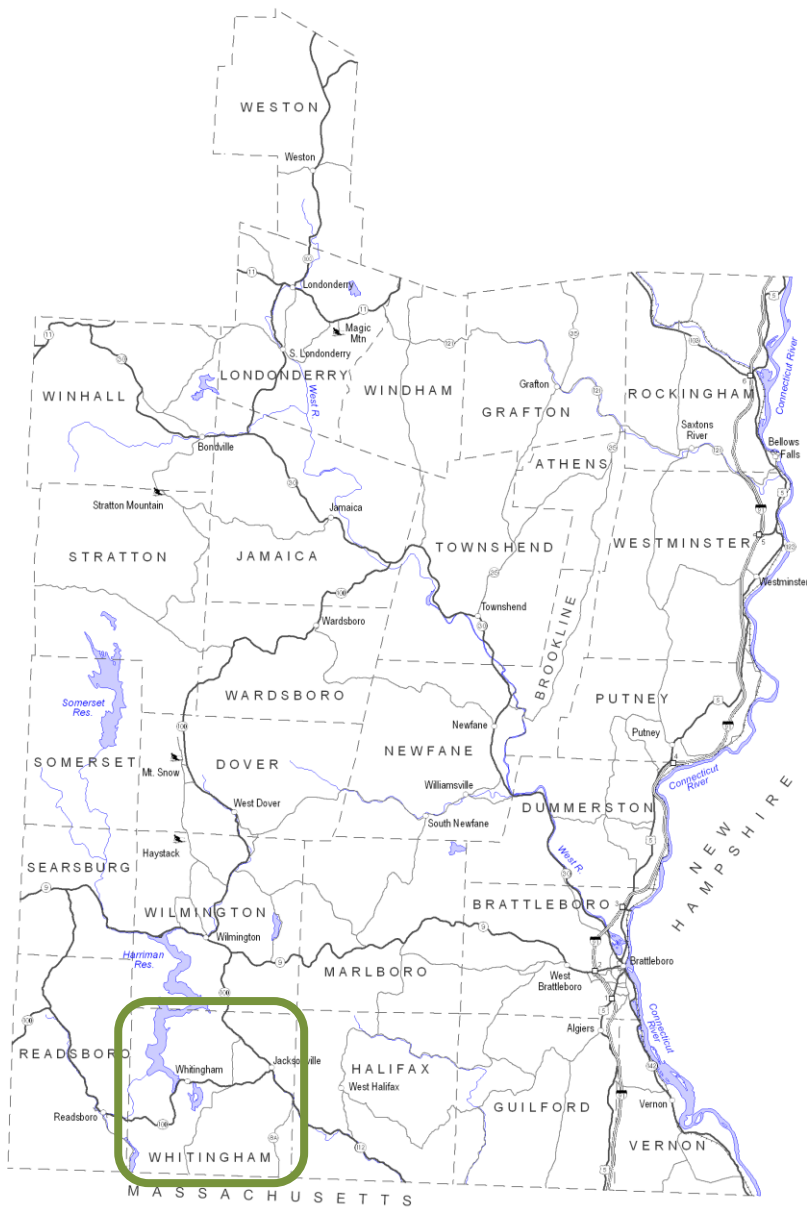


Town of Whitingham Local Hazard Mitigation Plan



FEMA Preliminarily Approved October 22, 2018
FEMA Final Approved November 9, 2018

Prepared for the Town of Whitingham
by the Windham Regional Commission



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INTRODUCTION AND PURPOSE

This Single Jurisdiction Hazard Mitigation Plan is NEW, and has never been approved by FEMA or adopted by the Town of Whitingham.

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

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

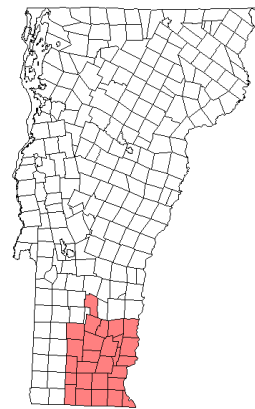
Hazard mitigation strategies and measures alter the hazard by: eliminating or reducing the frequency of occurrence; averting the hazard by redirecting the impact by means of a structure or land treatment; adapting to the hazard by modifying structures or standards; or avoiding the hazard by stopping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

- Flood-proofing structures
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying and modifying high traffic incident locations and routes
- Ensuring adequate water supply
- Elevating structures or utilities above flood levels
- Identifying and upgrading undersized culverts
- Planning for land use for floodplains and other flood-prone areas
- Proper road maintenance and construction
- Ensuring critical facilities are safely located
- Establishing and enforcing appropriate building codes
- Public information

WINDHAM REGION GEOGRAPHY

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

The Region's topography is relatively flat or gently rolling land in the Connecticut River valley in the east, while the western part of the region is characterized by the Green Mountain ridges and peaks with narrow



stream valleys. Stratton Mountain is the highest point in the region at 3,936 feet. The lowest point is along the Connecticut River in Vernon, at 200 feet.

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

WHITINGHAM GEOGRAPHY & TOWN PROFILE



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

Throughout the plan reference to “Town of Whitingham” should be taken to include the “Village of Jacksonville” along with the rest of Whitingham. Hazards experienced are the same in both the Town as a whole and Village specifically, except where noted. There are specific mitigation actions identified for the Village of Jacksonville

to address concerns in that area, but the responsibility for those actions would be with the Town, as the Village is a part of the Town.

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

Woodlands are predominant in Whitingham and cover a vast acreage of land. These lands provide the scenic backdrop for the town as well as provide wood products, game for hunting, maple products and recreation opportunities. Approximately 3,426 forest acres are in private non-industrial ownership and are actively managed under the Vermont Current Use Value Appraisal Program. The State of Vermont (Department of Fish and Wildlife) owns and manages Atherton Meadows, an 800-acre wildlife preserve in Whitingham. The highest elevation in town, between 2320 and 2340 feet is on the side of a mountain along Whitingham's western border in the Green Mountains. A gently sloping topography and a number of small lakes, ponds and wetlands make up the majority of the Whitingham landscape¹.

Surface waters are predominant landscape features in Whitingham. The Deerfield River is dammed for power generation forming Harriman and Sherman Reservoirs. Harriman Reservoir is over eight miles long, holds more than 38 billion gallons of water and is the largest body of water that lies entirely within the State of Vermont. Harriman Dam, a hydroelectric built in 1923

¹ Whitingham draft update Town Plan 2018

in Whitingham, was the largest earth-filled dam in the world at the time. Great River Hydro currently owns the Harriman Dam and 4,502 acres of forest land surrounding Harriman Reservoir. Harriman is one of 10 dams along the Deerfield River. Downstream is the northern end of the Sherman Reservoir that is formed by the Sherman Dam located in Rowe, Massachusetts.

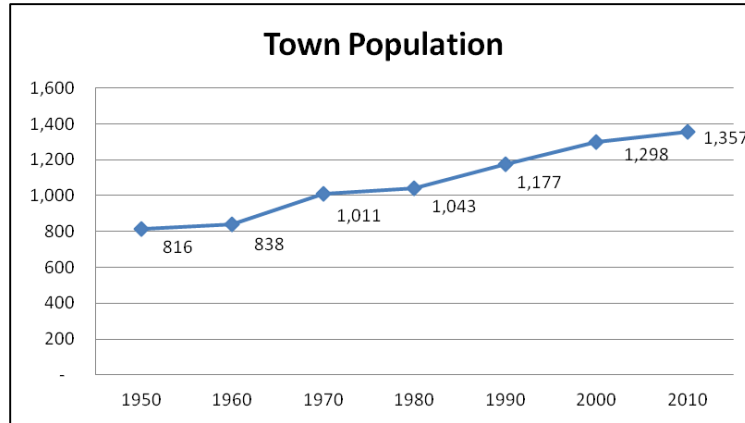
The major surface waters in Whitingham include the East Branch of the North River, North Branch of the Deerfield River, Harriman Reservoir (Lake Whitingham), Sherman Reservoir, Sadawga Lake, Clare Lake, Shippee Pond, North Pond, Gates Pond, Jacksonville Pond, Laurel Lake, Ryder Pond, and Holbrook Pond.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

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

Development Trends

As the following table and graph show, the 2000 Census indicates a population of 1,298 and a growth rate of 10.2 percent over the 1990 population of 1,177. This is higher than the 8.2 percent growth rate for the State, and also higher than the 5 percent growth rate for Windham County during the same period. Whitingham has steadily and slowly been increasing in population since 1950. Towns adjacent to Whitingham lost population between 2000 and 2010, with only Whitingham gaining in population. The gain in population during that time was smaller than the previous 10-year period from 1990-2000.

Town	1990	2000	2010	% Change 1990-2000	% Change 2000-2010
Whitingham	1,177	1,298	1,357	10%	5%
Readsboro	762	805	763	6%	-5%
Halifax	588	782	728	33%	-7%
Wilmington	1,968	2,225	1,876	13%	-16%
Heath, MA	716	805	706	12%	-12%
Rowe, MA	378	351	393	-7%	12%



Whitingham has a very small commercial and job sector. Most residents commute outside of town for work. During the period 2008-2012, the American Community Survey reports, 24.6% of Whitingham residents worked in Whitingham, including the 4.9% of residents that worked at home¹. Single family residential is the primary type of development that has occurred for decades in the Town. Seasonal housing has become a more prominent housing type/use than in previous decades prior to 1980. It accounts for about 33% of housing in the Town.

