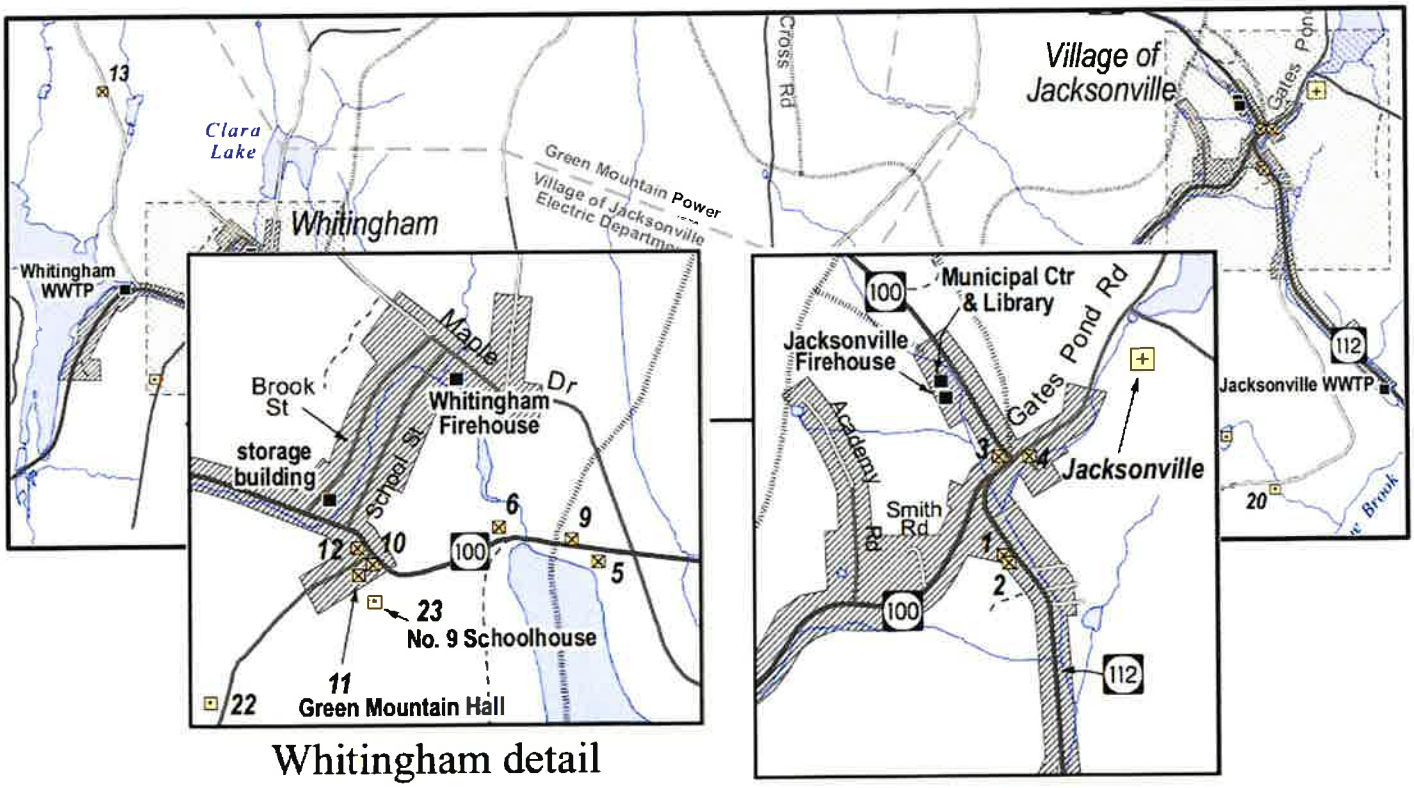
Overall, there isn't a lot of development in the floodplain, and it is concentrated where it exists. There was extensive flooding in the Villages during Tropical Storm Irene. There are a considerable number of structures in the river corridor. The affected structures in the Village of Whitingham are all in the River Corridor. The affected structures in Jacksonville are in either or both the river corridor or the SFHA.

Consolidated Communications has a Tier II facility in Jacksonville Village in the FEMA SFHA. The Harriman Switchyard is a Tier II facility and is also in the FEMA SFHA. The Whitingham Bulk Facility on School Street in Whitingham Village is in the River Corridor. The Bulk Facility is a Tier II reporter because of the amount of fuel oil that they have on-site. Tier II reports were not submitted to the Local Emergency Planning Committee for 2017 filing, for the other two facilities.

Properties within SFHAs, that have a mortgage, are required to purchase flood insurance. Approximately 8% of the buildings in the SFHA have flood insurance in force. Whitingham's participation in the National Flood Insurance Program (NFIP) gives residents access to discount flood insurance through the National Flood Insurance Program. Flood insurance can still be purchased privately; however, it is more expensive. Development in SFHAs must meet additional construction standards as outlined in Whitingham's floodplain regulations, which is part of their zoning ordinance.

Vulnerable Community Assets in Whitingham

There are several vulnerably located structures in Whitingham. The Municipal Center, the Library, the Jacksonville Firehouse, and the Jacksonville Sewer Plant are all in the FEMA SFHA and the River Corridor. The Whitingham Village Firehouse and Whitingham Sewer Plant are in the River Corridor. The below maps show where community facilities are located in Whitingham.



Whitingham detail

Jacksonville detail

Repetitive Loss:
FEMA, through the National Flood Insurance Program (NFIP), considers any insurable building for which two or more claims of more than $1,000 were paid by NFIP within any rolling ten-year period since 1978 to be a Repetitive Loss (RL) property.[5] According to FEMA, "the Privacy Act of 1974, 5 U.S.C. requires that FEMA not share personally identifiable information (PII) or information that could be used to infer PII without a data sharing agreement with the data recipient. Aggregated, community-level data can often be shared without an Information Sharing Access Agreement (ISAA). However, due to Whitingham's small number of RL properties, the Town's RL total could be used to infer property addresses. Therefore, for FEMA Region 1 to provide that information, the community would need to sign an ISAA with FEMA and add Threat Owl LLC as a third-party to the agreement."

The Whitingham Zoning Regulations state "Any modification, alteration, reconstruction, or improvement of any kind that meets the definition of "Repetitive Loss" shall be undertaken only in full compliance with the provisions of this bylaw." Additionally, the bylaws state, "In the case of existing structures, prior to the issuance of any Development/Permit, the ZA shall review the history of repairs to the subject building, so that any Repetitive Loss issues can be addressed before the permit is issued".

Participation in and compliance with the National Flood Insurance Program (NFIP)
The National Flood Insurance Program (NFIP) is a voluntary program organized by FEMA that includes participation from 20,000 communities nationwide. Combined with floodplain mapping and floodplain management at the municipal level, the NFIP participation makes affordable flood insurance available to all homeowners, renters, and businesses, regardless of whether they are located in a floodplain.

The NFIP was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that: 1) require any new residential construction within the 100-year floodplain to have the lowest floor, including the basement, elevated above the 100-year flood elevation; 2) allow non-residential structures to be elevated or dry flood proofed (the flood proofing must be certified by a registered professional engineer or architect); 3) require anchoring of manufactured homes in flood prone areas. The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed.

In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the purchase of flood insurance as a condition of any federally regulated, supervised or insured loan on any construction or building within the 100-year floodplain. In 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act to reduce subsidies for structures built before the NFIP was instituted (called pre-FIRM structures). Over 50 percent of Vermont's NFIP policies are pre-FIRM, which means that flood insurance premiums for many will increase over the ensuing years.

While the NFIP floodplain management criteria are administered by states and communities through their floodplain management regulations, FEMA's role is to provide technical assistance and to monitor communities for compliance with the minimum NFIP criteria. Whitingham joined

[5] https://www.fema.gov/flood-insurance

the NFIP on September 18, 1985, and is a member in good standing (CID 500141). The latest floodplain ordinance was adopted on November 19, 2014, and is in the zoning ordinance. The latest Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) referred to in the development of this plan have an effective date of September 28, 2007.

According to FEMA, when structures inside the Special Flood Hazard Area (SFHA) are damaged, National Flood Insurance Program (NFIP) participating communities have a responsibility to assess impacts before repairs can be made, no matter the cause of damage. If the cost to repair is 50% or more of the market value, the structure is considered Substantially Damaged and must be brought into compliance with current local floodplain management standards. Rebuilding to current standards decreases peril to life and property and prevents future disaster suffering.[6]

The Whitingham Bylaws outlines SFHA substantial damage and substantial improvement requirements for the town:

SUBSTANTIAL DAMAGE: means damage of any origin sustained by a structure whereby the cost of restoring the structure to its previously damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT: means any reconstruction, rehabilitation, addition, or other improvement of a structure, of which the cost equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either: (a) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specification which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or (b) Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure".

A nonconforming structure that is substantially damaged or destroyed may be reconstructed in place only in circumstances when the structure cannot be relocated to a less hazardous location on the parcel. The lowest floor of the reconstructed residential structure must be rebuilt with the lowest floor elevated to one foot or more above the base flood elevation, and a non-residential structure must be floodproofed according to Section 7.9.1(d) of this Bylaw, and the structure must otherwise comply with all requirements of the National Flood Insurance Program and this bylaw.

The town Zoning Administrator is appointed as the Floodplain Administrator to administer and enforce the town's bylaw. The Zoning Administrator enforces NFIP compliance through permit review requirements in its Flood Hazard Area regulations. Whitingham's regulations outline detailed minimum standards for development in flood hazard areas. The regulations also require administering Substantial Improvement and Substantial Damage (SI/SD) requirements.

- SUBSTANTIAL DAMAGE: means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.
- SUBSTANTIAL IMPROVEMENT: means any reconstruction, rehabilitation, addition, or other improvement of a structure, of which the cost equals or exceeds 50 percent of the

[6] https://www.fema.gov/fact-sheet/substantial-damage-quick-guide

market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either: (a) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specification which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or (b) Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure".

Wind

Description and Extent

High wind events can be the result of a wind storm, thunderstorm, hurricane/tropical storm, and/or a tornado. A tornado is a violently rotating column of air extending from a thunderstorm. There are numerous scales to measure wind speeds and their anticipated effect on the environment.

The Beaufort Wind Scale – measures wind speeds and anticipated damage (table 8)[7] Whitingham may experience wind event intensities anywhere on the Beaufort Wind Scale.

Table 8 – Beaufort Wind Scale

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-19 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	High waves (23-32 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (29-41 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (37-52 ft) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

Saffir-Simpson Hurricane Wind Scale – measures hurricane wind speeds and anticipated damage (table 9)[8]. It is reasonably anticipated that Whitingham will not experience a greater than Category 1 Hurricane on the Saffir-Simpson Scale.

Table 9 – Saffir-Simpson Hurricane Wind Scale

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

[7] http://www.spc.noaa.gov/faq/tornado/beaufort.html

[8] https://www.nhc.noaa.gov/aboutsshws.php

Enhanced Fujita Scale – measures tornado wind speeds (table 10)[9]. While very unlikely, Whitingham could experience a tornado falling anywhere on the Enhanced Fujita Scale.

Table 10 – Enhanced Fujita Scale

EF SCALE	
EF Rating	**3 Second Gust (mph)**
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Geographic Areas of the Hazard
Wind events have impacted the town of Whitingham town wide. Unlike flooding and fluvial erosion, which typically follow bodies of water, wind events can occur and have occurred throughout the town.

History
See Appendix D.

Probability of Future Events
Due to climate change, the town of Whitingham can anticipate future wind causing events. According to NOAA, there will be an increase in future hurricane seasons.[10] According to the NASA Global Climate Change, climate change should increase convective available potential energy (CAPE), which is a factor that fuels thunderstorm formations[11]. While it is difficult for scientists to precisely predict the trend of future wind causing events, climate change is creating a more favorable environment for these storms to develop.

Town Vulnerability
The entire town of Whitingham is susceptible to the impacts caused by wind events. The people, built environment, natural environment, and the economy are vulnerable to the impacts. No changes to asset impacts due to wind events as a result of development or land use changes could be identified. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: Wind events can cause injuries or fatalities to people who do not shelter-in-place in

[9] https://www.weather.gov/oun/efscale
[10] https://www.noaa.gov/news-release/noaa-forecasters-increase-atlantic-hurricane-season-prediction-to-above-normal
[11] https://climate.nasa.gov/news/897/severe-thunderstorms-and-climate-change/

time, or who do not have adequate shelter. Delayed sheltering-in-place can be caused by no-noticed events, or by individuals who do not heed the warning. The elderly, the homeless, residents with special needs and those without proper transportation may potentially be impacted more than other residents.

Built environment: Wind events can cause damage to town and private property, including buildings (windows and roofs), downed road signs, utility poles and power lines and overturned vehicles.

Natural environment: Wind events can cause damage to the environment with downed trees, and uprooted trees and plants.

Economy: Wind events can cause major economic impacts to the town. Impacts include disruption or closure of impacted businesses, homelessness due to house damage, and recovery costs, including employee overtime, time and equipment spent on the repairs.

Winter Storm (Snow, Ice, Cold and Hail)

Description and Extent

According to NOAA, A winter storm is a combination of heavy snow, blowing snow and/or dangerous wind chills. A winter storm is life-threatening. Most precipitation that forms in wintertime clouds starts out as snow because the top layer of the storm is usually cold enough to create snowflakes. Snowflakes are just collections of ice crystals that cling to each other as they fall toward the ground. Precipitation continues to fall as snow when the temperature remains at or below 0 degrees Celsius from the cloud base to the ground. Additionally, winter weather may bring ice, hail and frigid cold weather. Ice storms are characterized by ice accretion from freezing rain, which can weigh down trees and power lines, causing outages. Hail is a form of precipitation composed of spherical lumps of ice. Known as hailstones, these ice balls typically range from 5-50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms. Whitingham may see any range of snow, ice, or hail accumulation and cold temperatures.

- Snow Flurries. Light snow falling for short durations. No accumulation or light dusting is all that is expected.
- Snow Showers. Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- Snow Squalls. Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls are best known in the Great Lakes Region.
- Blowing Snow. Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.
- Blizzards. Winds over 35mph with snow and blowing snow, reducing visibility to 1/4 mile or less for at least 3 hours.[12]

The National Weather Service may issue the following watches, warnings or advisories.

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

Additionally, NOAA uses the "Potential Winter Storms Impact" prediction tool (table 12)[13] to indicate the level of winter event and severity.

