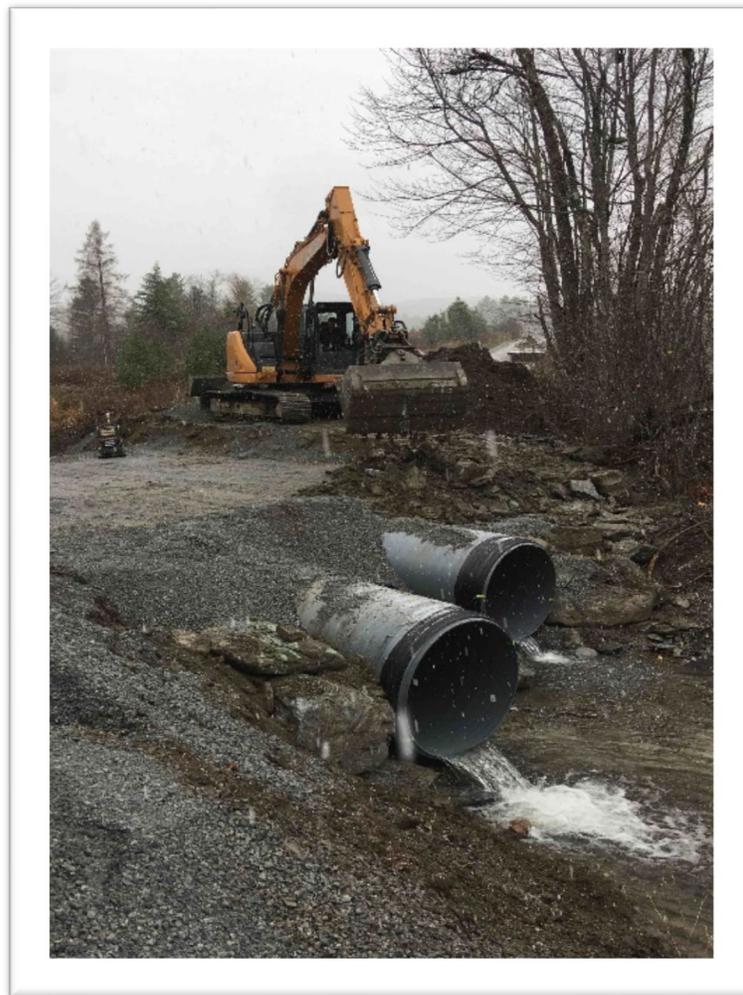


# Town of Fletcher, Vermont HAZARD MITIGATION PLAN 2020



Approved Pending Adoption by FEMA:  
Adopted by the Town of Fletcher Selectboard: Date:  
FEMA Final Approval:

**Resolution to Adopt the Fletcher Hazard Mitigation Plan**

Whereas, natural and man-made disasters may occur at any time, we recognize that by lessening the impacts of these disasters we will save resources, property and lives in the Town of Fletcher, Vermont;

And whereas the creation of the Town of Fletcher Hazard Mitigation Plan is necessary for the development of a risk assessment and effective mitigation strategy;

And whereas, the Town of Fletcher is committed to the mitigation goals and measures as presented in this plan;

And whereas, the respective officials identified in the mitigation action plan are hereby directed to pursue implementation of the recommended actions assigned to them;

Therefore, the Town of Fletcher Select Board hereby adopts the 2020 Fletcher Hazard Mitigation Plan.

**AUTHORIZING SIGNATURES**

Date: \_\_\_\_\_

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Selectboard Chair

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## ACKNOWLEDGEMENTS

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### **Project Participants:**

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Matt Gillilan - Town of Fletcher Selectboard

Norman Menard – Town of Fletcher Road Foreman

Amy Tinker – Town of Fletcher Town, Assistant Town Clerk & Assistant Treasurer

Northwest Regional Planning Commission – Taylor Newton - Senior Planner

This plan should be considered a plan in work due to the continually changing environment in which these hazards present themselves. This plan must also be reviewed and adjusted as growth in population, industry, and overall community demographics change.

## 1. INTRODUCTION

The impact of expected, but unpredictable natural and human-caused events can be reduced through community planning. The goal of this plan is to provide an all-hazards local mitigation strategy that makes the Town of Fletcher more disaster resistant.

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous efforts, 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. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe and identify local actions that can be taken to reduce the severity of the hazard. The national mission of Emergency Management is prevention, protection, response, recovery, and mitigation.

Hazard mitigation strategies and measures **alter** the hazard by eliminating or reducing the frequency of occurrence, **avert** the hazard by redirecting the impact by means of a structure or land treatment, **adapt** to the hazard by modifying structures or standards or **avoid** the hazard by stopping or limiting development and could include actions such as:

- Flood-proofing structures
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying & modifying high traffic incident locations and routes
- Ensuring adequate water supply
- Elevating structures or utilities above flood levels
- Identifying & upgrading undersized culverts
- Proactive land use planning for floodplains and other flood-prone areas
- Proper road maintenance and construction
- Ensuring critical facilities are safely located
- Buyout & relocation of structures in harm's way
- Establish & enforce appropriate building codes
- Public information

## 2. PURPOSE

The purpose of this Hazard Mitigation Plan is to assist the Town of Fletcher in identifying all hazards facing the county and their community and identify strategies to begin reducing risks from identified hazards. Once adopted, the local mitigation plan is not legally binding; instead, it outlines goals and actions to prevent future loss of life and property.

Adopting and maintaining the Hazard Mitigation Plan will provide the following benefits:

- Make certain funding sources are available to complete the identified mitigation initiatives that would not otherwise be available if the plan was not in place.
- Ease the receipt of post-disaster state and federal funding because the list of mitigation initiatives is already identified, including Vermont Emergency Relief Assistance Funding.
- Support effective pre- and post-disaster decision making efforts.

- Lessen the Town’s vulnerability to disasters by identified initiatives ranked by importance.
- Connect hazard mitigation planning to community planning where possible.

### 3. COMMUNITY PROFILE

The Town of Fletcher is located in eastern Franklin County (44.6752° N, 72.9238° W.) Fletcher shares borders with the towns of Fairfax, Fairfield, Bakersfield, Cambridge, and Waterville. Fletcher is within 20 miles of the City of St. Albans, the regional growth center, and approximately 35 miles from the City of Burlington, Vermont’s largest city. The total area of Fletcher is approximately 38 square miles. The population of the community is 1,424, according to the 2017 American Community Survey. There were 663 total housing units in 2017, of which 533 are owner-occupied, 29 are renter-occupied, and 1010 are vacant or seasonal. Most housing units were counted as single units (99%).

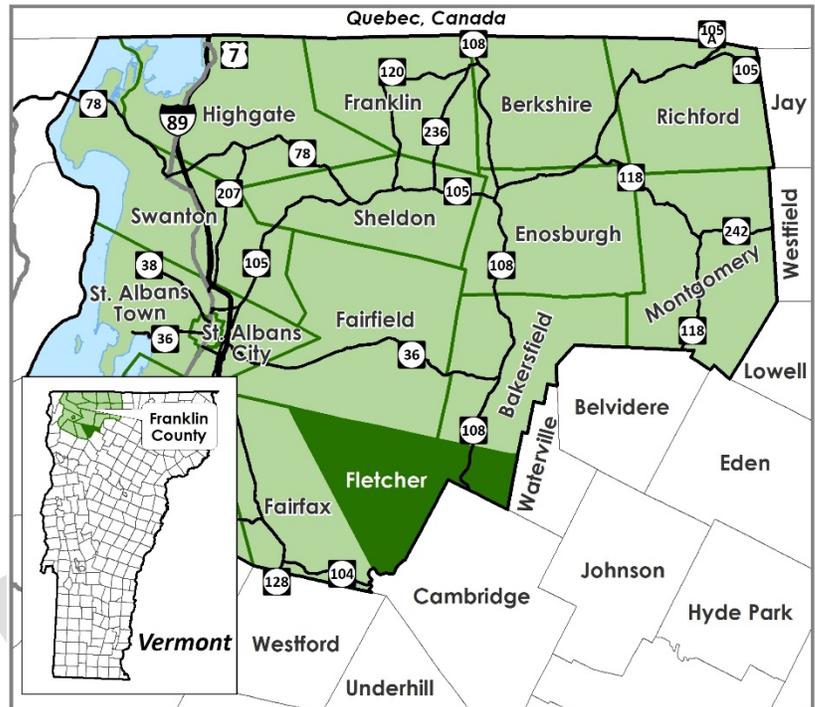


Figure 1- Location Map

The scenic character of Fletcher could best be described as quiet open farmland and forests with spectacular mountain views. For the most part, the Town’s rural character is still healthy and strong. The community of Fletcher contains two small villages. Most residents live in rural, large lots.

#### Existing Land Use

As of 2017, there were a total of 23,894 acres of land in Fletcher divided into 726 parcels averaging 32.7 acres in size. Approximately 3,184 acres of the land in Town are classified as farming in the Grand List. Most of the land is used for permanent residences 39% of all acreage); an additional 5% of the land is used for seasonal homes. Thus, residences use about 44% of the land in the Town.

*Permanent Residences:* About 50% of land is residential use. The average lot size of the 329 lots that are less than ten acres is 3.1 acres.

*Commercial Uses:* There are 8 commercial parcels of land in the Town; however, this figure does not include businesses that are not reported on the Grand List, such as home businesses, or farms.

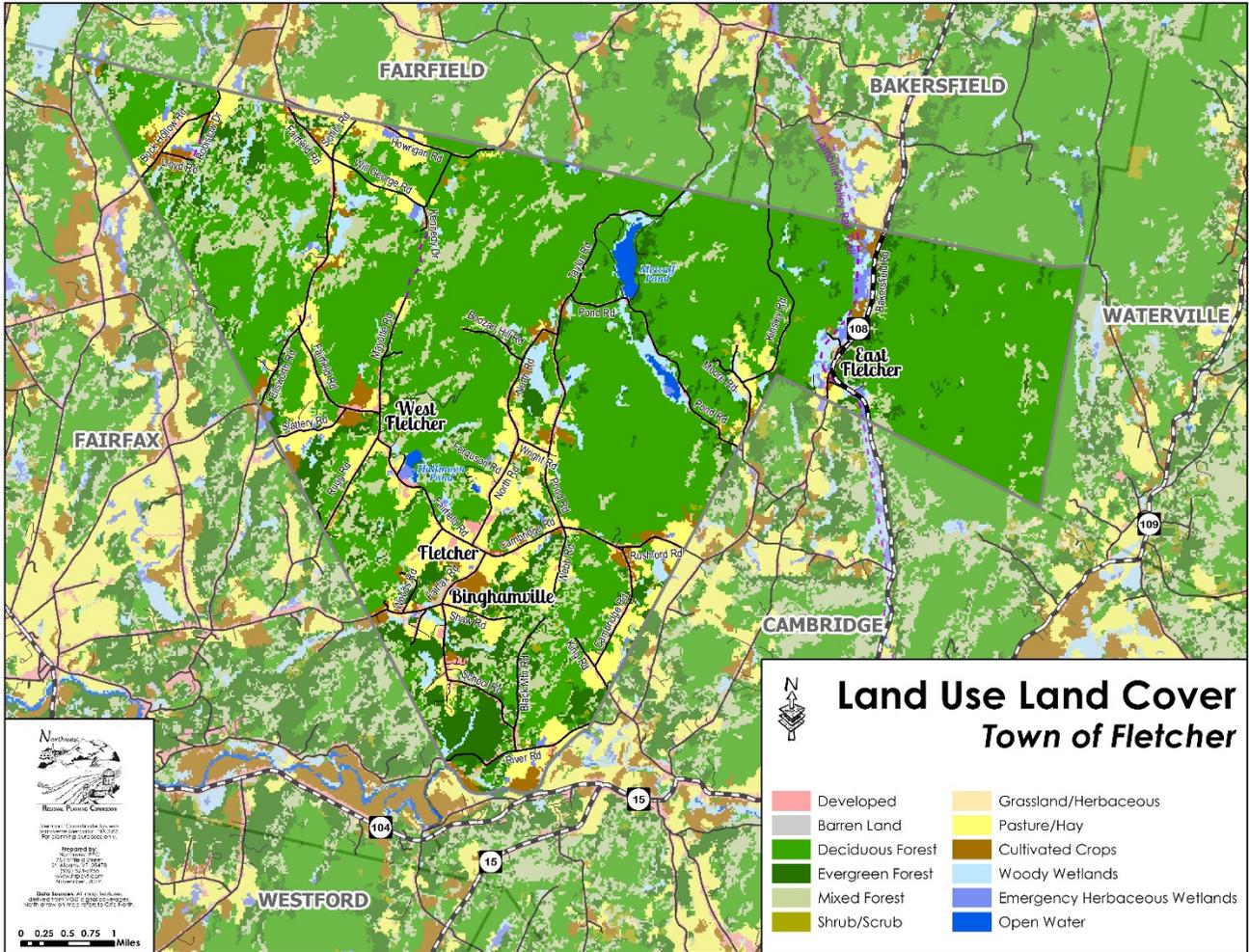


Figure 2 - Land Use/Land Cover

**Farms:** Over 3,184 acres of the land in Fletcher is classified as a farm.

**Forested Land:** Fletcher has substantial areas of forested land with no other land uses (7,542 acres). This includes mature forests, wetland forests, and young forests that are growing up from old farm fields or pastures. The Land Use/Land Cover Map shows forested areas (Figure 2). The large tracts of forest land shown on the map include small open non-forested areas and young forests that were once hay fields or pasture.

**Village Areas:** Fletcher has two villages: Fletcher and Binghamville. The Binghamville villages contains the Town Office, Elementary School, general store, and homes.

#### Future Land Use

The town of Fletcher currently divides its land use into the following zoning districts: Village District, Rural Residential/Agricultural District, Conservation District, Forest District, Shoreland-Recreation District, and Flood Hazard Area Overlay District. The purposes of these districts are summarized below and a complete description can be found in the Town of Fletcher Development Regulations adopted on March 19, 2018.

*Village District:* The Village District includes all lands within and adjacent to the historic settlements of Binghamville and Fletcher Center, as depicted on the zoning map attached in the Appendix. This district is meant to encourage the development of village areas as the focus of social and economic activities in the community and to provide for residential, commercial and other compatible development that serves the needs of the Town. Development consistent with the purpose of this district should occur at densities and reflect uses which will maintain the traditional social and physical character of the villages, including their historic and scenic resources, and which will not exceed the capability of the Town's lands, waters, services and facilities to absorb such densities.

*Rural Residential/Agricultural District:* The Rural Residential/Agricultural District includes lands within 1,500 feet of Class III, or better, roads. These lands are intended to be used primarily for residential, agricultural, and forestry uses. Compatible commercial and recreational activity is also supported. Development densities must be in keeping with the physical capabilities of the land and the availability of planned community facilities and services. Development methods to preserve the rural character and protect the agricultural resources of these areas are encouraged.

*Forest District:* The Forest District includes all lands eleven hundred feet or more in elevation on Wintergreen Mountains, and all lands on Gilson Mountain 1400 feet elevation and above. Included in this district are the upland roadless areas on Fletcher Mountain; all lands east of Route 108, but not including the area within 1500 feet of the road, which is in the Rural Residential / Agriculture District. This district serves to protect remote lands which are essentially undeveloped, lack direct access to public roads, are important wildlife habitat, are currently used for commercial forestry and/or have high potential for commercial forestry use, and have severe physical limitations for development. Conditional use review is required for all uses other than forestry or agriculture as a means of ensuring the integrity of the resources in this district and preventing undue burdens on public services.