Emergency Services

The Emergency Management Director, who is appointed by the Selectboard, coordinates emergency preparedness and response for the Town. Whitingham is served by two fire stations under the Whitingham Fire Department. The Department is composed of approximately 23 volunteer members. The Department serves the entire town and has mutual aid agreements with surrounding towns. Keene Mutual Aid serves as dispatch for the Department. Given the constraints imposed by a small volunteer Department, it has neither the financial nor the human resources to provide the level of fire protection that would be required by large-scale development. As with many small town fire departments in Vermont, there is a lack of younger volunteer firefighters. The Whitingham Fire Department makes all efforts to recruit volunteer fire-fighting personnel to protect Whitingham residents. Members attend training courses sponsored by Vermont Fire Academy and the various mutual aid associations. There is a firehouse in Whitingham Village and another firehouse in Jacksonville Village.

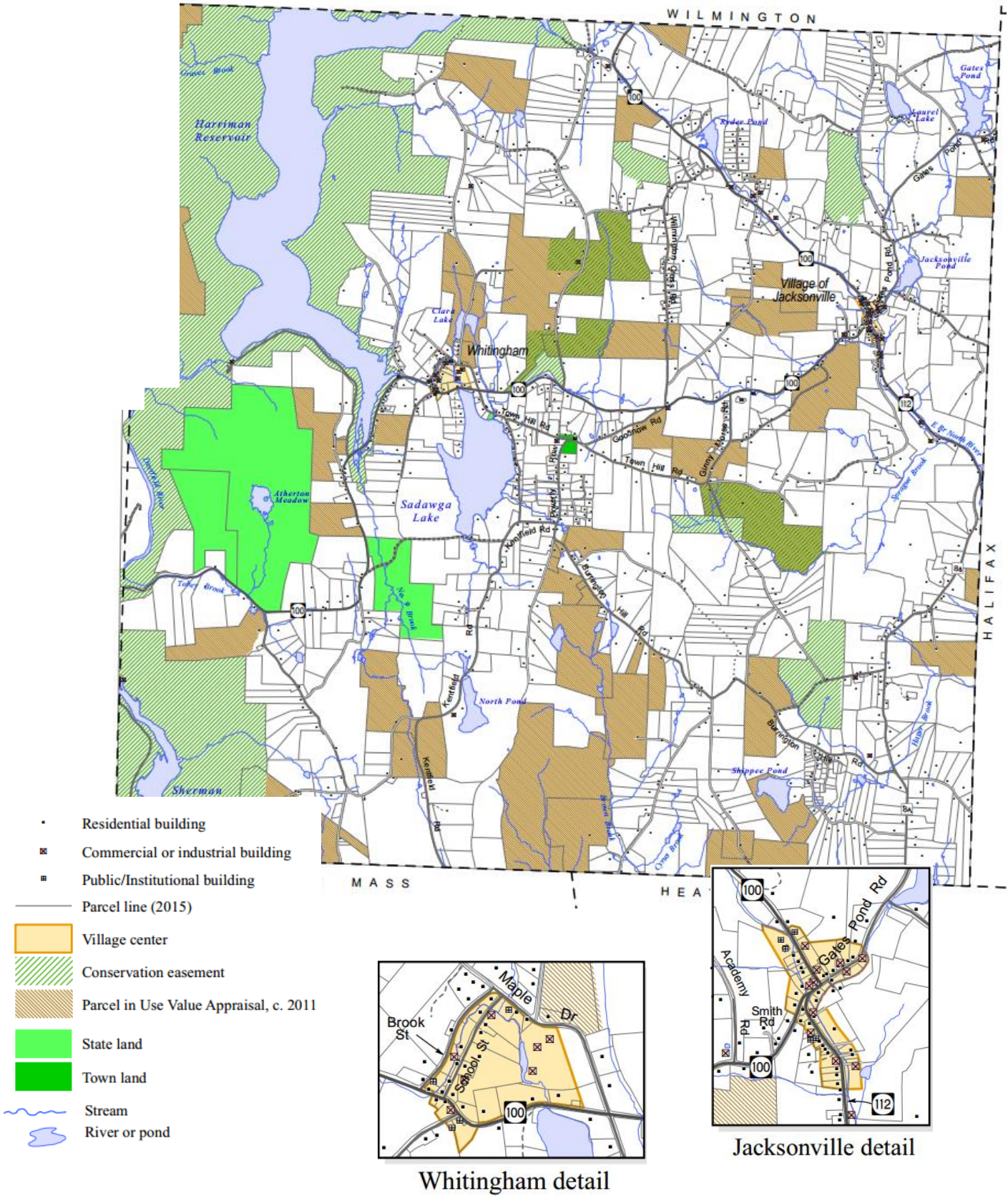
Emergency medical services are provided by Deerfield Valley Rescue (DVR). DVR is based in Wilmington and maintains an ambulance at the Jacksonville Firehouse. DVR is a non-profit organization funded through subscriptions and donations. DVR provides Whitingham and surrounding towns with ambulance service,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

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

The Vermont State Police provide police protection by default but the town does not have a contract with them so they aren't required to be in town for any set amount of time. Law enforcement remains an issue under continual review¹. Response times haven't been raised as a concern with the town.

The Municipal Center is the Local Emergency Operations Center. For emergency communications, Whitingham maintains a two-way radio system. As well, cellular repeaters with a range of ½ a square mile are being installed on telephone poles along Route 100 to assist with getting better emergency communications capabilities through the Deerfield Valley. The repeater has battery and solar backup located at the Whitingham Municipal Center.¹ Keene Mutual Aid just put an antenna on Town Hill.

Existing Land Use Map from the 2018 Draft Whitingham Town Plan



PLANNING PROCESS

Town residents who took part in the planning process for developing the Local Hazard Mitigation Plan for Whitingham tend to be affiliated with more than one association for the town. In rural areas of Vermont, it is typical that people who are most interested in the safety, health and welfare of their community will preside on more than one board and may for example, hold the role of Fire Chief, or school teacher, or be a small business owner, in addition to owning personal property in the town. Therefore, although the meeting may not have as many people in attendance as a more populated community would, those present at the meeting are representing not only a variety of roles, but many roles that would be held by numerous individuals in a more populated area.

Documentation of the Planning Process

This Single Jurisdiction Hazard Mitigation Plan is NEW, and has never been approved by FEMA or adopted by the Town of Whitingham.

Past Plan

During 2009 through 2011, Whitingham worked with Windham Regional Commission staff to develop a draft hazard mitigation plan, which was submitted to but never approved by FEMA or adopted by the town. This current plan will utilize pertinent information that came out of the past process where possible, but this is a newly developed plan.

Current Process

The Town commenced the planning process in October 2017. Alyssa Sabetto, Emergency Planner for the Windham Regional Commission, worked with Selectboard Office Administrator Gig Zboray to set up a meeting of a hazard mitigation planning committee. The Hazard Mitigation Planning participants later convened on October 18, 2017 at the Whitingham Municipal Center and met with Alyssa. Gig invited these attendees directly, and they formed the core planning team. The meeting was also advertised and open to the public.² It lasted for several hours and involved:

- a review of the draft document with discussion of more recent hazard events,
- completion of hazard analysis and discussion of what hazards the town wants the plan to focus on
- progress made in mitigation efforts that were noted several years ago,
- development of new hazard mitigation projects, and
- review of mapping of the town to note where hazard events are causing repeated or large scale damage.

Alyssa used what she could of the old draft plan, but she mostly rewrote the plan to meet the current standards and guidelines of FEMA for hazard mitigation plans. She took the information from the October 18, 2017 meeting, along with follow-up information gathered in conversations with the Road Commissioner and the Selectboard Office Administrator and assembled a new draft plan. Alyssa also reviewed and utilized the data sources noted and cited throughout this plan to gather further information. The draft was presented for internal town review by the Committee, town personnel, Planning Commission and Selectboard on August 8, 2018. This internal town review period was from August 8-August 22, 2018. Comments, corrections,

² See appendices 8 and 9 for sign in sheet and meeting agenda.

pictures and some additional information was received back from Gig Zboray. Alyssa made the revisions, additions and corrections to finalize the draft for public comment.

The revised draft plan was put out for public comment on August 24, 2018. This was done by posting an electronic copy on the town website and having a hard copy of the plan advertised and made available at the town office for public review and comment. Flyers were posted around town advertising its availability for review and comment. One comment was received from the public during the over two weeks plus comment period, but that comment did not have any requests for specific changes. It was simultaneously distributed to the adjacent towns of: Readsboro, Wilmington, Halifax, and Heath and Rowe, MA for comment via email.³ There were comments from Wilmington and Halifax, VT and Rowe, MA, none of which had suggested revisions. The plan was finalized by Alyssa Sabetto for submittal to VT Department of Emergency Management (VEM). This submittal allows VEM to make suggested revisions on the draft, and allows for any revisions to be made before the final draft is submitted to the Federal Emergency Management Agency Region 1 (FEMA) for review.

The following people were involved in the current hazard mitigation planning process:

Contributors (2011)	Affiliations	Home
Bonnie Jo Radasch	Administrative Assistant for Whitingham	Whitingham
Brad Lackey	Planning Commission	Whitingham
Almira Aekus	Town Clerk	Whitingham
Stanley Janovsky	Fire Chief and Road Commissioner	Whitingham
Alan Twitchell	EMD	Whitingham
Dinah Reed	Windham Regional Commission	Brattleboro
Contributors (2017)	Affiliations	Home
Karl Twitchell	Selectboard	Whitingham
Keith Bronson	Selectboard	Whitingham
Stanley Janovsky	Road Commissioner and Fire Chief	Whitingham
Robin Kingsley	Selectboard	Whitingham
Gig Zboray	Selectboard Office Administrator	Whitingham
Alyssa Sabetto	Windham Regional Commission	Brattleboro

Public Involvement and Input from Neighboring Communities

Making the Whitingham Hazard Mitigation Plan available for public comment included the following efforts:

- All of the meetings discussed in the above sections were advertised and open to the public.⁴
- Between 2011 and mid-2014, the Whitingham Draft Plan was posted on the Windham Regional Commission website for public review and comment. No comments were received during this time.
- The primary hazard mitigation planning meeting took place on October 18, 2017 and was open to the public.⁵
- The draft hazard mitigation plan was brought to the August 8, 2018 Whitingham Planning Commission meeting for review and input from members and the public.