[12] https://www.nssl.noaa.gov/education/svrwx101/winter/types/

[13] http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php

Table 12 – NOAA Potential Winter Storm Impacts Prediction Tool

Potential Winter Storm Impacts	
	Winter Weather Area **Expect Winter Weather.** • Winter driving conditions. **Drive carefully.**
	Minor Impacts **Expect a few inconveniences to daily life.** • Winter driving conditions. **Use caution while driving.**
	Moderate Impacts **Expect disruptions to daily life.** • Hazardous driving conditions. **Use extra caution while driving.** • Closures and disruptions to infrastructure may occur.
	Major Impacts **Expect considerable disruptions to daily life.** • Dangerous or impossible driving conditions. **Avoid travel if possible.** • Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts **Expect substantial disruptions to daily life.** • Extremely dangerous or impossible driving conditions. **Travel is not advised.** • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

According to FEMA, the ice storm risk index for Whitingham/Windham County is relatively high (86.9 score). The estimated annual loss for an ice storm in Windham County is approximately $439,462. During a winter weather storm on 15 March 2023, communities throughout Windham County were without power for one to two days. During the same storm, the community saw over 20 inches of snow. Whitingham snow totals and winter weather conditions could fall anywhere on the WSSI scale during the winter months.

Geographic Areas of the Hazard

Winter weather events have impacted the town of Whitingham town wide. Unlike flooding and fluvial erosion, which typically follow bodies of water, winter weather events can occur and have occurred throughout the town.

History

See Appendix E.

Probability of Future Events

Due to climate change, the town of Whitingham can anticipate winter weather events, including snow, ice, cold weather and hail events. According to NOAA, the frequency of extreme snowstorms in the eastern two-thirds of the contiguous United States has increased over the past century. Approximately twice as many extreme U.S. snowstorms occurred in the latter half of the 20th century than the first. In addition, studies have shown that natural variability associated with the presence of El Niño conditions has a strong influence on the incidence of severe snowstorms in the eastern United States.[14] While it is difficult for scientists to precisely predict the trend of future snow, ice, cold and hail events, climate change is creating a more favorable environment for these storms to develop.

[14] https://www.ncei.noaa.gov/news/climate-change-and-extreme-snow-us

Town Vulnerability
The entire town of Whitingham is susceptible to the impacts caused by winter weather events. The people, built environment, natural environment, and the economy are vulnerable to the impacts. No changes to asset impacts due to snow, ice, cold and hail events as a result of development or land use changes could be identified. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: Winter weather events can cause injuries or fatalities to people who do not shelter-in-place, or who do not have adequate shelter. Delayed sheltering-in-place can be caused by no-noticed events, or by individuals who do not heed the warning. The elderly, the homeless, residents with special needs and those without proper transportation may potentially be impacted more than other residents.

Built environment: Winter weather events can cause damage to town and private property, including buildings (roof collapse), blocked egress routes, blocked evacuation routes, frozen pipes, and downed powerlines.

Natural environment: Winter weather events can cause damage to the environment with downed trees.

Economy: Winter weather events can cause economic impacts to the town. Impacts include disruption or closure of impacted businesses, and recovery costs, including employee overtime, time and equipment spent on the repairs.

Wildfire

Description and Extent

According to the Federal Emergency Management Agency (FEMA), a wildfire is an unplanned, unwanted fire burning in a natural area, such as a forest, grassland, or prairie. Wildfires can start from natural causes, such as lightning, but most are caused by humans, either accidentally or intentionally. Wildfires can damage natural resources, destroy homes, and threaten human lives and safety. There are four categories of wildfires that can occur throughout the U.S.

- **Wildfires:** Fueled by natural vegetation; typically occur in national forests and parks, where federal agencies are responsible for fire management and suppression.
- **Interface or Intermix Fires:** Urban wildfires in which vegetation and the built environment provide fuel.
- **Firestorms:** Events of such an extreme intensity that effective suppression is virtually impossible; occur during extreme weather and generally burn until conditions change or the available fuel is exhausted.
- **Prescribed Fires and Prescribed Natural Fires:** Fires that are intentionally set or selected natural fires that are allowed to burn for beneficial purposes. [15]

The National Weather Service (NWS) issues a "Red Flag Warning" when conditions are conducive for wildfires. A Red Flag Warning means warm temperatures, very low humidities, and stronger winds are expected to combine to produce an increased risk of fire danger.

- If you are allowed to burn in your area, all burn barrels must be covered with a weighted metal cover, with holes no larger than 3/4 of an inch.
- Do not throw cigarettes or matches out of a moving vehicle. They may ignite dry grass on the side of the road and become a wildfire.
- Extinguish all outdoor fires properly. Drown fires with plenty of water and stir to make sure everything is cold to the touch. Dunk charcoal in water until cold. Do not throw live charcoal on the ground and leave it.
- Never leave a fire unattended. Sparks or embers can blow into leaves or grass, ignite a fire, and quickly spread.[16]

In 2019, Windham County experienced one wildfire that resulted in .2 acres being burned. In 2023, Windham County experienced four wildfires that resulted in 2.28 acres being burned. On Monday, 4 May, there was a three-acre brush fire on Fowler Road, off Route 100 in Whitingham.

Geographic Areas of the Hazard

Unlike flooding and fluvial erosion, which typically follow bodies of water, wildfire events can occur throughout the town. Whitingham is a mix of farmland and forests, which makes the community susceptible to wildfires. Due to the farmland and forests, the Town of Whitingham has a potential for rapid wildfire spread.

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[15] https://community.fema.gov/ProtectiveActions/s/article/Wildfire-What

[16] https://www.weather.gov/mqt/redflagtips

History
Although Whitingham has a low historical occurrence of wildfire, the threat is increasing due to climate change. There has not been a major wildfire in Whitingham history, or in Vermont history in the past 50 years.

- **Wildfire Smoke, July 5 – 7, 2002:** Smoke, from many forest fires across the Nemiscau region of northern Quebec, became trapped under a subsidence inversion, and was transported south across southern Vermont from the evening hours of July 5, to the late evening of July 7. The forest fires were sparked by exceptionally hot and dry weather over that part of Canada followed by an unusual amount of thunderstorm activity, resulting in many lightning strikes. The circulation between high pressure over Hudsons Bay and a low pressure off the Canadian Maritimes transported the smoke southward. The smoke obscured the sky, and even reduced surface visibilities to as low as one mile, especially on the early morning of July 7. Advisories were issued warning people with respiratory problems to remain indoors and all individuals to curb outside activity. No major problems were reported to the National Weather Service as a result of this smoke. By late Sunday, July 7, the low pressure weakened and moved further east, allowing the wind to back into more of a westerly direction, finally dissipating the smoke.[17]
- **Wildfire Air Quality Alert, June 5 – 8, 2023:** The entire state experienced poor air quality, especially in the southwestern corner of the state from wildfires in Canada.

Probability of Future Events
Although wildfires are uncommon in Whitingham and in Vermont, the Planning Committee acknowledges climate change may have the potential to increase wildfire occurrence. According to NOAA, Climate change, including increased heat, extended drought, and a thirsty atmosphere, has been a key driver in increasing the risk and extent of wildfires in the western United States during the last two decades. Wildfires require the alignment of a number of factors, including temperature, humidity, and the lack of moisture in fuels, such as trees, shrubs, grasses, and forest debris. All these factors have strong direct or indirect ties to climate variability and climate change.[18] Knowing this, the Planning Committee ranked wildfire as a high threat to the community.

Town Vulnerability
The entire town of Whitingham is susceptible to the impacts caused by wildfire events. The people, built environment, natural environment, and the economy are vulnerable to the impacts. Development within the wildland-urban interface or intermix zones, which much of Whitingham is within, could increase assets vulnerable to wildfire, however no known development of changes in zoning to incentive development in these areas is anticipated. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: Wildfire events can cause injuries or fatalities to people who do not evacuate in time. Delayed evacuation can be caused by no-noticed events, or by individuals who do not heed the warning. The elderly, the homeless, residents with special needs and those without proper transportation may potentially be impacted more than other residents.

[17] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=5309250
[18] https://www.noaa.gov/noaa-wildfire/wildfire-climate-connection

Built environment: Wildfire events can cause damage to town and private property, including buildings (burn damage), blocked egress routes, blocked evacuation routes, and loss of electrical power.

Natural environment: Wildfire events can cause damage to the environment with acres of forests and farmlands being burned.

Economy: Wildfire events can cause economic impacts to the town. Impacts include disruption or closure of impacted businesses, and recovery costs, including employee overtime, time and equipment spent on the repairs.

Heat

Description and Extent

According to the Centers for Disease Control, "Extreme heat is defined as summertime temperatures that are much hotter and/or humid than average. Because some places are hotter than others, this depends on what's considered average for a particular location at that time of year. Humid and muggy conditions can make it seem hotter than it really is". The National Weather Service may issue the following advisories:

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

Whitingham may experience any heat advisory level, however, given historical data, it's likely that Whitingham may see Heat Advisory – Take Action more often than an Excessive Heat Watch or Excessive Heat Warning – Take Action.

Geographic Areas of the Hazard

Unlike flooding and fluvial erosion, which typically follow bodies of water, extreme heat events can occur throughout the town.

History

Although Whitingham and the State of Vermont has a low historical occurrence of extreme heat events, the threat is increasing due to climate change. Per the State Hazard Mitigation Plan, the following extreme heat events had occurred:

- **August 1-2, 2006:** A heat ridge moved into Vermont during the early morning August 1. Temperatures soared into the 90s but significantly more important were dewpoints that reached the middle to upper 70s to produce excessive heat index values of 100°F to 105°F, some of the highest values in nearly a decade.
- **July 21, 2011:** Temperatures across much of southern Vermont warmed into 90s with dew points in the 70s, combined with the hot temperatures and resulted in heat indices of 100°F to 104°F. This was the 2nd day of a 3 to 4-day heat wave across a large portion of Vermont with heat index values of 100°F to 108°F across the Champlain and Connecticut valleys as well as some interior valleys. One death is attributed to this event in Windsor County.
- **March 17, 2012:** Winter of 2011-12 had temperatures that averaged 4-5°F above normal and snowfall 40-60% of normal. This combination accounted for snow pack across the region to be largely below normal or even non-existent by mid-March. In Vermont, temperatures climbed into the 70s March 18 and low-80s March 19-22. Record heat was recorded across all of Vermont with maximum temperatures 30-40°F above normal and some daily records being broken by 10°F or more. This event caused an estimated

reduction of 30% of maple sugar production, resulting in an estimated impact of nearly $10 million. In addition, there was significant loss of ski industry revenue due to a 25-50% reduction in snow loading.

- **July 1, 2018:** High temperatures affected zones in all 14 of Vermont's counties through Independence Day. Temperatures reached the mid-90s, and heat indices were recorded within the range of 95 -110 degrees. The heat wave continued for 6 consecutive days, and Burlington, VT saw the warmest 5 day stretch since 1892. It is important to note that the all-time minimum temperature also broke a previous record of 78 degrees, on July 2nd, 2018 at 80 degrees. Four deaths were attributed to this event, one recorded in Washington County and three in Chittenden County, all related to excessive indoor residential temperatures. Nearly 100 heat-related emergency department visits occurred state-wide during this heat wave, and more than 10 percent of Emergency Medical Service calls on July 1st were heat related.
- **June 18, 2020:** Areas of Vermont and New York experienced the 2nd longest heatwave duration with temperatures in the 90s for six days straight in northwestern Vermont. Burlington recorded the highest temperature in its history on June 22nd and 23rd with a reading of 96 degrees. Zones in 8/14 of Vermont's counties recorded high temperatures during this period of time. One death in Orleans County was associated with this heat wave.

Probability of Future Events

Although extreme heat events are relatively uncommon in Whitingham and in Vermont, the Planning Committee acknowledges climate change may have the potential to increase extreme heat occurrences. The average annual temperature in Vermont and across the United States continues to rise. The rise in ground surface temperatures and greenhouse gases will continue to future extreme heat events.

Town Vulnerability

The entire town of Whitingham is susceptible to the impacts caused by extreme heat events. The people, built environment, natural environment, and the economy are vulnerable to the impacts. No changes to asset impacts due to heat events as a result of development or land use changes could be identified. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: Heat events can cause injuries or fatalities to people who do not head advisories. People, especially those will disabilities, access and functional needs, may be more susceptible to heat related injuries, such as heat stroke.

Built environment: Heat events can cause a strain on the town's electrical system, leading to brown or blackout events. Extreme heat can also cause thermal expansion of concrete and steel and swelling on connection bridges.

Natural environment: Heat events can increase the occurrences of droughts and wildfires.

Economy: Wildfire events can cause economic impacts to the town. Impacts include disruption or closure of impacted businesses and the costs to operate a cooling shelter.

Infectious Disease Outbreak

Description and Extent

The Vermont Department of Health defines an infectious disease as one that is caused by micro-organisms, such as bacteria, viruses or parasites. A vector-borne disease is an infectious disease that is transmitted to humans by blood-feeding arthropods, including ticks, mosquitoes and fleas, or in some cases by mammals (e.g. rabies).

The Centers for Disease Control and Prevention (CDC) describes an epidemic as an unexpected increase in the number of disease cases in a specific geographical area.

The World Health Organization (WHO) declares a pandemic when a disease's growth is exponential.

A disease outbreak is endemic when it is consistently present but limited to a particular region.

Geographic Areas of the Hazard

Unlike flooding and fluvial erosion, which typically follow bodies of water, infectious disease outbreak events can occur throughout the town.

History

Per the State Hazard Mitigation Plan, the following disease outbreak events have occurred:

- 1918, 1957, 1968 – Pandemic Influenza
- 2009 – H1N1 strain
- 2015 – Sika virus
- 2020 – COVID-19

Probability of Future Events

Given increasing trends for global travel, and evacuees from natural disaster, exacerbated by climate change, and war torn countries, the probability of future disease outbreak events is increasing.

Town Vulnerability

The entire town of Whitingham is susceptible to the impacts caused by disease outbreak events. The people, built environment, natural environment, and the economy are vulnerable to the impacts. No changes to asset impacts infectious disease outbreak events as a result of development or land use changes could be identified. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: People with disabilities, access and functional needs may be most vulnerable to disease outbreak events. A disease outbreak event can impact any person.

Built environment: A disease outbreak can cause a strain on local health care facilities. Additionally, facilities may need to be modified to respond to the crisis (e.g., school turned into a triage center).

Natural environment: Infectious disease outbreak events can originate from local environments (e.g., farms, lakes, etc.) and mitigative measures may need to be taken to prevent future spread (e.g., treatment of a body of water).

Economy: Infectious disease outbreak events can cause economic impacts to the town. Impacts include disruption or closure of impacted businesses, and costs to operate immunization clinics.

Invasive Species

Description and Extent

The National Invasive Species Council defines an invasive species as one that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can overwhelm native species and their habitats, forcing the native species out. The spread of invasive species is primarily caused by human activity.

Geographic Areas of the Hazard

Unlike flooding and fluvial erosion, which typically follow bodies of water, invasive species events can occur throughout the town. However, some areas are more prone to invasive species events than others: Heavy travel corridors like I-91, Route 100 and Route 112, and local bodies of water.

History

Whitingham has seen the following invasive species outbreak events:

- Black swallowwort
- Slender cotton weed
- Milfoil
- Beech bark disease
- Japanese knotweed
- Purple loosestrife
- Phragmites
- Oriental bittersweet
- Honeysuckle
- Japanese barberry
- Yellow flag iris
- Common and glossy buckthorn
- Garlic mustard
- Knapweed
- Yellow rattle

Probability of Future Events

Given increasing trends for travel and human activity, the probability of future invasive species events is increasing. Three non-native insects which currently threaten Vermont are the emerald ash borer (EAB), Asian longhorned beetle (ALB) and hemlock wooly adelgid (HWA).