*Conservation District:* The Conservation District includes most upland areas and other conservation lands not included in other zoning districts. The remote nature of these lands, extreme topography and/or significant physical limitations on any type of building make these areas of town poorly suited for future community growth and development. This district is also specifically intended to protect the scenic and important natural resource value of such lands for forestry, ground and surface water recharge, wildlife habitat, and outdoor recreation. Very limited, low-density development is anticipated in this district.

*Shoreland-Recreation District:* The Shoreland-Recreation District includes all lands within five hundred (500) feet of the shoreline of Metcalf and Halfmoon Ponds. This district protects areas which have present or potential capability for water-based recreation. Development in this district must be carefully controlled to protect water quality and scenic beauty.

*Flood Hazard Overlay District:* The Flood Hazard Area Overlay District includes identifies areas subject to a one percent or greater chance of flooding in any given year (i.e., 100-year flood plains) as depicted on the Federal Insurance Administration's current set of Flood Insurance Rate Maps (FIRMs) for the Town of Fletcher. This district is meant to prevent increases in flooding caused by development in flood hazard areas, to minimize future public and private losses due to floods, and to promote the public health, safety and welfare. This district is also required for continued Town eligibility in the National Flood Insurance Program.

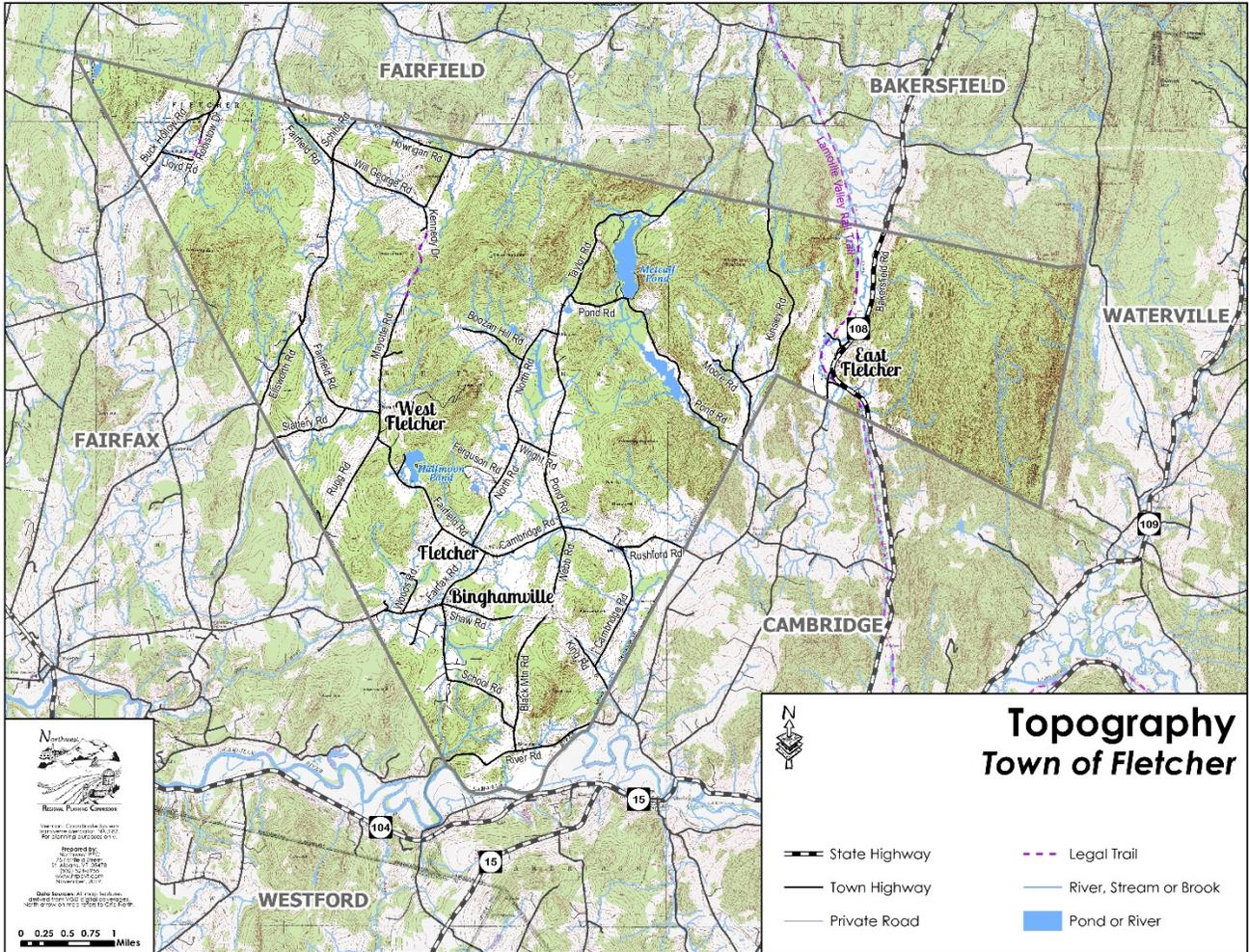


Figure 3- Topography

The character of Fletcher’s soils, topography, geology, and ground and surface water will influence the future growth and development of the Town. U.S. Soil Conservation Service Soil Survey maps provide valuable information on soils, slopes, geology, ground water, resource potential and wetlands.

Development Trends

Fletcher’s population historically has been steady. However, between 1970 and 2000 the population increased steadily (Figure 4). Population projections are based on past trends in birth, deaths and migration which provide reasonable estimates of future conditions.

Development in Fletcher has been characterized over the past several decades as rural residential development. The character of the Village is an important social and economic asset to the community. The Town does not have adequate sewer making the potential for additional development difficult. This coincides with Fletcher’s desire to maintain its rural character.

Energy

Vermont Electric Cooperative, Inc and Green Mountain Power provide electrical service to town residents.

According to the 2017 American Community Survey, fuel oil is the most popular home heating fuel and was used by 238 homes. Wood is the second most popular home heating fuel with 225 homes and propane was the third most popular home heating fuel with 78 units.

### Emergency Services

An annual retainer is paid to both Cambridge and Fairfax, for both fire and emergency medical services. A number of Fletcher residents actively serve on fire and rescue squads. Medical treatment is provided by ambulance services, doctors, dentists, and the Northwest Medical Center hospital in nearby St. Albans.

Fletcher has one elected constable, but law enforcement in town is generally the responsibility of the state police and the county sheriff. As in many rural communities, the level of police protection is a concern in Fletcher. Because of the limited service, response times can be long.

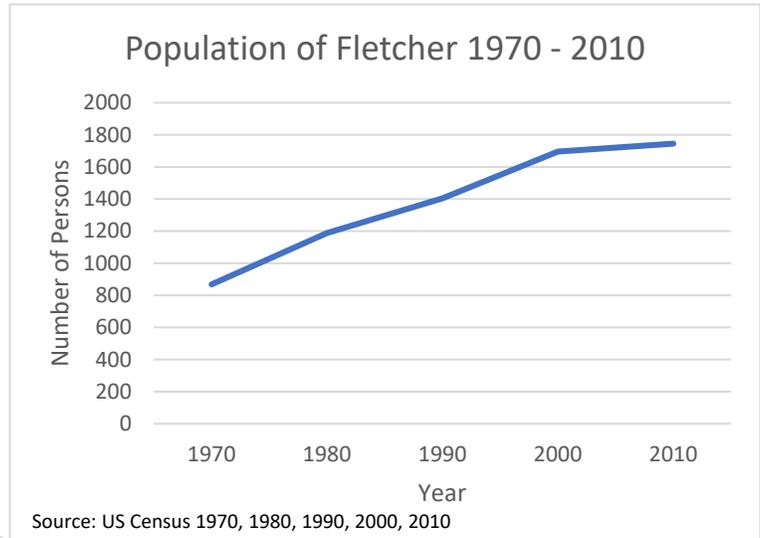


Figure 4 - Fletcher Population

### Water Supply and Sewage Disposal

At present, there are no municipal or community public water and sewer systems in Fletcher. All Fletcher residents, farms, and businesses are served by individually owned systems, which are the responsibility of the owner to install and maintain.

### Transportation

Fletcher's road network includes approximately 3 miles of state highway – Route 108. As part of the state's road network, this road is designed to state specifications, and is eligible for state and federal funding. Route 108 is considered a major artery, intended mainly to move traffic through the region. Average annual daily traffic along Route 108 through Fletcher, is estimated around 1,200 trips per day.

Fletcher's town roads include three major collectors, TH1 (Fairfax Rd/Cambridge Rd (East)), TH2 (Fairfield Rd/Cambridge Rd (West)) and TH3 (Buck Hollow Rd), which carry the largest volume of internal traffic and also provide links to state roads in neighboring communities. The Class 2 town roads are included in the regional road network; TH 1 and TH 2 are also included in the state's secondary system. Town Class 3 roads, TH15 (Taylor Road) (and a portion of TH4 (North Rd/Pond Rd)) and TH32 (Rushford Rd) serve as minor collectors, which also provide connections to neighboring communities.

The majority of roads in town are gravel roads, which are maintained by the town for year-round use and serve mainly to provide access to adjacent collector roads. Class 3 roads make up the bulk of the local road network. The maintenance and upkeep of Class 3 roads accounts for the largest share of the town's road budget. Class 3 roads require significant local public investment. Class 4 roads are maintained by adjoining landowners according to the current road policy. Some Class 4 roads are untraveled, impassable, and/or unmaintained.

## **4. PLANNING PROCESS**

### **Documentation of the Planning Process, Public Involvement and Input from Neighboring Communities**

The Town of Fletcher held several planning meetings to discuss the development of a Hazard Mitigation Plan. All meetings were open to the public. Public in attendance at the meetings were encouraged to participate. All All meetings were chaired by the Emergency Management Coordinator. Hard copies of drafts discussed at meetings were available to the public in attendance at meetings and upon request.

The Town of Fletcher held their initial planning meeting to approve the Hazard Mitigation Plan project on November 7, 2019. The meeting included the EMC Eva Gillilan, Road Foreman Norman Menard, Assistance Town Clerk Amy Tinker, Selectboard member Matt Gillilan and NRPC Senior Planner Shaun Coleman A draft plan was reviewed and an overview of FEMA mitigation grant programs was also discussed, criteria for the Vermont Emergency Relief Assistance Fund, Hazard Mitigation Grant and Flood Mitigation Assistance programs were reviewed. River corridor bylaws were mentioned and an overview of the Municipal Roads General Permit program was also discussed. Mitigation actions and priorities were reviewed and agreed upon. The draft plan was discussed at the scheduled Selectboard meeting on November 18, 2019 along with town's efforts to repair and document damages following the Halloween Storm. The plan was updated to reflect the input received at the meeting and sent out for review by committee members. A final LHMP meeting was held on November 21 at the Town Hall to review the plan. The public comment period was discussed and agreed upon. No public comments regarding the plan were received at these meetings.

A draft of the plan was posted for public comment on the NRPC and Town websites between February 3, 2020 and February 19, 2020. Draft copies of the Plan were also sent to the town clerks of Fairfax, Cambridge, Fairfield, Bakersfield and Waterville on February 3, 2020. Comments were requested to be sent to NRPC by February 17, 2020. No comments were received.

### **Incorporation of Existing Plans, Studies, Reports and Technical Information**

Mitigation plans from around the country, current State Mitigation Plans, FEMA planning standards, the FEMA Flood Mitigation Assistance Program requirements and the National Flood Insurance Program's Community Rating System were examined. Other materials examined consisted of community plans, including:

- Fletcher, Vermont Town Plan 2013-2018 and draft Fletcher, Vermont Town Plan 2019-2027
- Town of Fletcher, Vermont Development Regulations 2017
- State of Vermont Hazard Mitigation Plan 2018
- Town of Fletcher Flood Insurance Study, 1981
- Town of Fletcher Flood Insurance Rate Maps 1981
- Northwest Regional Planning Commission Regional Plan 2015

A complete list of references may be found in Attachment D.

## **5. RISK ASSESSMENT**

### **Identifying Hazards, Profiling Hazards, Estimating Losses and Assessing Vulnerability**

The NRPC staff and Town of Fletcher EMD collected data and compiled research on hazards including: severe NRPC emergency planners and Town of Fletcher EMC collected data and compiled research on hazards including: severe winter storm /ice storm, flooding / fluvial erosion, thunderstorms (high winds, lightning, hail), loss of electrical service, structure fire, hazardous materials, drought, telecommunications systems failure, tornado, earthquake, major fire – wildland, civil disturbance, terrorism/WMD. Research materials came from local, state and federal

agencies including FEMA, NOAA, NCDC and DOT. Research was also conducted by referencing historical local newspapers, texts, interviewing residents, and scientific documents. Internet references were widely utilized in historical research applications. Current mitigation activities, resources, programs, and potential action items from research materials and stakeholder interviews were also identified.

The information is based on surveys and interviews with local officials and the best available data sources found from federal, state, regional, and local agencies and departments. The risk and/or impact of several hazards were negligible and the state examination was considered sufficient in justifying the time spent on the analysis.

Hazard identification and risk estimation can be a highly complex, time consuming and very costly effort if sophisticated technical and engineering studies are undertaken. The Town of Fletcher does not have the resources to undertake hazard identification and risk assessment studies to this level of detail. The Town of Fletcher and the Northwest Regional Planning Commission used a module of Mitigation 20/20 software which included a hazard profile matrix (Attachment A) that was used to develop a risk rating for each identified hazard. The matrix is intended to be completed by relying on hazard identification and risk evaluation information that is available as well as the knowledge and judgment of planning participants. Health and safety consequences, property damage, environmental damage and economic disruption are classified as consequences of occurrence of each hazard. The following is a description of the risk characteristics used to classify each hazard primarily based on Mitigation 20/20 program:

**Frequency of Occurrence:**

1. Rare: Unknown but likely to occur in the next 500 years
2. Unlikely: Unknown and unlikely to occur in the next 100 years
3. Possible: Likely to occur in the next 100 years
4. Likely: Likely to occur in the next 25 years
5. Highly Likely: Likely to occur once a year or more

**Impact or % Community Impacted:**

0. Negligible: < 10% of properties damaged.
1. Limited: 10% to < 25% of properties damages/Loss of essential facilities/services for up to 7 days/few (<1% of population) injuries possible.
2. Critical: 25% to 50% of properties damaged/Loss of essential facilities/services for > 7 days < 14 days/Major (< 10% of population) injuries/few deaths possible.
3. Catastrophic: > 50% of properties damaged/ loss of essential facilities/services for > 14 days/Severe (> 10% of population) injuries/multiple deaths possible.

**Health & Safety Impacts:**

0. No health and safety impact
1. Few injuries or illnesses
2. Few fatalities but many injuries or illnesses
3. Numerous fatalities

**Property Damage:**

0. No property damage
1. Few properties destroyed or damaged
2. Few destroyed but many damaged
3. Few damaged but many destroyed
4. Many properties destroyed and damaged

**Environmental Damage:**

0. Little or no environmental damage
1. Resources damaged with short term recovery practical
2. Resources damaged with long term recovery feasible
3. Resources destroyed beyond recovery

**Economic:**

0. No economic disruption
1. Low direct and/or indirect costs
2. High direct and low indirect costs
3. Low direct and high indirect costs
4. High direct and high indirect costs

The risk estimation matrix (See Attachment C and Table 5.1) for the Town derives a “relative risk score” using a qualitative process in which to compile estimates of the likely frequency of occurrence, the extent of the community that would be impacted, and the likely consequences in terms of public safety, property damage, economic impacts and harm to environmental resources. The total is considered in this plan to constitute the “relative risk score”. The hazards with the highest risk score are severe winter storm/ice storm followed by flooding / fluvial erosion and severe thunderstorm (high winds, hail and lightning). It should be noted that the communities overall risk rating is low (146 out of a possible high of 1,105).