³ See appendix 3 for reach-out and response.

⁴ See appendix 7 for town website advertisement of October 18, 2017 meeting.

⁵ See appendix 8 for sign in sheet.

- The draft hazard mitigation plan was brought to a Selectboard meeting on August 15, 2018 for review and input from attendees and the public.
- The draft plan was made available in hard copy for public review and comment at the town office from August 24-September 14, 2018.⁶
- A draft of the plan was posted from August 24-September 14, 2018 on the town website for public comment.⁶
- Flyers were put up around town for public comment on the draft.⁷
- On August 22, 2018, an invitation was extended via email to neighboring towns to provide a means and opportunity to review and comment on the draft Whitingham Hazard Mitigation Plan.⁸ There were comments from Wilmington and Halifax, VT and Rowe, MA, none of which had suggested revisions. Inter-town communication will repeat for future revisions of this Plan.

RISK ASSESSMENT

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

Methodology

A **vulnerability analysis** for each community begins with an inventory of possible hazards and an assessment of the risk that they pose. These are the questions to be answered. What hazards can affect your community? How bad can it get? What is the likelihood of future events occurring? What areas of your town are most vulnerable to these hazards? How does climate change impact your town currently and what are you worried about for future impacts? Information collected from the core planning team went into this vulnerability assessment to identify the hazards the town feels most vulnerable to.

The **Potential Impact** (percentage of the community affected) or magnitude of the impact of the hazard can be classed as follows:

1 = Negligible	Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries
2 = Minor	Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries
3 = Moderate	Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities
4 = Major	Severe property damage on a town-wide or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

Probability of Future Events: This is the likelihood of future events occurring, taking into account how often events have occurred in the past as well as development trends the town is experiencing. This also takes into account the effects of climate change and the community's knowledge of those potential impacts.

1 = Unlikely	<1% probability of occurrence in the next 100 years (less than 1 occurrence in 100 years)
2 = Occasionally	1–10% probability of occurrence per year

⁶ See appendix 4.

⁷ See appendix 2.

⁸ See appendix 3.

3 = Likely >10% but <100% probability per year (at least 1 chance in next 10 years)
 4 = Highly Likely 100% probable in a year (an annual occurrence)

Warning Time: Amount of time generally given to alert people to hazard

- 1 = More than 12 hours
- 2 = 6–12 hours
- 3 = 3–6 hours
- 4 = None–Minimal

Additionally, seasonal patterns that may exist are considered, what areas are likely to be affected most, the probable duration of the hazard, the speed of onset (amount of warning time, considered with existing warning systems).

The combination of the Potential Impact, Probability of Future Events, and Warning Time was used to determine the hazard ranking score for each hazard.

The **Potential Impact, Probability of Future Events and Warning Time** for each hazard was discussed at the October 18, 2017 Hazard Mitigation Plan meeting. There was also a review of what was developed in 2011; however, the below table, which the participants developed at the most recent meeting was more detailed in terms of areas of vulnerability and current in terms of what has happened in recent years. The participants discussed each potential hazard in detail and ranked each element for each hazard. The numbers were combined to give each hazard a hazard score. This score was used to determine which hazards the plan would address.

While all hazards were considered by the Hazard Mitigation Planning participants for inclusion in this plan, it is not feasible to study each in depth. For hazards that are not profiled in this plan, the reader is directed to the Vermont State Hazard Mitigation Plan. The rationale for not addressing all of the hazards is that Whitingham has a low level of risk associated with them and/or the town does not choose to mitigate for them at this time. This plan will only focus on the hazards that Whitingham has decided are pertinent to their community and they have chosen to mitigate for at this time, which are Landslide, Flood and Fluvial Erosion, and Invasive Species. The below table shows the hazards in terms of their hazard ranking score as determined by the Hazard Mitigation Planning participants.

Possible Hazard	Probability of Future Events	Warning Time	Potential Impact	Score	Most vulnerable facilities and populations
Power Failure	4	4	3	11	Elderly and second home owners are most at risk. There are number of both in Whitingham.
Structure Fire	3	4	3	10	
Flood	3	3	4	10	Plan participants noted that there are more hard quick rain storms occurring than in the past. Burrington Hill Road by the gravel pit (old beaver ponds) is vulnerable. Jacksonville Village.
Fluvial Erosion / Landslide	3	3	4	10	On Holbrook Road there is a large constant slide caused by fluvial erosion. It is most active in April with mud season. The road crew has to clean out culverts frequently in that area. The slide is above the road. At times it has come down across the road and into the river before. Road cut caused the slide initially but the road has been there for many years. This is the only landslide in town.

Town of Whitingham, VT 11
Local Hazard Mitigation Plan

Possible Hazard	Probability of Future Events	Warning Time	Potential Impact	Score	Most vulnerable facilities and populations
Invasive Species / Infestation	4	1	4	9	Species of particular concern are Japanese knotweed and on Sadawga Lake there is milfoil. Emerald Ash Borer is present in Whitingham. This is a big concern of the town.
Highway Accidents	3	4	2	9	
Radiological Incident	1	4	4	9	Yankee Rowe in Rowe, MA is a decommissioned reactor (2002) with dry fuel storage casks present. Whitingham is outside the decommissioned Vermont Yankee Emergency Planning Zone.
High Wind	4	2	2	8	
Hazardous material spill	2	4	2	8	
Hail Storm	3	3	2	8	
Tornado/Microburst	2	3	2	7	
Wildfire	2	4	1	7	
School Safety Issues	1	4	2	7	The one school in town has a school crisis plan in place.
Air crash	1	4	2	7	
Terrorism	1	4	2	7	
Extreme Cold	4	1	2	7	
Beaver dams	2	4	1	7	Gates Pond has a beaver dam. There are hundreds of beavers in town; most are in the woods and causing no problem. Up off Stone House and Parsons Road, near the intersection, there is a beaver dam that has broken and caused some road damage. On Route 100 at the intersection of Shippee road, there is a state owned culvert that gets frequently plugged and a beaver fence may be helpful there.
Winter & Ice Storm	3	1	2	6	Storms do occur but they are a part of life in Vermont and are handled. There was a December 2007 ice storm that is particularly memorable.
Earthquake	1	4	1	6	Small quakes occasionally occur.
Hurricane	2	1	3	6	
Ice Jams	3	1	2	6	North River has some issues with ice jams and the road crew sometimes has to break them up.
Water Supply Contamination	1	4	1	6	No public water supply in Whitingham.
Dam Failure	1	2	2	5	Harriman Dam is owned by Great River Hydro. Lake Sadawga has two dams. Ryder Pond has a dam. Jacksonville Pond has a dam. Lake Clara has a dam. Gates Pond has a dam. There are 6 public dams total in town and this is not including Pine Lake private dam.

Possible Hazard	Probability of Future Events	Warning Time	Potential Impact	Score	Most vulnerable facilities and populations
Drought	2	1	1	4	
Extreme Heat	1	1	1	3	
Railroad Accidents				0	NA
Tsunami				0	NA
Volcano				0	NA

Though the above table shows vulnerability to some natural hazards, such as: beaver dams, winter/ice storms, ice jams, dam failure, and earthquake, Whitingham—due to their small size and limited resources—at this point in time doesn’t feel that the risk posed by these hazards is high enough to justify the cost it would take to mitigate for them. Regarding ice jams, Whitingham feels they have already mitigated this hazard as much as possible. They also have installed a number of beaver deceivers on culverts already to mitigate beaver dam failure issues. Extreme heat, tsunami and volcano are low-ranking natural hazards, that Whitingham has low vulnerability for, or not applicable to the town, according to the Hazard Mitigation Planning participants. Whitingham may choose to mitigate for hazards other than what this plan addresses if resources enable them to do so or if their level of vulnerability changes in the future. For hazards not covered in this plan, the reader is referred to the State All Hazards Mitigation Plan. Winter and ice storms are not being addressed in this plan because they are a way of life in Vermont and they are handled well by Whitingham and VTrans. Whitingham does not currently have ways of mitigating for winter weather events or extreme cold other than what is currently being done, including having three emergency shelters with generator heat sources. Current methods are deemed adequate at this time, though the town may choose to address these hazards in the future.



Flooding of the East Branch of the North River at Honora Winery and across Route 112 in Jacksonville Village during Tropical Storm Irene in September 2011. Photo courtesy of the Town of Whitingham.

Identifying and Profiling Hazards

The following sections include a narrative with a Description, Geographic Area of the Hazard, Impact, Extent, Probability, and discussion of Past Occurrences of the four highest ranking natural hazards affecting Whitingham.

Flooding and Fluvial Erosion

Flooding Description

Flooding is the most widespread and destructive hazard in the United States. Flooding has also been the most common and costly hazard to affect Whitingham. Flooding can occur anytime of the year as a result of heavy rains, thunderstorms, tropical storms, hurricanes or Nor'easters. It can result from the overflow of major rivers and their smaller tributaries, or inadequate local drainage. Historically, floods have been a factor in over 80 percent of all federally declared disasters. People living in close proximity to bodies of water such as rivers, lakes, and streams are at greater risk from flooding than those not living in the floodplain. There is a 26 percent chance of experiencing a flood during the life of a 30-year mortgage compared to a 4 percent chance of a fire.