Town Vulnerability

The entire town of Whitingham is susceptible to the impacts caused by invasive species events. The people, built environment, natural environment, and the economy are vulnerable to the impacts.

People: People may be infected or made ill by invasive species events (e.g., swimming in an active milfoil bloom).

Built environment: Invasive species may cause overgrowth or damage to various built environments, such as, powerlines and culverts. The damage can be minor to catastrophic.

Natural environment: Invasive species can wipe out an entire local ecosystem, causing complete devastation to the local natural environment. Bodies of water may become inhabitable, and forests can see complete devastation.

Economy: Invasive species can impact the tourism industry with the closure of local bodies of waters and outdoor recreation trails.

Drought

Description and Extent

According to NOAA NWS, a "drought is a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizable area". Types of drought, per the Vermont Hazard Mitigation Plan:

- Meteorological: a reduction in rainfall from a normal precipitation pattern in regard to the amount, intensity, or timing of the event as well as changes in the temperature, humidity, and wind patterns. The strict threshold differs for every nation; the United States defines meteorological drought as receiving less than 2.5mm of rainfall in 48 hours. Meteorological drought is the first drought stage detected.
- Agricultural: deficient moisture conditions that cause a lasting effect on crops and non-natural vegetation. It is dependent on rainfall, temperature, topography, evapotranspiration, permeability, and porosity of soils, precipitation effectiveness, and vegetative demand. Agricultural drought begins when the available soil moisture supports the actual evapotranspiration rate at only a fraction of the potential evapotranspiration rate. Hydrological: related to the effects of decreased precipitation on surface or subsurface water supply. It is the last stage of drought and is lagged behind meteorological and agricultural drought because water infiltrates down to the groundwater during the latter portion of the hydrological cycle. Subsurface water supply is the last drought component to return to normal when meteorological conditions and aquifer recharge return.
- Socioeconomic: what happens when the consequences of the drought start to affect the socioeconomic sector. It occurs when the demand for an economic good is greater than the available supply due to weather-related drought. Examples of such goods include water, hydroelectric power, foodgrains, meat, dairy, and much more. Socioeconomic drought affects the associated population both individually and collectively.
- Ecological: defined as "a prolonged and widespread deficit in naturally available water supplies — including changes in natural and managed hydrology — that create multiple stresses across ecosystems."

Table 26: Drought Severity Classification

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures Coming out of drought: some lingering water deficits pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures Streams, reservoirs, or wells low, some water shortages developing or imminent Voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely Water shortages common Water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses Widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses Shortages of water in reservoirs, streams, and wells creating water emergencies

Source: http://droughtmonitor.unl.edu/AboutUSDM/DroughtClassification.aspx

Geographic Areas of the Hazard
A drought event can occur anywhere throughout town, however, it may have a bigger impact on areas with bodies of water.

History
Per the Vermont Hazard Mitigation Plan:
"The droughts in the mid-1960s were the most severe in Vermont. Every county in the State experienced Exceptional Drought (D4) conditions in May of 1965. Since the 1960s Vermont has experienced several less severe periods of drought. There were two declared statewide droughts in June and July 1995. The drought persisted through the summer of 1995, and a third, more severe drought affected Southern Vermont in August of that year. In 2001-2002, Vermont was affected by a Severe Drought (D2), which peaked at over 14% of the State at the D2 level between November and December of 2001 and nearly 100% of the State in at least Moderate Drought (D1). Portions of Vermont were in Severe Drought (D2) from October 2016 through April 2017, peaking at 29.15% of Vermont in October and November 2016 and 80% of the State was in at least Moderate Drought (D1) (Figure 50). Moderate Drought conditions returned in October of 2017 and again in June 2018. From September to November of 2018 the State experienced another Severe Drought. Then from June 2020 to October 2021 much of the State was under Moderate Drought to Abnormally Dry conditions. From September to October of 2020 29.4% of the State was under Severe Drought conditions."

Probability of Future Events
Given the potential impacts of climate change or increased probability of extreme heat events, there is an increased likelihood of future drought events.

Town Vulnerability
The entire town of Whitingham is susceptible to the impacts caused by drought events. The people, built environment, natural environment, and the economy are vulnerable to the impacts. No changes to asset impacts due to drought events as a result of development or land use changes could be identified. Shallow wells may be impacted by drought events, however development or land use does not have a direct impact on that, as shallow wells at any location could be impacted. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: Droughts can cause issues to homeowners wells, leading to compromised drinking water, which could result in health issues.

Built environment: Droughts are not likely to cause any impacts to the built environment, however dried up wells may cause the need to dig a new well or replace well parts.

Natural environment: Droughts can cause minor to catastrophic issues for the natural environment. Local wild plants and crops may be lost during a prolonged drought events. Additionally, a drought can lead to streams and groundwater being depleted, which impacts wild and domesticated animals.

Economy: Droughts can impact the tourism industry, with depleted streams or areas for water activity. Additionally, droughts may impact 'leaf peeping season'.

Earthquake

Description and Extent

According to the USGS, an earthquake occurs when two blocks of the Earth suddenly slip past one another along what is called a fault or fault plane. As the two blocks slide, stored energy is released producing radiating seismic waves that result in an earthquake. The modified Mercalli Intensity Scale can be used to capture earthquake information.

Table 30: Modified Mercalli Intensity (MMI) Scale

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

Source: https://earthquake.usgs.gov/learn/topics/mag_vs_int.php

Geographic Areas of the Hazard

While earthquakes occur on fault lines, the entire town of Whitingham is susceptible to an earthquake.

History

Per the Vermont Hazard Mitigation Plan, since 1900, Vermont has only experienced three earthquakes registering 2.5 or greater of the Richter Scale.

Probability of Future Events

It is not currently possible to predict when or where an earthquake may occur.

Town Vulnerability

The entire town of Whitingham is susceptible to the impacts caused by an earthquake. The people, built environment, natural environment, and the economy are vulnerable to the impacts, although minor. No changes to asset impacts due to earthquake events as a result of

development or land use changes could be identified. Whitingham's population demographics are not expected to change significantly in the next five years, though a slight increase in the average age of the population may increase vulnerabilities of the population.

People: People could become injured or trapped during an earthquake. However, given the situation in Vermont, this is a low possibility.

Built environment: Buildings could become damaged or collapse during an earthquake. However, given the situation in Vermont, this is a low possibility.

Natural environment: An earthquake could trigger secondary hazards, such as landslides, dam failures and flooding. However, given the situation in Vermont, this is a low possibility.

Economy: Earthquakes could result in the closure (temporary or permanent) of local businesses due to damage sustained during the earthquake. However, given the situation in Vermont, this is a low possibility.

Ice Jam

Description and Extent
Riverine back-up when flow is blocked by ice accumulation. Often due to warming temperatures and heavy rain which causes snow to melt rapidly and frozen rivers to swell. There is no data available for ice jam extent.

Geographic Areas of the Hazard
Ice jams typically form near bridges and sharp turns in rivers. Although there is no mapped current or historic ice jams for Whitingham, locals say that sometimes jams will form on the East Branch of the North River just south of Jacksonville along Route 112.

History
There has been occurrences of minor ice jams forming on the North River in the early springtime.

Probability of Future Events
Whitingham can expect to see ice jams forming every early springtime.

Town Vulnerability
Properties along the East Branch of the North River is susceptible to impacts caused by an ice jam. The people, built environment, natural environment, and the economy are vulnerable to the impacts, although minor.

People: Ice jams, which can lead to flooding events, can cause injuries or fatalities to people who do not evacuate in time. Delayed evacuation can be caused by no-noticed events, or by individuals who are hesitant to leave their houses. The elderly, the homeless, residents with special needs and those without proper transportation may potentially be impacted more than other residents.

Built environment: Ice jam events, including flooding, can cause damage to town and private property, including roads, culverts, driveways, bridges, wells, sewage facilities/septic systems, and buildings.

Natural environment: Ice jam events, including flooding, can cause damage to the environment and fragile ecosystems. Vulnerabilities and impacts include soil erosion and sedimentation, water quality issues, habitat destruction and alteration, ecosystem displacement, and long term geomorphological changes.

Economy: Ice jam events, including flooding, can cause major economic impacts to the town. Impacts include disruption or closure of impacted businesses, homelessness due to house damage, and recovery costs, including employee overtime, time and equipment spent on the repairs.

EXISTING AUTHORITIES, POLICES AND PROGRAMS THAT SUPPORT HAZARD MITIGATION

The town of Whitingham is currently engaged in the following on-going hazard mitigation programs, projects and activities. These programs, projects and activities have been reviewed and updated since the 2018 Hazard Mitigation Plan to address any changes that have occurred.

Capability	Mitigation Support	Ability to Expand/Improve
Town Plan	Town Plan was adopted December 5, 2018. The Plan identifies: - Land use planning (areas of special concern: Critical Corridor Areas), - Natural resources protection (Policy examples: Maintain the natural course, condition, or function of watercourses and shore lands except for necessary crossings for adequate bridges or culverts. Maintain undisturbed buffers of native vegetation along streambanks and shorelands. Foster the protection and restoration of river corridors, floodplains, wetlands, and upland forested areas that attenuate and moderate flooding and fluvial erosion. Protect floodplains, river corridors, land adjacent to streams, wetlands, and upland forests through adoption and administration of flood hazard area regulations governing development in designated Special Flood Hazard Areas and River Corridors, in order to reduce the risk of flood damage to infrastructure, improved property, people, and the environment. Avoid new development in identified flood hazard, fluvial erosion, and river corridor protection areas. If new development is to be built in such areas, it should not exacerbate flooding and fluvial erosion. Encourage the protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion. Encourage flood emergency preparedness and response planning) - Energy policies (Policy example: Promote the use of alternative forms of energy that respect the built and natural environment.) - Flood hazard resilience plan	The Town Plan is reviewed/updated every five years, as required by statute. The town may expand or improve on any section it deems necessary, or that is required by changes in state statue.
Local Emergency Operations Plan	Municipal procedures for emergency response. Updated annually.	Continuously revise the plan with new best practices and emerging threats
Road Standards	Design and construction standards for roads and drainage systems.	The town may expand or improve on any section it deems

		necessary, or that is required by changes in state statue.
Zoning Bylaws	Updated November 10, 2021. Whitingham Zoning Regulations are designed to direct the future growth of the Town of Whitingham. Identifies NFIP program requirements, establishment of zoning districts, general regulations, and flood hazard regulations.	The town may expand or improve on any section it deems necessary, or that is required by changes in state statue.
Flood Hazard Area Regulations	Regulates development in FEMA identified SFHAs. Updated November 10, 2021.	The town may expand or improve on any section it deems necessary, or that is required by changes in state statue.
National Flood Insurance Program (NFIP)	Provides the ability for residents to acquire flood insurance. The Town participates and complies with the NFIP. The Town Plan identifies SFHAs and designates those identified areas as areas to be protected, including floodplains, river corridors, and land adjacent to streams, wetlands, and upland forests, to reduce the risk of flood damage to infrastructure and improved property.	The town can provide additional educational information to the public.
Maintenance Programs	Bridge & Culvert Inventory.	The town may expand or improve on any section it deems necessary, or that is required by changes in state statue.
Complete Incident Command System (ICS) basic training	Provides incident command fundamentals to town employees.	Encourage more town employees to take the basic ICS training (ICS 100, 200 and NIMS 700 and 800)
Program/Action—Home Buyouts	Continue to participate in the FEMA home buyout program	The town may expand or improve on any section it deems necessary.
Leaf removal and ditch cleaning	Leaf removal and ditch cleaning are maintenance activities done every spring by the road crew. If ditches are being eroded, the crew may also stone line them.	The town may expand or improve on any section it deems necessary.
Emergency Shelters	The town maintains three emergency shelters; one at the High School, another at the Jacksonville Fire Department, and a day shelter at the Municipal Center.	The town may expand or improve on any section it deems necessary.

MITIGATION STRATEGY

The Town of Whitingham developed a hazard mitigation strategy that focuses on priorities, mitigation capabilities, local resources, short-term and long-term goals and cost implications.

Mitigation Goals

- To reduce long-term impacts, including injury and losses, from the natural hazard of fluvial erosion and inundation flooding.
- To reduce long-term impacts, including injury and losses, from the natural hazard of wind.
- To reduce long-term impacts, including injury and losses, from the natural hazard of snow.
- To reduce long-term impacts, including injury and losses, from the hazard of wildfires

Mitigation Action Ranking

Prioritizing hazard mitigation projects involves a systematic approach that considers numerous factors to identify and address the most pressing risks within a community. Discussions focused on:

- Hazard Assessment: How did the hazard rank compare to other hazards in the community?
- Vulnerability Analysis: How vulnerable is the community to this hazard?
- Stakeholder Input: What are the stakeholders concerned about? Gather input from community members, stakeholders, and local experts. Understanding the concerns and priorities of the community members is crucial for identifying specific projects that align with their needs and expectations.
- Cost-Benefit Analysis: What is the cost-benefit effectiveness of the mitigation action?
- Lifesaving and Life-Sustaining Activities: Will this action focus on lifesaving and life-sustaining activities?
- Critical Infrastructure: Does this action focus on critical infrastructure?
- Equity and Vulnerable Populations: Does this action consider the needs of vulnerable populations?
- Compliance and Regulations: Does this action align with existing regulations and ordinances?
- Long-term Sustainability: Does this action promote long-term sustainability and resilience?
- Funding Availability: Can this action be funded by grants?
- Current Community: Do the actions reflect the changes in the community and changes in priorities?
- Climate Change: Do the actions take into consideration the impacts of climate change?
- Plan Integration: Can these actions be integrated into another planning mechanism?

Specific Criteria included:

Legend			
			Score
Cost*	High	Greater than $100,000	1
	Medium	$25,000 - $100,000	2

Benefit	Low	Less than $25,000	3
	High	Public Safety	3
	Medium	Infrastructure / Functionality	2
	Low	Aesthetics / General Maintenance	1

Hazard Prioritization	High	7 – 9
	Medium	4 – 6
	Low	1 – 3

Cost is considered after grant funding opportunities, which lowers the town cost requirement.

The committee used the discussion points and specific criteria (cost estimates and benefit estimates to determine the prioritization). The committee updated the 2018 action projects and also added new projects. These new projects better reflect the community as it stands today.