Each hazard was analyzed to estimate losses within the Town of Fletcher. The result is included in each hazard profile and in Table 1. Human losses were not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most figures exclude both the land value and contents of the structure. The data was calculated using FEMA’s Understanding Your Risks: Identifying Hazards and Estimating Losses (August 2001).

Vulnerability Scores

Vulnerability assessments build on the identification of hazards in the community and the risk that the hazards pose to the community. The vulnerability assessment process examines more specifically how the facilities and systems of the Town would be damaged or disrupted by the identified hazard.

The combination of the impact of the hazard and the frequency was used to determine the community vulnerability (risk score) as HIGH, MODERATE or LOW. The vulnerability classifications based on risk scores are as follows:

- 0-24 LOW
- 25-49 MODERATE
- 50-75 HIGH

For example, a flood event is *highly likely* (nearly 100% probability in the next year) in many communities within Franklin County but the degree of impact varies, so a *highly likely* flood with *critical* or *catastrophic* impact rates the community vulnerability as HIGH. A community with a *highly likely* or *likely* (at least one chance in the next 10 years) flood with a *limited* impact would receive a vulnerability rating of MODERATE. The vulnerability of a community having the occurrence of an event as *possible* or *unlikely* with *limited* or *negligible* impact would be LOW.

In order to determine estimated losses due to natural and man-made hazards in Fletcher, each hazard area was analyzed; results are shown below. Human losses were not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The median value of a home in Fletcher is \$207,300 according to the 2013 to 2017 American Community Survey estimates.

A full summary of hazards and impacts is provided in Table 5.1.

**Table 5.1 Summary of Hazards and Impacts for the Town of Fletcher**

Hazard Type	Frequency Of Occurrence	Impact/Magnitude	Risk Score (Vulnerability)	Estimated Potential Losses (Dollars)	Vulnerability
Severe Winter Storm/Ice Storm	Highly Likely	Limited to Catastrophic	Moderate	n/a	Roads, bridges, commercial and residential structures, seasonal homes, public buildings, (Fletcher School, PWB, Rec Center, Library, cemeteries), school, church, and utilities.
Flooding/Fluvial Erosion	Highly Likely	Limited to Catastrophic	Moderate to High	\$53,498 to \$267,489 residential & seasonal homes \$300,000 transportation infrastructure.	Loss of road access, power loss, telecommunications loss. Roads, bridges, commercial and residential structures, seasonal homes and utilities.
Severe Thunderstorm (High Winds, Lightning, Hail)	Highly Likely	Limited	Moderate	\$2,800,000 mainly utility	Primarily to utilities. Falling limbs and/or trees, power loss, church, school, telecommunications loss, structural damage, crop damage. Commercial and residential structures, seasonal homes, public buildings (Fletcher School).
Structure Fire	Possible	Limited	Low	\$207,300 (estimate 1 structure/year)	All structure types especially those lacking early detection systems.
Hazardous Materials	Possible	Limited	Low	n/a	Residential and seasonal homes, commercial structures, public buildings including Town Office/Fletcher School, Public Works Building/Garage, Recreation Center, Library Buildings, State Garage, church, school, utilities, and the environment.

Drought	Possible	Limited to Catastrophic	Low	n/a	Commercial structures – farms, livestock, private wells, public structures (water reservoir, water pumping station and wastewater treatment plant), residential and seasonal homes and vulnerable populations.
Tornado	Possible	Limited	Low	\$ 10,449,940	Falling limbs and/or trees, power loss, telecommunications loss. Structural damage to residential and seasonal homes, public buildings (Town Office, State Garage, Public Works Building/Garage, Recreation Center, State Garage, Water Pumping Station) commercial structures and utilities.
Earthquake	Possible	Limited to Catastrophic	Low	\$42,198,674	Infrastructure (roads, bridges), structural damage to residences, seasonal homes, commercial building, public buildings (Town Office, State Garage, Public Works Building/Garage, Community Center, Water Pumping Station, Water Reservoir), utilities.
Major Fire - Wildland	Possible	Limited	Low	n/a	Residential and seasonal homes, commercial structures, utility poles and lines, road closures, fires in rural areas lacking fire breaks.
Terrorism/WMD and Civil Disturbance*	Rare	Limited	Low	n/a	School, public building (Town Office, State Garage, Public Works Building/Garage, Community Center, Water Pumping Station).
Extreme Temperatures*	Possible	Limited	Low	n/a	Fauna, public health.
Hurricane*	Unlikely	Limited	Low	n/a	Local and state transportation networks. Residences, businesses, Town Office, State Garage, Public Works Building/Garage, Community Center, Water Pumping Station and Elementary School.
Infectious Disease Outbreak*	Possible	Limited	Low	n/a	Fauna, public health.
Invasive Species*	Possible	Limited	Low	n/a	Agricultural crops, forests.
Rock Cuts*	Rare	Limited	Low	n/a	None.
Nuclear Power Plant Failure*	Rare	Limited to Catastrophic	Low	n/a	All flora and fauna. Public health, Agriculture.
Rockslide/Landslide*	Rare	Limited	Low	n/a	None.
*Has never occurred.					

All the hazards identified in the state hazard mitigation plan were considered. The Committee decided it is not feasible to study each in depth again as many of the hazards were considered unlikely or rare. The hazards not profiled in this plan update are considered to be unlikely or rare in the Town of Fletcher and therefore will not be profiled in this plan update. Those hazards that are not considered in the local plan may have been profiled in the

State Hazard Mitigation Plan. The hazards not addressed in this plan update along with the justification for not including them are outlined in the following table.

**Table 5.2 Justifications for Hazards Not Profiled**

Hazard Not Profiled	Justification
Loss of Electrical Service	Rarely occurs and typically a consequence of other hazards such as winter storm (ice storm). Utilities are privately owned and regulated by public safety board. Town has emergency power generator at Fletcher School.
Ice Jams	There are no rivers in Fletcher and therefore there is no hazard posed by ice jams.
Dam Inundation	There are no dams in Fletcher.
Structure Fire	There are on average 4 calls to the Fire Department related to structure fires in town each year. The Fire Department has set response procedures they follow structure fires. New construction follows state fire marshal codes.
Hazardous Materials	There are no large-scale hazmat storage sites or manufacturing facilities in town. Hazardous materials are mostly propane and gasoline. The Town Fire Departments follows set hazmat response protocols should a spill occur.
Drought	Has not occurred in memory. Dry conditions occur briefly in late summer if they occur at all.
Telecommunications Systems Failure	Typically accompanies another hazard such as power loss, winter storm (ice storm). Telecommunications infrastructure that serves town is privately held.
Tornado	Has never occurred in Town. Generally profiled under high winds.
Earthquake	A moderate scale earthquake has never occurred in Town. The Town does not lie near any fault zone. Refer to Vermont State Hazard Mitigation Plan for further information regarding earthquake risk.
Major Fire – Wildland	Large wildland fire complex has never occurred in Town. Small grass fire in spring and summer occur rarely and typically less than an acre in size. Town fire department has response procedures to handle hazard.
Terrorism / WMD and Civil Disturbance	Has never occurred in Town. Vermont State Police would be primary response agency for any terrorist type incident.
Extreme Temperatures	The Committee agreed that extreme temperatures a non-issue because they are brief in duration if they occur at all. Hot spells in summer and cold snaps in winter are just part of life in Fletcher and not a concern.
Hurricane	The Town is too far north from the Atlantic coast. Vermont does not have any coastline. Tropical storms are profiled under High Winds section.
Infectious Disease Outbreak	Has not occurred in Town. Considered rare.
Invasive Species	Considered rare. Town would rely on state to assist individuals and commercial ag producers in mitigation and response to invasive outbreak.
Rock Cuts	None in town.
Nuclear Power Plant Failure	Fletcher is approximately 190 miles northwest from the nearest nuclear power plant, which is the recently decommissioned VT Yankee Nuclear Power Plant owned by Entergy Nuclear Vermont Yankee, LLC.
Rockslide/Landslide	Do not occur in Town. No areas where rockslides are an issue.

The community has identified and chosen to focus mitigation action items on the following hazards: Severe Winter Storm/Ice Storm, Flooding/fluvial erosion, and Severe Thunderstorms (High Wind, Lightning, and Hail). These are the hazards that are most likely to occur in Fletcher Town and are the hazards the town has developed mitigation actions around.

## Severe Winter Storm/Ice Storm

### Description

Winter storms with snow, ice and freezing temperatures in various combinations are fairly commonplace in Fletcher. Winter storms are accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, severe snow drifting, and dangerous wind chill. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Extreme cold often accompanies a severe winter storm or is left in its wake. Prolonged exposure to the cold can cause frostbite or hypothermia and become life – threatening. Severe winter storm can bring heavy accumulations of ice which can down trees, electrical wires, power poles and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards along the roadways.

### Impact and Geographic Area of the Hazard

The primary impacts of a winter storms / ice storm typically include disruptions to transportation networks due to fallen limbs and trees, school closings and occasionally telecommunications and power outages. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards along roadways.

Winter storms / ice storms affect the entire Town and generally cause disruptions to public and private services. Construction standards for snow load (see map below) indicate that structures in Fletcher should be built to withstand loads of 60 pounds per square foot. At that point, design standards would be exceeded and the structure runs the risk of collapse. Given this standard, a snowstorm which dumped 40 inches of snow or 10 inches of ice would likely result in a few collapsed roofs, especially on structures which are not built to these standards.

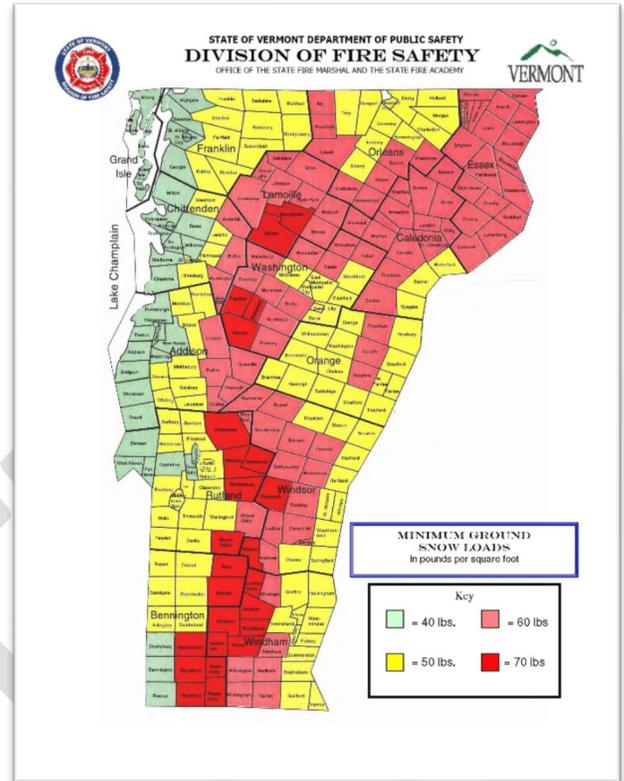


Figure 5 - Construction Snow Loads in Vermont. Fletcher = 50 lbs./sq. ft.

Table 5.3 – Fall Snowfall in Burlington

Burlington, Vermont					
Top 10 Fall Snowfall Totals					
Sep-Nov					
Highest			Lowest		
Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	24.0"	1900	1	0	2009/1948/1937/1915
2	23.0"	1921	2	0.1"	2004
3	21.9"	1906	3	0.4"	2010/1953/1930
4	20.4"	2002	4	0.5"	2003/1946/1941/1934/1918
5	19.4"	1910	5	0.7"	1999/1960/1894
6	19.2"	1971	6	0.8"	1982
7	18.8"	1968	7	0.9"	1988/1929
8	16.1"	1997	8	1.0"	1931
9	16.0"	1977	9	1.3"	1964
10	15.6"	1969	10	1.4"	1939

Source: National Oceanic and Atmospheric Administration

The primary impacts of an ice storm typically include disruption to transportation networks due to fallen limbs and trees, school closings and occasionally telecommunications and power outages. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards along roadways.

Vulnerable populations, such as the elderly, those dependent on medical equipment and specialized health or physical care, are at risk to all types of winter storms. Also at risk are farms and livestock. Barns can collapse due to heavy snow and ice loads. Dairy cattle are susceptible to mastitis<sup>1</sup> if they are unable to be milked. Many larger dairy farms have stationary or portable PTO driven generators as back-up power for automated milking equipment. Also at risk are people who use electric heat in their homes when associated power outages occur.

**Extent and Probability**

The National Weather service defines a blizzard as “a storm which contains large amounts of snow or blowing snow, with winds in excess of 35 mph and visibilities of less than 1/4 mile for an extended period of time (at least 3 hours).

Winter storms / ice storms occur annually in Fletcher, typically in the form of a Nor’easter. Nor’easters occur most often in the winter and early spring, but also sometimes during the fall. These storms can leave inches of rain or several feet of snow on the region, and sometimes last for several days.

Fletcher’s recent history has not recorded any loss of life due to the extreme winter weather. Driving is dangerous during these types of events due to poor visibility and slippery lanes of travel and motor vehicle accidents are likely to occur. Heavy snow with or without ice can topple trees and break branches which can fall on power lines and disrupt power and communications. Occasionally, roads may be blocked by a fallen tree.

**Table 5.4 – Winter Snowfall in Burlington**

Burlington, Vermont Top 10 Winter Snowfall Totals Dec-Feb					
Highest			Lowest		
Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	103.4”	2007-08	1	18.4”	1912-13
2	97.9”	2010-11	2	20.4”	1979-80
3	96.9”	1970-71	3	21.9”	1928-29
4	90.1”	2009-10	4	23.6”	1936-37
5	81.7”	1965-66	5	24.0”	1898-99
6	80.7”	2003-04	6	25.0”	1904-05
7	80.0”	1957-58	7	25.6”	1940-41
8	79.4”	2008-09	8	26.3”	2011-12
9	78.6”	1946-47	9	27.0”	1900-01
10	75.7”	1969-70	10	27.4”	1960-61

*Source: National Oceanic and Atmospheric Administration*

**Table 5.5 – Spring Snowfall in Burlington**

Burlington, Vermont Top 10 Spring Snowfall Totals Mar-May					
Highest			Lowest		
Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	52.7”	1933	1	0.1”	1945
2	47.8”	2001	2	1.0”	1903
3	45.7”	1971	3	2.0”	1910
4	37.7”	1974	4	2.7”	1927
5	36.4”	1916	5	3.1”	1934
6	36.1”	1997	6	3.2”	1991
7	34.4”	1994	7	3.9”	1946
8	33.9”	1983	8	4.0”	1905
9	31.0”	2007/1972	9	4.1”	1915
10	30.1”	2011	10	4.2”	1921

*Source: National Oceanic and Atmospheric Administration*

<sup>1</sup> Mastitis is the inflammation of the mammary gland caused by microorganisms, usually bacteria that invade the udder, multiply and produce toxins that are harmful to the mammary gland.

