

Shrewsbury, Vermont Local Hazard Mitigation Plan



Upper Cold River Road Restoration - 2016

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Rutland Natural Resources Conservation District

Shrewsbury Conservation Commission

Western Vermont Floodplain Manager



The 2021 Shrewsbury Hazard Mitigation Planning Team dedicates this Plan to all the Shrewsbury volunteers, like David Rice, who over the years have given countless hours of service to our community.

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1 INTRODUCTION

The impact of expected, but unpredictable natural events can be reduced through community planning and action. The goal of this Plan is to provide a natural hazards local mitigation strategy that makes Shrewsbury (the Town) more disaster resistant and more resilient after disaster has struck.

Hazard Mitigation is any sustained policy or action that reduces or eliminates long-term risk to people and property from natural hazards and their effects. FEMA and state agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This Plan recognizes that communities have opportunities to identify mitigation strategies and measures during all the other phases of Emergency Management – 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 local actions and policies that can be implemented to reduce the severity of the hazard.

2 PURPOSE

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

The benefits of mitigation planning include:

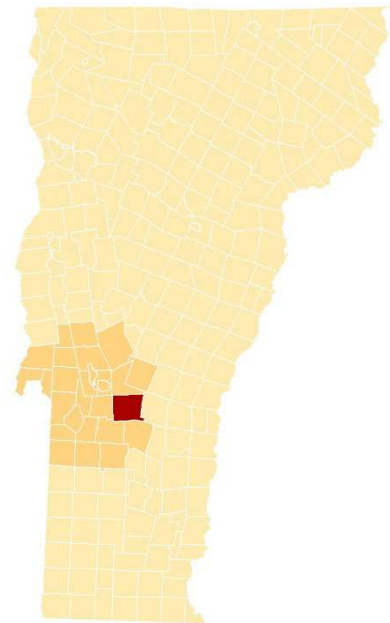
- Identifying actions for risk reduction that are agreed upon by stakeholders and the public.
- Focusing resources on the greatest risks and vulnerabilities.
- Increasing education and awareness of threats and hazards, as well as their risks.
- Reducing the degree of injury and inconvenience to the townspeople and their private and municipal property.
- Communicating priorities to State and Federal officials.
- Aligning risk reduction with other community objectives.

Furthermore, the Town seeks to be in accordance with the strategies, goals, and objectives of the 2018 State Hazard Mitigation Plan.

3 COMMUNITY PROFILE

Land Use and Development Patterns

Shrewsbury has a unique and special character, which is principally derived from the historical rural character of the community and the natural beauty of its mountain setting, containing large areas of wooded and open land, wetlands, and other habitat. The Town is still relatively undeveloped, (population < 1,200) with population clusters around one village, Cuttingsville, and three hamlet centers (Shrewsbury Center, Northam, and Eastham). Cuttingsville, located along Route 103 and adjacent to the railroad is home to the largest concentration of business activity in Town.



Residential land use is predominantly single-family, both permanent and vacation with approximately 540 single family units, including 40 mobile homes. Commercial and industrial land use in Shrewsbury is quite limited with no more than 20 businesses in the town. Most employed persons work in nearby communities such as Rutland City and Town (pop. 20, 500) and Ludlow (pop. 2,000). Agricultural land use, excluding kitchen gardens and pasturage for domestic animals, shows a drastic decline since the turn of the century, comparable to the agricultural downtrend in many southern Vermont hill towns.

For example, in 1940, Shrewsbury had 64 dairy farms. Currently, there are no commercial dairy farms. With the decline in agriculture-based businesses, most residents working within the town boundaries are employed at the Spring Lake Ranch, an auto dealership or in independent home-based businesses.

A major proportion of Shrewsbury's land is forested. Just under a quarter of the town's total acreage consists of woodlands managed by various State and Federal agencies. The Town's woodlands are an important resource for aquifer recharge, plant and wildlife habitat, and recreation, as well as timber production, maple sugaring operations, and carbon sequestration.

Land Features

Shrewsbury is a hilly and mountainous town. Elevation ranges from about 725 feet on Mill River at the Clarendon Town line to 3,737 feet at Shrewsbury Peak on the Mendon Town line. Much of the geology of these slopes is primarily ancient metamorphic rocks of Precambrian Age (600 million years and older). However, at the same time, much of Shrewsbury has shallow depth to bedrock. This makes the soil cover highly susceptible to erosion and can increase the risk of freezing of sewer and water lines. Slopes greater than 15% and areas at elevation higher than 2,000 feet are least able to support development.

Demographics and Growth Potential

The 2018 American Community Survey Five-Year Estimates prepared by the U.S. Census Bureau shows an estimated population of 1,177, and 452 households.

Between 2010 and 2018, the population has held relatively steady. The median age of Shrewsbury residents is 54.6 years old, up from 34.2 years in 1990. Shrewsbury's median age is 28% higher than the Vermont median age of 42.8. The portion of the population over 60 is 36%, compared to 25% in Vermont and 20.9% in the country. The population density of the Town is 23 persons per square mile compared to an overall State density of 68.

As previously mentioned, the Town has a unique and special character derived from the continued historic rural nature of the community. This character tends to retain the multi-generational Vermonter while welcoming others who also appreciate this sense of community and quiet lifestyle. This character is not compatible with rapid growth and intrusive development.

The demographics and low population density do not make the Town attractive to moderate or even small scale retail or industrial development. Growth potential is also limited by several other factors including limited highway access, limited utility availability (including cell phone and internet), land ownership and control, and natural conditions.

Precipitation and Water Features

Average precipitation is 48 inches of rain; with July being the wettest month. Average snowfall is 93 inches making Shrewsbury snowier than most places in Vermont, with January being the snowiest month.

The mountains feed several rivers and springs in the valley areas. Of these, Mill River and Cold River have been designated floodplains by FEMA. In addition, several water resources in Shrewsbury have been designated wetlands. These play an important function in water absorption and holding capacity that thereby reduces the hazards of flooding and replenishes the groundwater supplies.

Drinking Water and Sanitary Sewer

Most homes in Shrewsbury draw their drinking water from private springs and drilled wells. The exceptions are two community water systems:

- Cuttingsville Water District #1, serving 108 in the Village of Cuttingsville via two drilled wells and a 16,000 gallon reservoir north of the village.
- Spring Lake Ranch, serving 70 via two groundwater sources.

All structures in Shrewsbury are served by private septic systems.

Transportation

The present network of ±60 miles of roads in Shrewsbury serves the needs of current residents. Vermont State Route 103 and the Cold River Road provide primary access into and out of Shrewsbury. In addition to VT 103 and the Cold River Road, there are several other roads that have been identified as locally important for use as through-ways, detours, short-cuts, and access to critical facilities such as the fire stations, town garage, town office, and school. These routes are shown in orange on the map in **Figure 1**.

According to the Town's Road Stormwater Management Plan, nearly half of the Town's road mileage is hydrologically connected - meaning it is within 100-feet of a water resource (i.e., perennial/intermittent stream, wetland, lake, or pond). Proximity to water resources can make these sections of road more vulnerable to flooding and fluvial erosion.

Shrewsbury has a total of 29 bridges, many of which were rebuilt after Tropical Storm Irene, and ±600 culverts. Three bridges are on the state system. Seven bridges have a span of over 20 feet (5 are town owned, 2 are state owned).

The Brown Covered Bridge is one of the town owned bridges. It spans the Cold River just east of the intersection of Upper Cold River Road and Cold River Road in northwest Shrewsbury. It was built by Nicholas Powers in 1880. It is a lattice truss type bridge, 18.8 feet wide by 12.2 feet high and 113.3 feet long. In 2018, the Brown Bridge was designated as a National Historic Treasure. The wooden covered bridge presents a unique hazard for the Town and State because it can burn and float. During Tropical Storm Irene, floodwaters cut a temporary bypass around the western end of the bridge. This gave the flooding Cold River an escape route around the bridge. This kept the water level just below the deck of the bridge, relieving pressure that might have floated the wooden structure away. Fire on a wooden structure is always a threat. To mitigate this risk, the structure was treated with a fire retardant as part of the repairs to the bridge following Tropical Storm Irene.

In 2013 the Town entered into a Historic Bridge Preservation Easement Agreement with VTrans. This agreement included municipal responsibilities for the future maintenance of the bridge.

The local transportation network is maintained by the Town Highway Maintenance crew, whose garage is located on Mountain School Road.

Electric Utility Distribution System

Electric service to approximately 666 accounts is provided by Green Mountain Power via three circuits. Average annual outage statistics between 2015 and 2019 are summarized in **Table 1**.

Table 1: Power Outage Summary

5-Year Average (2015-2019)	
Avg # of times a customer was without power	5.38
Avg length of an outage in hours	5.19
# of hours the typical customer was without power	27.94
2019 only	
Avg # of times a customer was without power	3.11
Avg length of an outage in hours	4.41
# of hours the typical customer was without power	13.70

The longest power outage affecting the greatest number of accounts between 2015 and 2019 was 79.40 hours long and impacted 84 accounts. During this same period, there was an 85.38 hour long outage that impacted 28 accounts.

Sixty two percent of the land in the Town is more than 1,000 feet from an electric utility pole. Although an electric power transmission line runs through Shrewsbury, 3-phase power, which is often required for industrial purposes, is not available in the distribution system.