2018 Mitigation Action Update

Hazard	Action	Responsible Party	Timeframe	Funding Source	Mitigation or Preparedness	Cost Benefit/	Priority	Status
Invasive Species	Do a town-wide survey and map of Ash trees on public land; this is important to be able to understand the potential impact of EAB infestation, wild/poisonous parsnip and to plan ahead to save and inoculate any trees	Town Tree Warden and trained volunteers; VTInvasives.org and vtcommunityforestry.org	Summer 2019	Local Operating Budget	Mitigation	Low/ High	High	Complete Conducte survey on municipal property only in 2019.
Invasive Species	Educational campaign for private land owners about identifying Ash trees, wild/poisonous parsnip, and EAB infestation	Town Staff using VTInvasives.org developed resources	Start Spring 2019; ongoing	Local Operating Budget (time only)	Mitigation	Low/ High	High	Complete posted or webpage 2019.
All Hazards	Get Whitingham set up with VTAlert	EMD	Complete Spring 2019	Local Operating Budget and VEM assistance	Preparedness	Low/ High	High	Complete Town is signed up and residents are encourag to sign up in 2019.
Fluvial Erosion	Holbrook Road landslide - Stabilizing wall needs to be designed and probably bored into the bank to hold it in place. **Engineering phase**	Road Commissioner is applying for grant; Town would contract with an engineer for the design	Begin 2019-complete by the end of 2020	Better Back Roads grant	Mitigation	High /High	High	Never started. Healed itself.

Fluvial Erosion	Holbrook Road landslide - stabilizing wall needs to be designed and probably bored into the bank to hold it in place. **Building phase**	Road Commissioner is inquiring about grant funding; Contractor would complete work	Depends on if grant awarded; begin 2021 or 2022 and would be complete in one season - entire project would ideally be finished in 2025	Seeking grant funds	Mitigation	Low/ High	High	Never started. Healed itself
Flooding and Invasive Species	Develop and distribute educational material for residents about protecting and enhancing riparian buffers on their property. There are lots of lakeside homes and properties.	Selectboard Office/ ZA/ Health Officer	The first article will appear in the 2019 town newsletter and at least once per year thereafter.	Local Operating Budget	Mitigation	Low/Low	Low	News article developed and poste on webpage 2019.
Invasive Species	Petition VTrans to put up a sign near the state border with Massachusetts about Vermont laws prohibiting transport of firewood over state lines. Invasive tree pests are on the rise in VT.	Selectboard	Letter to be sent fall 2018	State funds for sign	Mitigation	Low/ Medium	Medium	Gig sent a letter, but VTrans denied request

2023 Mitigation Actions

Hazard	Category	Action	Responsible Party	Timeframe	Funding Source	Cost / Benefit	Priority	Status
Fluvial Erosion / Flooding	Structure and Infrastructure	Acquire and demolish a residential property located at 568 VT Route 112 in Jacksonville, VT through the FEMA buyout program.	Selectboard	November 2023 – November 2024	FEMA / VEM	Low/ High	High	Public noticed posted on 9/26/23
Wildfire	Local Plans and Regulations	Develop a wildfire annex in the Emergency Operations Plan. Once complete, conduct community education of wildfire.	Emergency Management Director	January 2024 – January 2025	Local Operating Budget (time only), unless VEM grant funding is available for consultant to develop annex	Low/ High	High	
Snow	Education and Awareness and Local Plans and Regulations	Continue with municipal roof snow shoveling. Develop and publish a snow roof load preparedness and educational sheet.	Emergency Management Director and Public Works Director	December 2024 – December 2025	Local Operating Budget	Low/ Low	Low	On-going
Wind	Structure and Infrastructure Project	Work with the local electric company on identifying and trimming back trees that could fall onto powerlines during a wind event. Identify and trim back trees that could fall onto egress routes, critical infrastructure during a high wind event.	Public Works Director and Fire Chief	On-going	Local Operating Budget	Low/ Medium	Medium	
Fluvial Erosion / Flooding / Wildfire / Snow / Wind	Education and Awareness Programs	Develop and publish a hazard prevention, mitigation and preparedness	Emergency Management Director	November 2023 – January 2024	Local Operating Budget (time only)	Low / Low	Low	Complete – posted on webpage

		educational poster						
Fluvial Erosion / Flooding	Structure and Infrastructure and Natural Systems Protection	New structure to replace the existing Whitingham Municipal Center access structures. in Jacksonville, Vermont, the central village in Whitingham. The intent of this project is to remove two. undersized structures and replace them with a single structure that meets the bankfull channel width of the river. The new structure will be designed with a span and vertical clearance that accommodates the East Branch of the North River through all appropriate flow events in accordance with the recommendations of an existing Scoping Study, River Corridor Plan and Hydraulics Study, and aligning to the VTrans Hydraulics Manual and Vermont stream equilibrium standards for bankfull width. In addition to the replacement access structure, this project	Selectboard	November 2023 – December 2026	Flood Resilient Communities Fund	Low / High	High	Bid awarded 11/15/23

		includes stream channel widening and stabilization of the channel in front of the Municipal Center to improve flood resiliency and reduce the risk of flooding during storm events.						
Fluvial Erosion / Flooding	Structure and Infrastructure Project	The proposed action involves the purchase of a vulnerable structure located on Vermont Route 112 in Whitingham (Village of Jacksonville), Vermont. The property would be purchased using a FEMA Voluntary Transaction Agreement and the town would demolish all structures on the property within 90 days of closing. Demolition would include a lead and asbestos survey and abatement (if necessary), removal of any impervious surfaces (e.g., driveway) and capping of municipal water and sewer lines at least one foot below grade. Post demolition activities would include filling, grading, seeding and mulching the property. Following demolition, the	Selectboard	November 2023 – December 2024	FEMA	Low / High	High	Publicly Noticed, Awaiting FEMA grant award status

		Town would maintain the property, ensuring that it is left as green, open space in perpetuity.						
Fluvial Erosion/Flooding	Structure and Infrastructure Project	The proposed project will address the failure of a retaining wall along the river at the Eames Village Park at the intersection of Gates Pond Road and VT Route 100.	Selectboard	January 2024 – January 2026	FEMA	Low / High	High	Grant for scoping applied for.

PLAN MAINTENANCE PROCESS

Once the plan is approved and adopted, the EMD along with the Selectboard Administrator in Whitingham, along with interested and appointed volunteers and stakeholders, will continue to. to monitor, evaluate, and update the plan throughout the next 5-year cycle. The Plan will be monitored and evaluated at least once a year and following a declared disaster. This plan monitoring will allow town officials and the public to discuss the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects that can help mitigate future hazardous events; e.g., bridge and culvert replacements, road replacements and grading, as well as buying out any repetitive loss structures that may be in the Special Flood Hazard Area, and revise the plan as needed. There will be no changes to the plan, unless deemed necessary by the Town. If so, the post disaster review procedure will be followed.

Plan Monitoring and Evaluation

The plan will be formally reviewed annually at the April Selectboard meeting along with the review of the town's Local Emergency Operations Plan (LEOP). This meeting will allow town officials and the public to discuss the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects that can help mitigate future hazards. There will be no changes to the plan, unless deemed necessary by the Town. If so, the post disaster review procedure will be followed. The town's EMD will be responsible for ensuring the plan is monitored and evaluated on a yearly basis.

Plan Maintenance – 5 Year Update Process

The Hazard Mitigation Plan is dynamic. To ensure that the plan remains current and relevant, it is important that it undergo a major update periodically as required in 44 CFR § 201.6(c)(4)(i). This update process will be thorough and occur every five years. This update includes a thorough evaluation of the plan and incorporates any new requirements that FEMA has for Hazard Mitigation Plans.

1. Approximately 24 months prior to plan expiration, the town's EMD should contact VEM to apply for grant funding to update their LHMP.
2. Once funding is secured and the grant agreement between the Town and the State is in place, the town can issue a request for proposal (RFP) to procure planning services in accordance with the grant agreement. The RFP should be issued approximately 18 months prior to the Plan expiration.
3. Once a consultant is procured, the Plan update can begin with a kick-off meeting including the consultant and local hazard mitigation planning team.
    a. The Whitingham Selectboard may appoint a team to convene a meeting of the hazard mitigation planning committee. The town's Emergency Management Director, or designee, will chair the committee, and other members should include local officials such as Selectboard members, fire chief, zoning administrator, road commissioner, Planning Commission members, health officer, interested stakeholders, etc. The Emergency Management Director will work with the Planner and be the point person for the Town.
4. The Planner will guide the Committee through the update process. This update process will include several advertised public meetings. At these meetings the Committee will

use the existing plan and update as appropriately guided by the Planner to address:

a. Update of hazard events and data gathered since the last plan update.
b. Changes in community and government processes, which are hazard-related and have occurred since the last review.
c. Changes in community growth and development trends and their effect on vulnerability.
d. Progress in implementation of plan initiatives and projects.
e. Incorporation of new mitigation initiatives and projects.
f. Effectiveness of previously implemented initiatives and projects.
g. Evaluation of the plan for its effectiveness at achieving its stated purpose and goals.
h. Evaluation of unanticipated challenges or opportunities that may have occurred between the date of adoption and the date of the report, and their effect on capabilities of the town.
i. Evaluation of hazard-related public policies, initiatives and projects.
j. How mitigation strategy has been incorporated into other planning mechanisms
k. Review and discussion of the effectiveness of public and private sector coordination and cooperation.
l. Impacts of climate change and how the local environment is changing due to climate impacts.

5. From the information gathered at these meetings, and other interactions the Emergency Planner has with the Town, along with data collected independently during research for the update, the Planner will prepare the updated draft in conformance with the latest FEMA Region 1 Local Hazard Mitigation Plan Review Crosswalk document.
6. The Selectboard will review the draft report. A consensus will be reached on changes to the draft. Emphasis in plan updates will be put on critically looking at how the plan can become more effective at achieving its stated purpose and goals.
7. Changes will be incorporated into the Plan by the Planner.
8. The Selectboard will notify the public that the draft is available for public comment and review. The Town will advertise and make available the draft plan for comments both electronically and in hard copy. The draft plan will simultaneously be distributed electronically to adjacent towns for review and comment.
9. Planner will incorporate public and adjacent town comments. The final draft will be provided to the Emergency Management Director, and interested individuals that participated in the update, for final review and comment, with review comments provided to the Committee and incorporated into the plan.
10. The Planner will finalize the plan with any remaining comments from the Emergency Management Director and others and submit it electronically to Vermont Emergency Management and FEMA.
11. The Vermont Emergency Management State Hazard Mitigation Officer (SHMO) and FEMA Region 1 will review the Plan.
12. SHMO and FEMA comments will be addressed in the plan by the Planner.
13. The plan will be resubmitted as needed until the plan is approved pending adoption. Once FEMA approves the plan, it will be ready for adoption.
14. The Selectboard will adopt the plan and distribute it to interested parties.
15. The final adopted plan will be submitted by the Planner to Vermont Emergency Management and FEMA.
16. FEMA will issue final approval of the adopted plan and the five year clock will begin again.

Post-Disaster Review/Update Procedure

Should a declared disaster occur, a special review may occur amongst the Selectboard, the Emergency Management Director, the Planner, and those involved in the five year update process described above. This review may occur in accordance with the following procedures:

1. Within six months of a declared emergency event, the town will initiate a post disaster review and assessment.
2. This post disaster review and assessment will document the facts of the event and assess whether existing Hazard Mitigation projects effectively lowered community vulnerability/damages. New mitigation projects will be discussed, as needed.
3. A draft After Action Report of the review and assessment will be distributed to the hazard mitigation committee.
4. A meeting of the committee will be convened by the Selectboard to make a determination of whether the plan needs to be amended. If the committee determines that NO modification of the plan is needed, then the report is distributed to local communities.
5. If the committee determines that modification of the plan IS needed, then the committee drafts an amended plan based on the recommendations and forwards it to the Selectboard for public input.
6. The Selectboard adopts the amended plan after receiving approval-pending-adoption notification from FEMA.

Continued Public Participation

Maintenance of this plan and implementation of the mitigation strategy will require the continued participation of local citizens, agencies, and other organizations. To keep the public aware of and involved in local hazard mitigation efforts, the town may take the following measures:

- Provide hazard mitigation information at Town Meeting
- Schedule and advertise a planning meeting each year, soon after Town Meeting
- Seeking participation from key players in addition to general public interest:
    - Selectboard
    - Planning Commission
    - Public Works
    - School
    - Fire & Rescue
    - Emergency Management/ 911 Coordinator
- Post the hazard mitigation plan on the town website.
- Selectboard will review past hazard mitigation committee members and consider whether new members should be added. Representatives of local businesses, nonprofits, academia, etc. should especially be considered.
- Notify the public of committee meetings through town bulletin board, website, newspaper, Facebook, etc.

APPENDIX A: MEETING SLIDES

Introduction Meeting

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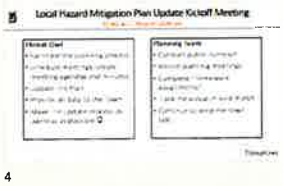