Severe ice storms impact the maple sugar economy in Fletcher as well. Maple sugar operations are comprised of extensive networks of sap lines between sugar maple trees within forests which take weeks and months to setup. Operations can run anywhere from a handful of taps to 95,000 taps. Ice laden trees and branches the fall onto the sap lines disrupt these networks and limit the volume of sap collected to make syrup. It takes considerable amount of time and labor to repair sap lines and restore the network to maximize production.

The Town is equipped to handle most winter emergencies, including maintaining road accessibility with various snow and tree debris removal equipment. The Town has access to private machinery, including bulldozers, plows, ATVs and snowmobiles, should they be needed in the event of an emergency. Heavy wet snows occurring during early fall and late spring and ice storms in the winter months are the cause of most power failures.

These random events are difficult to set a cost to repair or replace any of the structures or utilities affected. Based on current growth trends, impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Past Occurrences:

According to the National Climate Data Center, there have been 85 winter storms events affecting Franklin County, Vermont, including Fletcher, since January 1, 1997 totaling approximately \$1,097,500 in property damages and no deaths in the region. Additionally, there were 3 severe ice storms in the region causing \$2,500,000 in property damages and no deaths.

<b>Table 5.6 – Winter Storms/Ice Events in Fletcher</b>		
<b>Date</b>	<b>Location</b>	<b>Severity Remarks / Description of Area Impacted</b>
December 9 -14, 2014	Addison, Chittenden, Franklin, Grand Isle, Orange, and Windsor	DR-420. Rain and wet snow moved into Vermont 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 during the afternoon and evening hours of the 10th, then scattered snow showers ending on the 12th. 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 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 with over \$4 million in property damages estimated state-wide.
December 16-20, 2013	Addison, Chittenden, Franklin, Grand Isle, Orange, and Windsor	DR-4163. A wide-spread low-pressure system that brought snow and freezing rain through Ontario, Quebec, and Northern New England. These areas experienced an ice storm that brought wide-spread power outages. Many Towns throughout Franklin County, Vermont were affected by the ice storm. Vermont Electric Cooperative responded to over 60,000 customer outages during the week and estimated costs of restoring power at \$7,400,000. In Fletcher, the highway department was active keeping roads open and removing ice damaged trees and limbs from local roads. Several residents were without power for several days.
February 25, 2010	Central and Northern Vermont	Heavy wet snow fell across the State that resulted in snowfall accumulations of 6 to 30 inches. The weight of the heavy snow

		accounted for widespread power outages across the region that resulted in upwards of 50,000 customers state-wide without power.
December 1 -5 ,2010	Franklin, Lamoille and Chittenden Counties	DR-1951. Wind and snow spread across much of Vermont. Snowfall amounts in northern Vermont exceeded 2 feet across in some locations. Some of the highest amounts included 27 inches nearby at Jay Peak Ski Resort. Numerous vehicle accidents resulted from the snow-covered roadways and over 35,000 people lost power. Much of the damage was in the form of downed limbs, branches, trees, and some isolated structural damage in the form of blown off roof shingles. The prolonged persistence of strong and gusty winds accounted for the scope of damage across the region.
January 2-3, 2010	Central and Northern Vermont	Near record snow fell across the county from a powerful Atlantic storm system. Northwest winds of 15 to 25 mph with higher gusts caused considerable blowing and drifting snow with 4 to 5-foot snow drifts reported. A record 33.1 inches of snow fell at Burlington International Airport in South Burlington.
February 19 – 21, 2009	Northern Vermont	A prolonged flow of cool, moist and unstable air created persistent snow showers across the northern Counties during the afternoon of February 20th and continued until the early morning hours of February 21st. There were significant snowfall amounts (more than 12 inches) observed at various ski resorts. From 3 to 8 inches of snowfall accumulated within Grand Isle County and across the Champlain Valley.
January 29, 2009	Northern Vermont	Snow overspread the State early in the morning and continued into the evening hours. Snowfall accumulations with this storm were generally 8 to 14 inches in the County. There were no reported damages.
January 14-17, 2008	Franklin and Addison Counties	DR-1778. Scattered showers and thunderstorms moved very slowly along a cold front and produced very localized heavy rainfall. Several roads were washed out as local drainage systems were overwhelmed. There were approximately \$100,000 in damages state-wide.
February 14, 2007	New England	This storm was known regionally as the “Valentine’s Day Storm”. A winter storm (nor’easter) blanketed most of New England. In Vermont, snow fell heavy at times from late morning through early evening before dissipating during the night. Snowfall rates of 2 to 4 inches per hour and brisk winds of 15 to 25 mph caused near whiteout conditions at times, along with considerable blowing and drifting snow, making roads nearly impassable. Temperatures in the single numbers combined with brisk winds created wind chill values of 10 degrees below zero or colder.
January 6, 1998	Addison, Chittenden, Franklin, Grand Isle, Orange, and Windsor	DR 1201. This storm is referred to as the Ice Storm of 1998. Snow turned to freezing rain. Ice accumulations were generally between 1 and 2 inches with locally greater accumulations over portions of Grand Isle County and north western Franklin County. The impact on the region was dramatic. Trees and power lines snapped due to the weight of the ice. Power outages lasted for several days. Damage to the utility companies ran in the millions. With no electricity, the

		agricultural community was unable to milk cows with loss of income and damage to cows. Travel was dramatically impacted and many roads and bridges closed due to ice and fallen trees. The National Guard assisted with cleanup operations after the storm. Falling tree limbs and other debris was a significant hazard during and following the storm. It is not known what the financial losses were to the Town as a result of the storm. There was \$1,500,000 in damages in Grand Isle County. Public Assistance funding was \$5,899,183.
April 10, 1996	Statewide	A classic Nor'easter, this system spread snow across the region for nearly two days. The snow tapered off to flurries by late evening on the second day. The heaviest snow fell over and east of the Green Mountains with 7 to 14 inches. In the Champlain Valley 2 to 5 inches fell with heaviest amounts above the 700-foot level. The wet snow resulted in some power outages and minor automobile accidents across the state.
February 28, 1995	Northern Vermont	A low-pressure system which developed in the Ohio Valley resulted in a mixture of snow, sleet, and freezing rain across Vermont. Snow accumulations ranged from four to eight inches across much of northern Vermont.
March 13-14, 1993	State-wide	One of the worst storms of the century. Known as the "Blizzard of 93", it was one of the most powerful storms (Nor'easters) on record. The system moved up the Eastern Seaboard on the 13th and 14th coming close to breaking the pressure and snowfall records in many locations. Snowfall amounts ranged from 10 to 28 inches across the state. Due to the weight of the snow that accumulated, there were numerous damage reports of barns and building roofs being damaged or at risk of collapsing state-wide.
January 3, 1993	Northern Vermont	A combination of a cold surface and warm moist air aloft created freezing rain and freezing drizzle across the state. Road surfaces in northern were covered in "black ice". "Black ice" is a thin transparent form of ice allowing the black asphalt surface of a road to be seen through the ice. "Black ice" conditions typically result in numerous traffic accidents as motorists are unaware that the road surface is covered in ice.

The Town has classified severe winter storms/ice storms to be highly likely each year. Every winter there is a winter event where Town residents will have to address snow and ice build-up on personal property and the Town's public works department will have to ensure the roads remain clear of snow and ice.

### **Flooding/Fluvial Erosion**

#### Description:

Historically in Vermont, flooding has been the number one natural disaster in loss of life and property damages. In Fletcher, flooding occurs from significant precipitation from rainstorms and thunderstorms and flash flooding when a large amount of precipitation occurs over a short period of time. Snowmelt due to rapidly warming temperatures can cause localized flooding. In the spring, snowmelt can be exacerbated by heavy rainfall. Ice Jam

related flooding occurs when water is blocked by ice accumulation. This can happen due to warming temperatures coupled with heavy rain. Fluvial erosion is streambed and streambank erosion associated with physical adjustment of stream channel dimensions (width and depth). Flooding can occur through fluvial erosion. This happens when fast moving flood waters, typically in steep areas, cause areas of erosion around streams and rivers. Both inundation flooding and fluvial erosion occur naturally in stable, meandering rivers and typically occur as a result of any the conditions mentioned previously.

#### Impact and Geographic Area of the Hazard

Inundation flooding is when water rises and covers the adjacent low-lying land. The Federal Emergency Management Agency (FEMA) defines a floodplain as an area of land adjacent to lakes and streams that is subject to recurring inundation or high water. Inundation and fluvial erosion may both increase in rate and intensity as a result of human alterations to a river, floodplain, or watershed. For instance, when a beaver dam fails there may be significant, rapid inundation which can occur without warning. Public and private structures and infrastructure become vulnerable when they are located on lands susceptible to inundation and fluvial erosion.

The Lamoille River flows west through the town to form the southern boundary. There are several areas of floodplain in Fletcher. This includes areas along the banks of the Lamoille River, Stones Brook, Wilkins Brook, Black Creek, Metcalf Pond and Halfmoon Pond. The flood plain areas of Fletcher are primarily agricultural with some wooded areas. Most residential and commercial development is limited to two unincorporated settlements known as Fletcher and Binghamville. There is little or residential development planned in Fletcher. Low-lying areas in town are subject to periodic flooding causes the overflow of the Lamoille River and its tributaries particularly in the southwestern part of town.

Given the steep terrain of Fletcher, impacts from flash flooding and fluvial erosion could occur anywhere. Historically, flooding from Stones Brook, Wilkins Brook, Black Creek and Polly Brook and their tributaries impact the local roads network and associated infrastructure, cause damages to driveways and can flood basements and properties.

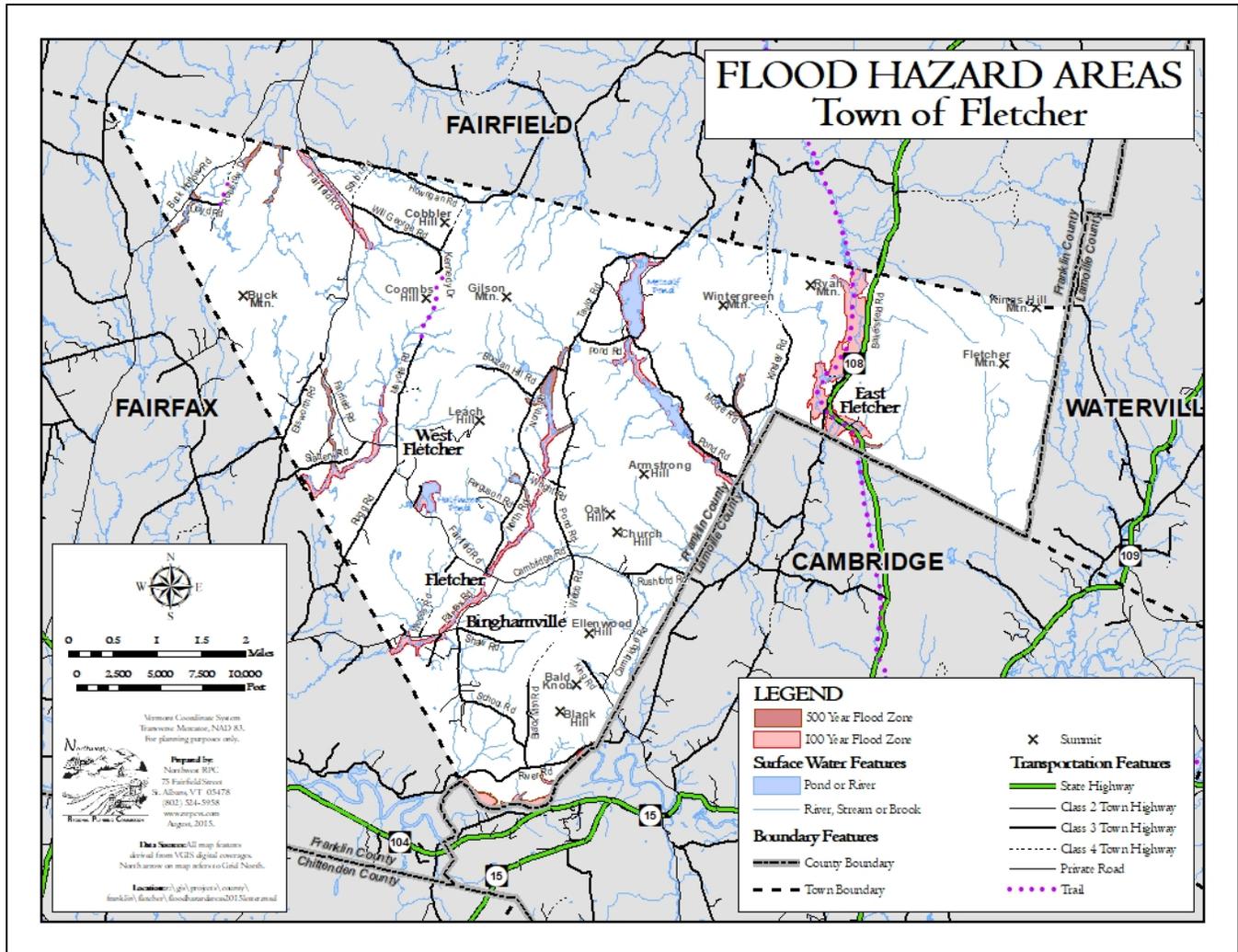
#### Floodplain/River Corridor Mapping

To identify areas prone to fluvial erosion hazards, the Vermont Agency of Natural Resource has identified River Corridors in all Vermont municipalities. River Corridors are based on the individual conditions of streams and rivers including topography and the existence of public infrastructure. River Corridors are not mapped for streams that have a watershed of less than 2 square miles. Instead, the Agency advises using a buffer of 50-feet on each side of a stream with the intention of protecting stream stability and natural flow.

Municipalities may adopt River Corridor maps and regulation as a part of their development regulations. Fletcher has adopted a stream buffer regulation that is similar to state administered River Corridor regulation to ensure that land development does not occur in areas prone to erosion.

The Town of Fletcher has adopted floodplain regulations as part of its zoning bylaw, which conforms to federal requirements for participation in the National Flood Insurance Program (NFIP). Restrictions are intended to protect life and property, and to allow property owners to obtain flood insurance, and mortgages, at affordable rates. These regulations restrict development in 100-year flood zones, as mapped on federal Flood Insurance Rate Maps (FIRMs) available for review at the town clerk's office. While this information is the best available, the hydrology that these maps are based on has not been updated since the 1980s and therefore does not account for shifts in shoreline or effects of development.

The follow is a map depicting flood hazards in Fletcher. FEMA Flood Insurance Rate Maps were digitized from the original base maps. The Lamoille River runs from east to west on the southern boundary. FEMA is currently in process of creating digital FIRMS for the Lamoille River watershed. The map shows impacts of flooding primarily to transportation infrastructure and driveways.



The assessed value of all structures in Fletcher is \$83.2 million. Assuming a range of town-wide damage of 1% to 5%, a damaging flood could result in \$832,000 to \$4,160,000 of total damage excluding building contents. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Extent / Probability

Flash floods, rain storms and fluvial erosion are all locally probable hazard events according to plan participants. Flash floods typically occur during summer when a large thunderstorm or a series of rain storms result in high volumes of rain over a short period of time. Higher-elevation drainage areas and streams are particularly susceptible to flash floods. Flash floods are likely in Fletcher, and potential damage to Route 108, Cambridge Road or Fairfax Road could limit access to town, as they are the major transportation corridors through the community. Flooding and fluvial erosion are considered highly likely by the town.