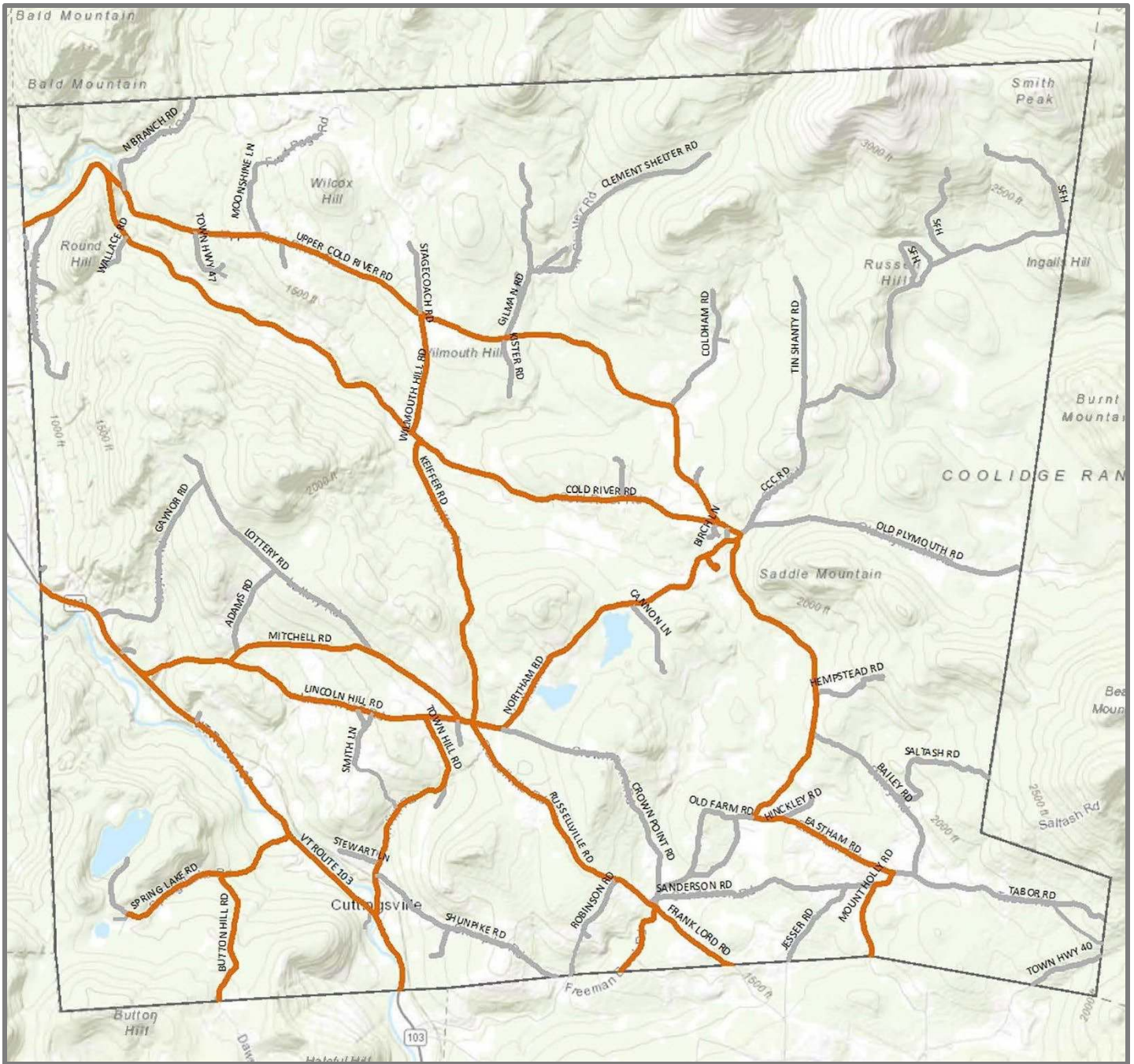


Figure 1: VTrans Transportation Resiliency Planning Tool Identified Locally Important Routes for Through-Ways, Detours, Short-Cuts, and Access to Critical Facilities

Shown in orange on Figure 1

Public Safety

Shrewsbury has a volunteer, professionally operated fire department, with two stations – one in Northam on Cold River Road and one on Shunpike Road about 0.3 miles from Route 103. The fire department also serves as first responders to automobile accidents. Search and rescue services are also performed by the department. In addition to their traditional roles, they conduct fire safety and awareness programs at the Shrewsbury Mountain School.

Law enforcement is provided by the Rutland County Sheriff's Department and Vermont State Police.

The nearest hospital is the Rutland Regional Medical Center. Ambulance service is provided by Regional Ambulance Service, which is located adjacent to the hospital. From the Shrewsbury Town line to the hospital is about 3.2 miles using the Cold River Road and 6.8 miles using Route 103.

Emergency Management

The Selectboard Chair currently serves as the default Emergency Management Director (EMD). The EMD and appointed Emergency Management Coordinator (EMC) work with others in town to keep the Local Emergency Plan up-to-date and coordinate with nearby towns on regional emergency planning efforts.

4 PLANNING PROCESS

Plan Developers

Steffanie Bourque, an Emergency Management Planner at the Rutland Regional Planning Commission (RRPC), assisted the Town with updating its Local Hazard Mitigation Plan. Hazard Mitigation Grant Program funds from FEMA supported this process.

The Hazard Mitigation Planning Team members who assisted with the update include the Road Commissioner, EMC / Selectboard member, Planning Commission member, and community volunteers.

Plan Development Process

The 2021 Shrewsbury Local Hazard Mitigation Plan is an update to the 2015 single jurisdiction mitigation plan. A summary of the process taken to develop the 2021 update is provided in **Table 2**.

Table 2: Plan Development Process

April 2020: LHMP announcement article in the *Times of Shrewsbury*, a monthly community newsletter. Article advised residents of the upcoming update and provided name and contact information for those interested in serving on the Planning Team – see Appendix D.

May 13, 2020: Hazard Mitigation Planning Team kick-off meeting. *Due to the COVID-19 pandemic, this was a web-based, virtual meeting.* Planning Team members were confirmed. Discussed what a LHMP is; the benefits of hazard mitigation planning; current plan status; the planning process; outreach strategy; and plan sections.

May 20, 2020: Public notice posted on RRPC and Town social media that the Town is engaged in hazard mitigation planning and updating their LHMP. Emailed notice to officials in neighboring towns of Clarendon, Mendon, Mount Holly, Rutland Town, and Wallingford. Name and contact information provided in notices for more information. No response received.

June 2020: LHMP update on plan development process article in the *Times of Shrewsbury* – see Appendix D.

June 4, 2020: Planning Team meeting – confirmed the plan purpose and completed work on the community profile. Began work on the community hazard risk assessment, storm history, and identifying assets vulnerable to the highest risk natural hazards.

July 8, 2020: Planning Team meeting – completed work on the storm history and assets vulnerable to the highest risk natural hazards. Completion of the hazard identification and risk assessment is a critical milestone in the plan update process. Draft readied for public meeting on August 5, 2020.

Late July – Early August 2020: LHMP update on plan development process and August 5, 2020 public meeting article in the *Times of Shrewsbury* – see Appendix D. Also posted on RRPC and Town websites.

August 5, 2020: Working draft LHMP shared with Vermont Hazard Mitigation Officer, Rutland Natural Resource Conservation District, and Shrewsbury Conservation Commission for review and comment.

Table 2. Plan Development Process (cont.)

August 5, 2020: Working draft LHMP presented at joint public meeting of the Shrewsbury Selectboard and Planning Commission to encourage input from local government and the public that could affect the plan's conclusions and better integrate with Town initiatives. Members of the public attended. Public notice included instructions to email comments on the draft to Steven Nicholson. Comments on the draft plan were accepted until August 19, 2020.

August 20, 2020: Planning Team meeting – discussed comments received on the August 5 working draft from Shrewsbury Conservation Commission and Rutland Natural Resources Conservation District; completed work on hazard identification and risk assessment. Began work on hazard mitigation strategy – confirmed mitigation goals; identified community capabilities; and began developing mitigation actions.

September 10, 21, and 28, 2020: Planning Team meetings – continued work on mitigation strategy – finalized community capabilities; evaluated and prioritized range of mitigation actions; identified actions for implementation.

October 15, 2020: Planning Team completed work on the mitigation strategy; plan maintenance; and changes since the 2015 plan. Draft LHMP finalized for presentation to local officials and the public at the November 4, 2020 Selectboard meeting.

November 2020: LHMP update on plan development process and November 4, 2020 public meeting article in the *Times of Shrewsbury* – see Appendix D. Also posted on RRPC and Town websites.

November 4, 2020: Final draft LHMP emailed to neighboring towns, Rutland Natural Resource Conservation District, and Shrewsbury Conservation Commission for review and comment. Final draft LHMP presented at joint public meeting of the Shrewsbury Selectboard and Planning Commission for review and comment. Members of the public were present, including the Tree Warden. Public notice included instructions to email comments on the draft to Steven Nicholson. Comments on the draft plan were accepted until November 18, 2020. Comments from the Meeting House Committee regarding the status of the generator installation and the Conservation Commission were received and incorporated into the plan.

November 23, 2020: Final draft LHMP submitted to VEM for Approval Pending Adoption.

In addition to the local knowledge of Planning Team members and other relevant parties, several existing plans, studies, reports, and technical information were utilized in the preparation of this Plan. A summary of these is provided in **Table 3**.

Table 3: Existing Plans, Studies, Reports & Technical Information

2020 Local Emergency Management Plan

2020 FEMA NFIP Insurance Reports

2020 Stormwater Infrastructure Report

2020 Ash Tree Inventory

2019 Shrewsbury Town Plan

2019 Road Stormwater Management Plan

2019 Transportation Resiliency Planning Tool

2019-2015 Green Mountain Power Outage Data

2018 State of Vermont Hazard Mitigation Plan

2018 American Community Survey Five-Year Estimate

2017 Unified Zoning and Subdivision Regulations

2013 Cold River Corridor Plan

2013 Historic Bridge Preservation Easement Agreement for the Brown Bridge (B34)

2011 Flood Hazard Area Regulations

2009 Mill River Corridor Management Plan

RRPC Local Liaison Reports of Storm Damage

National Oceanic and Atmospheric (NOAA) National Climatic Data Center's Storm Events Database

FEMA Disaster Declarations for Vermont

OpenFEMA Dataset: Public Assistance Funded Project Summaries for Vermont

USGS Stream Gage Data

FEMA Flood Insurance Rate Maps

Changes Since the 2015 Plan

Shrewsbury remains a quiet municipality as described in the Community Profile section of this Plan. The Town has not experienced any significant change in population or development since 2015.

According to the Shrewsbury Zoning Administrator, the Town issued approximately 10 permits for new homes and numerous permits for additions, porches, decks, agricultural buildings, sheds, and garages between 2015 and 2020.

Development in Shrewsbury since 2015 has not made the community more vulnerable to natural hazards.

The Town's mitigation priorities shifted a bit. In 2015, the Shrewsbury Local Hazard Mitigation Plan was an all-hazards (natural, manmade, and technological) plan. Floods, fluvial erosion, and ice jams; severe thunderstorms, hurricanes, and tornadoes; landslides and rockslides; and highway and railroad accidents posed the greatest risks to the Shrewsbury.