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Hazard Review Meeting

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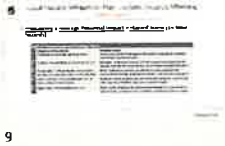
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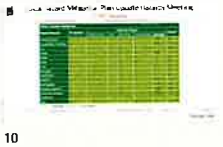
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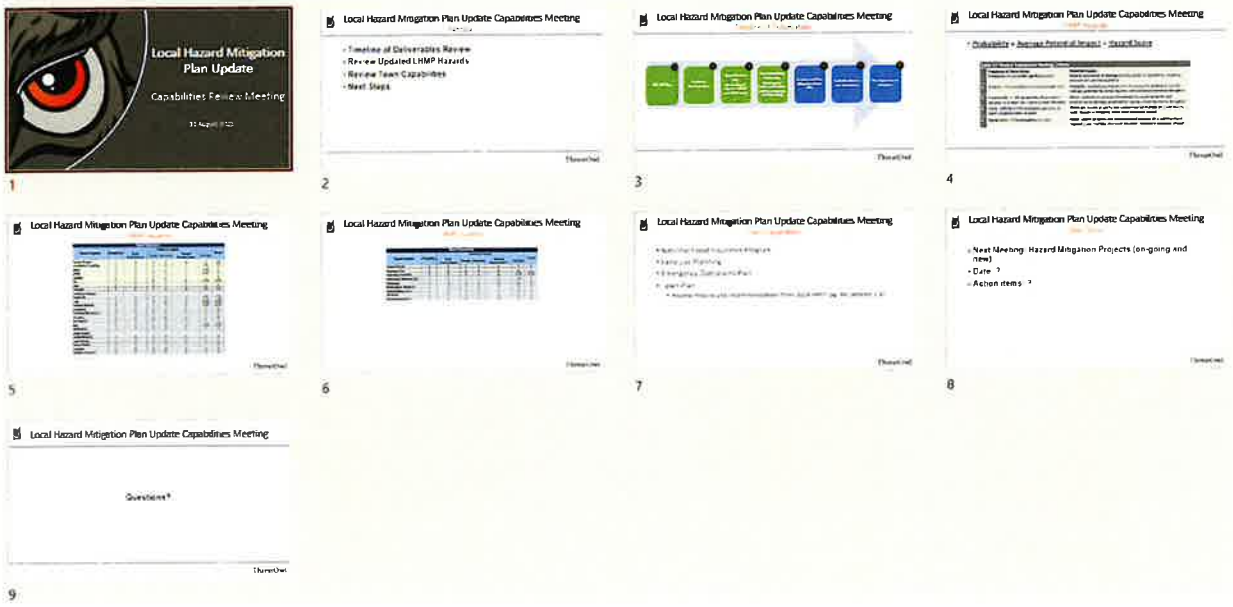
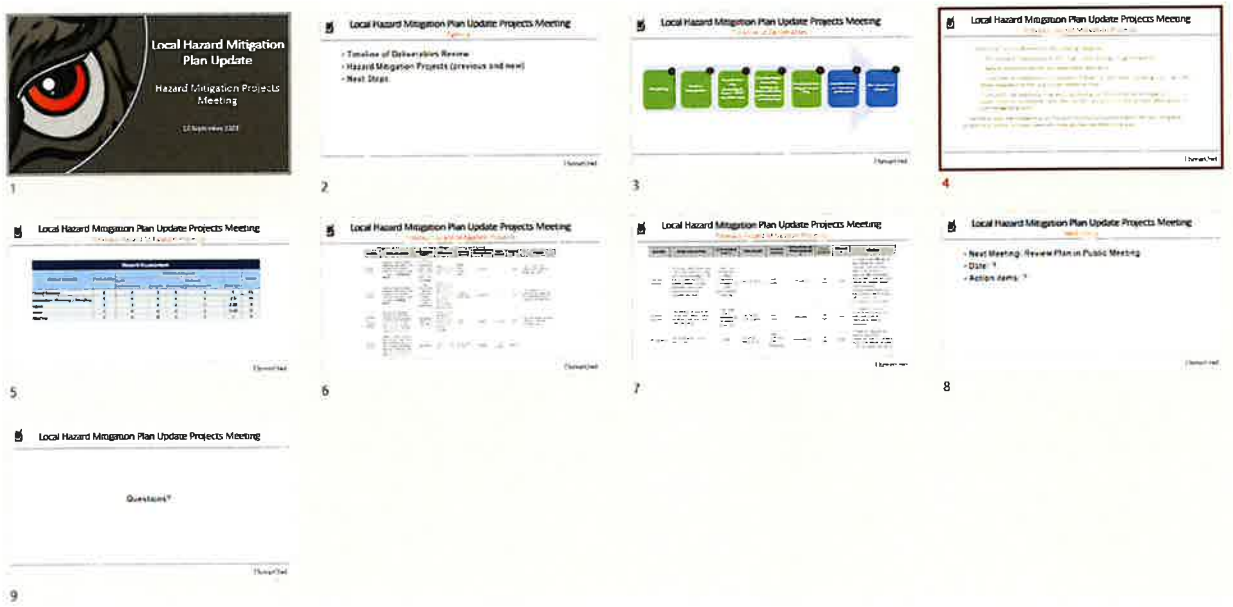
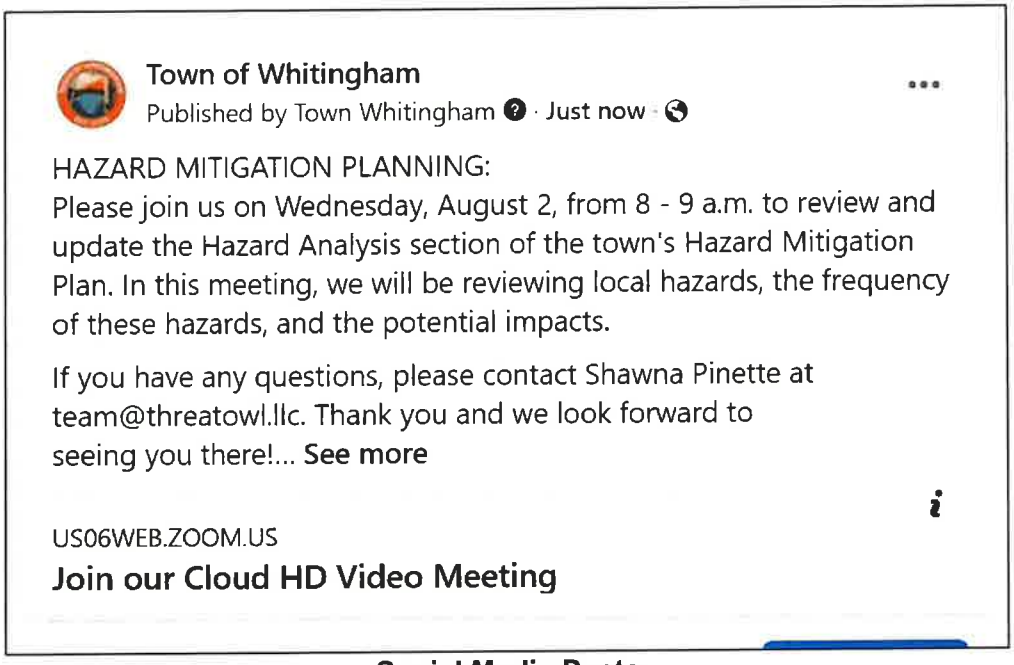
Capabilities Review Meeting



Hazard Mitigation Projects Meeting



APPENDIX B: PUBLIC OUTREACH EXAMPLES



Town of Whitingham
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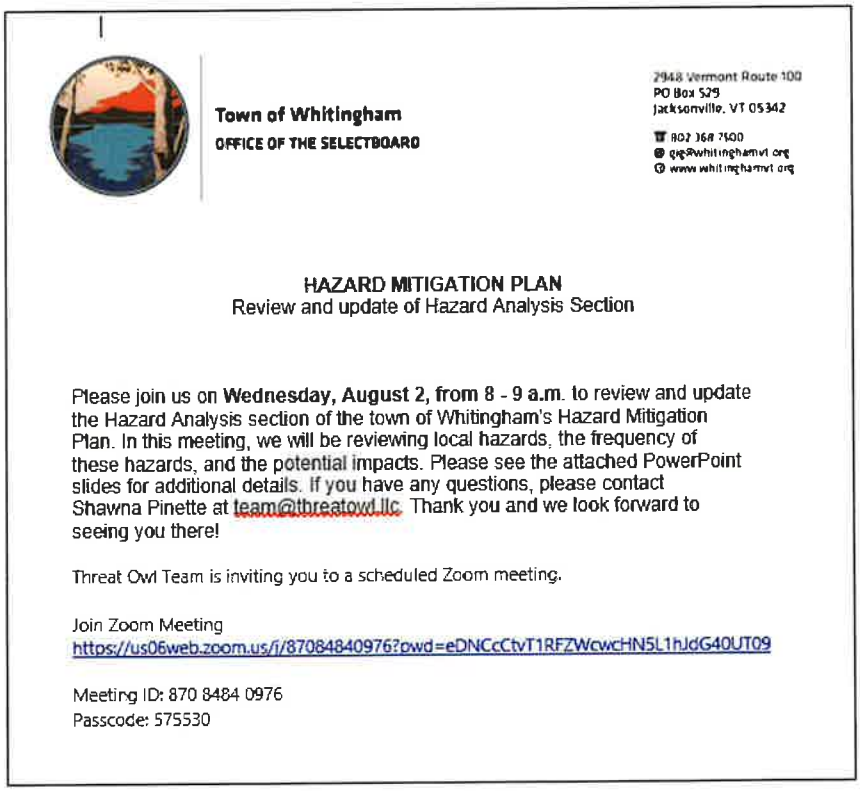
HAZARD MITIGATION PLANNING:
Please join us on Wednesday, August 2, from 8 - 9 a.m. to review and update the Hazard Analysis section of the town's Hazard Mitigation Plan. In this meeting, we will be reviewing local hazards, the frequency of these hazards, and the potential impacts.

If you have any questions, please contact Shawna Pinette at team@threatowl.llc. Thank you and we look forward to seeing you there!... See more

US06WEB.ZOOM.US
Join our Cloud HD Video Meeting

Social Media Posts



Town of Whitingham
OFFICE OF THE SELECTBOARD

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www.whitinghamvt.org

HAZARD MITIGATION PLAN
Review and update of Hazard Analysis Section

Please join us on **Wednesday, August 2, from 8 - 9 a.m.** to review and update the Hazard Analysis section of the town of Whitingham's Hazard Mitigation Plan. In this meeting, we will be reviewing local hazards, the frequency of these hazards, and the potential impacts. Please see the attached PowerPoint slides for additional details. If you have any questions, please contact Shawna Pinette at team@threatowl.llc. Thank you and we look forward to seeing you there!

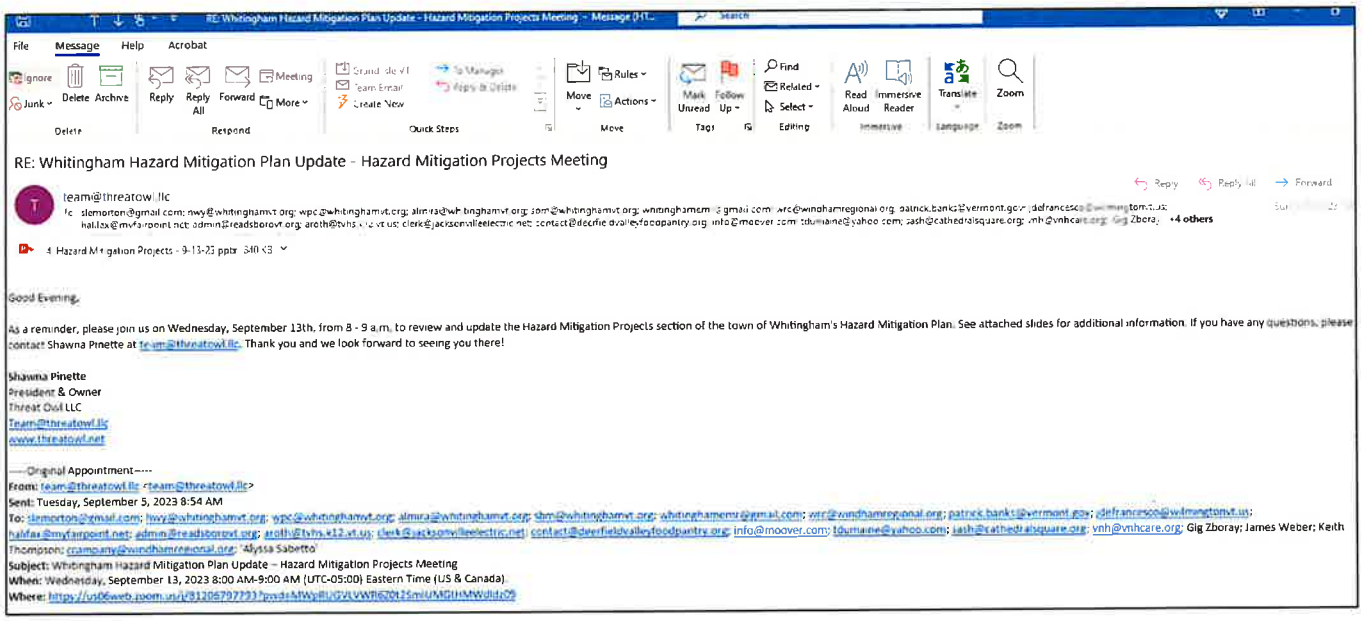
Threat Owl Team is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting
https://us06web.zoom.us/j/87084840976?pwd=eDNCcCtvT1RFZWcwcHN5L1hJdG40UT09

Meeting ID: 870 8484 0976
Passcode: 575530

Hard Copy Notices

Posts on Town Website



Emails sent to Planning Committee and Contact List

APPENDIX C: FLUVIAL EROSION AND INUNDATION FLOODING HISTORY

Per Vermont Hazard Mitigation Plan[19]

- **Rainfall Event, November 3, 1927:** This event was caused by nearly 10" of heavy rain from the remnants of a tropical storm that fell on frozen ground. The flood claimed 84 lives, more than 1,000 bridges, and hundreds of miles railroads and roads. Over 600 farms and businesses were destroyed. Flooding in the White River valley was particularly violent, with the river flowing at an estimated 120,000 cubic feet per second on the morning of November 4, 1927.
- **Rainfall & Snowmelt Event, March 13–19, 1936:** Historic flood damage in Vermont occurred in the hamlet of Gaysville, which had a large mill, church, stores, and many residences destroyed during the flood. The worst widespread spring flooding occurred when slow-moving storms with warm air combined to drop around 8" of rain on a late winter snowpack that had a water equivalent of 10".
- **Rainfall Event, September 21, 1938:** A very fast-moving hurricane (known as the "Long Island Express") hit Vermont in the early evening causing severe flooding as a result of more than 4" of rain that accompanied the storm. Buildings were lost, power lines downed, and many trees felled.
- **Rainfall Event, June 28-30, 1973:** Widespread flood when up to 6" of rain fell. A Presidential disaster was declared for the entire State and damage was estimated at $64 million (in 1973 dollars).
- **Rainfall Event, August 9-10, 1976 (DR-518):** Remnants of Hurricane Belle caused significant rain and flooding in portions of Vermont, resulting in $100 million in damages (in 1976 dollars) and 10 associated deaths[20].
- **Ice Jam, Montpelier, March 11, 1992 (DR-938):** Approximated a 100-year event, resulting in nearly $5 million (nominal dollars) in damages to local roads, buildings, private businesses, and homes. This disaster effectively shut down many functions of the State government and the State legislature for several days, resulting in indirect losses for which no existing data has been generated. The inundation associated with this jam was of very short duration (less than 12 hours); otherwise, disruption of services could have represented a much more serious economic loss.
- **Rainfall Event, June 17–August 17, 1998 (DR-1228):** Intense summer thunderstorm flood when torrential rain deluged the Warren, Randolph, and Bradford areas. A record amount of precipitation fell in Vermont that summer, with Burlington setting a new annual rainfall record of 50.42".
- **Rainfall from Tropical Storm Floyd, September 16, 1999 (DR-1307):** Flooding and wind damage in parts of Vermont.