There is a stream gauge on the Lamoille River located approximately 2.75 miles upstream in Jeffersonville. This is the closest gauge to Fletcher. Flood height is 450 feet. This gauge was recently installed and there is not much historical data associated with the gauge. According to NOAA, gauge heights at this location will result in the following:

<b>Table 5.7 – Lamoille River Gauge at Jeffersonville</b>	
<i>Note: Cambridge and Jeffersonville are east of Fletcher and Fairfax is west of Fletcher.</i>	
<b>Gauge Height</b>	<b>Potential Effects</b>
453.5	In Jeffersonville, Main Street, Depot Street, and Maple Street will begin to flood. Businesses along Route 15 in Jeffersonville will flood. Route 15 between Johnson and Fairfax will be inundated and impassable in some areas. There will be widespread field flooding from Jeffersonville downstream through Fairfax.
453	Water will begin to enter streets in Jeffersonville. The north end of Main Street will flood first, and low-lying homes will be affected. Portions of Route 15 between Johnson and Fairfax will begin to flood, and there will be widespread field flooding along the river.
451.5	Route 15 in Cambridge becomes impassable. Traffic diversions will be required, and motorists planning to travel Route 15 through Cambridge should allow extra time to detour around the flooded roadway. There will be widespread field flooding from Jeffersonville downstream through Fairfax.
451	Water will cover Route 15 in Cambridge Village at the Wrong Way Bridge. Traffic diversions may be necessary, and motorists planning to travel route 15 through Cambridge should allow extra time to detour around the flooded roadway. There will be widespread field flooding from Jeffersonville downstream through Fairfax.
450	Water will rise to near the edge of Route 15 in Cambridge Village at the Wrong Way Bridge. There will be widespread field flooding from Jeffersonville downstream through Fairfax.
447	The Lamoille River will begin to leave its banks around Jeffersonville and downstream through Cambridge Village. Persons with interests in the floodplain, such as farmers, campers and seasonal canoe and kayak operators should move their equipment to higher ground.

Flooding from the Lamoille River in Fletcher is typically field flooding. Residents along River Road in Fletcher are above the flood area.

Metcalf Pond – There are approximately 45 summer camps/cottages along Metcalf Pond and 3 single family homes that could be affected by flooding in the immediate vicinity of the Pond. Additionally, Wintergreen Mountain Road, S. Shore Drive, Noble Road, Reynolds Rod and Scott Road could be damaged as well. The roads and drainage in this area are well maintained. The Pond flows south through swamp and marshland to the west of Pond Road. The road and drainage system are well maintained and impacts from flooding would be minimal.

Stones Brook – Stones Brook drains south between North Road and Pond Road. The unnamed tributaries of Stones Brook that drain off the slopes of Gilson Mountain can overwhelm undersized culverts on Boozan Hill Road and North Road. Wright Road which connect North and Pond Roads is at risk of getting damaged from a flash flood event or high precipitation event. This area has experienced flood damages as recent as the Halloween event in 2019. Stones Brook also intersects Fairfield Road and then Fairfax Road before fanning out into flood plains near the border with Fairfax. The Town has improved drainage in the Fairfield Road area to prevent damages.

Halfmoon Pond – In West Fletcher, Halfmoon Pond drains south into Stones Brook. There are several residences to the south and west of Halfmoon Pond that could be impacted by flood waters from the pond. Fairfield Road has been impacted by flooding in this area. During high precipitation events, the risk of flooding from Stones Brook is greatly increased near the Fairfield Road where it joins with Stones Brook.

Wilkins Brook – Flooding is a concern along Wilkins Brook in West Fletcher. Several unnamed tributaries off Coombs Hill and Leach Road feed into Wilkins Brook putting Mayott Road and Slattery Road at risk for a flash flood event. Both roads have been damaged by flooding from high precipitation events. Driveways with undersized culverts could be damaged.

Northwest Fletcher – The upper reaches of the Fairfield River are in this area and the main tributary that runs along Fairfield Road is within a FEMA flood zone. Howrigan Road and Will George Road have been damaged by flooding in recent years. Town has been working to improve the drainage in the area. Additionally, Polly Creek drains southwest into Fairfax along the Buck Hollow Road where it eventually merges with Mill Brook which drains into the Lamoille River. A small portion of Polly Creek where it intersects Buck Hollow Road and Lloyd Road is within a FEMA flood zone. Flooding along Polly Creek would affect these roads but likely the damages would be limited.

According to the most recent data available from the Vermont Agency of Natural Resources, as of June 2018, the Town of Fletcher has 2 flood insurance policies in force with \$389,000 in insurance in-force and \$2,210 total premiums. There have been no NFIP flood insurance claims in Fletcher since 1978. There are no repetitive loss properties.

A GIS based overlay analysis was conducted using FIRM data with the Vermont E-911 address data of structure locations. The results of the overlay found that 46 structures are within the 100-year or 500-year flood zone. Assuming a range of damages of 1% to 5% for structure types, damage estimates were derived for structures within the flood zone using grand list values. The results are found in the following table.

<b>Table 5.8 Estimated Damages to Structures from Flooding (excluding transportation infrastructure)</b>			
<b>Type</b>	<b>Number</b>	<b>Value Including Land</b>	<b>Damage Estimate</b>
Residential homes	6	\$1,070,622	\$10,706 – \$53,531
Seasonal homes	40	\$4,279,160	\$42,792 - \$213,958
<i>Source: 2017 Town of Fletcher Grand List Does not account for building contents.</i>			

Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same given current growth trends and local development regulations.

Past Occurrences:

The flood of November 1927 has been the most severe flood on historic record with the Town of Fletcher. The storm brought 3.2 inches of rainfall within 24 hours and a total of 6.32 inches for the duration of the storm. Many of the residents of Fletcher had to be evacuated from their homes and rescued in boats. The farms within the community lost most of their livestock and houses were flooded.

Other historic significant flooding events along the Lamoille River occurred in 1936, 1938, 1940, 1942, 1973, 1976 and 1977.

The January 15, 1996 winter storm (FEMA 1101 DR) triggered flooding throughout the Town and County. The flooding damaged many roads throughout Town. During the night of July 14 through to the morning of July 15, 1997, heavy rain fell continuously throughout eastern Franklin County (FEM-1184-DR). Several roads, bridges and culverts were damaged in Town. There was \$7,256,842 in public assistance funding in 5 counties hit hardest by the event. There are no specific damage estimates for Fletcher.

In 1998, above average precipitation events occurred in January, March and April. On August 11, 1998, road flooding was especially severe in Fletcher to the point where many roads were closed. Many homes had water in their basements. Damage estimates across the county were approximately \$1,000,000.

Mild weather with melting snow and rain on January 24, 1999, resulted in a few rivers reaching or exceeding their banks during Sunday. In particular, flooding was reported around the Fletcher-Montgomery-Enosburgh area. Damage estimate from the event were approximately \$10,000.

On February 28, 2000 mild winter weather combined with a cold front creating flood conditions throughout Fletcher and neighboring communities. Steady rain added to the snowmelt runoff. Several roads in town were flooded. There are no documented damages.

The Burlington Weather Service reports that 2004 was the third wettest summer on record. On September 23, 2004 a declaration was made (FEMA 1559-DR) due to severe storms and flooding from August 12th through September 12th 2004. Some of the flooding that occurred was a result of heavy rain produced from Tropical Storm Francis. Floods forced temporary closure of several roads. There was approximately \$10,000 in damages across the county.

A two-day heavy rainfall event occurred on May 18th and 19th, 2006 compounding above normal rainfall conditions. Two-day rain fall amounts of 3 to 5 inches were common in Franklin County with locally more than 6 inches along the resulting in numerous flooded roads as well as some road and culvert washouts.

On June 29, 2006 a series of thunderstorms and tropical like showers moved over the Fletcher area during the evening and delivered heavy rainfall on already saturated soils. An unofficial weather spotter reported 3.30 inches of precipitation in 90 minutes. The end result was several flooded basements, a few flooded road culverts, some minor washouts on Route 108 through town and some minor washouts along Route 36 between Fletcher and Fairfield. There was approximately \$20,000 in damages reported in the county.

On June 4, 2007 (FEMA-1698-DR), and August 24, 2007 (FEMA-1715-DR), Franklin County was on the edge of a strong frontal system that brought heavy rain which damaged road infrastructure.

In many portions of Vermont, June and July 2008 were the wettest records for those months in 114 years of record keeping (NOAA 2008), and the overall summer of 2008 was the third wettest on record for that same time span (NRCC 2009). Annual precipitation levels were the fifth highest on record in Vermont during 2008, with both high

snow and rainfall recorded during the year throughout much of the northeast. Three disaster declarations were made from June through August: June 14-17 (DR 1778), July 18-21 (DR 1784) and August 8 – 12 (DR1780).

During the period of April 15-18, 2014 severe storms and flooding affected n Caledonia, Essex, Franklin, Lamoille, Orange, Orleans, and Washington Counties in Vermont. A federal declaration was made (DR 4178). In Fletcher, some flooding and washouts occurred on local roads.

The year 2011 was a record year for flooding in the state of Vermont. The first floods occurred over a two-week period in April and May of 2011 (DR 1995, 4043). 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. In the spring, 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 breaking the 140-year-old peak stage elevation. Additionally, flooding and fluvial erosion caused by Tropical Storm Irene was catastrophic, destroying property and taking lives, and again eliciting a disaster declaration (DR-4022). Fletcher was one of a few Vermont communities to not be greatly affected by these flood events.

October 31 – November 1, 2019: Steady rain 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. Numerous flooded streams, flooded and several washed out roads were reported in northern Vermont beginning just after midnight on November 1st and several larger rivers flooded as well, including the Lamoille and Missisquoi basins and portions of the Winooski and Mad River basins. In Fletcher, nearly every road had some form of damage as local drainage networks were overwhelmed. Several residents had driveways that needed to be rebuilt. Damages were approximately \$200,000 in Town on roads alone and over \$5 million statewide.

Floods are a reminder to residents the power inherent in nature and is an urgent reminder of the need for proper management and appropriate use of critical floodplain areas. Development within floodplains poses significant risks and should generally be avoided. River channels and floodplains function as a single hydrologic unit, periodically transferring floodwaters and sediment from one to the other. Appropriate uses of floodplains are those that can accommodate this cycle. Examples of uses that are appropriate to floodplains include agriculture, open space and recreation.

### **Severe Thunderstorms (High Winds, Lightning, Hail)**

#### Description

Thunderstorms are caused by an updraft, which occurs when warm, moist air rises vertically into the atmosphere. The updraft creates a cumulus cloud, which will eventually be the thunderstorm cloud. Severe thunderstorm winds are brief in duration and bring gusts in excess of 50 mph. Severe thunderstorms are capable of producing high winds, large hail, lightning, flooding, rains, and tornadoes.

The National Oceanic and Atmospheric Administration's National Severe Storms Laboratory defines a microburst as a small, concentrated downburst in a thunderstorm that produces an outward flow of strong winds at or near the surface. Microbursts can cause extensive damage at the surface and in some instances can be life-threatening.

The National Weather Service (NWS) issues a wind advisory when winds are sustained at 31 to 39 mph for at least one hour or any gusts 46 to 57 mph. Winds of 58 mph or higher cause the NWS to issue a High Wind Warning. In Vermont, high winds are most often seen accompanying severe thunderstorms. In fact, straight-line winds are

often responsible for most of the wind damage associated with a thunderstorm. These winds are often confused with tornadoes because of similar damage and wind speeds.

Beaufort Number	Wind Speed Range (mph)	NOAA Terminology	Description
0	0	Calm	Smoke rises vertically.
1	1-3	Light air	Direction shown by smoke but not by wind vanes.
2	4-7	Light breeze	Wind felt on exposed skin; leaves rustle.
3	8-12	Gentle breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	Moderate breeze	Raises dust and loose paper; small branches are moved.
5	19-24	Fresh breeze	Small trees sway.
6	25-31	Strong breeze	Large branches in motion; umbrellas used with difficulty
7	32-38	Near gale	Whole trees in motion, inconvenience felt when walking against the wind.
8	39-46	Gale	Breaks twigs off trees. Cars veer on road. Generally, impedes progress.
9	47-54	Severe Gale	Light structural damage.
10	55-63	Storm	Trees uprooted. Considerable structural damage
11	64-73	Violent Storm	Widespread structural damage.
12	74-95	Hurricane	Considerable and widespread damage to structure

Impact and Geographic Area of the Hazard

According to NOAA’s National Severe Storms Laboratory, damage from severe thunderstorm winds account for half of all severe reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. Severe Thunderstorms with accompanying high winds are a hazardous threat to the entire Town. Violent windstorms are possible in all areas of Fletcher.

The Town has experienced a variety of severe thunderstorm and accompanying winds from storm systems that develop along ridgelines from systems that track from the west over Lake Champlain and through the Lamoille River corridor. Ridgelines along northwestern and northeastern areas of town are more susceptible to lightning strikes than others. Buck, Wintergreen, Fletcher and Gilson Mountains contribute to thunderstorm formation in Fletcher and accompanying high winds are greater in intensity at the upper elevations.

According to National Weather Service, microbursts are typically small, less than two and half miles, and last only about 5 to 10 minutes, with maximum wind speeds that can exceed 100 mph. Microburst with accompanying high winds affect forested areas, utility lines and exposed property. Toppled trees can make roads impassable and disrupt power and telecommunication services anywhere in town. People living in mobile homes are especially at risk for injury and death. Even anchored mobile homes can be seriously damaged when winds gust over 80 mph.

Severe thunderstorms often generate lightning and/or hail. Lightning can strike anywhere but exposed areas and non-grounded structures at higher elevation are more susceptible to lightning strikes. There are rare instances where lightning has caused structure fires (barns) and grass fires during dry periods. Hail is a typical accompanying hazard that can affect all areas of Town and can damage vehicles and roofs.

Extent/Probability

There have been 31 thunderstorm events in the region since January 1, 1998 according to the National Climatic Data Center. Of those, all are classified as severe thunderstorms with wind speeds of 50 knots or greater. Severe

thunderstorms can cause power outages, property damage, transportation interruptions, affect businesses and can cause loss of life. Micro bursts with high wind speeds and high precipitation accumulations over brief periods often down trees and branches and power lines and can overwhelm local drainage networks for brief periods. Micro bursts have occurred almost annually over the past 10 years.

Lightning strikes in Franklin County average between 4-6 strikes per square mile each year based on data collected by NASA satellites between 1995 and 2002. Within the Town of Fletcher, these numbers would average 6-8 lightning strikes per year. There is very little data on lightning strikes in Town. Lightning can cause wildfires, structure fires, damage infrastructure and destroy vegetation. Private properties in Fletcher have experienced damages from severe thunderstorms however, no records of damage in Town is kept. Wildfire and structure fires caused by lightning would be considered extremely rare in Fletcher. There are no recorded deaths from severe thunderstorms or high winds or lightning in Fletcher.

Hailstorms usually occur in Vermont during the summer months and generally accompany passing thunderstorms. While local in nature, these storms are especially significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage. There have been 49 recorded hail events in Franklin County between 1998 and 2018. Hail is considered a relatively infrequent occurrence. Those hail events that do occur tend to be highly localized and limited to a relatively small area and typically occur with thunderstorms.