Whitingham has an NFIP compliant floodplain ordinance, which gives residents access to discount flood insurance and enables the Town to regulate development within the Special Flood Hazard Area (SFHA). SFHAs are subject to inundation by the 1% annual chance flood (100-year flood). Maps of these areas can be found at the Town Office or online at the FEMA Map Service Center.⁹



Debris and flooding between the two bridges leading to the Whitingham Municipal Center, during Tropical Storm Irene in September 2011. Photo courtesy of the Town of Whitingham.

Fluvial Erosion/Landslide Description

Outside of the Jacksonville Village area, most of the damage caused by flooding events in Whitingham is caused by fluvial erosion. Fluvial erosion is the destruction of river banks caused by the movement of rivers and streams, when stream power overcomes resistance of bed and bank material. This can range from gradual bank erosion to catastrophic changes in river channel location and dimension during flood events. This occurs when the stream has more energy than is needed to transport its sediment load, due to channel alterations or runoff events that increase water speed in the channel, leading to erosion.

⁹ <https://msc.fema.gov/portal>

There is only one instance of a landslide in Whitingham and it is located on Holbrook Road. It is located in a River Corridor south of Jacksonville just off of Route 112. This slide is caused by a combination of fluvial erosion and the road cut for Holbrook Road. This issue is addressed in the mitigation actions table in this plan. For this reason, landslides are included with fluvial erosion in this plan.

Gravity and water power are the forces driving fluvial erosion. Factors that allow the force of gravity to overcome the resistance of earth material to erosion include: saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, removal of trees and other vegetation and earthquake shaking. Major erosion events are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompany these events. Associated issues in Whitingham are related to road cutting and bank erosion for the most part, areas where roads have been built between steep slopes on one side of the road, and slopes to a river or brook on the opposite side. Existing homes are dotted on the landscape along these roads which have existed for 200 years or more, so cannot be easily closed or relocated.



Fluvial erosion damages to Fowler Road due to flooding of an upland stream in Tropical Storm Irene, September 2011. Photo courtesy of the Town of Whitingham.

The historic road network of many Vermont towns and villages typically follows waterways. This historic settlement pattern creates vulnerability for the road network, infrastructure and development within and along what are called River Corridors. River Corridor mapping was released by the Vermont Agency of Natural Resources in early December 2014; small stream mapping was released in January 2016. This mapping delineates fluvial erosion

hazard areas and includes a 50-foot buffer beyond those designated areas. For small streams, a 50-foot buffer from top-of-bank on either side of the waterway constitutes the River Corridor. This mapping can assist municipalities in developing bylaws and effective mitigation strategies to regulate development within fluvial erosion hazard zones. Whitingham does not currently have a fluvial erosion bylaw, but plans to add this to their floodplain regulations in the near future.

Impact of Flooding and Fluvial Erosion

There is limited FEMA designated floodplain throughout the whole of Whitingham, due to the hilly and mountainous terrain. Most of the designated floodplain is in and around the numerous ponds that are scattered throughout the Town and along the East Branch of the North River, which runs through Jacksonville Village and along Route 112 into Halifax. Damages to Route 100 or 112 could limit access to the Town. Jacksonville Village was heavily impacted by Tropical Storm Irene in 2011. There was flooding throughout the Village and numerous

buildings were damaged. The stream is very pinched through the whole extent of the Village and several undersized bridges and culverts that exacerbate the problem.

A *River Corridor Plan for the East Branch of the North River In Halifax and Whitingham, Vermont*¹⁰ was completed in December 2017. This document is a detailed study of the East Branch of the North River including Hager Brook. The *Corridor Plan* focuses on the waterway's current condition and identification of projects to improve the health of the waterway, the ability of the waterway to achieve geomorphic equilibrium, and reduce both flood and fluvial erosion risk. This *Mitigation Plan* will review, reiterate and recommend the five Jacksonville Village area projects identified in the *River Corridor Plan for the East Branch of the North River*. Readers are encouraged to separately review the *Corridor Plan* as it provides more detail than is contained in this plan. Though the East Branch of the North River watershed only covers a portion of the Town, if completed, the projects would greater lower the vulnerability of the Town as most of the vulnerability is concentrated in and around the Village of Jacksonville. The *Corridor Plan* says this about the Whitingham portion of the watershed: *Overall Phase 2 geomorphic ratings indicate a range of river stability from poor to good along the study reaches. The two "poor" reaches were located within the Village of Jacksonville where the channel is highly encroached by adjacent development and has been historically straightened. One "good" reach is located upstream of the Village where the channel flows through a forested floodplain and is stable.*

The area of Whitingham that the River Corridor Plan studied was divided into two reaches, which each have an A and B section. The description of those reaches is below and the map is shown here.

- Reach M06¹¹
Reach M06 was divided into two segments based on impacts from development, armoring, and encroachment. The first segment (A) flows from shortly downstream of the intersection of Holbrook Road and Route 112 to near the intersection of Route 112 and Sprague Brook Road. Segment M06.A is characterized by incision, but to a lesser degree than the extreme incision in the upstream reach. Segment M06.B flows from just downstream of the intersection of Route 100 and Route 112 in the village of Jacksonville to where bank armoring and incision decrease downstream of the intersection with Holbrook Road and is characterized by incision due to extreme straightening, encroachment, and bank armoring in the village.
- Reach M07¹²
M07 was divided into two segments based on channel dimensions resulting from development, armoring, and encroachment impacts. The first segment (A) flows from just upstream of the Whitingham town offices to just downstream of the crossing at the intersection of Route 112 and Route 100. Segment M07.A is characterized by an extremely incised and armored channel in the town of Jacksonville that does not allow adjustment processes to occur. The upstream segment



¹⁰ Completed by Fitzgerald Environmental Associates, December 2017.

¹¹ Completed by Fitzgerald Environmental Associates, December 2017.

(B) flows from the first crossing on Route 100 upstream of the village of Jacksonville to just upstream of the Whitingham town offices. Segment M07.B is wider than the downstream reach and maintains the ability to move and access floodplains in its very broad valley.

The main area of concern in Whitingham is the stretch directly within Jacksonville which is highly controlled and constrained. The area directly above Jacksonville (shown in green on the map) is a more natural area of the watershed that is made more important because of its assistance in allowing for floodwater storage above the constrained village area. A waterway that is constrained is unable to reach geomorphic equilibrium which increases flooding in that area and puts increased pressure and larger flood loads on upstream and downstream sections, as well as causing more flooding damage. A river is in geomorphic equilibrium when its water, energy, sediment, and debris are in balance. In this condition a river is neither building up sediment in the channel nor losing sediment from its bed. Importantly, a river in equilibrium has not become overly deep and can continue to overflow onto its floodplains. The water that spills onto the floodplain slows down, and the velocity of the water still in the channel does not become excessively powerful. Mitigation actions are intended to assist with achieving greater equilibrium which will also lessen or even eliminate flooding levels and damages.

We need functional streams and rivers with room to adjust (River Corridors) and intact floodplains to moderate the impact of high water events.
- Whitingham Town Plan 2018

Plan participants felt that most of the mitigation that they would like to see happen is outside of the town's control because it involves state assets. For example, a state owned culvert cannot be upgraded until the state decides to do that. The town has little say in the matter. Inundation flooding and fluvial erosion both impact Jacksonville Village. Fluvial erosion impacts a larger area of Whitingham outside of the village, including a number of roadways throughout the Town. Roads that plan participants specifically noted vulnerabilities on included Holbrook Road, Fowler Road and Burrington Hill Road. The Fowler Road and Burrington Hill Road locations are not in FEMA designated flood hazard area but are in VT ANR designated River Corridor. Holbrook Road is not in any designated hazard area. The Town officials recognize that there is a big link between rivers and roads in Whitingham and that this leads to vulnerability. The public is generally not as aware of mapped designated hazard area, though experience teaches residents where the vulnerable spots are. The fact that not all of the areas that experience damage are mapped shows that maps and regulations alone cannot prevent all vulnerably located development.



Fluvial erosion on Chappel Hill Road. Photo courtesy of the Town of Whitingham.

Flash floods typically occur in high elevation drainage areas as a result of summer thunderstorm activity. Drainage ditches and culverts are the biggest concern for local flash

flooding events. Other areas of concern during flooding events are homes located along small brooks throughout town that are subject to rise during quick flash flooding events. The Village areas are also vulnerable to flash flood events, as there are a number of undersized culverts and bridges in Jacksonville particularly.

Ice jam flooding is fairly common in the early springtime, generally around March. The heavy rainfall, combined with runoff from snowmelt due to the mild temperatures, results in flooding of rivers, streams and creeks, mainly from the formation of ice jams. Whitingham doesn't have mapped current or historic ice jams.¹² However, locals say that sometimes jams will form on the East Branch of the North River just south of Jacksonville along Route 112.

Whitingham has had a history of flooding as a result of beaver dams breaking. A beaver dam broke on Rt. 8A and plugged a culvert downstream which had to be replaced with the Town budget costing approximately \$25,000 – 30,000. Since that time the Road Crew has put up a number of beaver fences on culverts to allow for the beavers to build their dams without plugging culverts.

The areas susceptible to beaver activity:

- Culvert across Head of Pond Road next to Sadawga Lake – floods out Head of Pond Road
- Culvert on Faulkner Road next to Clara Lake
- Culvert on Butler Brook
- Culvert at Intersection of Faulkner Road and East Road
- Culvert at Brick House Road
- Culvert on Route 100 across from Shippee Road entrance.
- There is a beaver dam on Shippee Road, a well.
- Culvert at Burrington Hill Road

Extent

The extent of a flood event can vary from a minor event due to a typical rain event or could be a major event as a result of rapid snow melt in spring, rain on frozen ground, or as a result of a tropical depression or storm. Town historians claim that the extent of flooding is such that brooks may breach their banks and flow onto land and down roads.