[19] https://vem.vermont.gov/draft-2023-state-hazard-mitigation-plan

[20] http://www.trorc.org/wp/wp-content/uploads/2013/08/Appendix_I_Flood-Events-in-the-past-100-years.pdf

- **Rainfall Flash Flood Event, July 14-16, 2000 (DR-1336):** 2-4" of widespread rain fell, with locally higher amounts across higher terrain. Specific amounts included 3" in Bennington and 5" in Wardsboro. This rain produced enough runoff to cause the Battenkill to exceed the 6' flood stage by about a foot at Arlington. The Deerfield River rose 6' above unofficial flood stage in Wilmington. Several roads were reported under water. Thunderstorm rainfall, as well as the earlier rainstorm, dumped in excess of 8" in Newfane. In Shaftsbury, County Route 67 was washed out. U.S. Route 7 was closed due to flooding and rockslides. In Windham County, a five-mile stretch of State Route 30 was closed due to flooding and residents were evacuated. Street flooding was reported at Brattleboro.
- **Snowmelt, December 16-18, 2000 (DR-1358):** Despite the fact that DR-1358 (2000) is officially listed as a winter storm, and DR-1101 (1996) occurred in January, damages in both cases were primarily flood-related, particularly for DR-1101, which was flooding associated with rain and a mid-winter thaw that melted a 30" snow pack in two and a half days.
- **Rainfall Flash Flood Event, July 24-August 13, 2003 (DR-1488):** July 24 saw steady rain during the morning hours, with locally heavy rain associated with thunderstorms later in the day. Scattered showers and thunderstorms erupted during the afternoon hours on August 3. A slow moving storm over Windham County produced estimated rainfalls of 3-4" in about four hours, causing flash flooding. Around $1 million in estimated damages.
- **Rainfall Event, August 12, 2004 (DR-1559):** A frontal boundary from northern Vermont southwest across eastern New York resulted in showers and thunderstorms with very heavy rainfall. Flash flooding in Addison County on August 28 resulted in nearly $2 million estimated damage due to thunderstorms accompanied by torrential rainfall with 2-5" of rainfall falling on already saturated soil. Numerous smaller roads were flooded or washed out, many homes reported flooded basements.
- **Rainfall Flash Flood Event, May 19, 2006:** In May 2006, Burlington received a record amount of rainfall, almost an inch more than the previous record, set in 1983. Rainfall amounts included: the NWS Burlington office in South Burlington with 3.48", Jericho at 3.75" and Mount Mansfield with 4.79".
- **Rainfall Flash Flood Event, June 26, 2006:** Flooding caused extensive damage to the small town of Athens, Vermont. This flooding was caused by persistent rainfall for the entire month of June, exacerbated by excessive rain caused by one storm system passing through. The damage was mostly suffered in roadways because of flash flooding, which turned a normally placid body of water, Bull Creek, into a raging flow. There were reports of a mudslide in Dummerston, which also caused damage to roadways. The State Emergency Operations Center (SEOC) was activated.
- **Ice Jam, March 15, 2007:** Montpelier experienced a significant ice jam event on the Dog River, resulting in extensive planning and preparations for possible flooding. A significant ice jam had been in place on the Winooski in Montpelier since January 20th, causing the Dog River jam. In early 2007, ice jams also caused problems in the towns of Woodstock and Chelsea, including localized road flooding in some locations.

- **Rainfall Flash Flood Event, July 9, 2007 (DR-1715):** Localized heavy rainfall exceeded 3" within two hours with some localized storm totals approaching 6", causing many roads to be flooded or washed out and an estimated $4 million of property damage.
- **Rainfall Flash Flood Event, June 14, 2008 (DR-1778):** Localized heavy rainfall up to 7" occurred in Ripton (Addison County) and 3-5" in Rutland with an estimated $2 million worth of damage in Rutland County, predominately in downtown Rutland.
- **Rainfall Event, July 24, 2008 (DR-1790):** Widespread rainfall of 1-2" occurred during the afternoon and evening of July 24th with localized amounts that exceeded 3", causing flooding in Washington, Lamoille, Orleans and Caledonia counties.
- **Ice Jams, January 25-February 1, 2010:** Ice jams were reported in Montpelier, Ferrisburg, Shelburne, Berkshire and Stratford, accompanied by minor localized flooding in some locations.
- **Ice Jam, March 6, 2011:** An ice jam formed on the Mad River caused damage to roads and threatened flooding to the area near Moretown and several other towns following heavy rainfall on March 5-6.
- **Snowmelt & Rainfall Events, April and May 2011 (DR-1995, DR-4043):** 2011 was a record year for flooding in the State of Vermont. A total of four disaster declarations were issued, all attributed to flooding and fluvial erosion. The first floods occurred over a two-week period in April and May. These floods impacted the northern half of the State, including the counties of Addison, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orleans, Washington, and Windham. The damage totaled over $1.8 million in FEMA assistance. Heavy rains in late March/early April on top of a deep late season snowpack resulted in riverine flooding and sent Lake Champlain well over the 500-year flood elevation. Additional spring runoff events resulted in Lake Champlain being above base flood elevation for more than a month. High lake levels coupled with wind driven waves in excess of 3' resulted in major flood damage for shoreline communities. May 6, 2011, was the highest ever recorded level of Lake Champlain in Burlington at 103.27', one of only two recorded levels above major flood stage (101.5ft).
- **Snowmelt & Rainfall Event, May 26, 2011 (DR-4001):** Although not as severe as floods that occurred earlier in the month, multiple counties were included in the declaration, including Caledonia, Essex, Orange, and Washington counties. The river gage on the Winooski in Montpelier crested at 19.05' (major flood stage is 17.5'), the second highest on record (1927 flood: 27.10').
- **Rainfall from Tropical Storm Irene, August 28, 2011 (DR-4022):** Severe damage statewide from record-breaking rainfall associated with Tropical Storm Irene. The storm impacted the entire State, with Public Assistance designations for every county and Individual Assistance designations for 12 of 14 counties. The highest recorded rainfall during this event was on Mendon Mountain, totaling over 11", making it the greatest single-day rainfall in Vermont's recorded history. Given the significance of this event to the State, more details are below.
- **Rainfall Flash Flood Event, May 29, 2012 (DR-4066):** Severe storms, tornadoes, and flooding occurred on May 29, 2012, impacting Addison, Lamoille, and Orleans counties.

Over $1 million worth of damages estimated. Some of these thunderstorms deposited up to 2" of rainfall in portions of north-central and northeast Vermont. The end result was flash flooding in portions of north-central, northeast Vermont and Addison County with estimated storm totals of 3-5".

- **Rainfall Flash Flood Event, May 22, 2013 (DR-4120):** Heavy rain event caused flash flooding, predominately in Chittenden County, washing out bridges, culverts, and roads. Over $2 million worth of damages estimated.
- **Rainfall Flash Flood Event, June 25-July 10, 2013 (DR-4140):** Thunderstorms produced a quick 1-3" of heavy rain in a half hour, causing flash flooding across the State, with over $6 million worth of damages estimated. The most significant impacts were in Windsor and Chittenden Counties.
- **Snowmelt & Rainfall Event, April 15, 2014 (DR-4178):** A combination of heavy rain and snowmelt from late-season snowpack caused flooding across northern and central Vermont with nearly $2 million in estimated damages. 4-6" was released from the snowpack.
- **Rainfall Flash Flood Event, June 11, 2015 (DR-4232):** Thunderstorms with 1-2" of heavy rainfall caused flash flooding in Chittenden and Washington Counties with over $1 million in damages.
- **Rainfall Flash Flood Event, June 29-July 1, 2017 (DR-4330):** Heavy rainfall of 3-4" over several days caused pre-saturated soils across much of central Vermont. During the afternoon of July 1, a series of heavy rain showers and thunderstorms moved in delivering very heavy localized rainfall that caused some scattered flash flooding, with an estimated over $8 million in damages.
- **Ice Jam, January 13, 2018:** Swanton and Johnson as well as several smaller jams formed across Vermont.
- **Ice Jam and Heavy Rainfall Event, January 24, 2019**: Following a heavy snowfall event in Bennington and Windham Counties, temperatures surged into the 40s to mid-50s resulting in steady rainfall occurred throughout the day. 1-4 inches of rain was recorded over southern Vermont. The combination of the rainfall along with the mild temperatures melting some of the snow resulted in areal flooding over portions of the region along with minor to moderate river flooding on the Walloomsac River. Some flooding due to ice jams also occurred along the Whetstone Brook and the Bourn Brook resulting in water backing up onto roadways and the Mountain Home Trailer Park, prompting evacuations of over 50 people. Many homes experienced extensive flood damage in the region. Rising waters also resulted in sewer backups in businesses in some areas.
- **Snowmelt and Rainfall Flash Flood Event, April 15, 2019:** Rapid snowmelt and 1-2in/hr. rainfall caused rising water levels in Rutland and Windsor Counties, leading to flash flooding and road washouts. Otter Creek in Rutland County specifically caused road washouts, leading to a motorist being trapped and requiring rescue in Killington. The flash flooding resulted in $1.6 million in property damages, most of which occurring in North Pawlet in Rutland County.

- **Rainfall Flash Flood Event, October 31-November 1, 2019:** Steady rain in Chittenden, Washington, Orleans, and Essex Counties developed during the mid to late evening of October 31st and became heavy at times through the early morning hours of November 1st. Rainfall amounts 1.5 to 2 inches were common across much of Vermont with a swath of 2 1/2 to 4 inches across northwest and north central Vermont. Impacts of this event were concentrated around the Winooski, Mad River, Lamoille, and Missisquoi basins. These basins experienced riverine flooding compounded with strong winds (40-50 mph) that resulted in downed trees and structural damaged that escalated power outages to their peak of over 100,000. Estimated public infrastructure damage was in excess of $5 million. Some roadways were washed out or inundated with Burlington experiencing urban street flooding.
- **Heavy Rainfall and Rain on Snow Event, December 25, 2020:** Windham County experienced heavy and steady rain showers between the 24th and 25th. Rainfall totals ranged from 1-3 inches. The region also maintained a snowpack containing 1-3 inches of SWE that was almost all lost during this event. The combination of warm air, rainfall and melting snowpack led to areas flooding across the region. Roads were closed across portions of southern Vermont as a result of flooding with one road being washed out. This event was also accompanied by wind gusts between 40 to 55 MPH.
- **Heavy Rainfall Event, July 29th, 2021**: Bennington and Windham Counties experienced moderate to heavy rainfall during the afternoon of the 29th, where between 2-5 inches of rain fell on top of an already very wet July experiencing 12-18 inches of rain. Nearly two dozen towns in southern Vermont were listed with either minor or major impact due to flooding, according to Vermont Emergency Management, with damage estimates ranging from less than $10,000 to more than $200,000 each. Numerous roads or culverts were closed or washed out. About 350 individuals were reported to be isolated individuals due to main road washouts around their home. President Biden approved a formal request for a Major Disaster declaration for Bennington and Windham counties as a result of the storms. Over $5 million in damages to public infrastructure was identified by Vermont officials, including costs to repair public roads and bridges as well as debris removal. The Saxtons River in the Town of Rockingham observed high floodwater flows, reaching a peak of 10,500 cubic feet, which was the highest flow observed since Irene in 2011.
- **July 2023 Flood Event, July 9, 2023**: At the time of submittal of the SHMP 2023 update, Vermont was actively responding to flooding that began on July 9, 2023. Over 3-days, areas of Vermont saw 9 inches of total rainfall. The days and weeks following continued to rain, adding to already saturated soils, flooding rivers, and at-capacity dams. The storm caused numerous landslides, road closures, and home damages.

In addition to the Vermont Hazard Mitigation Plan data, the following table (table 7)[21] details flooding events impacting Windham County:

21 https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Flash+Flood&beginDate_mm=07&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=07&endDate_dd=31&endDate_yyyy=2023&county=WIN

Table 7 – NOAA Flooding Events Windham County, VT

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								1	1	6.987M	0.00K
GRAFTON	WINDHAM CO.	VT	06/12/1996	17:00	EST	Flash Flood		0	0	150.00K	0.00K
GRAFTON	WINDHAM CO.	VT	06/13/1996	14:00	EST	Flash Flood		0	0	1.000M	0.00K
GREEN RIVER	WINDHAM CO.	VT	07/13/1996	17:00	EST	Flash Flood		0	0	9.00K	0.00K
WILMINGTON	WINDHAM CO.	VT	12/02/1996	06:00	EST	Flash Flood		0	0	5.00K	0.00K
COUNTYWIDE	WINDHAM CO.	VT	06/19/1998	14:30	EST	Flash Flood		0	0	70.00K	0.00K
BENNINGTON (ZONE)	BENNINGTON (ZONE)	VT	01/24/1999	04:30	EST	Flash Flood		0	0	5.00K	0.00K
COUNTYWIDE	WINDHAM CO.	VT	09/16/1999	21:00	EST	Flash Flood		0	0	300.00K	0.00K
WILMINGTON	WINDHAM CO.	VT	07/16/2000	03:15	EST	Flash Flood		0	0	15.00K	0.00K
COUNTYWIDE	WINDHAM CO.	VT	07/16/2000	21:30	EST	Flash Flood		0	0	200.00K	0.00K
BRATTLEBORO	WINDHAM CO.	VT	12/17/2000	16:00	EST	Flash Flood		0	0	15.00K	0.00K
SAXTONS RIVER	WINDHAM CO.	VT	12/17/2000	16:30	EST	Flash Flood		0	0	25.00K	0.00K
LONDONDERRY	WINDHAM CO.	VT	08/03/2003	15:10	EST	Flash Flood		0	0	50.00K	0.00K
WINDHAM	WINDHAM CO.	VT	08/03/2003	15:48	EST	Flash Flood		0	0	50.00K	0.00K

DHAM%3A25&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=50%2CVERMONT#

GRAFTON	WINDHAM CO.	VT	08/03/2003	15:54	EST	Flash Flood	0	0	250.00K	0.00K
BELLOWS FALLS	WINDHAM CO.	VT	08/06/2003	15:00	EST	Flash Flood	0	0	0.00K	0.00K
BRATTLEBORO	WINDHAM CO.	VT	08/30/2004	19:00	EST	Flash Flood	0	0	0.00K	0.00K
ATHENS	WINDHAM CO.	VT	06/29/2005	10:50	EST	Flash Flood	0	0	0.00K	0.00K
ATHENS	WINDHAM CO.	VT	06/29/2005	12:05	EST	Flash Flood	0	0	0.00K	0.00K
CAMBRIDGEPORT	WINDHAM CO.	VT	06/29/2006	14:06	EST	Flash Flood	0	0	0.00K	0.00K
TOWNSHEND	WINDHAM CO.	VT	06/29/2006	15:30	EST	Flash Flood	0	0	0.00K	0.00K
BELLOWS FALLS	WINDHAM CO.	VT	08/07/2008	12:30	EST-5	Flash Flood	0	0	1.00K	0.00K
PUTNEY STATION	WINDHAM CO.	VT	01/25/2010	13:08	EST-5	Flash Flood	0	0	0.00K	0.00K
ATHENS	WINDHAM CO.	VT	05/20/2011	18:10	EST-5	Flash Flood	0	0	0.00K	0.00K
SAXTONS RIVER	WINDHAM CO.	VT	05/20/2011	18:10	EST-5	Flash Flood	0	0	0.00K	0.00K
BELLOWS FALLS	WINDHAM CO.	VT	08/28/2011	10:01	EST-5	Flash Flood	0	0	0.00K	0.00K
ROCKINGHAM	WINDHAM CO.	VT	08/28/2011	10:14	EST-5	Flash Flood	0	0	0.00K	0.00K
GREEN RIVER	WINDHAM CO.	VT	08/28/2011	10:35	EST-5	Flash Flood	0	0	0.00K	0.00K
WILMINGTON	WINDHAM CO.	VT	08/28/2011	11:00	EST-5	Flash Flood	0	0	0.00K	0.00K
WHITINGHAM	WINDHAM CO.	VT	08/28/2011	11:00	EST-5	Flash Flood	1	0	0.00K	0.00K