The 2021 Plan update focused exclusively on natural hazards. The Town again ranked severe thunderstorms with associated flash flooding, fluvial erosion, and high winds (and to a lesser extent inundation flooding and hail) as one of the community's highest risk natural hazards. In addition, they ranked severe winter storms with associated extreme cold, snow, ice, and high winds as another highest risk natural hazard.

In 2021, the Town did not formally assess the risk associated with invasive species; however, they did discuss the potential hazards and risks associated with the Emerald Ash Borer (EAB) and Hemlock Wooley Adeligid given that they are a High Risk Area for EAB. Invasive species were not included in the 2015 Plan.

Shrewsbury was very successful in completing many improvements following Tropical Storm Irene – see **Appendix E**. In addition, Shrewsbury has made significant progress in completing the mitigation projects identified in the 2015 Plan – see **Appendix C**.

Actions taken by Shrewsbury following Tropical Storm Irene and since 2015 have made the community more prepared and much less vulnerable to future natural hazard impacts.

Nonetheless, due to an increase in the frequency and intensity of weather events, the Town remains vulnerable to flash flooding, fluvial erosion, high winds, severe winter storms, as well as invasive species (particularly the Emerald Ash Borer).

As a result, the Town has identified two new mitigation actions to address severe winter storm and high wind impacts; one new mitigation action to address invasive species, and several actions to address remaining flood hazards – see **Table 6**.

5 HAZARD IDENTIFICATION AND RISK ASSESSMENT

After engaging in discussions, the Town identified the following “highest risk hazards” that they believe their community is most vulnerable to:

Local Vulnerabilities and Risk Assessment

One of the most significant changes from the 2015 Plan is the way hazards are assessed. To be consistent with the approach to hazard assessment in the 2018 State Hazard Mitigation Plan, the Hazard Mitigation Planning Team conducted an initial analysis of known natural hazard events¹ to determine their probability of occurring in the future.

The Planning Team then ranked the hazard impacts associated with the known natural hazard events based on the probability of occurrence and potential impact to life, the economy, infrastructure, and the environment. The ranking results are presented in **Table 4**.

- *Thunderstorms with associated flash flooding, fluvial erosion, and high winds – and to a lesser extent inundation flooding and hail.*
- *Winter Storms with associated extreme cold, snow, ice, and high winds.*

Each of these “highest risk hazards” (**orange** in **Table 4**) are further discussed in this section and depicted in the Local Natural Hazards and Vulnerabilities Map in **Appendix B**.

The “lower risk hazards” that are considered to have a low probability of occurrence and low potential impact are not discussed. For information on these hazards, consult the State Hazard Mitigation Plan.

Table 4: Community Hazard Risk Assessment

Hazard Event	Hazard Impacts	Probability	Potential Impact					Score
			Life	Economy	Infrastructure	Environment	Average	
Thunderstorm	Flash Flooding/ Fluvial Erosion	4	2	3	3	3	2.75	11.00
Tropical Storm/Hurricane								
Landslide	Inundation Flooding	3	2	2	3	3	2.50	7.50
Ice Jam	High Winds	4	2	2	3	3	2.50	10.00
Tornado	Hail	3	1	2	3	2	2.00	6.00
Winter Storm	Cold/Snow /Ice/Wind	4	2	2	3	3	2.50	10.00
Drought	Heat	3	1	1	1	1	1.00	3.00
	Drought	3	1	1	1	3	1.50	4.50
Wildfire	Wildfire	2	1	1	1	2	1.25	2.50
Earthquake	Earthquake	2	1	1	2	1	1.25	2.50

*Score = Probability x Average Potential Impact

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

¹ This Plan defines natural hazards as atmospheric, hydrologic, geologic, and wildfire phenomena. Hazards not necessarily related to the physical environment, such as infectious disease, were excluded from consideration by the Planning Team.

Invasive Species

The Planning Team did not formally assess the risk associated with invasive species; however, they did discuss the potential hazards and risks associated with the Emerald Ash Borer (EAB) and Hemlock Wooley Adelgid (HWA) specifically.

Vermont's EAB infestation was first detected in 2018 in northern Orange County. In October 2020, a new detection of EAB in West Rutland was confirmed. This is the first confirmed detection in Rutland County, making Shrewsbury a "High Risk Area" for EAB. The Shrewsbury Tree Warden has completed a preliminary inventory of trees within the road right-of-way and determined approximately 1,200 Ash trees are at risk. The potential risk to private woodlots and impacts on the local economy have not been quantified.

HWA has been around Vermont for decades and the only area with a concern is the Connecticut River Valley in Windsor and Windham counties. The expansion of HWA is tied to cold winter temperatures, which kill the egg masses laid earlier in the year. A consistent cold spell can kill 99% of egg masses each winter. So, Shrewsbury continues to have an ally in keeping HWA in control. It is the opinion of the Shrewsbury Tree Warden that natural expansion rate controls coupled with the fact that there simply are not many sizeable hemlocks growing roadside or in the road right-of-way makes the HWA a relatively low risk.

As noted in the State Hazard Mitigation Plan, "Flooding is the most common recurring hazard event in Vermont" (2018: 55). There are two types of flooding that impact communities in Vermont: inundation and flash flooding. Inundation is when water rises onto low lying land. Flash flooding is a sudden, violent flood which often entails fluvial erosion (stream bank erosion).

Inundation flooding of land adjoining the normal course of a stream or river is a natural occurrence. If these floodplain areas were left in their natural state, floods likely would not cause significant damage.

While inundation-related flood loss can be a significant component of flood disasters, the more common mode of damage in Vermont is associated with fluvial erosion, often associated with physical adjustment of stream channel dimensions and location during flood events. These dynamic and oftentimes catastrophic adjustments are due to bed and bank erosion of naturally occurring unstable stream banks, debris and ice jams, or structural failure of or flow diversion by human-made structures. An ice jam occurs when the ice layer on top of a river breaks into large chunks which float downstream and cause obstructions (State HMP 2018). The Town has a high incidence and high probability of ice jams on the Cold River; however, these jams do not typically result in flooding.

Several major flooding events have affected the state in recent years, resulting in multiple Presidential Disaster Declarations. From 2003 to 2010, Rutland County experienced roughly \$1.4 million in property damages due to flood events.

The worst flooding event in recent years came in August of 2011 from Tropical Storm Irene (DR4022), which dropped up to 10-11 inches of rain in some areas of Rutland County. Irene caused 2 deaths and \$55,000,000 in reported property damages and \$2.5 million in crop damages in Rutland County. Although the storm was technically a tropical storm, the effects of the storms are profiled in this flooding section, since the storm brought only large rainfall and flooding to the Town, not the high winds typically associated with tropical storms. This caused most streams and rivers to flood in addition to widespread and severe fluvial erosion.

Highest Risk Hazard Profiles

Inundation/Flash Flooding/Fluvial Erosion

Floods can damage or destroy public and private property; disable utilities; destroy or make impassable roads and bridges; destroy crops and agricultural lands; cause disruption to emergency services; and result in fatalities. People may be stranded in their homes for a time without power, heat, or communication or they may be unable to reach their homes. Long-term collateral dangers include the outbreak of disease, loss of livestock, broken sewer lines or wash out of septic systems causing water supply pollution, downed power lines, loss of fuel storage tanks, fires, and release of hazardous materials.

From 2012 to 2019, Rutland County experienced approximately \$3.5 million in property damages; with \$1.9 million due to a flash flood event in July 2017 (DR4330) and \$1 million due to a flash flood event in April 2019 (DR4445).

In Shrewsbury, flooding is a risk. Damages from Tropical Storm Irene were significant, resulting in approximately \$3.8 million in impacts - \$102,956 in Individual Assistance; \$3,515,142 in FEMA grants (including State/Local match); \$164,551 in National Flood Insurance.



Irene Damages to Cold River Road

The DR4022 list of projects does not include the replacement of a bridge over Sargent Brook on the Governor Clement Shelter Road. This bridge is part of the Appalachian Trail and was paid for by the US Department of Transportation. In addition, the Town received \$165,733 from the VTrans under the 3-cent Grand List reimbursement provision to offset costs to the Town.



Irene Damages to Brown Covered Bridge Approach

Thirty-three projects to repair damages to public infrastructure were completed between 2011 and 2016, with the Project Completion and Certification Report signed in June 2019. See **Appendix E** for a list of DR4022 projects and Project Completion and Certification Report.



Irene Damages to Cold River Road

In Shrewsbury, damage due to flooding usually consists of impacts to roads, culverts, bridges, and on occasion homes, the US Post Office, and auto dealership on VT Route 103.

As shown on the Local Natural Hazards and Vulnerabilities Map in **Appendix B**, Shrewsbury is not particularly vulnerable to inundation flooding, with the exception of some spots on VT Route 103 (between Spring Lake Road and Town Hill Road) and Spring Lake Road (at the intersection with VT Route 103) along the Mill River; on Wilmouth Hill

Road (at the Cold River Road intersection) along the Cold River; on Hinckley Road and Eastham Road (near Bridge B18) along Freeman Brook.

53 structures are in the Special Flood Hazard Area and 9 are in the floodway (10% of community structures); including residential dwellings, commercial properties, and a library. According to FEMA, 22% of these properties have flood insurance. In total, these 17 policies cover \$2,831,200 in value.

There are no repetitive loss properties.

Amazingly, in the Cuttingsville zoning district, none of the 22 major structures in the Mill River mapped floodway/floodplain suffered damage beyond basement flooding during Tropical Storm Irene.



Debris Pile from Flooding in Cuttingsville

In 2009, a river corridor plan was prepared for the Mill River watershed. Of the approximate 45,610 acre Mill River watershed that drains through Cuttingsville, about 14,015 acres (30%) is in Shrewsbury. That plan summarized information about the physical condition of the Mill River watershed; identified factors that are influencing the stability of the system; and synthesized the information to identify restoration and management priorities.

The Mill River corridor plan includes three locations in Shrewsbury with projects to protect the river corridor, remove berms, and restore the riparian buffer.