It is extremely difficult to predict where the event will occur and the type of associated structural damage. The estimated damage from a severe thunderstorm event occurring to 10% of all structures (including utilities) in Town with 20% damage is \$2.8 million. The estimated cost does not include building contents.

Past Occurrences

<b>Table 5.10 Severe Thunderstorm Events</b>		
<b>Date</b>	<b>Location</b>	<b>Severity Remarks / Description of Area Impacted</b>
October 29, 2017	Counties of Addison, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orange, Orleans, Washington and Windham	From October 29-30, a strong thunderstorm fueled by an ex-tropical storm brought damaging winds to Vermont, causing power outages and knocking trees down throughout the state. Winds reached over 70 mph at times and rain caused flooding. Estimated damages were \$4,687,401.61 across all of the involved counties.
February 17, 2006	Counties of Chittenden, Franklin, and Grand Isle	On an arctic front entered the Champlain Valley of Vermont. Sustained winds of 30 to 40 mph with damaging wind gusts in excess of 60 mph moved across the region between late morning and midafternoon. There were widespread reports of trees and power lines down across. There was an estimated \$150,000 in property damages within the affected area.
October 16, 2005	Counties of Addison, Chittenden, Franklin, Grand Isle and Rutland	Strong winds from Canada swept across Vermont. There were brief power disruptions, downed trees and associated damages to residential property throughout Town. Property damage estimate were approximately \$35,000 for the 5 County area.

September 17, 1999	New England	Remnants of Tropical Storm Floyd moved across eastern New England. Strong winds combined with saturated soils from heavy rain resulted in trees and power lines blown down. A few boats were damaged along the shores of Lake Champlain. The strongest winds reported were 43 knots (50 mph) in Fletcher and on adjacent Lake Champlain. Rainfall across the county associated with the remnants of Floyd was 3 1/2 to 4 inches.
February 15, 1995	Franklin and Grand Isle Counties	A strong pressure gradient across the state resulted in wind gusts over 50 knots across parts of the Champlain Valley. Property damage estimates for were \$50,000.
December 26, 1993	Statewide	A strong pressure gradient developed across the state in the wake of an arctic front resulting in high winds and damage in parts of every county. Trees and tree limbs were downed resulting in significant damage in some areas. Numerous power outages were reported across the state. Property damage estimates state-wide were \$500,000.

## 6. ASSESSING VULNERABILITY

While Fletcher has identified severe winter storm/ice storm, flooding, and severe thunderstorms (high wind, lightning, and hail) as its most common hazards, only flooding is covered in the following section. Flooding is the easiest hazard to assess specifically in terms of the vulnerability of both public and private property. Winter storm/ice storm and severe thunderstorms are much more unpredictable in terms of how they may impact property in Fletcher.

### Structures in the SFHA and River Corridor

There are approximately 46 structures within FEMA-designated Special Flood Hazard Areas (SFHAs)<sup>2</sup>. Properties within SFHAs, that have a mortgage, are required to purchase flood insurance. Fletcher’s participation in the National Flood Insurance Program (NFIP) gives residents and business owners 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 Fletcher’s floodplain regulations.

There are approximately 4 structures located in the Vermont Agency of Natural Resources-designated River Corridor.

### Repetitive Loss Properties

<sup>2</sup> Flood Hazard Summary Report for Fletcher, available on VT ANR’s Floodready website <<https://anrweb.vt.gov/DEC/FoFReports/>>

According to the State Hazard Mitigation Officer, the Town of Fletcher has no repetitive loss properties. The definition of severe repetitive loss as applied to this program was established in the National Flood Insurance Act. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

Type	Number	Value Including Land
Residential Homes	506	\$90,289,100
Seasonal Homes	62	\$6,632,700
Mobile Homes – Unlanded	6	\$388,000
Mobile Homes - Landed	46	\$3,859,200
Farms	17	\$7,762,700
Commercial	8	\$2,530,100
Other (Utilities, Woodland and Miscellaneous)	38	\$20,363,500
<b>Total Listed Value</b>	<b>726</b>	<b>\$141,788,400</b>

(a) That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or

(b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart. <sup>3</sup>

Critical Facilities

A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the appropriate jurisdictions, or fulfills important public safety, emergency response, and/or disaster recovery functions.

The critical facilities identified in the Town of Fletcher Hazard Mitigation Plan, listed fully in Attachment A, include shelters; government offices; hazardous materials storage sites; and the school.

Participation and Compliance with the National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) is a voluntary program organized by the Federal Emergency Management Agency (FEMA) that includes participation from 20,000 communities nationwide and 247 Vermont towns and cities. 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.

FEMA published a flood hazard study for the Town of Fletcher in 1985. Flood Insurance Rate Maps (FIRMs) were prepared by FEMA in 1985. Flood hazard areas were identified along the brooks and streams that run through the town. The FIRMs and Study are available for review on-line at FEMA.gov.

Creation of the Flood Hazard District in the Town’s Development Regulations enabled Fletcher to be eligible for FEMA’s National Flood Insurance Program (NFIP), which permits residents within the Flood Hazard District to purchase flood insurance. The purpose of the district is to prevent increases in flooding caused by development in flood hazard area, to minimize future public and private losses due to floods, and to promote the public health,

<sup>3</sup> FEMA <<http://www.fema.gov/severe-repetitive-loss-program>>

safety and general welfare. The Town is committed to enforcing floodplain regulations and ordinances to be eligible to participate in the NFIP program and protect the people and property of Fletcher by restricting development in flood prone areas. Fletcher is a member in good standing with the NFIP (CID 500216B). The Town will continue to ensure future compliance with the NFIP by making sure that local regulations meet NFIP minimums and conducting enforcement as necessary.

The Town works with the elected officials, the State, the Northwest Regional Commission, and FEMA to correct existing compliance issues and prevent any further NFIP compliance issues through continuous communications, training and education.

## **7. MITIGATION STRATEGY**

The following hazard mitigation goals are adopted by Fletcher:

### General Goals

- Prevent/reduce the loss of life and injury resulting from all-hazards events.
- Prevent/reduce the financial losses and infrastructure damage incurred by municipal, residential, agricultural and commercial establishments due to disasters.
- Include hazard mitigation planning in the municipal planning process including the Town Plan, Capital Improvement Plan and Local Emergency Management Plan.
- Ensure the general public is part of the hazard mitigation planning process.

The following goals and policies from the Fletcher Town Plan support hazard mitigation.

### Town Plan (adopted 2013) Goals & Policies That Support Hazard Mitigation

#### **Goals**

- To provide a coordinated, comprehensive planning process and policy framework that guide decisions made by public officials and private interests, and will promote that which is in the best interests of the residents of the Town of Fletcher and encourage citizen involvement at all levels of the planning process to ensure that decisions having local impact are made with as much local input as possible;
- Discourage development in areas which are hazardous to human health and safety, or which are otherwise unsuited for this purpose;
- To meet the needs of the community in a fiscally responsible manner with appropriate public facilities and service that support residents' livelihood and lifestyles;
- Reduce the loss of life and injuries that result from disasters.
- Reduce damages to public infrastructure resulting from all hazards events through hazard mitigation planning and project implementation.

#### **Policies**

- Emergency response and public safety services, including fire, ambulance and policing services will be provided through cooperative agreements with neighboring towns, agencies and/or private organizations as appropriate, based on available funding. Volunteer efforts, including volunteer service and community-based programs, will be supported as appropriate.;
- All new development will be located and sited to be accessible to emergency response vehicles;
- The flood hazard overlay district is intended to protect life and property within federally designated flood hazard areas as depicted on Flood Hazard Boundary Maps. Uses are to be used limited to non-structural, open space uses including farming, forestry, education and outdoor recreation;
- Update zoning regulations, specifically health related and onsite sewage regulations, to reflect minimum state regulations;

- Provide financial support for educational opportunities for town health officer;
- Continue to investigate options for the cost-effective provision of emergency services and police protection as appropriate; support the development of a local community watch program;
- Support a community emergency response plan for hazardous materials incidents as required by the state, as available funding and resources permit.
- Continue to negotiate with Fairfield for emergency response coverage in the northern sections of Fletcher;

### **Existing Hazard Mitigation Programs, Actions and Activities**

The following is a list of existing hazard mitigation programs, actions, and activities in Fletcher:

#### Flooding

- The Town has flood zone regulations which designate a Flood Hazard District and Shore District whose purpose is to minimize future public and private losses caused by development in flood hazard areas.
- The town participates in the National Flood Insurance Program (NFIP). Maintaining compliance with NFIP regulations both now and in the long term is a high priority activity.
- Flood Hazard Areas in Fletcher are identified on Flood Hazard Boundary Maps (FHBMs) and Flood Insurance Rate Maps (FIRMs) produced by FEMA. The purpose of these districts, which are located along the flood plains of rivers and streams throughout the Town, is to prevent increases in flooding caused by excessive development of lands within flood hazard areas.
- Ditches located in areas susceptible to flooding are inspected and maintained on an annual basis. Ditches in general are inspected and cleaned
- Culverts are inspected at least once a year. Seasonal maintenance is developed based on an annual inspection.

#### Severe Winter Storms (Ice Storm)

- Town Highway Department has snow removal equipment.
- Shelter agreement between Fletcher School and American Red Cross are renewed on a semi-annual basis.
- Road crews have response equipment to deal with downed trees and branches.

#### Severe Thunderstorms (high winds, hail, lightning)

- Fletcher School has a stationary generator and transfer switch for use as a community shelter.
- On-going regularly scheduled road maintenance programs includes cutting vegetation away from utility lines.
- Town supports utility company efforts to maintain utility corridor from vegetation that can disrupt power.
- Municipal offices have lightning protection for electrical equipment.
- Town highway department has appropriate debris removal equipment.
- Annual Insurance Service Office (ISO) inspection.
- NIMS/ICS Training for EMC and local officials to meet state NIMS strategy.

#### On-Going Mitigation and Preparedness Activities

- Town is interested in State and Federal funding for mitigation projects and activities.
- Town applies for state grants (Local Roads, Bridge and Culvert) to address road construction/improvement projects.
- Member of Franklin County Mutual Aid Association.
- Town annually appoints emergency management coordinator to ensure town is prepared for all-hazards events.

- Regularly scheduled maintenance programs ongoing (culvert survey & replacement, ditching along roadways, cutting vegetation to allow visibility at intersections).
- Town has mapped critical facilities and infrastructure.
- Community participates in the Vermont Enhanced 911 System.

**Identified Hazard Mitigation Actions, Programs, and Activities**

The following list documents the questions (criteria) considered by the town of Fletcher when established as a priority for future hazard mitigation actions. Each of the following criteria was rated according to a numeric score of “1” (indicating Poor), “2” (indicating Average) and “3” (indicating Good). The highest possible score is 36. The full scoring matrix used is located as an appendix.

- 1) Does the action reduce damage?
- 2) Does the action contribute to community objectives?
- 3) Does the action meet existing regulations?
- 4) Does the action protect historic structures or structures critical to Town operations?
- 5) Can the action be implemented quickly?
- 6) Is the action socially acceptable?
- 7) Is the action technically feasible?
- 8) Is the action administratively possible?
- 9) Is the action politically acceptable?
- 10) Is the action legal?
- 11) Does the action offer reasonable benefits compared to its cost of implementation?
- 12) Is the action environmentally sound?

Mitigation actions are listed in terms of mitigating threat or risk to public health and safety, reduction of hazard to community assets, adherence to Town plan and local ordinances, cost, and feasibility. Actions are classified as either short - term or long - term activities. Short –term action items are activities which the municipality may be capable of implementing within one to two years. Long-term action items may require new or additional resources, funding or authorities. Ongoing action items occur at least once per year.

The following identified programs, actions and activities are future mitigation strategies for the Town of Fletcher. These mitigation strategies have been chosen by the town as the most appropriate policies and programs to lessen the impacts of potential hazards.

Cost-Benefit Analysis

Each project will incorporate a full benefit-cost analysis (BCA) following FEMA’s BCA methodology and latest software to ensure cost effectiveness and maximize savings.

There was a rough cost/benefit analysis done for each project listed in the table. The below cost and benefits tables address the priorities for the mitigation strategies that are stated in the Mitigation Actions Table.

**Cost Estimates**

High	=>\$100,000
Medium	= \$25,000 – 100,000
Low	=< \$25,000

**Benefit Estimates**

High	Public Safety
Medium	Infrastructure / Functionality
Low	Aesthetics / General Maintenance

Implementation of the mitigation actions is summarized in the below table, as far as who, when and how they will be carried out. Further details about some actions can be found following the mitigation actions table, in text.

Table 6.2 – Mitigation Actions						
Priority/S core	Mitigation Action / Hazard Addressed	Responsibility/ Oversight	Funding Source	Timeframe	Cost / Benefit	Status
High 35	Procure and install generator at Town Office  All Hazards.	Selectboard	Town Budget	Short – term January 2020 start to July 2020 finish.	Medium / high	RFP for install. Review bids. Apply for grants (if any).
High 35	Replace bridge on Wright Road along Stones Brook.  Flooding / Fluvial Erosion	Selectboard / Road Foreman	State Structures Grant or Better Roads Grant / Local	Short Term April 2020 start to October 2020 finish	Medium /High	Apply for funding. Apply for permitting. Design. Implement.
High 34	Replace undersized culvert on Pond Road near Metcalf Pond.  Flooding / Fluvial Erosion, Severe Thunderstorms (High Wind, Lightning, and Hail)	Selectboard / Road Foreman	State Structures/ VT Better Roads Grant / Grants-In-Aid Grant/ Local	Short – term May 2021 start to August 2021 finish.	Medium / High	Apply for funding. Apply for permitting. Design. Implement.
High 36	Community Education: How to Prepare for Severe Winter Conditions  Severe Winter Storm/Ice Storm.	Emergency Management Coordinator	Town Budget	December 2018 – March 2020	Low/ High	September is National Preparedness Month. Fire Academy, FEMA and Red Cross have winter preparedness education materials that could be the basis for community messaging.
High 34	Upgrade culverts/drainage north end of Kinsley Road  Flooding / Fluvial Erosion	Selectboard, Road Foreman	State Structures/ VT Better Roads Grant / Grants-In-Aid Grant/ Local	Short – term May 2021 start to August 2021 finish.	Medium / High	Apply for funding. Apply for permitting. Design. Implement.

High 34	Upgrade culverts on Boozan Hill  Flooding / Fluvial Erosion	Selectboard, Road Foreman	State Structures/ VT Better Roads Grant / Grants-In-Aid Grant/ Local	Short – term May 2021 start to August 2021 finish.	Medium / High	Apply for funding. Apply for permitting. Design. Implement.
High 36	Protect Critical Facilities and Infrastructure from Lightning Damage  Severe Thunderstorm (High Wind, Lightning and Hail)	Selectboard, Highway, Road Foreman,	Town Budget	May 2020 to December 2020	Low/ High	Install lightning protection and surge suppression protection on critical facility on electronic equipment.
High 35	Road Stormwater Erosion Inventory  Flooding, Severe Winter Storm /Ice Storm, Severe Thunderstorm (High Wind, Lightning and Hail)	Selectboard and Highway Department	DEC grant / NRPC assist	Short term July 2020 to August 2020	Low/ High	Inventory currently being conducted.
High 34	Support Power Utility Efforts to Protect Utility Corridors (tree / branch removal).  Severe Winter Storm /Ice Storm, Severe Thunderstorm (High Wind, Lightning, and Hail)	Selectboard	Local	Long Term Start: January 2020 End: December 2025	Low / High	Support power utility standards of in identifying utility corridors in need of tree pruning.