The highest recorded measurement on the North River at the nearest stream gauge to Whitingham (at Shattuckville, MA) was 18.17 feet, which was measured on August 28, 2011 during TS Irene. According to the National Weather Service flood stage at that gauge is 9 feet.¹³

Extent for thunderstorms/heavy rain events: The tables below shows the top 10 rain events at both a former USGS weather monitoring station in Jacksonville and the nearest current Windham County National Weather Service Cooperative station at Ball Mountain Lake (in the Town of Jamaica). Both tables are given to give perspective and more historic data (and to show how TS Irene compares). Most stations take their observations in the morning (7 and 8am are the most common times), so the precipitation would have fallen between 7am on the previous date to 7 am on the date listed in the table below. To give context to this data, the "Precipitation Frequency Estimates" table on the following page, allows one to determine the

¹² CRELL Ice jam database/map <http://icejams.crrel.usace.army.mil/apex/f?p=524:5:0::NO>

¹³ USGS Stream gauge 01169000 North River at Shattuckville, MA (76 years of record) <http://waterwatch.usgs.gov/index.php>.

event frequency based on the rainfall amount. This table puts Irene (24-hour value) at between a 50 and 100-year event for Whitingham. It is important to remember that precipitation levels vary throughout the region.

Maximum 1-Day Total Precipitation ¹⁴ for Whitingham 1 W, VT		
Rank	Value (inches)	Ending Date
1	5.08	1948-12-31
2	4.47	1990-08-07
3	4.35	1955-08-14
4	4.28	1973-06-30
5	3.92	1987-04-05
6	3.83	1955-10-15
7	3.82	1938-09-22
8	3.62	1985-09-28
-	3.62	1969-06-16
10	3.60	1976-08-10
Period of record: 1930-05-01 to 1998-07-31		

Maximum 1-Day Total Precipitation ¹⁵ for BALL MTN LAKE		
Rank	Value (inches)	Ending Date
1	5.60	1973-06-30
2	4.90	2011-08-29
3	4.36	1999-09-17
4	3.97	2005-10-09
5	3.32	1987-06-23
6	3.30	1975-08-08
7	3.21	2003-08-02
8	3.14	1988-04-29
9	3.07	2010-10-01
10	3.02	2000-12-18
Period of record: 1969-05-01 to 2016-06-19		

The table below is specific for Whitingham, and has the values associated with the size of an event in order to determine the storm frequency¹⁶. This is for reference. Whitingham should consider what size event is reasonable to set standards to build to, for both infrastructure and

¹⁴ Data provided by the NOAA, Northeast Regional Climate Center at Cornell University. <http://www.nrcc.cornell.edu/>. Courtesy of Jessica Spaccio, Climatologist. 5/14/2018.

¹⁵ Data provided by the NOAA, Northeast Regional Climate Center at Cornell University. <http://www.nrcc.cornell.edu/>. Courtesy of Jessica Spaccio, Climatologist. 4/3/2015.

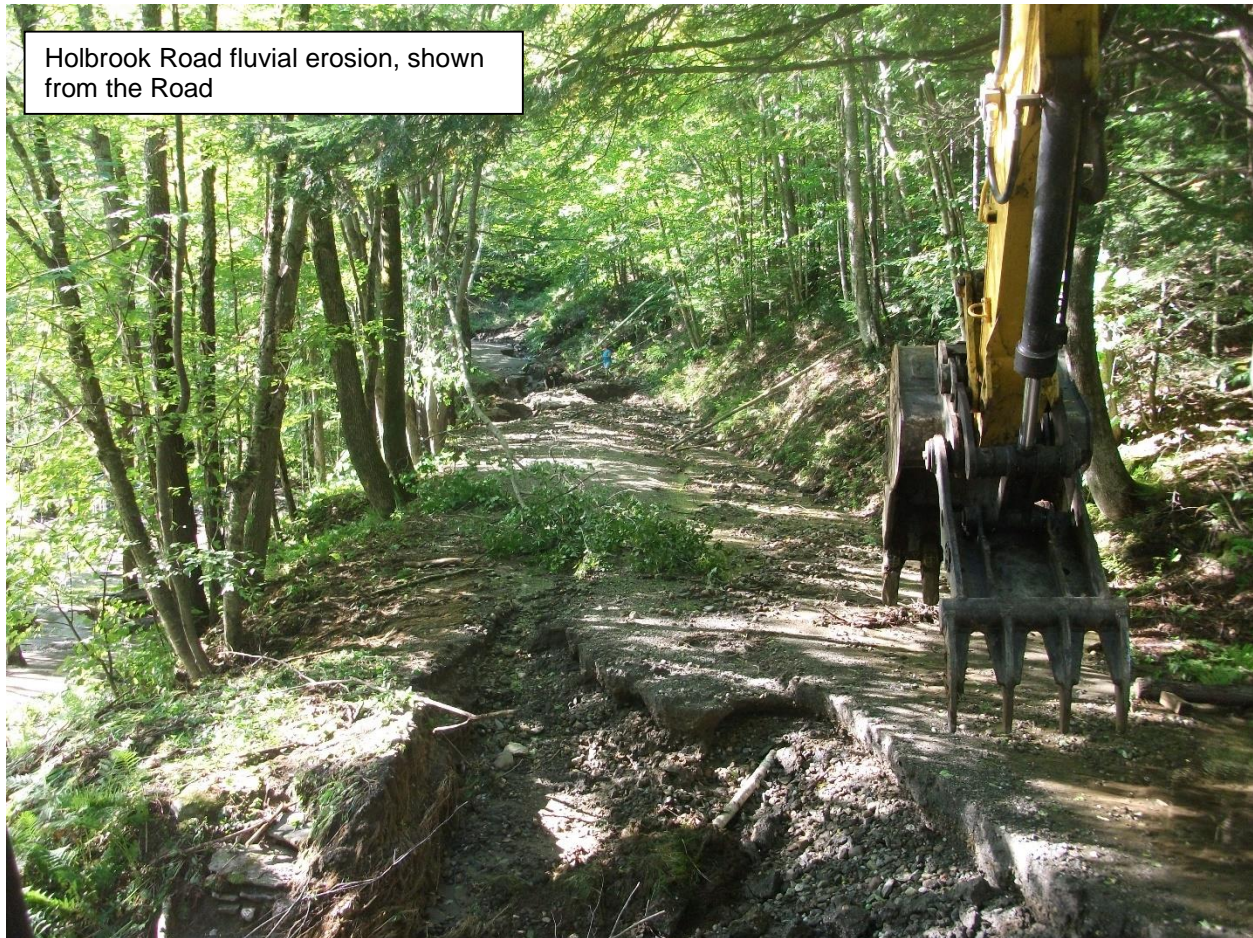
¹⁶ NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: Whitingham, VT <https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=vt> accessed 5/14/18.

buildings. Some experts advise that towns should be using the 10 year one hour or two-hour frequency estimates to reflect the monsoon type storms that are seen in the region. Infrastructure built for 24 hour events often can't keep up with high intensity storms leading to erosion and street flooding. This should be a consideration in the future.

PRECIPITATION FREQUENCY ESTIMATES (in inches)										
by duration for ARI (years):	1	2	5	10	25	50	100	200	500	1000
5-min:	0.299	0.35	0.434	0.503	0.598	0.672	0.746	0.829	0.94	1.02
10-min:	0.424	0.496	0.615	0.713	0.848	0.952	1.06	1.18	1.33	1.45
15-min:	0.499	0.584	0.723	0.838	0.997	1.12	1.24	1.38	1.57	1.71
30-min:	0.678	0.794	0.984	1.14	1.36	1.53	1.69	1.88	2.14	2.33
60-min:	0.857	1	1.25	1.44	1.72	1.93	2.14	2.38	2.7	2.94
2-hr:	1.1	1.29	1.59	1.84	2.18	2.44	2.71	3.05	3.51	3.86
3-hr:	1.27	1.48	1.83	2.11	2.5	2.81	3.11	3.52	4.07	4.49
6-hr:	1.63	1.9	2.33	2.7	3.19	3.58	3.96	4.49	5.19	5.72
12-hr:	2.06	2.4	2.97	3.44	4.08	4.58	5.07	5.72	6.57	7.21
24-hr:	2.48	2.94	3.68	4.29	5.14	5.79	6.44	7.28	8.4	9.25
2-day:	2.87	3.46	4.42	5.22	6.32	7.17	8.02	9.19	10.7	11.9
3-day:	3.15	3.82	4.91	5.81	7.05	8.01	8.97	10.3	12.1	13.4
4-day:	3.41	4.13	5.29	6.26	7.59	8.61	9.64	11	12.9	14.3
7-day:	4.16	4.94	6.21	7.27	8.72	9.85	11	12.5	14.4	15.9
10-day:	4.89	5.7	7.03	8.13	9.64	10.8	12	13.5	15.4	16.9
20-day:	7.11	7.98	9.41	10.6	12.2	13.5	14.7	16.1	18	19.4
30-day:	8.96	9.88	11.4	12.6	14.3	15.7	17	18.3	20	21.4
45-day:	11.2	12.2	13.8	15.2	17	18.5	19.9	21.1	22.7	23.9
60-day:	13.1	14.2	15.9	17.4	19.3	20.8	22.4	23.5	25	26.2

Extent of Fluvial Erosion

The largest area of fluvial erosion is on Holbrook Road. This slide is about 100' feet wide. There is not much awareness of the vulnerability of Holbrook Road. There are 12-15 homes that are on the road, 7 are above the slide and are directly affected when damage occurs at the location of the slide.