Flash flooding can impact areas in Town that are located outside of designated floodplains, including along streams confined by narrow valleys. Flash flooding events periodically wash out sections of several roads – Cold River, Upper Cold River, Crown Point, Mitchell, Russellville, Bailey, Keiffer, Adams, Lincoln Hill, and Spring Lake Road.



Flash Flood Damages along Eastham Road

In 2019, the Town completed an inventory of hydrologically-connected roads for the Municipal Roads General Permit. This inventory identified areas vulnerable to flash flooding and recommended corrective actions to make these areas more resilient.

The section of Northam Road adjacent to Johnson Pond is susceptible to wash out when the beaver dam on the pond fails or is overtopped.

During Tropical Storm Irene, fluvial erosion in the Cold River watershed significantly damaged several roads – Old Plymouth Road, Eastham Road, Mountain School Road, Wilmouth Hill Road, Upper Cold River Road, and Cold River Road.



Cold River Fluvial Erosion along Cold River Road

A river corridor plan for the Cold River watershed was completed in 2013. The goal of this planning effort was to provide:

- 1) A basis for understanding the overall causes of channel instability and habitat degradation along the river corridors in the watershed.
- 2) A list of preliminary corridor restoration projects to mitigate flood and erosion hazards in the watershed

The Cold River corridor plan includes 29 projects that were identified to promote the restoration or protection of channel stability and aquatic habitat. Twenty-three of these projects are in Shrewsbury.



Cold River Fluvial Erosion along Upper Cold River Road

The Cuttingsville Water District #1 infrastructure is not believed to be vulnerable to flooding.

High Wind/Hail

Severe thunderstorms can produce high winds, lightning, flooding, rains, large hail, and even tornadoes. Thunderstorm winds are generally short in duration, involving straight-line winds and/or gusts more than 50 mph.

Thunderstorm winds can cause power and communication outages, transportation and economic disruptions, significant property damage, and pose a high risk of injuries and loss of life.

From 2004 to 2010, for thunderstorms that caused more than \$200,000 in damage, Rutland County experienced nearly \$2 million in property damage. From 2011 to 2019, thunderstorms resulted in just under \$2.2 million in property damage in Rutland County, with \$525,000 due to a high wind event in May 2017.

Hail is a form of precipitation composed of spherical lumps of ice. Known as hailstones, these ice balls typically range from ¼ - 2" diameter on average, with much larger hailstones forming in severe thunderstorms. The size of hailstones is a direct function of the severity and size of the thunderstorm that produces it. Much of the hail activity in Rutland County is scattered and varies in intensity, and the resulting damage usually takes form in uprooted trees, downed power and communication lines, and damage to automobiles and crops.

Violent windstorms are possible here; Shrewsbury is susceptible to high directional winds in scattered locations throughout the town. Many storms with high winds result in downed trees, damaged phone and power lines, buildings, and other property. Shrewsbury is vulnerable to power outages and they present a potentially significant risk to many residents.

Much of the Town is served by a land line phone service that has converted from copper wire to fiber service. When the power goes out, an in-home battery provides the electricity necessary to make a call. The battery life is about eight hours, whether the phone is used or not.

Due to the natural terrain in Shrewsbury, there are many areas that cannot receive cell phone service. During a power outage lasting longer than eight hours many will not be able to contact the fire department, police, or ambulance service. This is of concern given Shrewsbury's aging demographics and many remote and isolated homes.

To mitigate the impacts of power outages, the following public buildings/critical facilities have been equipped with back-up power: Town Office (which serves as the primary local emergency operations center and shelter); Shrewsbury Mountain School (which serves as the alternate local shelter); both fire stations; and the municipal garage. Back-up power was installed at both fire stations within the last five years.

The centrally located Meeting House has large open areas on two floors and a food preparation area. The Meeting House Committee oversaw installation of a generator in November 2020, so that this facility may now more effectively serve as a local emergency shelter.

Extreme Cold/Snow/Ice/Wind

In the Rutland Region, most winter weather events occur between the months of December and March. Throughout the season, winter weather events can include snowstorms, mixed precipitation events of sleet and freezing rain, blizzards, glaze, extreme cold, the occasional ice storm, or a combination of any of the above. Events can also be associated with high winds or flooding, increasing the potential hazard.

The costs of these storms come in the form of power outages due to heavy snow or ice accumulations, damaged trees, school closings and traffic accidents.

From 2002 to 2010, Rutland County experienced \$1.1 million in property and crop damages from winter storms. From 2011 to 2019, Rutland County experienced \$1.5 million in property damage, with \$300,000 due to a 10" to 20" heavy, wet snowfall across the county on December 9, 2014.

There have been four winter storm-related federally declared Disasters in the county (the ice storm of January 1998 – DR 1201; severe winter storms in December 2000 and 2014 – DR 1358 and DR 4207, respectively; and severe storm and flooding in April 2007 – DR 1698).

Typically, towns' vulnerability to snow and ice storms are power outages and loss of road accessibility. As previously described, except for the serious issue of loss of land line telephone communication, the Town is prepared for a power outage caused by ice/wet snow accumulation on power lines or trees falling on powerlines due to weight of ice accumulation in a storm, especially if the outage coincided with a large scale sheltering event.

In general, snow accumulation has not made the Town vulnerable to loss of road accessibility. The Town's fleet of snowplows has ensured that roads are accessible, even in major snow accumulation events. Areas prone to significant drifting are limited to Bailey Road and are maintained accordingly.

Highest Risk Hazard History

Note: These are the most up to date significant events impacting Shrewsbury (local). Federal declarations are depicted in **bold**.

Inundation/Flash Flooding/Fluvial Erosion

6/20/2019: 6" rain; \$30,000 local damage

4/15/2019: DR4445 1-2" rain with significant snow melt: \$3,000 local damage

7/1/2017: DR4330 3-4" rain the previous 3-4 days with flash flooding on 7/1/17: \$41,800 local damage

6/25-7/11/2013: DR4140 with heavy rain over multiple days: no damage reported

8/28/2011: DR4022 Tropical Storm Irene with ±5" rain: \$3,782,649 local damage (\$102,956 Individual / \$3,515,142 FEMA grants / \$164,551 NFIP)

6/12/2007: flash flood producing rain: no reported damage

High Wind

2/24/2019: 48 mph winds: \$25,000 regional damage

9/6/2018: 55 mph wind: \$2,000 local damage

4/1/2018: 55 mph winds: \$50,000 regional damage

10/30/2017: 40 mph wind: \$100,000 regional damage

5/5/2017: 40 mph winds: \$25,000 regional damage

5/27/2014: 55 mph winds: no reported damage

9/11/2007: thunderstorm wind: \$5,000 local damage

10/29/2006: 50 mph gusts: \$5,000 regional damage

11/25/2004: 59 mph gusts: \$10,000 regional damage

Extreme Cold/Snow/Ice/Wind

11/26/2018: 4-8" pasty, heavy wet snow: \$25,000 regional damage

2/1/2015: Record cold month with 15 to 20+ days below zero: no reported impact

1/7/2015: 0 to 10 degrees with winds of 15-30 mph; Creating wind chills colder than -20 to -30 below zero: no reported impact

12/9/2014: DR4207 with 10-20" snow: \$200,000 regional damage

11/26/2014: 11" snow: \$25,000 regional damage

2/13/2014: 24" snow: \$10,000 regional damage

12/26/2012: Snowfall rate of 1-2" per hour with accumulations of 6-8": \$10,000 regional damage

2/23/2010: 6-30" snow: \$200,000 regional damage

4/15-16/2007: DR1698 "Nor'icane" with 3" snow and rain with winds of 60 to 80 mph: \$22,670 local damage

3/5/2001: EM3167 2-18" snow: \$5,440 local damage

Vulnerability Summary

Inundation/Flash Flooding/Fluvial Erosion

Location¹: *Inundation Flooding* - VT Route 103 (between Spring Lake Rd and Town Hill Rd) and Spring Lake Rd (at VT Route 103 intersection) along the Mill River; on Wilmouth Hill Rd (at Cold River Rd intersection) along the Cold River; on Hinckley and Eastham Rds (near Bridge B18) along Freeman Brook

Flash Flooding - Cold River, Upper Cold River, Crown Point, Mitchell, Russellville, Bailey, Keiffer, Lincoln Hill, and Spring Lake Rds

Fluvial Erosion - Old Plymouth, Eastham, Mountain School, Wilmouth Hill, Upper Cold River, and Cold River Rds

Vulnerable Assets¹: Roads, culverts, bridges, homes, auto dealership, US Post Office

Extent: 6" rain; extent data for fluvial erosion is unavailable

Impact: \$3,782,649 local damage

Probability: Inundation Flooding: >10% but <75% chance per year; Flash Flooding/Fluvial Erosion: >75% chance per year

High Wind

Location¹: Town-wide

Vulnerable Assets¹: Phone and power lines; buildings; other property; trees

Extent: ±59 mph winds

Impact: \$100,000 regional / \$5,000 local damage

Probability: >75% chance per year

Extreme Cold/Snow/Ice/Wind

Location¹: Town-wide; Drifting on Bailey Road

Vulnerable Assets¹: Roads, culverts, bridges, trees, power and phone lines

Extent: Up to 30" of snow; 80 mph winds, 15 to 20+ days below zero

Impact: \$200,000 regional / \$22,670 local damage

Probability: >75% chance per year

¹ See **Appendix B:** Local Natural Hazards and Vulnerabilities Map

6 HAZARD MITIGATION STRATEGY

The highest risk natural hazards and vulnerabilities identified in the previous section of this Plan directly inform the hazard mitigation strategy outlined below, which the community will strive to accomplish over the coming years. The mitigation strategy chosen by the Town includes the most appropriate activities to lessen vulnerabilities from potential hazards.

Mitigation Goals

The Hazard Mitigation Planning Team discussed mitigation goals and identified the following as the community's main mitigation goals:

- Reduce or avoid long-term vulnerabilities to identified hazards.
- Reduce the loss of life and injury resulting from these hazards.
- Mitigate financial losses incurred by municipal, residential, industrial, agricultural, and commercial establishments due to disasters.
- Reduce the damage to public infrastructure resulting from these hazards.
- Encourage hazard mitigation planning as a part of the municipal planning process.
- Encourage the adoption and implementation of existing mitigation resources, such as River Corridor Plans and Fluvial Erosion Hazard Maps, if available.
- Recognize the connections between land use, stormwater management, road design, maintenance, and the effects from disasters.
- Ensure that mitigation measures are sympathetic to the natural features of community rivers, streams, and other surface waters; historic resources; character of neighborhoods; existing land use and the capacity of the community to implement them.