Summary of Mitigation Actions – The following is a summary of each mitigation project identified by Fletcher:

*Procure and install generator at Town Office* – The new Town Office does not have emergency backup power. The town has received estimates to install a stand-alone generator with automatic transfer switch. A vendor should be selected shortly following town’s procurement procedures.

*Replace Bridge on Wright Road (TH21) along Stones Brook*- This action will reduce a long-term vulnerability for the Town. This cutover road is frequently damaged from flooding due to the constraints of the structure existing structure. The Town is waiting for a hydraulic study at this site. Costs for this action are approximately \$70,000.

*Replace undersized culvert on Pond Road (TH16) near Metcalf Pond* – The existing culvert needs to be upgraded to reduce flooding and erosion in the area. Ditches should be upgraded to meet Best Management Practices under the Municipal Roads General Permit program. Local residents have raised concern for flooding and road shoulder erosion. Costs for this action are approximately \$70,000.

*Community Education: How to Prepare for Severe Winter Conditions* - Using social media (Facebook, Front Porch Forum, Town website, direct mailings, and local newsprint) the Town EMC will publish information to educate the public on winter storm preparedness. The Department will utilize existing materials developed by the American Red Cross, FEMA and State Fire Marshall's Office regarding safe operation of emergency generators, safe winter driving tips, maintenance of chimneys, and carbon monoxide safety. This campaign will be done annually.

*Upgrade culverts/drainage north end of Kinsley Road (TH17)* – This action will reduce a long-term vulnerability from flooding and erosion. The existing series of culverts along the north end of the road are undersized and should be upgraded. During high precipitation events and during spring snow melt, the culverts cannot handle draining stormwater. The water causes damages the road and threatens several residents down the slope. The culverts should be upsized and ditches should be stone-lined following Best Management Practices.

*Upgrade culverts on Boozan Hill Road (TH14)* – This action will reduce damages from flooding and erosion. The existing series of culverts are due for to be upgraded based on size and condition. Several residents on the north end of the road would be isolated should the road be severely damaged from flooding. During high precipitation events, the culverts overtop. The culverts should be upsized and ditches should be stone-lined following Best Management Practices.

*Road Stormwater Erosion (Hydrologically Connected) Inventory* – The State of Vermont has developed a municipal roads general permit which requires municipalities to take actions to reduce erosion from town roads in order to improve water quality. The first step is for municipalities to identify sections of town roads that are connected to surface waters through ditches, culverts or other drainage structures. Connected roads present substantially greater risks to water quality. The Town has completed this step.

The next step which is currently underway is an inventory of the connected portions of the road network to determine if the road and drainage systems meets the new state Road and Bridge Standards, and will likely include measures such as: Ditch Slopes greater than 5% to be stone-lined or have stone check-dams; Ditches: "U-shaped" and disconnected from surface waters where possible; Upgrading road drainage culverts and installing outlet stabilization and/or headers where erosion is present; Soils exposed by maintenance would be seeded and mulched or otherwise stabilized. The Town is currently completing this step. The final step will be to develop and implement a long-term plan to bring all sections of connected roads up to standards.

*Support Power Utility Efforts to Protect Utility Corridors* – This action will reduce a long-term vulnerability for the Town. The utility lines are privately owned; however, the Town will support the power company's utility line and corridor tree pruning program in order to protect power lines. Trees or branches that are a concern to impact utility lines will be reported to the power company. The power company has improved upon their line corridor tree pruning program to reduce the impacts of ice storms and falling trees/branches in recent years.

#### Existing Planning and Regulatory Capabilities

Fletcher is a rural town with a low population. The Town staff includes a Part-time Town Clerk/Treasurer, a part-time Zoning Administrator and three full-time Highway Department staff. The highway department staff covers 42.46 miles of town highway. They are constantly treating roadways in winter months, so they are strained to do other things that come up. The full-time staff size is similar to other towns in northern Vermont of similar size. The Town has a volunteer Planning Commission and Development Review Board.

The Town has no local police department. Vermont State Police and the Grand Isle County Sheriffs' Department cover all areas of law enforcement from traffic violations to major crimes.

Fletcher is reliant upon Volunteer Fire Department and Rescue Squads from neighboring municipalities staffed by well-trained and devoted volunteers.

How this Plan will Improve Existing Capabilities

The following policies, programs and activities related to hazard mitigation are currently in place and/or being implemented in the Town of Fletcher. In cooperation with NRPC, the Town Emergency Management Coordinator (a member of the Selectboard) analyzed these programs for their effectiveness and noted improvements needed. Fletcher uses all of the plans listed below to help plan for current and future activities with the town. For example: the Local Emergency Management Plan has a contact list that is used for response purposes in the case of a hazard event, and is updated every year after Town Meeting. The Town Plan directs visions and goals that include Natural Resources and Land-Use decisions. In the development of this plan, the latest 2013 Town Plan was used. Town Road and Bridge Standards are followed by the town and they do an annual culvert and bridge inventory that is mapped by the NRPC. The town is compliant with the NFIP.

As Fletcher goes through the update process for the planning mechanisms outlined in the table below, the Town will look to the Hazard Mitigation Plan’s Table of Actions and Risk and Vulnerability Assessments to help guide land use district decisions, and guide goals and policies for those districts. After Town Meeting every March, policies and action items in the Town Plan may be reviewed and integrated into hazard mitigation as needed. The Local Emergency Management Plan contact list should be updated after Town Meeting each year, including updates to vulnerable geographic locations, as well as locations of vulnerable populations. Updates to each of the planning mechanisms outlined in the table below are handled by the responsible party identified in the table. There is no timeframe for updating the below referenced plans and regulations to better incorporate hazard mitigation, however, as each document is updated the hazard mitigation plan will be reviewed for incorporation. The goals of this hazard mitigation plan will be incorporated in the upcoming town plan update to ensure that emergency preparedness and mitigation planning efforts are included in the Town Plan, with particular attention to including the projects in the Mitigation Actions Table. This will assist with ensuring that this plan is utilized and project follow-through occurs.

The following authorities, policies, programs, and resources related to hazard mitigation are currently in place and/or being implemented in the Town of Fletcher in addition to the NFIP. These programs reduce the effects of hazards to existing, new, and future buildings, infrastructure, and critical facilities by preventing their location in identified hazard areas and ensuring that infrastructure and buildings are designed to minimize damage from hazard events. The Town has analyzed these programs for their effectiveness and noted any improvements that may be needed. Other mitigation/emergency planning related documents and their status are outlined in the below table:

<b>Table 6.3 Town Policies and Plans</b>			
<b>Existing Protection</b>	<b>Description</b>	<b>Effectiveness/Enforcement/ Hard that is addressed</b>	<b>Gaps in Existing Protection/Improvements Needed</b>
Town Plan	Policies that provide protection and limited development in wellhead protection areas, wetlands, steep slopes, and shallow soils.	Policies and vision for future land use. Includes flood resiliency element. Adopted December 16, 2013. The plan has technically expired.	None found

Development Regulations.	Restrictions on development in potential hazardous areas such as steep slopes, floodplains. Also regulates land development in FEMA flood areas.	Development Regulations recently updated. Adopted March 19, 2018.	None found
Local Emergency Management Plan	Summary of response and notification procedures.	Semiannual updates.	None found.
Fire Mutual Aid	Assistance from county fire, rescue, municipal and public works departments.	Franklin County Mutual Aid Agreement, 2015.	Does not include ambulance rates.
Road and Bridge Standards	Standards for road and bridge construction and repair.	Adopted April 27, 2015.	
School Emergency Response	Responses by various types of emergency incidents at school.	Vermont School Crisis Guide.	Needs updating.

Through current plans, policies and mitigation actions, Fletcher is working to decrease damages from severe winter storms (ice storms), floods and structure fires.

Flooding and Development Regulations

The Town of Fletcher has adopted floodplain regulations in order to protect the health, safety, and welfare of its residents and to allow the community to participate in the National Flood Insurance Program (NFIP). In 1981, the Town established a bylaw for special flood hazard areas. The purpose of this bylaw is:

- Minimize and prevent the loss of life and property, the disruption of commerce, the impairment of the tax base, and the extraordinary public expenditures and demands on public services that result from flooding and other flood related hazards; and
- Ensure that the design and construction of development in flood and other hazard areas are accomplished in a manner that minimizes or eliminates the potential for flood and loss or damage to life and property; and
- Manage all flood hazard areas designated pursuant to 10 V.S.A. § 753; and
- Make the state, municipalities, and individuals eligible for federal flood insurance and other federal disaster recovery and hazard mitigation funds as may be available.

The Town Zoning Administrator is responsible for monitoring compliance with the NFIP.

**7. PLAN IMPLEMENTATION, MONITORING & EVALUATION**

Monitoring and Updating the Plan – Yearly Review

Once the plan is approved and adopted, the Selectboard in Fletcher, along with interested and appointed volunteers and stakeholders, will continue to work with staff at the Northwest Regional Commission to monitor, evaluate, and update the plan throughout the next 5-year cycle. The plan will be reviewed annually at the May Selectboard meeting along with the review of the town’s Local Emergency Management Plan (LEOP), once it is created. During the annual review, the Selectboard will evaluate the plan effectiveness at achieving its stated purpose and goals. 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 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. Northwest Regional Commission's staff will assist the Fletcher Selectboard with this review, as requested by the Town. Progress on actions will be kept track using a table the NRPC will provide to the Selectboard to update. 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 Maintenance (5 Year Update and Evaluation Process)

The Hazard Mitigation Plan is dynamic and should not be static. To ensure that the plan remains current and relevant, it is important that it be updated periodically. The plan should be updated every five years in accordance with the following procedure:

1. The Fletcher Selectboard will appoint a team to convene a meeting of the hazard mitigation planning committee. The team will include a Fletcher Emergency Management Director who will chair the meeting. Others members should include local officials such as Selectboard members, Zoning Administrator, Road Commissioner, Health Officer and interested stakeholders. The Emergency Management Director will work with the Northwest Regional Planning Commission staff and be the point person for the Town.
2. The NRPC staff will guide the Committee through the update process. This update process will include several publicly warned meetings. At these meetings, the Committee will use the existing plan and update as appropriately guided by the NRPC staff 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 state 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.
3. From the information gathered at these meetings, along with data collected independently during research for the update, the NRPC staff will prepare and update a draft in conformance with the FEMA *Local Hazard Mitigation Plan Review Tool* document.
4. The Selectboard will review the draft report. Consensus 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.
5. The changes will be incorporated into the Plan by NRPC staff.

6. 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 be distributed electronically to neighboring municipalities.
7. Public comments will be incorporated by NRPC staff. The final draft will be provided to the plan development participants and town staff for final review and comment with review comments provided to the Emergency Management Director and incorporated into the plan.
8. The NRPC staff will finalize the plan, with any remaining comments from the plan participants and town staff incorporated, and then submitted electronically to DEMHS State Hazard Mitigation Officer (SHMO) who will then submit to FEMA Region 1.
9. The Plan will be reviewed by the State Hazard Mitigation Officer (SHMO) and FEMA Region 1.
10. SHMO and FEMA comments will be addressed in the Plan by NRPC staff.
11. The Plan will be resubmitted as needed until the plan is approved pending adoption by State/FEMA Region 1. Once the plan is approved by State/FEMA, it will be ready for adoption.
12. The Selectboard will adopt the plan and distribute to interested parties.
13. The final adopted plan will be submitted by NRPC staff to VEM and FEMA.
14. FEMA will issue final approval of the adopted plan.

#### Continued Public Involvement

The Fletcher Selectboard is dedicated to involving the public directly in the continual review and updates of the Hazard Mitigation Plan. Copies of the plan will be kept at the Town Office. The existence and location of these copies will be publicized in the media (newspaper, web sites, Town Annual Report, etc.) In addition, any proposed changes will be publicized in the media.

#### Programs, Initiatives and Projects Review

Although the plan should be reviewed in its entirety every five years as described above, the Town may review and update its programs, initiatives and projects more often directly with the State Hazard Mitigation Officer (SHMO) based on changing local needs and priorities.

The Town of Fletcher should incorporate elements of this plan, such as identified projects, into capital planning initiatives and annual budget reviews during Town Meeting.

#### Post-Disaster Review/Update Procedure

Should a declared disaster occur, a special review will occur amongst the Selectboard, the Emergency Management Coordinator, the NRPC staff, and those involved in the five year update process described above. This review will 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. Members of the State Hazard Mitigation Committee will be notified that the assessment process has commenced.

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 to the Selectboard for public input.
6. The Selectboard adopts the amended plan after receiving approval-pending-adoption notification from FEMA.

DRAFT

**Attachment A**

**Critical Facilities, Hazmat Storage Facilities, and Vulnerable Sites  
Town of Fletcher**

<b>Facility Name or Facility Designation</b>	<b>Facility Owner</b>	<b>Function</b>	<b>Street or Location</b>
Fletcher Elementary/Middle School	Town of Fletcher	Educational Facility	340 School Road
Fletcher Town Garage	Town of Fletcher	Government	229 Oustinoff Road
Fletcher Town Hall	Town of Fletcher	Government Facility	33 Shaw Road
Fletcher Union Meeting House	Fletcher Historical Society	Religious Facility	Cambridge Road
Fletcher General Store	Singh Enterprises LLC	Hazmat Storage Facility	110 School Road
United Church of Fletcher/Fairfield	Vermont United Church of Christ	Religious Facility	Route 36 & Route 108

## Attachment B

### Town of Fletcher Priority Matrix

Each of the following criteria was rated according to a numeric score of “1” (indicating Poor), “2” (indicating Average) and “3” (indicating Good).

1. Does the action reduce damage?
2. Does the action contribute to community objectives?
3. Does the action meet existing regulations?
4. Does the action protect historic structures or structures critical to Town operations?
5. Can the action be implemented quickly?
6. Is the action socially acceptable?
7. Is the action technically feasible?
8. Is the action administratively possible?
9. Is the action politically acceptable?
10. Is the action legal?
11. Does the action offer reasonable benefits compared to its cost of implementation?
12. Is the action environmentally sound?

	Criteria												Total Score
	1	2	3	4	5	6	7	8	9	10	11	12	
Procure and install generator at town office	3	3	3	3	2	3	3	3	3	3	3	3	35
Replace bridge on Wright Road (TH21) along Stones Brook.	3	3	3	3	2	3	3	3	3	3	3	3	35
Replace undersized culvert on Pond Road (TH16) near Metcalf Pond.	3	3	3	2	2	3	3	3	3	3	3	3	34
Community Education: How to Prepare for Severe Winter Conditions	3	3	3	3	3	3	3	3	3	3	3	3	36
Upgrade culverts/drainage north end of Kinsley Road (TH17)	3	3	3	2	2	3	3	3	3	3	3	3	34
Upgrade culverts on Boozan Hill (TH14)	2	3	3	2	3	3	3	3	3	3	3	3	34
Protect Critical Facilities and Infrastructure from Lightning Damage	3	3	3	3	2	3	3	3	3	3	3	3	35
Road Stormwater Erosion Inventory	3	3	3	3	2	3	3	3	3	3	3	3	35
Support utility efforts for keeping utility corridor free from vegetation.	3	3	3	3	3	3	3	3	3	3	3	3	36

## Attachment C

### Hazard Identification and Risk Assessment

#### Town of Fletcher

Refer to Section 5 of this plan for a description of the risk characteristics used to classify each hazard.