RAWSONVILLE	WINDHAM CO.	VT	09/01/2011	17:40	EST-5	Flash Flood	0	0	0.00K	0.00K
RAWSONVILLE	WINDHAM CO.	VT	09/01/2011	17:40	EST-5	Flash Flood	0	0	0.00K	0.00K
RAWSONVILLE	WINDHAM CO.	VT	09/01/2011	18:00	EST-5	Flash Flood	0	0	0.00K	0.00K
PUTNEY	WINDHAM CO.	VT	07/02/2013	22:40	EST-5	Flash Flood	0	0	0.00K	0.00K
WILMINGTON	WINDHAM CO.	VT	09/01/2013	15:55	EST-5	Flash Flood	0	0	0.00K	0.00K
BRATTLEBORO	WINDHAM CO.	VT	09/12/2013	15:00	EST-5	Flash Flood	0	0	0.00K	0.00K
BRATTLEBORO	WINDHAM CO.	VT	09/12/2013	15:00	EST-5	Flash Flood	0	0	0.00K	0.00K
BRATTLEBORO	WINDHAM CO.	VT	09/12/2013	15:00	EST-5	Flash Flood	0	0	0.00K	0.00K
LONDONDERRY ARPT	WINDHAM CO.	VT	07/28/2014	14:45	EST-5	Flash Flood	0	0	0.00K	0.00K
BROCKWAYS MILLS	WINDHAM CO.	VT	07/28/2014	19:45	EST-5	Flash Flood	0	0	0.00K	0.00K
WEST BRATTLEBORO	WINDHAM CO.	VT	06/19/2017	14:45	EST-5	Flash Flood	0	0	5.00K	0.00K
BRATTLEBORO	WINDHAM CO.	VT	06/19/2017	14:45	EST-5	Flash Flood	0	0	50.00K	0.00K
WEST BRATTLEBORO	WINDHAM CO.	VT	06/19/2017	14:45	EST-5	Flash Flood	0	0	5.00K	0.00K
BRATTLEBORO	WINDHAM CO.	VT	06/19/2017	14:45	EST-5	Flash Flood	0	0	25.00K	0.00K
AMES HILL	WINDHAM CO.	VT	06/19/2017	14:45	EST-5	Flash Flood	0	0	25.00K	0.00K
WESTMINSTER STATION	WINDHAM CO.	VT	06/19/2017	14:45	EST-5	Flash Flood	0	0	1.00K	0.00K

EAST JAMAICA	WINDHAM CO.	VT	01/12/2018	16:30	EST-5	Flash Flood		0	0	0.00K	0.00K
JAMAICA	WINDHAM CO.	VT	01/12/2018	16:50	EST-5	Flash Flood		0	0	0.00K	0.00K
BROOKLINE	WINDHAM CO.	VT	01/12/2018	16:50	EST-5	Flash Flood		0	0	0.00K	0.00K
WEST WARDSBORO	WINDHAM CO.	VT	08/03/2018	13:30	EST-5	Flash Flood		0	0	0.00K	0.00K
EAST DUMMERSTON	WINDHAM CO.	VT	08/07/2019	15:00	EST-5	Flash Flood		0	0	1.00K	0.00K
PUTNEY STATION	WINDHAM CO.	VT	07/11/2021	20:00	EST-5	Flash Flood		0	0	25.00K	0.00K
AMES HILL	WINDHAM CO.	VT	07/17/2021	18:35	EST-5	Flash Flood		0	0	200.00K	0.00K
WEST BRATTLEBORO	WINDHAM CO.	VT	07/17/2021	18:35	EST-5	Flash Flood		0	0	300.00K	0.00K
STRATTON	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	0.00K	0.00K
SOUTH WINDHAM	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	200.00K	0.00K
SOUTH WINDHAM	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	200.00K	0.00K
WARDSBORO	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	200.00K	0.00K
NEWFANE	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	1.000M	0.00K
ATHENS	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	1	600.00K	0.00K
SOUTH NEWFANE	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	150.00K	0.00K
SIMPSONVILLE	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	0.00K	0.00K

SIMPSONVILLE	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	80.00K	0.00K
WEST WARDSBORO	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	200.00K	0.00K
BELLOWS FALLS	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	1.000M	0.00K
WEST WARDSBORO	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	0.00K	0.00K
EAST DOVER	WINDHAM CO.	VT	07/29/2021	19:50	EST-5	Flash Flood		0	0	50.00K	0.00K
LONDONDERRY	WINDHAM CO.	VT	07/10/2023	04:30	EST-5	Flash Flood		0	0	500.00K	0.00K
NEWFANE	WINDHAM CO.	VT	07/10/2023	09:00	EST-5	Flash Flood		0	0	25.00K	0.00K
Totals:								1	1	6.987M	0.00K

APPENDIX D: WIND HISTORY

History

Per Vermont Hazard Mitigation Plan[22]

- **Tornado, May 31, 1998:** Bennington County was hit with an EF2 tornado that damaged homes and property in North Bennington. The tornado originated near Round Lake, New York, and moved rapidly eastward into Vermont, producing damage in North Bennington before dissipating in Shaftsbury. Funnel clouds were also reported that day in the Brattleboro area, but no tornadoes were confirmed to have touched down. Strong straight-line winds also damaged areas of Bennington and Windham Counties. Estimated $630,000 in property damages from this event.
- **Tropical Storm Floyd, September 16, 1999 (DR-1307):** Strong winds reaching 51 mph combined with saturated soil from heavy rain resulted in trees and power lines being blown down, causing power outages. A death occurred when a tree fell on a mobile camper in Randolph. $675,000 in estimated damages from the wind.
- **Tornado, June 5, 2002 (DR-1428):** Thunderstorms spawned two tornadoes, one in Woodford Hollow in Bennington County (EF1) and the other one near Wilmington in Windham County (EF2). The first touchdown produced a swath 150 yards wide and a path length of one-half mile. Many trees as large as a foot in diameter were either knocked over or ripped apart. Trees also fell on three automobiles. The second tornado, four miles Northeast of Wilmington, was even stronger despite a narrower swath of 50 yards.
- **Wind Storm, April 15, 2007 (DR-1698):** High winds during this April storm resulted in many trees down and damage to some private homes and public infrastructure, primarily in southern Vermont. $4.8 million in estimated damages from the wind.
- **Tornado, July 18, 2008 (DR-1784):** A tornado was reported in Bakersfield (EF1), causing localized damages. A tornado with winds reaching 100 mph ripped an apartment's roof off, snapped large trees, and destroyed a barn in the small town of Washington in May 2009. Estimated $150,000 in damages.
- **Wind Storm, December 1, 2010 (DR-1951):** Wind across the higher peaks of the Green Mountains caused strong to damaging down slope winds in excess of hurricane force to the western slope communities and wind gusts approaching 55 mph into the Champlain Valley. Much of this damage was in the form of downed limbs, branches, trees, playground sets and some isolated structural damage in the form of blown off roof shingles. Over 35,000 utility customers lost power with an estimated $3.35 million damages.
- **Tropical Storm Irene, August 28, 2011 (DR-4022):** While the vast majority of the impact from Tropical Storm Irene was due to flooding, damaging north winds of 35 to 45

[22] https://vem.vermont.gov/draft-2023-state-hazard-mitigation-plan

mph sustained with gusts in excess of 60 mph buffeted Grand Isle County and Lake Champlain. Estimated wave heights of 4-6' and possibly higher damaged boats, moorings and knocked down or uprooted numerous trees with thousands of customers without power. An estimated $1.25 million in property damage is attributed to wind.

- **Tornado, May 29, 2012 (DR-4066):** Severe storms rolled through the Northeast portion of the State. The tornado, rated as an EF0 by NOAA, had wind speeds that peaked at 70 mph, tearing 45 trees out of the ground and pelting area house with marble-sized hail. Estimated $10,000 in property damage.
- **Hurricane Sandy, October 29, 2012:** Hurricane Sandy came to the Northeast and did not significantly affect Vermont. Nevertheless, Vermont did experience high winds from the storm, especially in the southern part of the State. All of Vermont's 14 counties experienced electric utility impacts, and approximately 64,600 customers lost power. All customers had their power restored in approximately 56 hours. Estimated damages were under $1 million.
- **Wind Storm, October 30, 2017 (DR-4356):** Numerous tree damage and power outages with wind gusts of 40 to 50 mph, reaching 60 mph in some locations. $2.25 million in property damages is estimated from this event. Maximum wind gusts from this event are mapped in Figure 40.
- **Thunderstorm, July 30, 2019:** Severe storms impacted the Northwest portion of Vermont, with winds ranging 57 to 76 mph. Scattered thunderstorms resulted in downed tree limbs, trees, and utility lines. The storms caused an estimated total of $235,000 in property damage. The storms within Champlain Valley in Chittenden County unfortunately caused the loss of 2 lives whilst kayaking near Thayers Beach.
- **Wind Storm, November 1, 2019:** Strong winds affected zones in each of Vermont's 14 counties, resulting in downed tree limbs, power outages, and uprooted trees which affected transportation routes. Wind speeds ranged from 45 to 55 mph and resulted in $903,000 in total property damage. Within Chittenden County, estimated public infrastructure damage totaled close to $5 million, with 100,00 reported power outages.
- **Thunderstorm, August 26, 2022:** Scattered thunderstorms impacted western Vermont counties Chittenden and Rutland, with wind speeds reaching 75 mph. In Rutland County, the storm trapped 5 people and 75 cattle in a barn, resulting in 2 human injuries and the ultimate death of 50 cattle. As a result of the storm, property damage estimated at $506,000 and crop damage at $100,000, significantly affecting the economy of Rutland.
- **Wind Storm, December 23, 2022 (DR-4695):** Strong winds traveling southeast at speeds of 25-35 mph with gusts at 50-60 mph affected majority of the state, along with heavy rain and snow melt leading to flooding. 70,000 utility customers lost access to power at the peak of the storm, with almost 100,000 customers losing power in total as a result of the event. The wind storm resulted in $3.7 million in property damages and one fatality in Rutland County resulting from a falling tree.

In addition to the Vermont Hazard Mitigation Plan data, the following table (table 11)[23] details wind events impacting Windham County:

Table 11 – NOAA Wind Events Windham County, VT

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	101.40K	5.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	11/27/1997	00:00	EST	Strong Wind		0	0	10.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	05/25/1999	13:15	EST	Strong Wind		0	0	2.40K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/07/2008	13:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/07/2008	13:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/24/2008	22:30	EST-5	Strong Wind	45 kts. MG	0	0	3.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/24/2008	22:30	EST-5	Strong Wind	45 kts. MG	0	0	3.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/30/2008	00:30	EST-5	Strong Wind	43 kts. EG	0	0	5.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/30/2008	00:30	EST-5	Strong Wind	43 kts. EG	0	0	3.00K	0.00K

23 https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Strong+Wind&beginDate_mm=07&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=07&endDate_dd=31&endDate_yyyy=2023&county=WINDHAM%3A25&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=50%2CVERMONT

EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	05/31/2009	19:00	EST-5	Strong Wind	35 kts. EG	0	0	2.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	09/30/2010	21:17	EST-5	Strong Wind	43 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/01/2016	01:00	EST-5	Strong Wind	39 kts. EG	0	0	10.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/01/2016	01:00	EST-5	Strong Wind	39 kts. EG	0	0	10.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	10/22/2016	17:00	EST-5	Strong Wind	43 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	10/22/2016	17:00	EST-5	Strong Wind	43 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/10/2017	15:00	EST-5	Strong Wind	43 kts. EG	0	0	5.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/01/2017	19:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/16/2017	15:00	EST-5	Strong Wind	31 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	11/10/2017	01:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	1.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/10/2017	01:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	1.00K

EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	11/19/2017	06:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	1.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/19/2017	06:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	1.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	10/27/2018	05:00	EST-5	Strong Wind	30 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	11/03/2018	11:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/03/2018	11:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	11/10/2018	12:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/10/2018	12:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/17/2018	21:00	EST-5	Strong Wind	28 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/17/2018	21:00	EST-5	Strong Wind	28 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/22/2018	12:00	EST-5	Strong Wind	35 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/22/2018	12:00	EST-5	Strong Wind	35 kts. EG	0	0	1.00K	0.00K

EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/01/2019	06:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/01/2019	06:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/08/2019	13:00	EST-5	Strong Wind	49 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/08/2019	13:00	EST-5	Strong Wind	49 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/12/2019	16:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	04/03/2019	14:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/03/2019	14:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	10/16/2019	19:00	EST-5	Strong Wind	49 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	10/16/2019	19:00	EST-5	Strong Wind	49 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	10/31/2019	16:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	10/31/2019	16:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K

EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	11/01/2019	00:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/01/2019	00:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/15/2019	00:00	EST-5	Strong Wind	45 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/12/2020	04:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/12/2020	04:00	EST-5	Strong Wind	40 kts. EG	0	0	1.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	08/04/2020	13:00	EST-5	Strong Wind	45 kts. EG	0	0	5.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	08/04/2020	13:00	EST-5	Strong Wind	45 kts. EG	0	0	5.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/25/2020	06:00	EST-5	Strong Wind	45 kts. EG	0	0	0.00K	1.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	04/30/2021	11:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/30/2021	11:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	07/29/2021	19:50	EST-5	Strong Wind	40 kts. EG	0	0	2.00K	0.00K

EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/06/2021	14:00	EST-5	Strong Wind	39 kts. MG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/06/2021	14:00	EST-5	Strong Wind	39 kts. EG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/11/2021	21:00	EST-5	Strong Wind	44 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/11/2021	21:30	EST-5	Strong Wind	45 kts. EG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/17/2022	22:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/17/2022	22:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/07/2022	18:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/07/2022	18:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/07/2022	21:30	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/07/2022	21:30	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/23/2022	01:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K

WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/23/2022	01:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/25/2023	21:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/25/2023	21:00	EST-5	Strong Wind	40 kts. EG	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/03/2023	08:00	EST-5	Strong Wind	42 kts. MG	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/03/2023	08:00	EST-5	Strong Wind	43 kts. MG	0	0	0.00K	0.00K
Totals:								0	0	101.40K	5.00K

APPENDIX E: WINTER WEATHER HISTORY

History

Per Vermont Hazard Mitigation Plan[24]