Community Capabilities

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

Administrative and Technical

In addition to the Emergency Management staff described in Section 3, paid municipal officials that may assist with mitigation planning and implementation of specific mitigation actions include: Road Commissioner, Town Clerk, and Town Treasurer.

In addition, there are the following volunteers: 3-member Selectboard, 5-member Planning Commission, 7-member Conservation Commission, Development Review Board, Meeting House Committee, Historic Society Board, Tree Warden, and *Times of Shrewsbury* staff.

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

Strengths: Very competent and responsive Fire and Highway Departments – they are very well trained and capable and serve as Shrewsbury's front line emergency response ● local participation - volunteers tend to be knowledgeable with significant experience ● past success in securing and administering grants for public infrastructure improvements ● strong working relationships with neighboring communities to augment local resources

Areas for Improvement: Volunteers tend to be retired and the Town needs to engage the next, younger generation in helping to run the Town ● better communication and coordination between the Selectboard, EMD, the Road Commissioner, the Town Clerk, and Treasurer ● greater emphasis on record retention and what documentation is needed right from the start, even before an Emergency Declaration is made ● establish an emergency management team/committee that would monitor the identified hazards and search for opportunities for mitigation funding – the bureaucracy and standards for such programs are so complex and time consuming, it may be difficult for a volunteer to follow through ● few staff perform multiple functions – lack of redundancy makes town's administrative and technical capabilities vulnerable

Planning and Regulatory

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

Strengths: Many plans and standards have been adopted ● capital planning and budgeting ● Federal and State interest in maintenance of Brown Covered Bridge

Areas for Improvement: Increase local appreciation for historic and infrastructure value of Brown Covered Bridge ● capital planning and budgeting for Brown Covered Bridge protection fund ● need an emergency communications plan since cell coverage is poor and fiber-optic land line batteries only last 8 hours

Unified Zoning and Subdivision Regulations: Adopted June 7, 2017

Description: Provide for orderly community growth.

Relationship to Natural Hazard Mitigation Planning: Establish Surface Waters/Wetlands and Steep Slopes overlay zones with specific standards for development proposed in these zones. The purpose of these overlay zones is to discourage development in unstable and inappropriate areas to prevent water pollution and erosion and to protect ecological and aesthetic resources.

Flood Hazard Area (FHA) Regulations: Adopted May 4, 2011

Description: Apply to all areas in the Town identified as areas of special flood hazard **and** fluvial erosion hazard zones.

Relationship to Natural Hazard Mitigation Planning: Ensures the design and construction of development in flood **and** fluvial erosion hazard areas are accomplished in a manner that minimizes or eliminates the potential for flood loss or damage to life and property.

Road and Bridge Standards: Adopted on July 3, 2019

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

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

Fire Department ISO Rating: Issued in 2020

Description: The Shrewsbury Fire Department's ISO rating is 9/10. This rating is a score from 1 to 10 that indicates how well-protected the community is by the local fire department.

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

Municipal Plan: Adopted April 3, 2019

Description: A framework for defining and attaining community aspirations through public investments, land use regulations, and other implementation programs.

Relationship to Natural Hazard Mitigation Planning: The Emergency Management section of the Town Plan include specific goals and policies related to natural hazards.

Local Emergency Management Plan: Last adopted on April 29, 2020

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

Relationship to Natural Hazard Mitigation Planning: The LEMP includes actions for tracking events and response actions including damage reports to facilitate funding requests during recovery. This type of information can be essential to preparing hazard mitigation project applications for FEMA funding.

Road Stormwater Management Plan: December 2019

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

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

Financial

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

Shrewsbury's current annual town budget is approximately \$1,127,244, with \$846,284 to fund the Highway Department. The Town also votes yearly on \$90,000 to go towards reserve funds for the Town Office and Town Garage upkeep as well as replacement funds for Town Office and Town road equipment and records restoration. The Town has been able to cash flow large projects without the need to borrow except during Tropical Storm Irene where a yearly loan was taken for two different years.

Strengths: Tax revenues are sufficient for daily operations to maintain the status quo and make measurable upgrades to the local road network ● every department has a reserve fund with a replacement schedule ● maximize grant opportunities (FEMA, VTrans, ANR)

Areas for Improvement: Consider creating an "opportunity" fund to make available local financial match funds for unforeseen mitigation grant opportunities

Education and Outreach

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

- Community email distribution list
- Pierce's Coop/Store in-store bulletin board, emails
- Monthly town newsletter – *Times of Shrewsbury*
- Shrewsbury Day annual celebration
- Shrewsbury Mountain School
- Shrewsbury Conservation Commission
- Town website

Strengths: Multiple programs/organizations are already in place in the community

Areas for Improvement: Reinstate formal/original Town Meeting Assembly with lunch and discussions ● better coordination is needed to implement future mitigation activities

National Flood Insurance Program Compliance

The Town joined the National Flood Insurance Program (NFIP) in 1978. The Zoning Administrator enforces NFIP compliance through permit review requirements in its Flood Hazard Area regulations. Shrewsbury's regulations outline detailed minimum standards for development in flood hazard areas defined as Special Flood Hazard Areas, Floodway Areas, and the Fluvial Erosion Hazard Zone.

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

- 1) Provide information to residents on safe building initiatives and the availability of flood insurance.
- 2) Work with the RRPC to ensure that floodplain and river corridor maps are kept up to date.

The Shrewsbury Planning Commission is in the process of updating its Fluvial Erosion Hazard regulations to better meet new State suggestions.

State Incentives for Flood Mitigation

Vermont's Emergency Relief Assistance Funding (ERAF) provides state funding to match FEMA Public Assistance after federally-declared disasters. Eligible public costs are generally reimbursed by FEMA at 75% with the State matching 7.5%. The State will increase its match to 12.5% or 17.5% of the total cost if communities take certain prescribed steps to reduce flood risk as described below.

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

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

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

Shrewsbury's current ERAF rate is 17.5% because they have adopted all four mitigation measures as well as Fluvial Erosion Hazard regulations.

Mitigation Action Identification

The Hazard Mitigation Planning Team discussed the mitigation strategy, reviewed projects from the 2015 Plan, and identified possible new actions from the following categories for each of the highest risk natural hazards identified in Section 5:

- 1) **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
- 2) **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This applies to public or private structures as well as critical facilities and infrastructure. Many of these types of actions are projects eligible for funding through the FEMA Hazard Mitigation Assistance Program.
- 3) **Natural Systems Protection:** These are actions that minimize damage and losses and preserve or restore the functions of natural systems.
- 4) **Education and Awareness Programs:** These are actions to inform and educate the public about hazards and potential ways to mitigate them. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk is more likely to lead to community support for direct actions.

Local Plans and Regulations

Integrate Mitigation into Capital Improvement Programs: Hazard mitigation can be included in capital improvement programs by incorporating risk assessment and hazard mitigation principles into the capital planning efforts.

Manage Development in Erosion Hazard Areas:

The intent of River Corridor Bylaws is to 1) allow for wise use of property within river corridors that minimizes potential damage to existing structures and development from flood-related erosion, 2) discourage encroachments in undeveloped river corridors and 3) reasonably promote and encourage infill and redevelopment of designated centers that are within river corridors.

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

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

Structure and Infrastructure Projects

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

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

Conduct Regular Maintenance for Drainage Systems: Regular maintenance will help drainage systems and flood control structures continue to function properly. Techniques include: 1) routinely cleaning and repairing stormwater infrastructure – culverts, catch basins, and drain lines; 2) routinely cleaning debris from support bracing underneath low-lying bridges; and 3) inspecting bridges and identifying if any repairs or retrofits are needed to maintain integrity or prevent scour.

Protect Infrastructure and Critical Facilities: Mitigation techniques can be implemented to help minimize losses to infrastructure and protect critical facilities from flood events by: 1) elevating roads above the base flood elevation to maintain dry access; 2) armoring the banks of streams near roadways to prevent washouts or 3) rerouting a stream away from a vulnerable roadway; and 4) floodproofing critical facilities.

Protect Power Lines: Power lines can be protected from the impacts of natural hazards by: 1) incorporating inspection and maintenance of hazardous trees within the road right-of-way into the drainage system maintenance process and 2) burying power lines.

Retrofit Critical Facilities: Critical facilities can be protected from the impacts of high winds and winter storms. Techniques include: 1) retrofitting critical facilities to strengthen structural frames to withstand wind and snow loads; 2) anchoring roof-mounted mechanical equipment; and 3) installing back-up generators or quick connect wiring for a portable generator.

Natural Systems Protection

Protect and Restore Natural Flood Mitigation Features: Natural conditions often provide floodplain protection, riparian buffers, groundwater infiltration, and other ecosystem services that mitigate flooding. It is important to preserve such functionality. Possible projects include: 1) establishing vegetative buffers in riparian areas; 2) stabilizing stream banks; 3) removing berms; 4) minimizing impervious area development; and 5) restore incision areas.

Education and Awareness Programs

Educate Property Owners About Freezing Pipes: Extreme cold may cause water pipes to freeze and burst, which can cause flooding inside a building. Education and Awareness Programs for property owners may include: 1) educating building owners on how to protect their pipes, including locating water pipes on the inside of building insulation or keeping them out of attics, crawl spaces, and vulnerable outside walls and 2) informing homeowners that keeping water within the pipes moving by letting a faucet drip during extreme cold weather may prevent freezing and the buildup of excessive pressure in the pipeline, avoiding bursting.

Assist Vulnerable Populations: Measures could be taken to ensure vulnerable populations are adequately protected from the impacts of natural hazards, such as: 1) organizing outreach and 2) establishing and promoting accessible heating or cooling centers in the community.

Mitigation Concepts Evaluation and Prioritization

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

Mitigation Action Implementation

After careful evaluation and prioritization, the Planning Team agreed upon a list of specific actions that are acceptable and practical for the community to implement.

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

For the selected actions, the Planning Team then 1) assigned a responsible party to lead the implementation of each action; 2) identified potential funding mechanisms; and 3) developed a timeframe for implementing each action. This action plan is presented in **Table 6**.