Probability of Flooding and Fluvial Erosion

Flooding is highly likely, as determined by the number of past events and the local knowledge of the Hazard Mitigation Planning Committee. There are events every year, especially during spring snow melt and late summer season rains. Flash flooding is a locally probable event, with flash floods typically occurring in summer months. Higher-elevation drainage areas and streams are particularly susceptible to flash floods, which plan participants noted are more common.

Fluvial erosion is highly likely and exists in Whitingham, especially due to the damage caused by TS Irene in 2011, where fluvial erosion hazard flooding de-stabilized many steep-sloped areas and washed out riparian zones next to roads and streams.

Past Occurrences

Since 1996, when National Climatic Data Center detailed records start, there have been 41 flood events in Windham County, Vermont. Whitingham experiences routine spring flooding, but this is not always documented. There have been 16 Presidential Disaster Declarations in Windham County since 1953. Of these, 7 were severe storms, 5 were floods, 2 hurricanes, 1 snow event and 1 severe ice storm.¹⁷

¹⁷ FEMA tool: Data Visualization: Disaster Declarations for States and Counties: Windham County, VT <http://www.fema.gov/data-visualization-disaster-declarations-states-and-counties> Accessed 5/14/18.

Disaster Declarations for Windham County, VT						
Disaster Number	Incident Begin Date	Incident End Date	Declaration Date	Incident Type	Title	Disaster Close Out Date
4356	10/29/2017	10/30/2017	01/02/2018	Severe Storm and Flooding	SEVERE STORMS AND FLOODING	
4043	5/20/2011	5/20/2011	11/8/2011	Severe Storm(s)	SEVERE STORMS AND FLOODING	
4022	8/27/2011	9/2/2011	9/1/2011	Hurricane	TROPICAL STORM IRENE	
3338	8/26/2011	9/2/2011	8/29/2011	Hurricane	HURRICANE IRENE	3/10/2014
1816	12/11/2008	12/18/2008	1/14/2009	Severe Ice Storm	SEVERE WINTER STORM	10/15/2014
1698	4/15/2007	4/21/2007	5/4/2007	Severe Storm(s)	SEVERE STORMS AND FLOODING	3/13/2013
1559	8/12/2004	9/12/2004	9/23/2004	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
1488	7/21/2003	8/18/2003	9/12/2003	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
3167	3/5/2001	3/7/2001	4/10/2001	Snow	SNOW	2/28/2005
1336	7/14/2000	7/18/2000	7/27/2000	Severe Storm(s)	SEVERE STORMS AND FLOODING	6/30/2008
1307	9/16/1999	9/21/1999	11/10/1999	Severe Storm(s)	TROPICAL STORM FLOYD	6/30/2008
1124	6/12/1996	6/14/1996	6/27/1996	Flood	EXTREME RAINFALL AND FLOODING	2/23/2005
1101	1/19/1996	2/2/1996	2/13/1996	Flood	ICE JAMS AND FLOODING	2/17/2005
518	8/5/1976	8/5/1976	8/5/1976	Flood	SEVERE STORMS, HIGH WINDS & FLOODING	4/16/1981
397	7/6/1973	7/6/1973	7/6/1973	Flood	SEVERE STORMS, FLOODING, & LANDSLIDES	11/12/1976
277	8/30/1969	8/30/1969	8/30/1969	Flood	SEVERE STORMS & FLOODING	5/26/1972

Detail on Specific Flooding Events that have affected Whitingham and the Windham Region:

June 9, 2015 - A moist and unstable air mass ahead of an advancing cold front led to the developing of thunderstorms during the early afternoon hours on Tuesday, June 9th across eastern New York. As the thunderstorms organized into small lines, some of the thunderstorms produced wind damage, mainly to trees and power lines. These thunderstorms reached southern Vermont by the midafternoon hours and produced a report of wind damage near Halifax. Trees and wires were reported down during a thunderstorm on McMillan Road in Halifax. Thunderstorms ended over the region by the late afternoon, as the cold front crossed the region from west to east.

July 14, 2014 - As a strong area of low pressure moved across upstate New York on Monday, July 28th, repeated rounds of thunderstorms occurred during the afternoon and evening hours. This led to flash flooding across northern Windham County, as small streams and creeks rapidly overspread their banks. Although the worst of the flooding remained north of Windham County in Windsor County, many residents reported this flooding to be the worst seen in the area since Tropical Storm Irene in 2011. Heavy rain from thunderstorms led to flash flooding in Windham.

July 7, 2014 - A warm and humid air mass was in place across southern Vermont on the afternoon of Monday, July 7th. A cluster of showers and thunderstorms moved from upstate New York into southern Vermont during the mid-afternoon hours. These thunderstorms had previously weakened, but were still associated with very strong winds aloft. As these thunderstorms interacted with the high terrain of the southern Green Mountains, they produced gusty winds. These winds caused damage to trees and power lines near Readsboro. The thunderstorm continued eastward towards the Connecticut River Valley, but did not produce any additional severe weather before exiting the state to the east.

September 12, 2013 - A series of cold fronts moved towards the region on Thursday, September 12th. Despite some periods of cloudiness, a warm and humid air mass ahead of the approaching boundaries allowed for moderate amounts of instability to be in place. Along and ahead of the boundaries, several lines of showers and thunderstorms developed and moved across the region during the afternoon and early evening hours. In addition to a large amount of cloud to ground lightning, a few of the thunderstorms became severe, with damaging wind gusts. Several trees were downed across the region. Some areas that received repeated showers and thunderstorms experienced flash flooding as well, with roads washed out and/or closed as a result. Two to four inches of rain in a short period of time was reported in the areas that experienced flash flooding.

September 1, 2013 - A moist and humid air mass was in place across the region on Sunday, September 1st. A surface frontal boundary was situated across eastern New York into southern New England during the morning hours. During the day, the frontal boundary slowly lifted northward. With enough instability in place due to daytime heating, some showers and thunderstorms developed along this frontal boundary. The showers and thunderstorms tracked over the same locations during the afternoon hours across southern Vermont. As a result of the persistent heavy rain, flash flooding occurred in downtown Wilmington. A mudslide also occurred due to the heavy rainfall. By the evening hours, the showers and thunderstorms were located north of the region and beginning to weaken, and the threat for flash flooding ended.

July 10, 2013 - Warm moist air over the northeast provided the ingredients for heavy rainfall, and saturated ground from record May and June rainfall made the region vulnerable to flooding. Showers and thunderstorms developed during the afternoon and evening of July 2 2013, producing heavy rainfall moved repeatedly across southeast Vermont, with isolated flash flooding.

Tropical Storm Irene – August 28, 2011 - The Federally Declared Disaster DR-4022, Tropical Storm Irene, tracked northeast across eastern New York and western New England during Sunday, August 28th, producing widespread flooding, and damaging winds across the region, including Whitingham. Tropical Storm Irene caused rivers and streams to overflow. Whitingham got 11 inches of rain. The Road Crew could not keep up with things. Holbrook Road was pretty much gone, and was impassable; It was the worst hit road and was impassable for a month and half after the storm. Reed Hill Road also got damaged. The whole Village of Jacksonville was severely damaged. Every property along route 100 and route 112 was flooded. There was 2—5 feet of water on the roadway in Jacksonville, but the water came and went over 15 hours. The stone edge of Jacksonville Pond dam was damaged and overtopped. The flooding is marked on the map, but there was flooding from the lake down to the town, outside of the FEMA floodplain. Parsons road also got damaged. A lot of the flooding damage was caused by log jams causing backup flooding. Route 112 was barely passable. There was some road damage in Jacksonville area, but farther down route 112 was not that bad. Several businesses and a number of houses in Jacksonville were flooded. There was severe damage to a number of bridges, as well to roads and culverts. Route 100 in Windham County was closed due to flooding and wash outs. Portions of Route 100 remained closed after the flood waters receded due to significant damage.

Rainfall amounts generally averaged 4 to 8 inches. Much of the rain which fell occurred within a 12-hour period, beginning early Sunday morning, and ending Sunday evening. Strong winds also occurred across southern Vermont, with frequent wind gusts of 35 to 55 mph, along with

locally stronger wind gusts exceeding 60 mph. The strongest winds occurred from the north to northeast during the morning hours, then from the west to northwest during Sunday evening. The combination of strong winds, and extremely saturated soil led to numerous downed trees and power lines across the region. This also resulted in widespread long duration power outages. In particular, the approximate number of customers affected by power outages included: Windham County, 18000. President Obama raised the federal match share to 90% from 75% for TS Irene relief, therefore lowering the state and local shares by 7.5% each. Total received from FEMA Public Assistance for damaged infrastructure during Tropical Storm Irene was approximately \$983,695.62 (including Federal and State reimbursements).

May 20, 2011 - Showers and thunderstorms developed in a moist and unstable air mass across the region. Storms across a portion of Windham County resulted in flash flooding.



Tropical Storm Irene from the perspective of the Municipal Center. Photo courtesy of the Town of Whitingham.

August 5, 2008 - The passage of a strong upper level disturbance, combined with a moist and unstable air mass in place, led to the development of numerous thunderstorms across southern Vermont during Thursday afternoon on August 7th, some of which contained large hail. In addition, locally very heavy rainfall led to flash flooding in some areas.

April 15-21, 2007 - Flash floods and inundation flooding over a period of several days - The Town of Halifax got 8 inches of snow in the morning of April 15, followed by 6-8 inches of rain. Rain and snow caused damage to roads and utility lines across Windham County. Across the state, nearly \$3.6 million was obligated as part of the FEMA Public Assistance Program. Whitingham was awarded \$125,493.16 for flooding damages.

June 29, 2006 - After being nearly stationary while deepening for several days, an upper-level trough from the Great Lakes to the lower Ohio Valley was accelerating eastward at daybreak on June 29. An associated weak low pressure over Lake Erie trailed a cold front through the Ohio Valley. During the day, this system moved rapidly eastward and touched off thunderstorms in the warm, humid air mass over western New England in the early evening. Torrential rainfall produced flash flooding in Windham County.