Hazard Type	Impact or % Community Impacted. Area	Frequency of Occurrence	Consequence of Occurrence				Total
			Health & Safety	Property	Environment	Economic	
Severe Winter Storm / Ice Storm	3	5	0	1	1	2	35
Flooding / Fluvial Erosion	2	5	0	1	1	2	30
Severe Thunderstorm (High Winds, Hail, Lightning)	0	5	1	1	0	3	25
Drought	3	1	1	1	2	2	9
Major Fire – Wildland	1	2	0	1	1	1	8
Water & Septic Service Loss	2	1	0	1	2	2	7
Hazardous Materials (Fixed Site and Transport)	2	1	0	1	1	2	6
Structure Fire	1	1	1	1	1	1	5
Tornado	1	1	0	1	1	2	5
Earthquake	1	1	1	1	1	2	6
Telecommunication Systems Failure	3	1	0	0	0	1	4
Civil Disturbance	1	1	0	0	0	1	2
Terrorism/WMD	1	1	1	0	0	2	4

**Total Risk Rating**

**146**

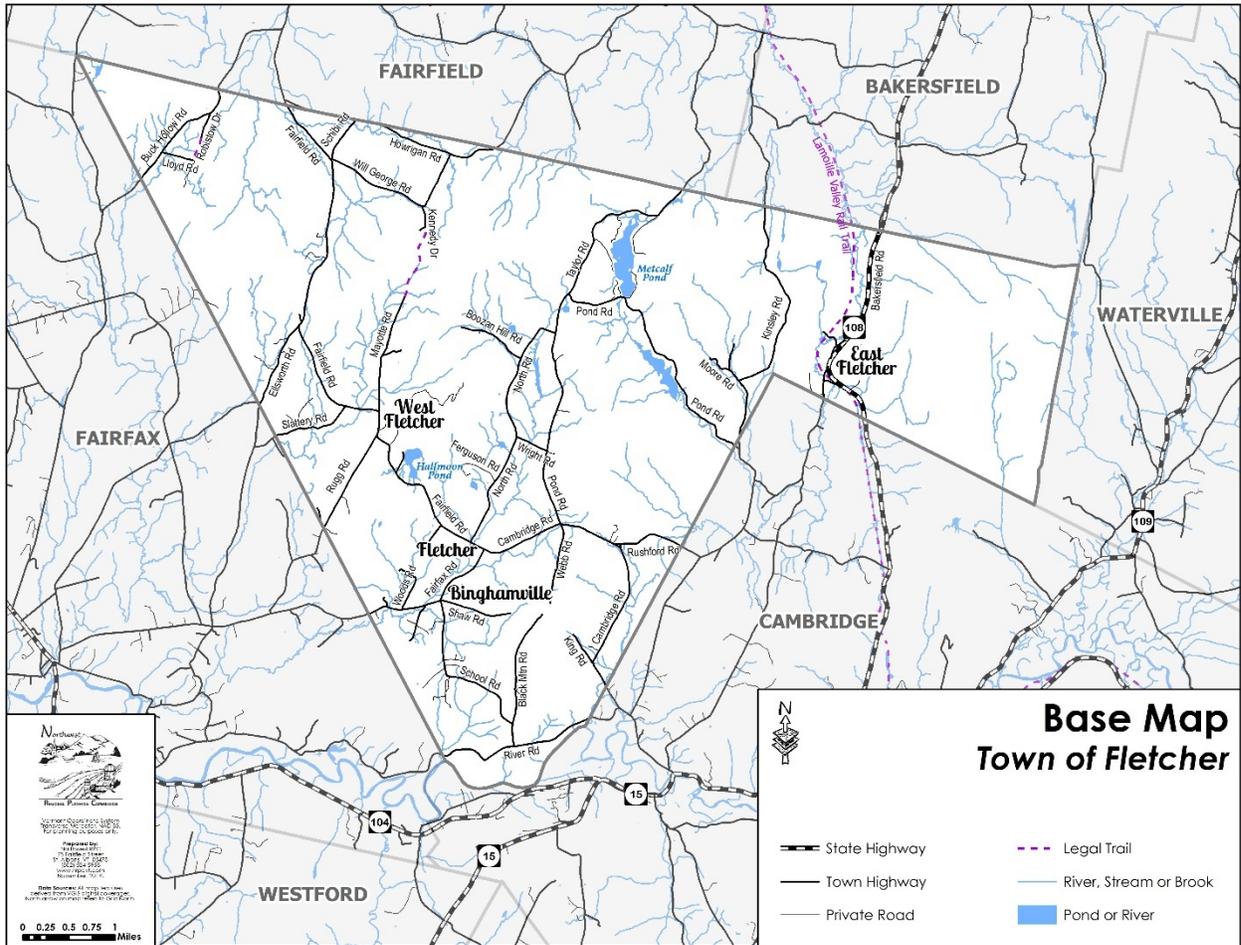
## **Attachment D**

### **Public Government Participation**

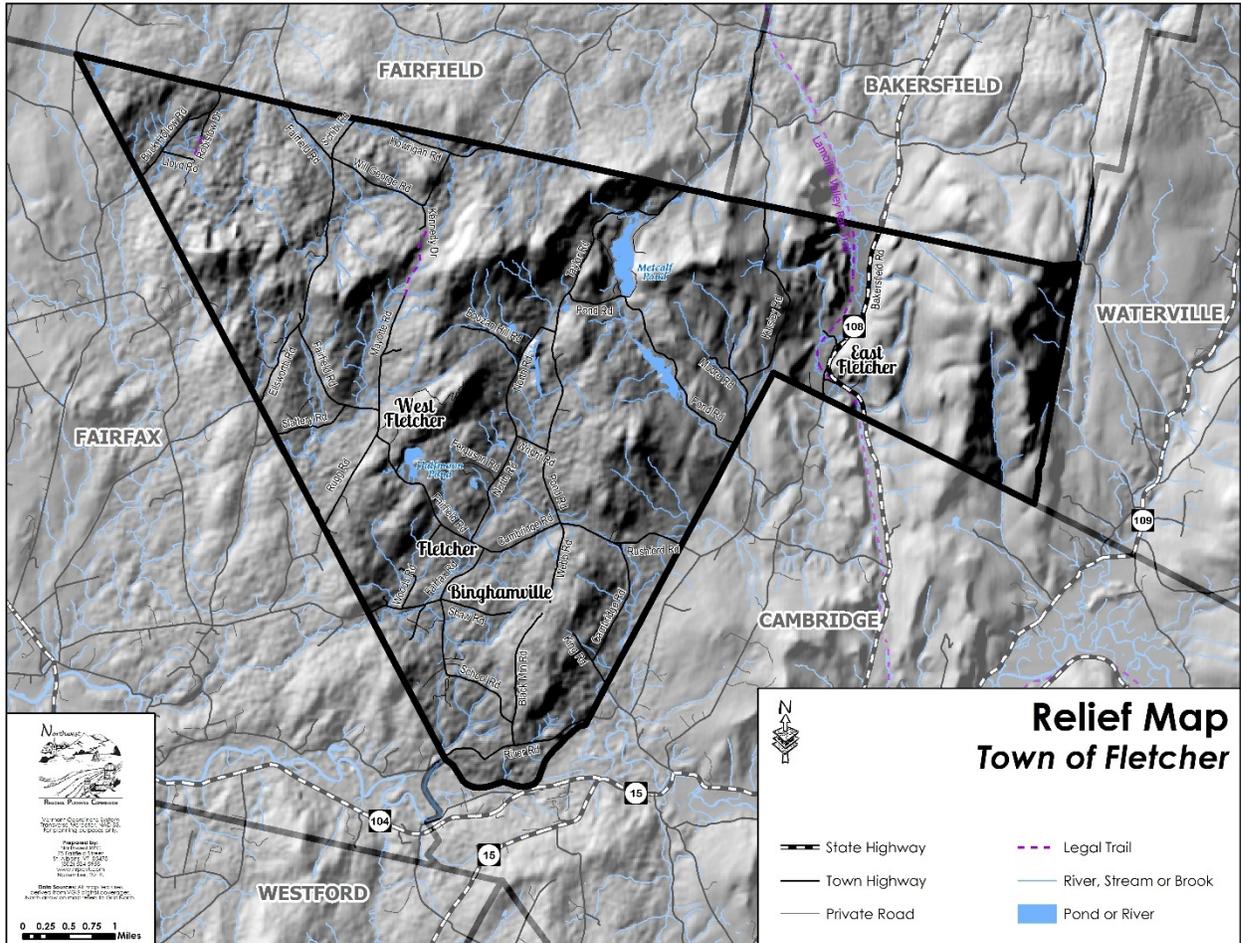
Information in the Hazard Mitigation Plan is based on research from a variety of sources. It encompassed research using a historical perspective and future projections for the vulnerability assessment. The research methods and various contributions to the plan included but were not limited to:

- Town of Fletcher Select Board
- Town of Fletcher Emergency Management Coordinator
- Town of Fletcher Town Clerk's Office
- Northwest Regional Planning Commission
- Town of Fletcher Highway Department
- Local Emergency Planning Committee #4 (Franklin County)
- Vermont Department of Transportation District 8
- Vermont Emergency Management
- Vermont Agency of Natural Resources
- Vermont Fire Academy
- Northeast States Emergency Consortium
- Federal Emergency Management Agency
- National Weather Service
- National Oceanic Atmospheric Administration
- Vermont Geological Survey

**Attachment E  
Town of Fletcher Base Map**

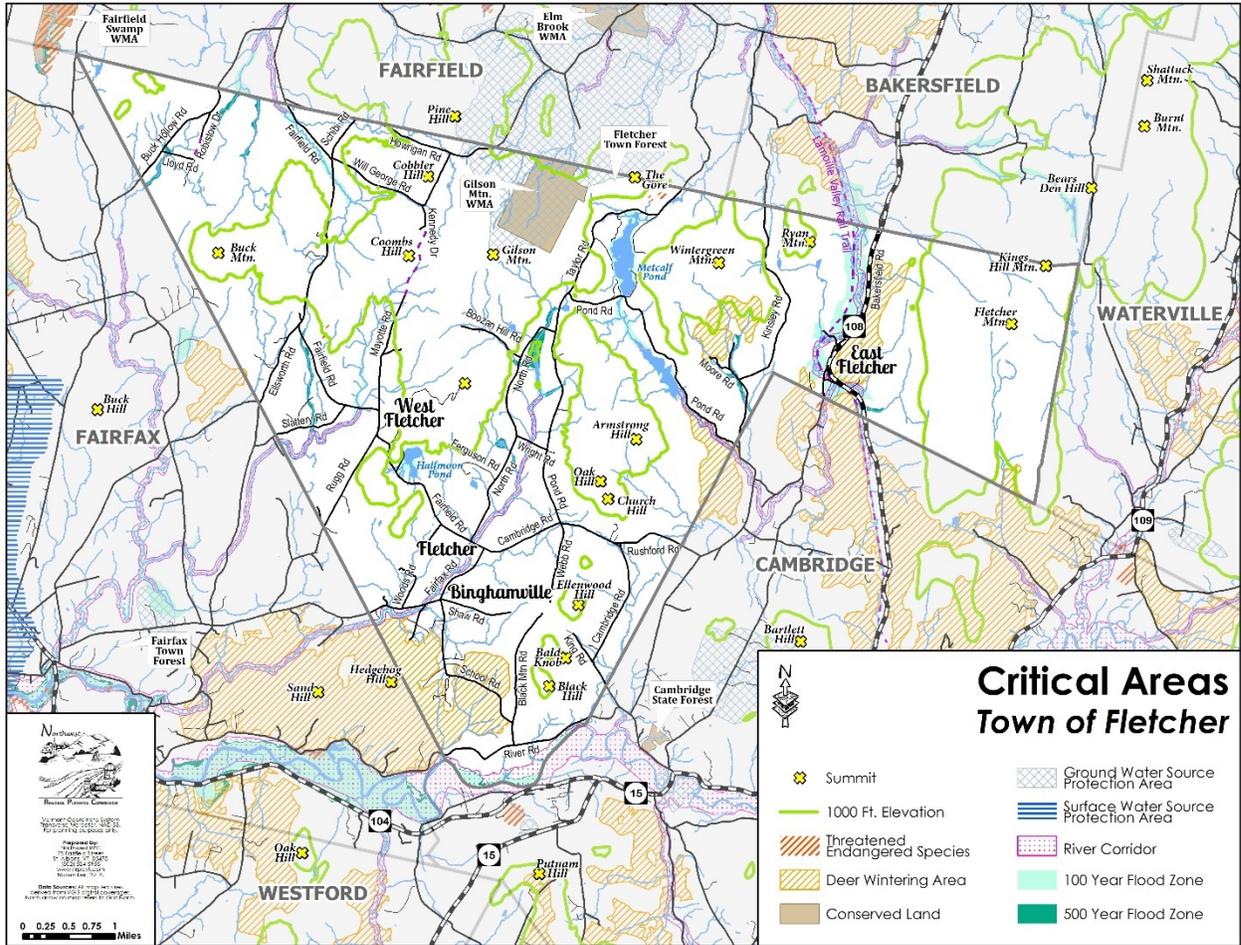


**Attachment F  
Town of Fletcher Relief Map**



# Attachment G

## Fletcher Critical Areas Map



## Attachment H

### References

- American Community Survey. (2016). Available: <http://www.factfinder.census.gov>
- Cornell University. (2019). Northeast Regional Climate Data Center. Available: <http://www.nrcc.cornell.edu>
- Federal Emergency Management Agency. (Various). Town of Fletcher Flood Insurance Study (1980) and Flood Insurance Rate Maps (2001).
- Federal Emergency Management Agency (2019). Available: <http://www.fema.gov>
- Fletcher Town (2019). Local Emergency Management Plan. Fletcher, VT
- National Oceanic and Atmospheric Administration. (2019). National Climatic Data Center. Available: <http://www.ncdc.noaa.gov/oa/ncdc.html>
- National Oceanic and Atmospheric Administration. (2019). National Weather Service. Available: <http://www.nws.noaa.gov>
- Northeast States Emergency Consortium. (2016). Disaster Resistant Communities Resources and Tools. Available: <http://www.nesec.org>
- Northwest Regional Planning Commission. (2016). Regional Plan. St. Albans, VT.
- Town of Fletcher, VT (2017) Grand List, Fletcher, VT.
- University of South Carolina, Department of Geography. (2015). Hazards Research Lab. Available: <http://www.cla.sc.edu/GEOG/hrl/index.htm>
- U.S. Geologic Survey. (2016). Earthquake Hazards Program. Available: <http://eqhazmaps.usgs.gov>
- Vermont Agency of Transportation. (2015). Handbook for Local Officials. Montpelier, VT.
- Vermont Center for Rural Studies. (2016). Available: <http://crs.uvm.edu>
- Vermont Department of Environmental Conservation. (2001). Fluvial Geomorphology: A Foundation for Watershed Protection, Management and Restoration. Waterbury, VT.
- Vermont Department of Environmental Conservation, Vermont Geologic Survey. (2004). HAZUS-MH Earthquake Reports for Franklin and Grand Isle Counties. Waterbury, VT.
- Vermont Department of Public Safety, Vermont Emergency Management. (2018). State of Vermont Hazard Mitigation Plan. Waterbury, VT.
- Vermont Department of Public Safety. (2019). Repetitive Loss Properties. Waterbury, VT: State Hazard Mitigation Officer.