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

Table 5: Mitigation Concepts Evaluation and Prioritization

Mitigation Concept	Life Safety	Prop Protect	Tech	Political	Admin	Other Obj	Benefit Score	Est Cost	C/B
Local Plans and Regulations									
Plan for and Maintain Adequate Road and Debris Clearing Capabilities	1	1	1	1	1	1	6	1	Yes
Update Road Erosion and Culvert Inventories	1	1	1	0	1	1	5	1	Yes
Review VTrans Bridge Inspection Reports ¹ and Plan for Identified Repairs to Prevent Scour	1	1	1	0	0	1	4	1	Yes
Integrate Mitigation into Capital Improvement Programs	1	0	1	0	0	1	3	1	Yes
Improve Stormwater Management Planning by Completing a Stormwater Management Plan	0	0	1	0	0	0	1	1	No
	Most of the Town is undeveloped or very lightly developed. There are no sizeable areas of contiguous impervious surface, natural conditions prevail within the predominately forested watersheds of both the Cold River and Mill River, much of it owned by the State or Federal government. This includes the watersheds of adjacent towns that drain through Shrewsbury. Because of this, the stormwater runoff volumes and rates cannot be meaningfully controlled without the construction of flood control structures, which are unlikely to be permitted by the State. For these reasons, the Planning Team did not select this mitigation action for implementation.								
Manage Development in Erosion Hazard Areas by Adopting River Corridor Bylaws	Shrewsbury’s existing Flood Hazard Area Regulations apply to all areas in the Town identified as areas of special flood hazard and fluvial erosion hazard zones; therefore, the Planning Team did not evaluate this action.								
Structure and Infrastructure Projects									
Routinely Clean and Repair Stormwater Infrastructure	1	1	1	1	1	1	6	1	Yes
Re-work Roadside Ditches	1	1	1	1	1	1	6	1	Yes
Secure an Emergency Access to the Shrewsbury Town Garage and Mountain School (local shelter)	1	1	1	1	1	1	6	2	Yes
Protect Power Lines and Roadway by Inspecting and Removing Hazardous Trees in Road ROW	1	1	1	1	0	1	5	1	Yes
Adequately Size Drainage Culverts in Flood-Prone Areas	1	1	1	0	1	1	5	2	Yes
Floodproof Critical Facilities – Brown Bridge	1	1	1	0	1	0	4	2	Yes
Re-route Streams Away from Infrastructure	0	1	1	0	1	0	3	2	Yes
Stabilize Outfalls	0	1	0	1	1	1	4	1	Yes
	There are no known unstable outfalls, so this action was not recommended for implementation at this time. However, the Road Commissioner will monitor culvert outfalls for any change in condition.								
Remove Existing Structures from Flood-Prone Areas	1	1	1	0	-1	-1	1	3	No
Elevate Roads Above Base Flood Elevation to Maintain Dry Access	0	0	1	-1	0	0	0	3	No
Increase Drainage/Absorption Capacities with Green Stormwater Management Practices	-1	-1	1	0	0	1	0	1	No
Routinely Clear Debris from Support Bracing Underneath Low-Lying Bridges	There are no low-lying town bridges with support bracing, so the Planning Team did not evaluate this action.								
Install Back-up Generators or Quick Connect Wiring at Critical Facilities	All public buildings/critical facilities have back-up power, so the Planning Team did not evaluate this action.								

¹ VTrans inspects all town-owned bridges in the State's Town Highway Bridge Program every two years. Bridge inspection reports are available on the VTrans website.

Mitigation Concept	Life Safety	Prop Protect	Tech	Political	Admin	Other Obj	Benefit Score	Est Cost	C/B
Bury Power Lines	The Shrewsbury Unified Zoning and Subdivision Regulations stipulate the Development Review Board may require the underground installation of power and telephone lines. Beyond these instances, the Planning Team did not believe burying power lines to be a reasonable or practical mitigation action for implementation.								
Retrofit Critical Facilities to Strengthen Structural Frames to Withstand Wind and Snow Loads	No critical facilities that require retrofitting, so the Planning Team did not evaluate this action.								
Anchor Roof-Mounted Mechanical Equipment on Critical Facilities	No critical facilities with roof-mounted mechanical equipment, so the Planning Team did not evaluate this action.								
Natural Systems Protection									
Establish Vegetative Buffers in Riparian Areas	0	1	1	1	0	1	4	1	Yes
Stabilize Stream Banks	0	1	1	0	1	0	3	2	Yes
Remove Berms and/or Accumulated Debris from Stream to Restore Flood Capacity	0	1	1	0	1	0	3	3	Yes
Restore Incision Areas	There are no known incision areas of concern, so the Planning Team did not evaluate this action.								
Education and Awareness Programs									
Educate Property Owners about Emerald Ash Borer	1	1	1	1	0	0	4	1	Yes
Keep the Ditches Clean Campaign	0	1	1	1	0	1	4	1	Yes
Assist Vulnerable Populations	Shrewsbury’s Local Emergency Management Plan includes information on how to address the needs of vulnerable populations during an emergency. A public education campaign could be undertaken to better inform residents how to access back-up power services or emergency shelters.								

Table 5 Evaluation Criteria:

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

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

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

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

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

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

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

1= Highly effective or feasible

0 = Neutral

-1 = Ineffective or not feasible

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

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

Table 6 Community Lifelines Description: A Community Lifeline enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security. The primary objective of lifelines is to ensure the delivery of critical services that alleviate immediate threats to life and property when communities are impacted by disasters. These critical services are organized into one of seven lifelines:



1. Law Enforcement
2. Fire Service
3. Search & Rescue
4. Government Service
5. Community Safety



1. Food
2. Water
3. Shelter
4. Agriculture



1. Medical Care
2. Public Health
3. Patient Movement
4. Medical Supply Chain
5. Fatality Management



1. Power Grid
2. Fuel



1. Infrastructure Responder Communications
3. Alerts, Warnings, & Messages
4. Finance
5. 911 & Dispatch



1. Highway/Road/Motor Vehicle
2. Mass Transit
3. Railway
4. Aviation
5. Maritime



1. Facilities HAZMAT, Pollutants, Contaminants

Table 6: Mitigation Action Implementation

Plan for and Maintain Adequate Road and Debris Clearing Capabilities: This includes capital planning and funding to support the appropriate number of staff and equipment needed to maintain the transportation network in Shrewsbury.

ADDRESSED HAZARDS

Winter Storm
Primary Hazard



High Winds

Lead Party

Selectboard

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED

Safety & Security



Transportation
Primary Lifeline

Area of Impact

Town-wide; ±60 mile road network

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Road Commissioner

BENEFIT SCORE = 6

PROJECT TIMELINE

To coincide with preparing the annual Town budget each January

Update Road Erosion and Culvert Inventories: These inventories were completed in 2019 and serve as the basis for asset management and should be kept up-to-date annually, with a full re-assessment every 5 years.

ADDRESSED HAZARDS

Flooding

Lead Party

Road Commissioner

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED

Safety & Security



Transportation
Primary Lifeline

Area of Impact

Town-wide; ±30 miles of hydrologically-connected roads and ±600 culverts

FUNDING SOURCES

- Local funding
- VTrans Better Roads

PARTNERSHIPS

- Rutland Regional Planning Commission

BENEFIT SCORE = 5

PROJECT TIMELINE

Re-assessment in 2024 construction season

Plan for Bridge Repairs: Every two years, VTrans inspects all town-owned bridges that are in the State's Town Highway Bridge Program. These inspection reports will be reviewed and used to plan for any identified flood-related bridge repairs.

ADDRESSED HAZARDS

Flooding

Lead Party

Road Commissioner

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED

Safety & Security



Transportation
Primary Lifeline

Area of Impact

Eight (8) town-owned bridges: B7, B15, B23, B27, B30, B32, B33, B34

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Selectboard
- VTrans

BENEFIT SCORE = 4

PROJECT TIMELINE

Review Reports in Nov 2021
Develop Plan for Repairs, if needed, in Jun 2021

Routinely Clean and Repair Stormwater Infrastructure: Regular maintenance is one of the most effective ways to mitigate the impacts of flooding. Routine cleaning and repairs of ditches, culverts, and catch basins will be done according to the Highway Department's maintenance schedule and the Municipal Roads General Permit (MRGP).

ADDRESSED HAZARDS**Flooding****Lead Party**

Road Commissioner

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**
Primary Lifeline**Area of Impact**Town-wide; ±60 mile road network
and ±600 culverts**FUNDING SOURCES**

- Local funding
- VTrans Better Roads
- Grants-In-Aid

PARTNERSHIPS

- Selectboard

BENEFIT SCORE = 6**PROJECT TIMELINE**See Highway Department's
Maintenance Schedule and MRGP

Re-work Roadside Ditches: Properly installed and stabilized roadside ditches are critical to protect the integrity of the road. Although Shrewsbury has an extensive network of ditches, the areas noted below have ditches that need to be re-worked to bring them up to current municipal Road Standards.

ADDRESSED HAZARDS**Flooding****Lead Party**

Road Commissioner

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**
Primary Lifeline**Area of Impact**

- 1) Upper Cold River Road
- 2) Adams Road & Lottery Road
- 3) Keiffer Road
- 4) Spring Lake Road
- 5) Others as required by the MRGP

FUNDING SOURCES

- Local funding
- VTrans Better Roads
- Grants-In-Aid

PARTNERSHIPS

- Selectboard

BENEFIT SCORE = 6**PROJECT TIMELINE**

- 1) 2021 construction season
- 2) 2021 construction season
- 3) 2021-22 construction season
- 4) 2022-23 construction season
- 5) See MRGP

Secure an Emergency Access to the Shrewsbury Town Garage and Mountain School (local shelter): The single access point to the Garage, Mountain School, and Town Transfer Station make it vulnerable to isolation during a flooding event that may wash out the road. Mountain School Road's vulnerability to wash out is exacerbated by an in-stream pond created by a private dam on the Cold River. The proposed emergency access is ±100 feet below the river crossing on Northam Road.