October 8, 2005 - On October 8 at daybreak, a nearly stationary cold front was over southwestern New England. The air over the northeastern United States was very moist. Low pressure in the vicinity of the eastern Carolina states moved slowly north northeast along the

cold front. Heavy rain fell over southern Vermont through the early morning hours of October 9. During this period, there was over 6 inches of rainfall in southern Vermont, triggering widespread flooding. Several evacuations of people from their homes occurred. Route 100 in Whitingham was closed.

October 29, 2003 – Areas of low pressure moved northeast along a frontal boundary across New York and western New England from Sunday night, October 26th into Monday night, October 27th. Rainfall ranged from 1 1/2 to 2 1/2 inches with the greatest amounts in and east of the Green Mountains.

August 3, 2003 – A tropical air mass was in place over southern Vermont on August 3. With a strong disturbance over the Great Lakes adding weak lift to a very unstable atmosphere, scattered showers and thunderstorms erupted during the afternoon hours. A slow moving storm over Windham County produced Doppler radar estimated rainfalls of 3 to 4 inches in about four hours. Whitingham received a FEMA payout of \$33,232.92 for damages.

September 28, 2002 - The remnants of Tropical Storm Isidore moved northeast from the Ohio Valley on Friday, September 27th into New York state during the afternoon of the 27th and across central Vermont during Friday night, September 27th. Heavy rain accompanied this system with generally between 1 1/2 and 2-inches of rainfall reported. Amounts were locally higher in the mountains. Earlier in the month, September 14-15, the remnants of Tropical Storm Hannah resulted in rainfall of around an inch across the same area. No flooding was reported with either event.

July 2000 - A stalled frontal boundary across extreme southern Vermont interacted with a strong upper level disturbance from July 15 into early July 16. The result was a slow-moving low pressure area which formed over Virginia. This low pumped a deep layer of tropical air into the region and produced the second widespread heavy rainstorm of the summer. Two to four inches of widespread rain fell, with locally higher amounts across the higher terrain of Windham County. Specific amounts included 3.00 inches at Bennington and 5.17 inches at West Wardsboro, in Windham County. This rain produced enough runoff to cause the Battenkill to exceed the six-foot flood stage by about a foot at Arlington, Bennington County, a 47 year high. Also, the Deerfield River rose 6 feet above unofficial flood stage in Wilmington, Windham county. Several roads were reported under water.

The widespread heavy rain event set the stage for more widespread flooding later Sunday. The air remained very moist and unstable in wake of the rainstorm. More thunderstorms erupted late in the day across southern Vermont. These storms moved very slowly, trained over the same region, and were further enhanced by the steep terrain. The thunderstorm rainfall, as well as the earlier rainstorm, dumped in excess of 8 inches locally at Newfane, Windham county. Since the ground was already saturated, the heavy rains from the thunderstorms produced flooding and flash flooding across the region. Whitingham was part of a Federal Declaration for this event and received \$122,178.34.

September 17, 1999 - The remnants of Hurricane Floyd moved up the eastern seaboard on September 16 and during the early hours on September 17. The storm brought both high winds and heavy rainfall to Southern Vermont, which included a large swath of 3 to 6 inch amounts. Specific rainfall amounts included 2.91 inches in Bennington and 5.70 inches at Brattleboro. The rain produced significant flooding across the region, which proved destructive. Many smaller tributaries reached or exceeded bank full.

Winds from the passage of Floyd were estimated to have gusted to over 60 mph, especially over hill towns. The combination of the wind and very saturated ground, produce widespread downing of trees and power lines across much of Southern Vermont. Some trees fell on vehicles and houses. The rain and wind produced power outages across the region. As many as 2,000 people lost power in Southern Vermont.

June 19, 1998 - Thunderstorms with torrential downpours produced flash floods across parts of Windham County. Shoulders of routes 100 and 112 were washed out near Jacksonville and Halifax. Several mountain roads were washed out throughout the County.

In 1996, Between Saturday morning July 13 and Sunday morning July 14 rainfall from three to five inches was common across southern Vermont resulting in significant damage and a Presidential Declaration of Emergency. Flooding occurred throughout New England causing millions of dollars in damage. The remnants of Hurricane Bertha tracked from the Mid-Atlantic region northeast to Quebec, Canada. Several roads and streams were flooded throughout the region. Scattered power outages also occurred over the area, when strong winds downed water-laden tree branches onto wires.

During 1976, flooding occurred throughout New England, as result of Hurricane Belle, causing millions of dollars in damage.

In 1973 there was an extreme rainfall event from June 28-30 that affected all areas of Vermont except the northwest section. Rainfall amounts as much as 6 inches in 24 hours in some locations. This was the largest rain event since the 1927 flood. Highway damage was extensive in the south-central, southeastern, and northeastern areas of the State. Three persons were killed in the 1973 flood, and damage was estimated at \$64 million. Sizable crop loss was reported, and damage to State highways was estimated to be \$10 million. The entire State was declared a disaster area.¹⁸ Route 100 was completely washed out, as was Fowler Road. Kentfield Road was badly damaged. After this event, there was extensive dredging, berming and windrowing in an attempt to control channel location and reduce future flood impacts.

In 1938 major hurricane flooding knocked out every bridge in Whitingham.

The Vermont Flood of 1927 was the deadliest flooding event in the history of the State; eighty-four people were killed with over \$28 million in property damage. The Spring Floods of 1938, which had an effect on all of New England, caused \$113 million in damage, killed 24 people and made 77,000 people homeless.

Sources used

Local knowledge of areas of concern and impacts, Discussions and emails with Whitingham Selectboard Office Administrator during July 2018, *River Corridor Plan for the East Branch of the North River In Halifax and Whitingham, Vermont* completed December 2017,

¹⁸ USGS "Vermont Floods and Droughts" information page <http://md.water.usgs.gov/publications/wsp-2375/vt/>. Accessed 4/3/15.

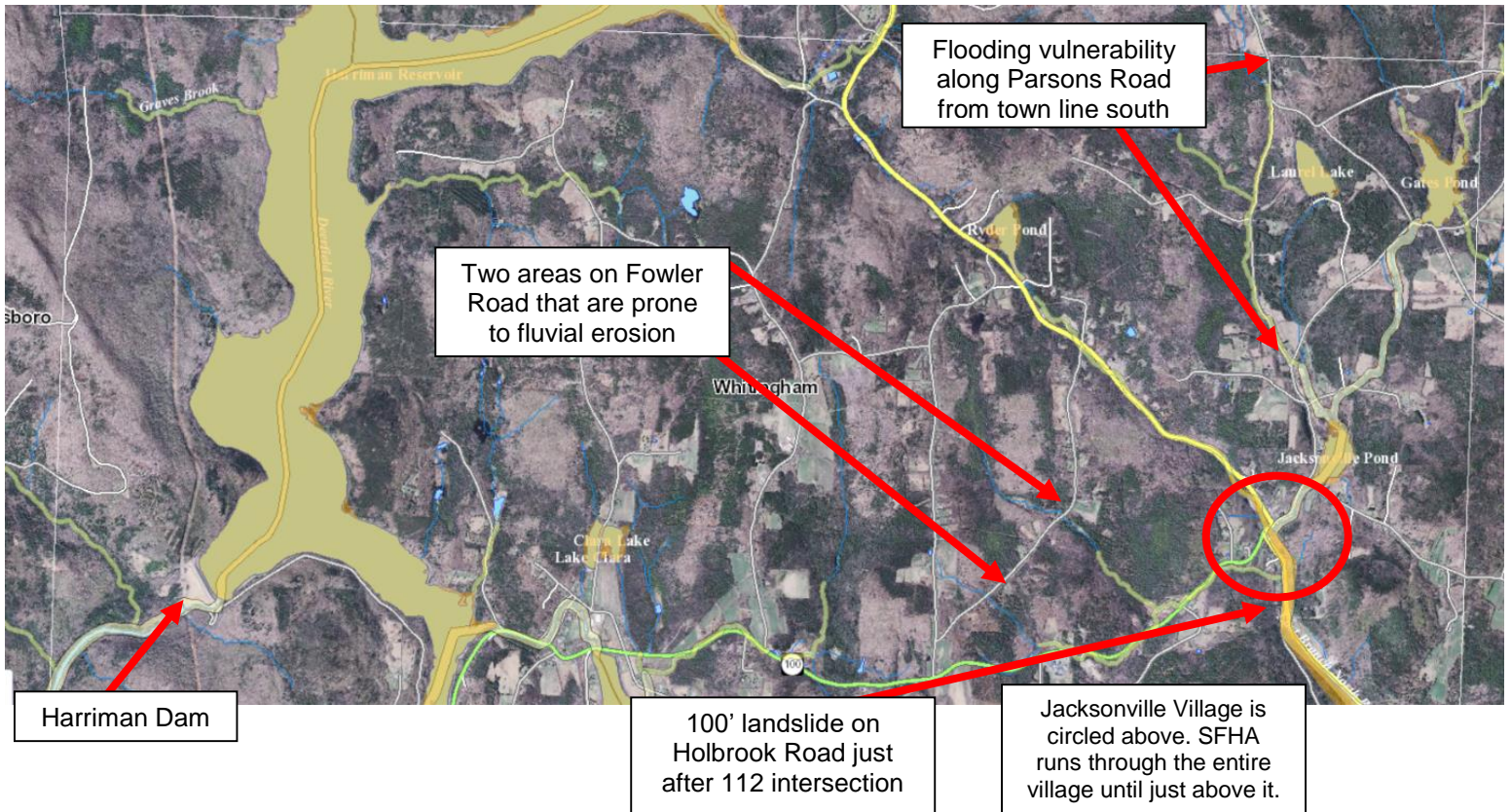
Geographic Area of Hazard/Location/Occurrence of Fluvial Erosion and Flooding/Special Flood Hazard Area and River Corridor Mapping

In some instances, stabilization/mitigation projects in Whitingham have helped. In other areas throughout Whitingham, issues remain. Many of the fluvial erosion issues are on private land, and thus require the consent of the land owner to mitigate the hazard. The river Corridor mapping (included in this plan) shows the ANR defined River Corridors, which are likely to have fluvial erosion. The map also points out some of the issues discussed in the text of particular problem spots.