- **Blizzard, February 15-17, 1958:** More than 30" of snow and 26 deaths in New England.
- **Blizzard, December 26-27, 1969:** Snow amounts between 18–36" in northwestern Vermont and 45" in Waitsfield. Governor Dean Davis declared a State disaster. Drifts of snow from the storm piled up to 30' in places.
- **Snow Storm, December 19, 2000 (DR-1358):** Snow amounts between 7-10". A few reports included: Berkshire: 9.7", Eden: 8.2", Jay Peak 8", St. Johnsbury: 7.1", and Worcester: 7".
- **Snow Storm, March, 2001:** A string of storms hit Vermont in March 2001, beginning with 15-30" of snow on March 5-6, 10-30" on March 22, and 10-20" on March 30.
- **Snow Storm, February 14, 2007:** The second heaviest snowfall ever recorded in the month of February. Some areas of Vermont received 28-36" of snow in a 24 to 48-hour period. Heavy snow loads on roofs led to the collapse of at least 10 barns, causing the death of some cows and other livestock. Estimated nearly $3 million in property damage.
- **Snow Storm, January 2-3, 2010:** Burlington experienced the most significant snowfall on record from one event with 33.1" of snow.
- **Winter Snow Totals, 2010-2011:** The winter of 2011 was the second snowiest on record for Vermont, with a total of 128.4" of snow. A March blizzard in Burlington brought 25.8" of snow in two days. The storm closed schools for days, and many people were without power. Driving was hazardous due to a 1" layer of ice beneath several inches of snow.
- **Snow Storm, December 28, 2011:** A strong cold front moved across Vermont during the late morning and afternoon hours accounting for a rapid cool down and localized snow squalls with heavy snow. The western slopes of the Green Mountains saw 5-12" of snow along foothill communities. Near white-out conditions in snow squalls and rapidly freezing roadways accounted for numerous vehicle accidents as well as a closure of I-89 between Richmond and Waterbury.
- **Snow Storm, November 26, 2014:** The storm began late morning November 26 and increased in intensity, falling at rates at or greater than 1" per hour. Snowfall caused slow and difficult travel the day before Thanksgiving. Snow continued through the day and evening with heavy bands at times and tapered off overnight. By the early morning on Thanksgiving, most of southern Vermont saw snowfall of 8-15" with the heaviest amounts across the higher elevations of the southern Green Mountains.
- **Snow Storm, December 9-13, 2014 (DR-4207):** Rain and wet snow moved into Vermont around midday December 9 and changed to a heavy, wet snow during the evening. A band of moderate snowfall impacted much of central and northern Vermont

[24] https://vem.vermont.gov/draft-2023-state-hazard-mitigation-plan

during the afternoon and evening hours of December 10, then scattered snow showers ending on December 11-12. Total snowfall totals across Vermont ranged from 3-6" in Essex County to 12-20" across the Green Mountains into the Champlain Valley. The heavy, wet nature of the snowfall with snow to water ratios of 8:1 or less accounted for snow-loaded trees that resulted in more than 175,000 power outages in the region. This was the 2nd most power outages due to weather in Vermont. Over $4 million in property damages estimated.

- **Winter Storm, January 18, 2015:** Initial precipitation across Vermont was in the form of rain with air temperatures in the 30s to around 40 degrees. After more than a week of temperatures frequently near zero, road sub-surface temperatures were in the teens and 20s. Therefore, as rain fell and dusk approached, wet roads quickly became icy roads and led to numerous vehicle accidents and closures of state and interstate roads. Rain changed to heavy, wet snow across higher elevations. Snowfall totals were 2 to 6 inches across northern Vermont with some locally higher in higher elevations, which led to scattered power outages.
- **Winter Storm, February 2, 2015:** A storm system originating in the American southwest brought widespread snowfall across the state, ranging from 6-12 inches with temperatures hovering near zero degrees. Impacts were felt across the state, with winter road conditions providing hazards of mobility especially for rural regions.
- **Winter Storm, December 29, 2015:** Snow overspread Vermont around midnight on December 29th and ended by mid to late afternoon, changing to sleet and freezing rain before ending. Snowfall amounts across the area was 3 to 7 inches with limited icing. Motor accidents occurred across the region, including a Semi, SUV crash along Route 4 near Killington, VT during the afternoon that resulted in 3 indirect fatalities.
- **Winter Storm, February 12, 2017:** A northern system over the Great Lakes and a southern system over the Ohio River Valley moved eastward over NY and New England, rapidly intensifying. Depositing wet and dense snow at rates of 1-2 inches per hour that clung to trees, weighing them down. In total, 7 to 12 inches of snowfall occurred through most of the local area, with up to 20 over the higher terrain of the Green Mountains.
- **Blizzard, March 14, 2017:** A major Nor'easter developed off the coast of NC/VA during the morning of the 14th and intensified as it moved north-northeast across southern New England during the night into central Maine by the morning of March 15th. Snow developed across Vermont by mid-morning on the 14th and intensified to at least 1 to 3 inches per hour for several hours during the late afternoon, with some areas witnessing rates of 4 to 5 inches per hour for more than one hour, and overnight hours before gradually diminishing late on the 15th. In addition, blizzard to near blizzard conditions developed around the time of the heaviest snowfall and lasted for 3-4 hours within several miles of Lake Champlain and some higher exposed terrain as well. Total snowfall across Vermont was 12 to 36+ inches with northwest Vermont experiencing the heaviest snowfall. Numerous schools, businesses and local government offices closed for March 14th and 15th with numerous vehicle accidents and stranded vehicles.

- **Snow Storm, December 22, 2017:** A quick moving storm system brought snow to Vermont during the morning commute on December 22nd and ending shortly after the evening commute. A widespread 5 to 10 inches of snow fell across central VT. The timing and intensity of the snowfall lead to hundreds of vehicle accidents and blocked highways for several hours.
- **Winter Storm, January 12, 2018:** A warm moist flow followed by an artic front caused an inch or more of precipitation across Vermont in the form of rain, freezing rain, sleet, and snow. Temperatures 25-20 degrees above normal caused significant snowmelt followed by an inch of rain which caused rivers to approach bankfull with several reports of rivers flooding due to ice jams. Some of these rivers included the Winooski near Montpelier Jct, Lamoille at Johnson, Passumpsic near Lyndonville, Missisquoi near Swanton and the Connecticut river near Windsor. Sharply falling temperatures overnight allowed for a flash freezing of roads making for extremely hazardous travel.
- **Winter Storm, January 19, 2019:** Snow began the afternoon of the 19th and ended by early afternoon on the 20th with accumulations of 8 to 16+ inches. Winds developed and increased to 10 to 20 mph with gusts in excess of 30 mph causing considerable blowing and drifting of the snow. Very cold temperatures were experienced as well, with highs of –5 to 15 degrees and lows of 10 to 20 below zero. Strong winds later in the system created wind chills of 20 to 40 below zero. The combination of all these factors created hazardous travel through the 21st as the very cold temperatures prohibited road chemicals from working effectively. This event occurred throughout the state, blanketing most of the state with snow depths of 10-20 inches varying by location. Greater snow depths occurred at high terrain of Bennington and western Windham counties.
- **Winter Storm, March 22, 2019:** Wet snow conditions and eventual brisk winds of 15 to 25 mph with higher gusts at night combined with the snow weighted trees and power lines to cause thousands of power outages to approximately 10,000-15,000 customers. This event was widespread throughout Vermont, with precipitation rates changing as elevation increased (rain early on in the valleys).
- **Snow Storm, February 7, 2020:** System began with light snowfall which later became steadier snowfall mixed with freezing rain and sleet. Later, snow became heavier with rates of 1-2+ inches per hour. This combination made for extremely hazardous travel and led to numerous schools closing, early closings of businesses and state government offices. Approximately 10-20,000 people lost power, especially in the central and eastern parts of the state. Two-day snowfall across the area was generally 10 to 20 inches with icing under 1/4 inch across the southern Champlain Valley.
- **Snow Storm, November 26, 2021:** Rain transitioned into a wet snow beginning at higher elevations around noon and eventually into the Champlain Valley by early evening. Snowfall amounts ranged from a wet few inches in the Champlain Valley with 4 to 8 inches in the some of the higher elevations in the Green Mountains. The wet nature of the snow led to scattered power outages in the foothills.
- **Winter Storm, March 14, 2023:** A winter storm with snow accumulations of up to 11 inches (about 36" in Whitingham) and wind gusts up to 45 mph impacted the entire State

of Vermont on the 14th to 15th of March. Temperatures hung around freezing throughout the event period. The heavy wet snow caused trees to fall and lose limbs, blocking multiple roadways and pulling down powerlines causing blackouts across the state. Roadway closures were primarily seen in Windham, Windsor, and Bennington counties. This event was reported to be the worst in five years and activated the State Emergency Operations Center.

Table 13 – Top 20 Greatest Storms in Burlington, VT[25]

Rank	Snowfall	Dates	Month/Year
1	33.1"	2-3	Jan 2010
2	30.4"	14-15	Mar 2017
3	29.8"	25-28	Dec 1969
4	25.8"	6-7	Mar 2011
5	25.7"	14-15	Feb 2007
6	24.7"	13-14	Jan 1934
7	22.9"	5-6	Mar 2001
8	22.4"	13-14	Mar 1993
9	20.0"	25	Nov 1900
10	19.7"	25-28	Jan 1986
11	19.1"	16-17	Mar 1937
12	18.8"	14-15	Dec 2003
13	18.7"	12-13	March 2014
14	18.6"	19-21	Jan 2019
14	18.3"	6-7	Dec 2003
16	17.8"	3-4	Jan 2003
17	17.8"	4-5	Feb 1995
18	17.7"	3-4	Mar 1994
19	17.2"	6-8	Feb 2008
20	17.1"	25-26	Feb 1966

In addition to the Vermont Hazard Mitigation Plan data, the following table (table 14)[26] details snow/winter storm events impacting Windham County:

[25] https://www.weather.gov/media/btv/climo/extremes/top20snow.pdf

[26] https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Winter+Storm&beginDate_mm=07&beginDate_dd=01&beginDate_yyyy=1950&endDate_mm=07&endDate_dd=31&endDate_yyyy=2023&county=WINDHAM%3A25&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=50%2CVERMONT

Table 14 – NOAA Snow/Winter Storm Events Windham County, VT

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								0	0	936.35K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/26/1996	00:00	EST	Winter Storm		0	0	15.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/06/1996	04:00	EST	Winter Storm		0	0	10.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/07/1996	12:00	EST	Winter Storm		0	0	35.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/27/1997	19:00	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/04/1997	15:00	EST	Winter Storm		0	0	10.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/14/1997	04:00	EST	Winter Storm		0	0	10.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/31/1997	08:00	EST	Winter Storm		0	0	750.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	04/01/1997	00:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	11/14/1997	01:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	11/22/1997	01:00	EST	Winter Storm		0	0	25.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	12/23/1997	00:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	12/29/1997	16:00	EST	Winter Storm		0	0	20.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/15/1998	12:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/23/1998	03:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/21/1998	02:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/02/1999	23:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/08/1999	06:00	EST	Winter Storm		0	0	0.65K	0.00K

WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/14/1999	06:00	EST	Winter Storm		0	0	0.70K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/06/1999	12:00	EST	Winter Storm		0	0	2.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/25/2000	10:00	EST	Winter Storm		0	0	13.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	02/14/2000	13:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	02/18/2000	16:00	EST	Winter Storm		0	0	5.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	04/09/2000	16:00	EST	Winter Storm		0	0	5.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	12/30/2000	12:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	02/05/2001	15:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	02/25/2001	07:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/05/2001	11:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/09/2001	15:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/21/2001	20:00	EST	Winter Storm		0	0	25.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/30/2001	09:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	12/09/2001	02:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/06/2002	23:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/31/2002	13:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	03/20/2002	17:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	11/17/2002	00:00	EST	Winter Storm		0	0	10.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	12/11/2002	23:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	12/25/2002	16:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	01/01/2003	21:00	EST	Winter Storm		0	0	0.00K	0.00K
WINDHAM	WINDHAM	VT	01/03/2003	19:00	EST	Winter		0	0	0.00K	0.00K

(ZONE)	(ZONE)					Storm					
WINDHAM (ZONE)	WINDHAM (ZONE)	VT	02/17/2003	21:00	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/06/2003	12:00	EST	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/06/2003	12:00	EST	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/14/2003	12:00	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/14/2003	12:00	EST	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/28/2004	00:00	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/28/2004	00:00	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/03/2004	20:00	EST	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/16/2004	16:00	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/16/2004	16:00	EST	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/22/2005	21:30	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/22/2005	21:30	EST	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/10/2005	06:00	EST	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/02/2007	03:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/02/2007	03:00	EST-5	Winter Storm		0	0	0.00K	0.00K

WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/04/2007	13:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	04/04/2007	13:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/12/2007	04:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/15/2007	06:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/02/2007	23:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/02/2007	23:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/16/2007	02:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/16/2007	02:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/12/2008	17:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/12/2008	17:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/28/2009	04:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/28/2009	04:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/26/2010	14:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/26/2010	14:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/12/2011	01:00	EST-5	Winter Storm	0	0	0.00K	0.00K

WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/12/2011	01:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/18/2011	04:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/18/2011	04:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/01/2011	05:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/01/2011	05:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/25/2011	04:30	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/25/2011	04:30	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	10/29/2011	15:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	10/29/2011	15:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/29/2012	13:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/29/2012	13:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/01/2012	00:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/01/2012	00:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/26/2012	19:30	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/08/2013	16:00	EST-5	Winter Storm		0	0	0.00K	0.00K

WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/08/2013	16:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/27/2013	01:30	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/13/2014	09:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/13/2014	09:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	11/26/2014	11:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/26/2014	11:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/09/2014	07:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/03/2015	16:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/12/2017	09:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/12/2017	09:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/14/2017	02:30	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/14/2017	02:30	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/31/2017	03:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/01/2017	00:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/07/2018	09:00	EST-5	Winter Storm		0	0	0.00K	0.00K

WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/07/2018	09:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/02/2018	02:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/07/2018	04:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/07/2018	04:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/13/2018	03:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/13/2018	03:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/15/2018	18:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	11/15/2018	18:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	11/26/2018	19:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/09/2019	00:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/19/2019	16:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/19/2019	16:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/12/2019	10:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/12/2019	10:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/29/2019	16:00	EST-5	Winter Storm		0	0	0.00K	0.00K

WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/29/2019	16:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/23/2020	14:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/23/2020	14:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/16/2021	01:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/01/2021	12:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/01/2021	12:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	04/15/2021	20:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/17/2022	01:30	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/17/2022	01:30	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/03/2022	16:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	02/25/2022	02:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	02/25/2022	02:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	12/15/2022	19:00	EST-5	Winter Storm	0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	12/15/2022	19:00	EST-5	Winter Storm	0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	01/22/2023	19:00	EST-5	Winter Storm	0	0	0.00K	0.00K

WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	01/22/2023	19:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/03/2023	18:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/03/2023	18:00	EST-5	Winter Storm		0	0	0.00K	0.00K
EASTERN WINDHAM (ZONE)	EASTERN WINDHAM (ZONE)	VT	03/13/2023	17:00	EST-5	Winter Storm		0	0	0.00K	0.00K
WESTERN WINDHAM (ZONE)	WESTERN WINDHAM (ZONE)	VT	03/13/2023	17:00	EST-5	Winter Storm		0	0	0.00K	0.00K
Totals:								0	0	936.35K	0.00K

END OF DOCUMENT