ADDRESSED HAZARDS**Flooding****Lead Party**

Road Commissioner

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED**Safety & Security****Food, Water, Shelter**
Primary Lifeline**Area of Impact**

Mountain School Road

FUNDING SOURCES

- Local funding
- FEMA HMGP

PARTNERSHIPS

- Selectboard
- Shrewsbury Mountain School

BENEFIT SCORE = 6**PROJECT TIMELINE**Acquire Property Jan 2021 – Jul 2021
Rough-in Gravel Road in Jul 2022

Remove Hazardous Trees in Road Right-of-Way: Hazardous trees in the road right-of-way can contribute to power and communication outages as well as debris in the roadway during winter storms and high wind events. Shrewsbury will remove hazardous trees within their road right-of-way as they are identified and/or request removal by Green Mountain Power if also within the power line right-of-way.

ADDRESSED HAZARDS**Winter Storm****High Winds****Lead Party**

Tree Warden

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED**Energy**

Primary Lifeline

**Transportation****Communications****Area of Impact**

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Green Mountain Power
- Road Commissioner
- Selectboard

BENEFIT SCORE = 5**PROJECT TIMELINE**

As needed

Adequately Size Drainage and Perennial Stream Culverts in Flood-Prone Areas: Undersized culverts can lead to road washouts and flooding. Shrewsbury has identified several locations where upsized culverts are needed.

ADDRESSED HAZARDS**Flooding****Lead Party**

Road Commissioner

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**

Primary Lifeline

Area of Impact

- 1) Mountain School Road – perennial culvert replacement
- 2) Lincoln Hill Road – upsize 6' perennial culvert
- 3) Northam Road – upsize 36" drainage culvert
- 4) Northam Road – upsize 6' perennial culvert
- 5) Upper Cold River Road – upsize 18" perennial culvert
- 6) Cold River Road – upsize 18" drainage culvert
- 7) Others as required by MRGP

FUNDING SOURCES

- Local funding
- VTrans Better Roads
- VTrans Structures Grant
- Grants-In-Aid
- FEMA HMGP

PARTNERSHIPS

- Selectboard
- ANR Stream Engineer
- US Army Corps of Engineers
- Rutland Natural Resource Conservation District

BENEFIT SCORE = 5**PROJECT TIMELINE**

- 1) Assemble a Selectboard-appointed committee to develop a plan for culvert replacement in Jan 2021. *This project should be coordinated with a recommended private dam removal project on the Cold River – see 2013 River Corridor Plan.*
- 2) 2022-23 construction season
- 3) 2022 construction season
- 4) 2023-24 construction season
- 5) 2021 construction season
- 6) 2025 construction season
- 7) See MRGP

Floodproof the Brown Covered Bridge: The Brown Covered Bridge is a historic and cultural resource as well as a transportation asset in Shrewsbury. It remains vulnerable to flooding at the west approach. Shrewsbury will investigate options to floodproof the west approach.

ADDRESSED HAZARDS**Flooding****Lead Party**

Selectboard

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**

Primary Lifeline

Area of Impact

Brown Covered Bridge

FUNDING SOURCES

- Local funding
- VTrans Structures Grant
- FEMA HMGP

PARTNERSHIPS

- VTrans
- VT Historic Bridge Program

BENEFIT SCORE = 4**PROJECT TIMELINE**

Initiate Scoping Study in Jan 2022

Re-route Streams Away from Infrastructure: A section of the Cold River and the Sargent Brook confluence from Wilmouth Hill Road to the Town line remains a threat to Cold River Road, Wilmouth Hill Road and bridge, and the Brown Covered Bridge. Shrewsbury will investigate a range of options for reducing the risks to infrastructure in this area, including, but not limited to, re-routing this section of the river.

ADDRESSED HAZARDS**Flooding****Lead Party**

Selectboard

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**

Primary Lifeline

Area of Impact

- 1) Cold River Road from Wilmouth Hill Road to the Town line
- 2) Wilmouth Hill Road and bridge at the Sargent Brook confluence
- 3) Brown Covered Bridge

FUNDING SOURCES

- Local funding
- VTrans Structures Grant
- FEMA HMGP

PARTNERSHIPS

- VTrans
- ANR Stream Engineer
- US Army Corps of Engineers
- Rutland Natural Resource Conservation District

BENEFIT SCORE = 3**PROJECT TIMELINE**

Assemble a Selectboard-appointed committee to develop a plan for the remaining vulnerable infrastructure along this section of the Cold River in Jan 2021. *This project should be coordinated with other natural system protection projects on the Cold River and Sargent Brook confluence – see 2013 River Corridor Plan.*

Establish Vegetative Buffers in Riparian Areas, Stabilize Stream Banks, Remove Berms and/or**Accumulated Debris to Restore Flood Capacity:** Shrewsbury will work with the Rutland Natural Resources

Conservation District to identify areas for collaboration to pursue these actions, especially those in the 2013 River Corridor Plan for the Cold River Watershed.

ADDRESSED HAZARDS**Flooding****Lead Party**

Selectboard

Type of Project

Natural System Protection

COMMUNITY LIFELINES TARGETED**Safety & Security**
Primary Lifeline**Transportation****Area of Impact**

- 1) Cold River Watershed, particularly along the Cold River and Sargent Brook confluence from Wilmouth Hill Road to the Town line
- 2) Mill River Watershed

FUNDING SOURCES

- Local funding
- VTrans Better Roads
- VANR Water Quality Grants

PARTNERSHIPS

- Road Commissioner
- Rutland Natural Resources Conservation District
- ANR Stream Engineer
- US Army Corps of Engineers

BENEFIT SCORE = 3-4**PROJECT TIMELINE**

Assemble a Selectboard-appointed committee to work with the Rutland Natural Resource Conservation District to identify areas for collaboration in Jan 2021.

Educate Property Owners about Emerald Ash Borer and Keep the Ditches Clean Campaign: Shrewsbury will

undertake education and awareness efforts on 1) the Emerald Ash Borer and the impacts of infestation and 2) the importance of keeping the municipal ditches free of yard waste and other debris.

ADDRESSED HAZARDS**Flooding****Invasive Species****Lead Party**

Selectboard

Type of Project

Education and Awareness

COMMUNITY LIFELINES TARGETED**Safety & Security**
Primary Lifeline**Transportation****Area of Impact**

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Tree Warden
- Shrewsbury Conservation Commission
- Times of Shrewsbury Staff

BENEFIT SCORE = 4**PROJECT TIMELINE**

Emerald Ash Borer educational outreach in *Times of Shrewsbury* in Spring 2021
Keep the Ditches Clean educational outreach in *Times of Shrewsbury* in Fall 2021

Process for Incorporating Plan Requirements into Other Planning Mechanisms

For Shrewsbury to succeed in reducing long-term risks, the information and recommendations of this Plan should be integrated throughout government operations.

The following are specific examples of how the Town will incorporate this Plan into other plans, programs, and procedures:

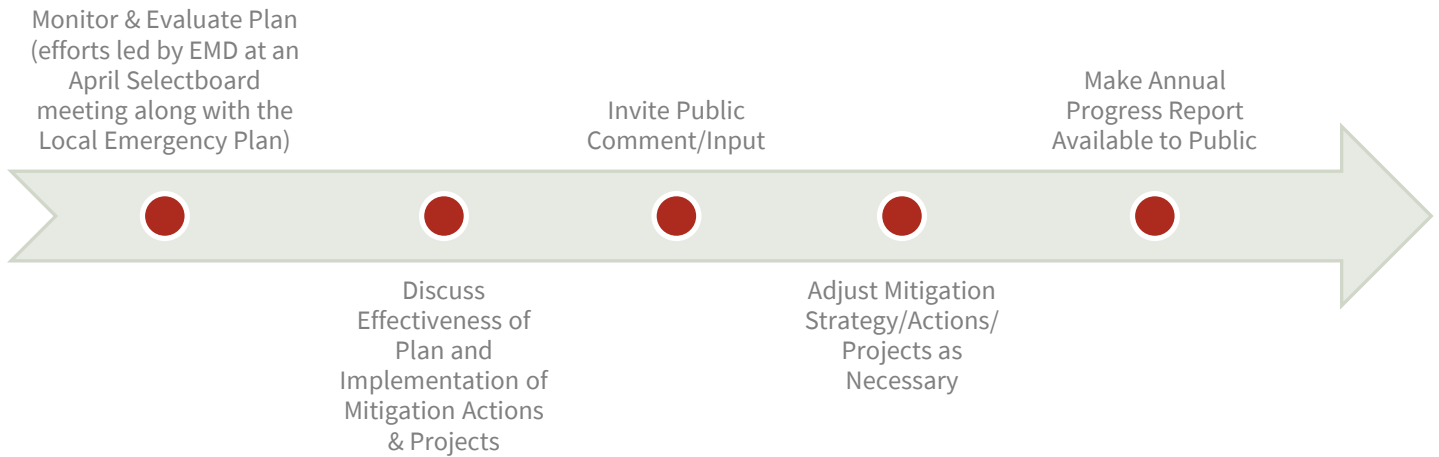
- The Selectboard will work with the Road Commissioner to incorporate risk assessment and hazard mitigation goals into capital planning efforts and improvement programs.
- The Planning Commission will integrate the hazard mitigation goals for disaster resiliency into the goals and objectives of the next Town Plan update in 2027.
- The Road Commissioner will implement several mitigation infrastructure projects (e.g., upsize perennial and drainage culverts in flood-prone areas, re-work roadside ditches) through existing plans (2019 Road Stormwater Management Plan for hydrologically-connected road segments).
- The Selectboard (or an appointed committee) will work with the Rutland Natural Resource Conservation District to identify opportunities to collaborate on addressing the hazard mitigation projects identified in the 2013 River Corridor Plan for the Cold River Watershed.

7 PLAN MAINTENANCE

This Plan is dynamic. To ensure the Plan remains current and relevant, it is important it be monitored, evaluated, and updated periodically.

Monitoring and Evaluation

This Plan will be monitored and evaluated annually starting in 2022 in accordance with the following process:



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

Updating

This Plan will be updated at a minimum every five (5) years in accordance with the following process:

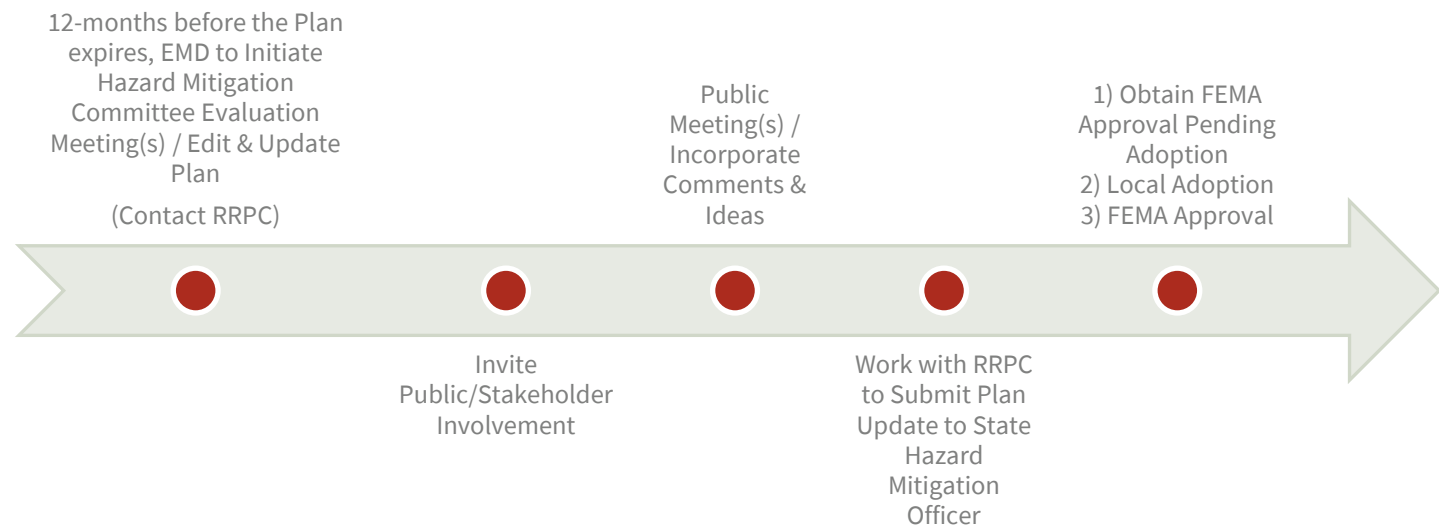


Table 7: Mitigation Action Status

Mitigation Action	2022	2023	2024	2025	2026
Local Plans and Regulations					
Plan for and Maintain Adequate Road and Debris Clearing Capabilities					
Update Road Erosion and Culvert Inventories					
Plan for Bridge Repairs					
Structure and Infrastructure Projects					
Routinely Clean and Repair Stormwater Infrastructure					
Re-work Roadside Ditches					
Secure an Emergency Access to the Shrewsbury Town Garage and Mountain School (local shelter)					
Remove Hazardous Trees in Road ROW					
Adequately Size Drainage and Perennial Stream Culverts in Flood-Prone Areas					
Floodproof the Brown Covered Bridge					
Re-route Streams Away from Infrastructure					
Natural Systems Protection					
Establish Vegetative Buffers in Riparian Areas					
Stabilize Stream Banks					
Remove Berms					
Remove Accumulated Debris to Restore Flood Capacity					
Education and Awareness Programs					
Keep the Ditches Clean Campaign					
Emerald Ash Borer Educational Outreach					

CERTIFICATE OF ADOPTION
TOWN OF Shrewsbury, Vermont Selectboard
A RESOLUTION ADOPTING THE Shrewsbury, Vermont 2021 Local Hazard Mitigation Plan

WHEREAS, the Town of Shrewsbury has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **2021 Shrewsbury, Vermont Local Hazard Mitigation Plan**, which result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Shrewsbury has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **2021 Shrewsbury, Vermont Local Hazard Mitigation Plan (Plan)** under the requirements of 44 CFR 201.6; and

WHEREAS, the **Plan** specifically addresses hazard mitigation strategies, and Plan maintenance procedures for the Town of Shrewsbury; and

WHEREAS, the **Plan** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Shrewsbury with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this **Plan** will make the Town of Shrewsbury eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Shrewsbury Selectboard:

1. The **2021 Shrewsbury, Vermont Local Hazard Mitigation Plan** is hereby adopted as an official plan of the Town of Shrewsbury;
2. The respective officials identified in the mitigation action plan of the **Plan** are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and **Plan** maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as part of this resolution for a period of five (5) years from the date of this resolution; and
4. An annual report on the process of the implementation elements of the Plan will be presented to the Selectboard by the Emergency Management Director or Coordinator.

IN WITNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Shrewsbury this 20th day of January 2021.

ATTEST

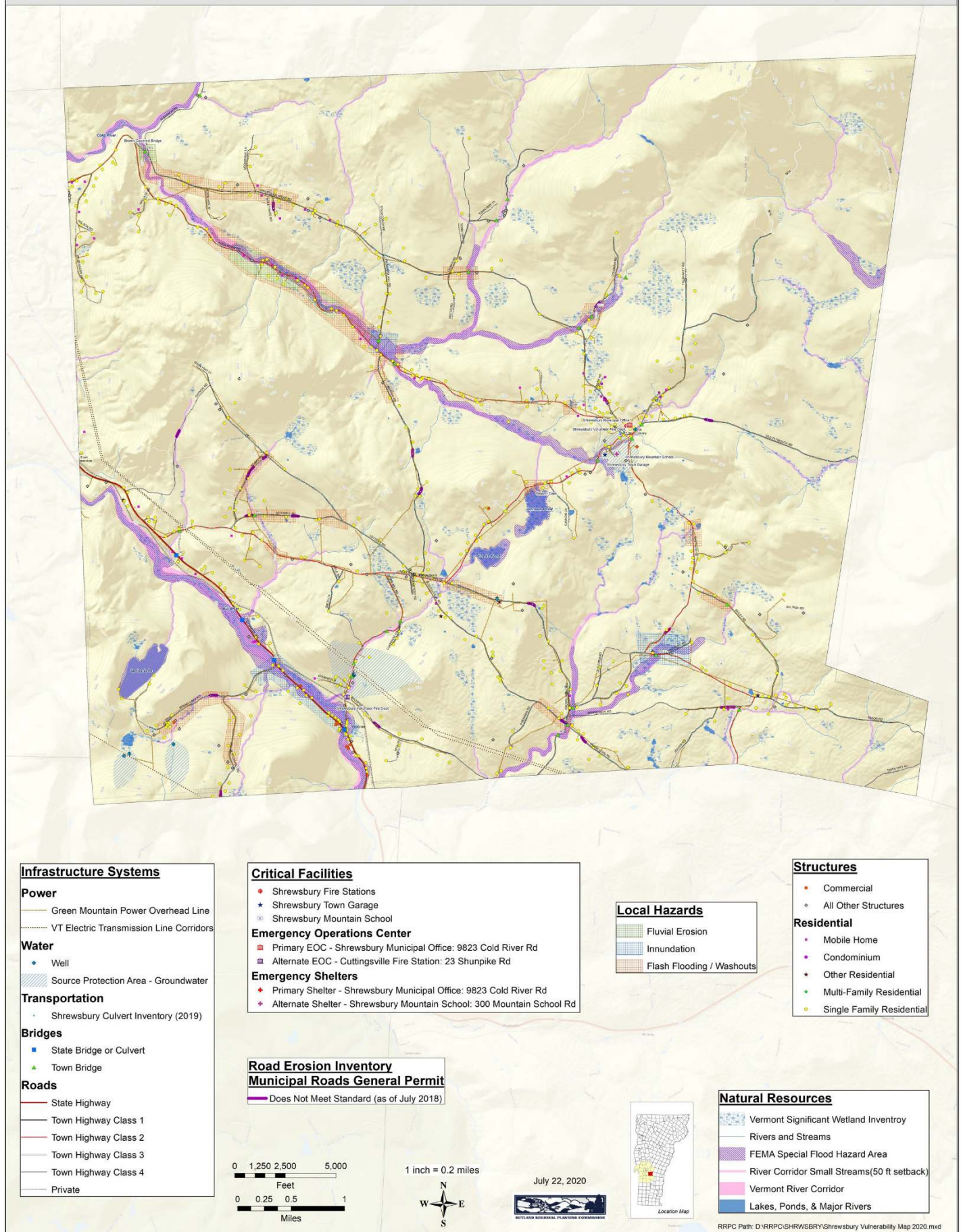
Town Clerk

Selectboard Chair

Selectboard Member

Selectboard Member

Shrewsbury, Vermont: Local Natural Hazards and Vulnerabilities Map



Mitigation Actions and Projects

Vulnerability Mitigated	Mitigation Action	Local Leadership	Funding Resources	Target Start	Target End	2020 Update
Spring Lake Ranch Road flooding	Install larger culvert to carry storm level waters	Selectboard and Road Commissioner	AOT, HMGP, Town budget	September 2015	June 2017	Completed
Road collapse, Cold River Rd. by Adams home	Purchase land and rebuild road on stable ground; bank stabilized	Selectboard and Road Commissioner	HMGP, AOT, HRRR	January 2016	June 2018	Completed
Northham Rd. flooding by Johnson Pond Beaver dam	Install larger culvert to carry storm level waters	Road Commissioner	HRRR	September 2015	June 2017	Incomplete – remains a priority
Landslide, southwest end of access road to Brown Covered Bridge	Stabilize landslide, reinforce banks and reconstruct road	Selectboard and Road Commissioner	HRRR, AOT, BBR	October 2015	October 2018	Completed

Preparedness Actions and Projects

Vulnerability Mitigated	Preparedness Action	Local Leadership	Funding Resources	Target Start	Target End	2020 Update
Inadequate water supply for fire fighting	Replace water supply hose	Fire Chief	AFG, Town budget	June 2015	March 2016	No longer addressed in this plan as it is not a natural hazard.
Loss of egress to school and highway department on School Street	Build second road access to school and highway department	Selectboard and Road Commissioner	HMGP, Town budget	June 2016	August 2016	Incomplete – remains a priority. The Town has started the process of buying the land for the emergency access road.

Acronyms

AFG Assistance to Firefighters Grant
 AOT Vermont Agency of Transportation
 BBR Vermont Better Back Roads Program
 HMGP Hazard Mitigation Grant Program
 HRRR High Risk Rural Roads Program
 RC&D Resource Conservation and Development