FEMA has mapped “A” zones in Whitingham. “A” zones do not have Base Flood Elevations determined. Properties within the SFHA, that have a mortgage, are required to carry flood insurance, and properties without a mortgage are advised to. Whitingham’s participation in the NFIP gives residents access to discount flood insurance through the National Flood Insurance Program (NFIP). The Flood Hazard Summary Sheets on FloodReady Vermont’s website says there are 36 structures in the Special Flood Hazard Area and 36% of these structures have flood insurance.¹⁹

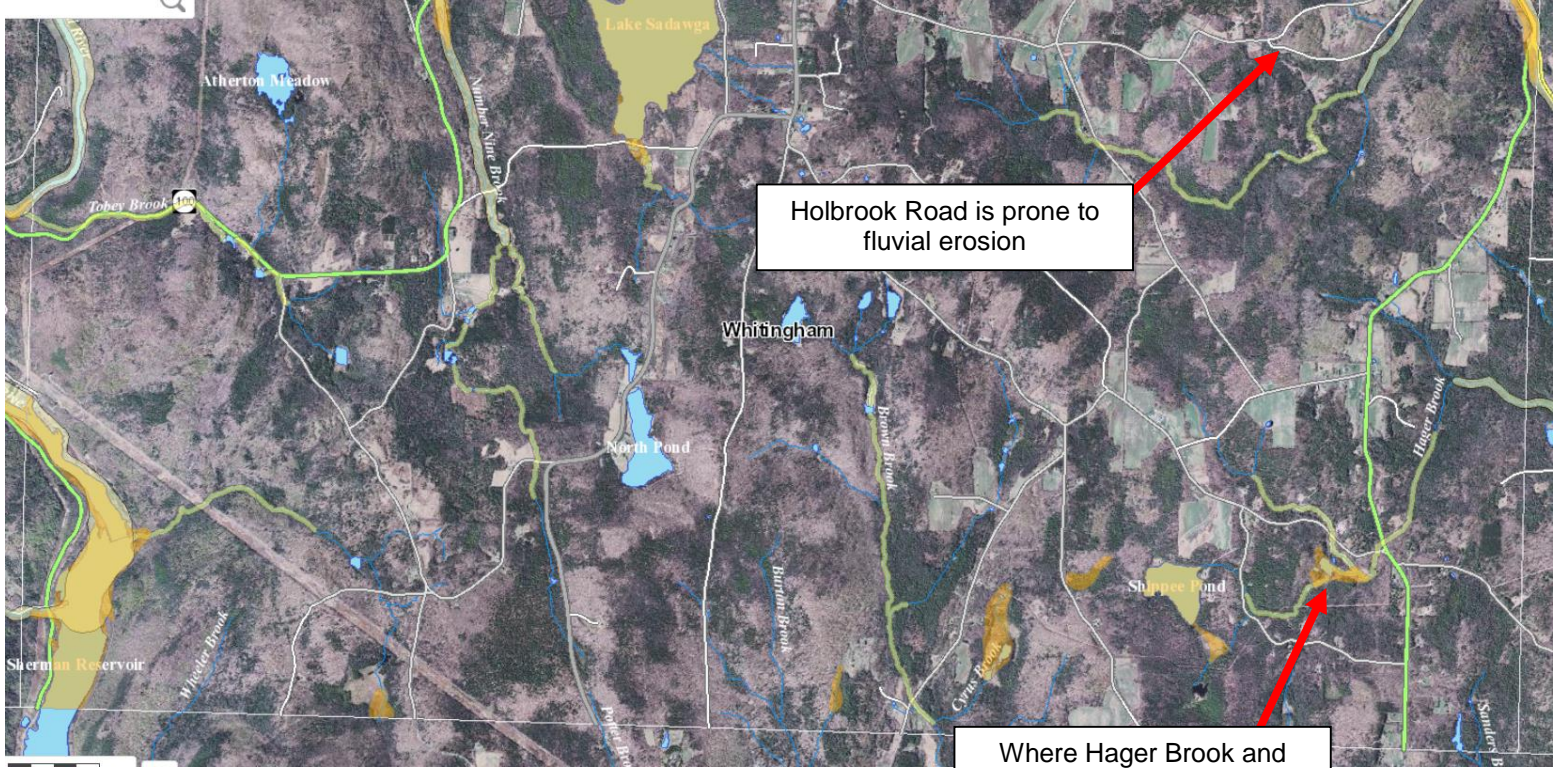
¹⁹ Flood Hazard Summary Report for Whitingham, accessed 6/11/18 <
<https://anrweb.vt.gov/DEC/FoFReports/SSRSReportViewer.aspx?RepName=ExpandedCommunityReport&Municipality=Whitingham>>

The below maps were created using the Vermont Agency of Natural Resources 'Natural Resources Atlas. These maps are snips showing all of the special flood hazard areas (SFHAs) that FEMA has designated in Whitingham. They are shown in orange. The floodplains shown in these maps are based on the FEMA Flood Insurance Rate Maps (FIRMs) available through the FEMA Map Service Center.²⁰ This map also shows the River Corridors that Vermont Agency of Natural Resources (ANR) has mapped. River Corridors encompass an area around the present channel where fluvial erosion, channel evolution and down-valley meander migration are most likely to occur. The mapped river corridor includes this area and a 50-foot buffer on either side to allow for the recommended setback and zone of avoidance to protect the riparian/fluvial erosion hazard corridor. Together this area is the mapped River Corridor. The ANR defined River Corridor to also include a 50-foot setback requirement on all streams with a watershed between .5 and 2 square miles. The relevant streams with this setback are also mapped. This setback would be determined on the ground, measuring 50-feet from top of bank or top of slope. The below map shows the northern half of Whitingham.



²⁰ FEMA Map Service Center <https://msc.fema.gov/portal>

The below map shows the Special Flood Hazard Areas (SFHAs) in orange (A zone), red (AE), Floodway (red hatched), and the River Corridors in cream color, for the southern half of Whitingham. SFHAs are around the two reservoirs on the Deerfield River (but not the Deerfield outside of the reservoirs), and the various lakes throughout Town. River Corridor is scattered along many smaller streams throughout Whitingham. The largest waterway that SFHA falls along is the East Branch of the North River.



Holbrook Road is prone to fluvial erosion

Where Hager Brook and another small brook cross Burrington Hill Road is a high hazard fluvial erosion and flood hazard area

Invasive Species

Invasive species are a region-wide hazard; however, each location will be confronted with a distinct mix of invasive species that thrive under the particular ecological conditions of that place. Each invasive species has a different potential to spread to other areas based on the rate at which it spreads and the ecological suitability of the ecosystem that it is expanding into.



Black Swallowwort carpets a bank to the exclusion of almost everything else. It even twines up a utility pole guy wire. Note the abundant seed pods. (Photo courtesy of John Anderson, Dummerston)

Many species of plants and animals have been introduced into our ecosystem for various uses; these exotic species have varying propensities for becoming invasive. An invasive species is an exotic species whose introduction into an ecosystem in which the species is not native causes or is likely to cause environmental or economic harm or harm to human health. Many species of invasive plants and animals are currently affecting Southeastern Vermont and can have significant levels of impact to the native flora and fauna.

Invasive Plant Species

In the absence or near absence of natural predators or controls, invasive non-native plants are able to spread quickly and out-compete native plants. Invasive plant

species can create monocultures, which often provide poor habitat for native animals that have not evolved with the non-native species, resulting in degraded habitat value and increased vulnerability. The invasive plant issue really escalated in the early 1990's. Invasive plants tend to thrive in disturbed areas. Within the Windham region, they are more prolific in the towns along the Connecticut River than they are to the west, because the eastern towns are more populated, contain major transportation routes such as I-91 and the rail corridor, which serve as vectors for their expansion, and tend to have significant land disturbance. Some of these plants were originally planted because of their positive aspects such as their ability to grow in difficult growing conditions, long growing season length, their large seed production and their ornamental value. These same reasons are a big part of why they have become invasive.

Heavy travel corridors like I-91, Route 100 and Route 112 in Whitingham are also highways for the spread of invasives. Black swallowwort (pictured above), an aggressive invasive vine plant with small purplish black flowers, is rampant along Route 30 and is working its way up the West River Trail. Some plants can't take the use of salt on roads, but a newer invasive – slender cottonweed – is working its way up I-91 and along Route 5 sparsely – and it appears to be a salt tolerant plant.

Waterways and riparian areas are also corridors that invasives can overtake and spread along. Sadawga Lake Association in Whitingham has recently received two grants to pursue a process for mitigating milfoil infestation in its lake. Sadawga Lake residents have raised concerns about the damaging effects of milfoil with the State of Vermont for the past decade. Two years ago, due to the effects of Tropical Storm Irene, the state drew down the lake in order to repair its dam. Residents have noted that the extent of milfoil may be lower after the draw down. The

two grants will assist in establishing a baseline which will be used gauge the extent of milfoil in future years. The Darrin Water Institute will advise on procedures that can be used to reduce the extent of milfoil and promote native species that are beneficial to lake health. Already researchers have discovered plant species that are unique to Sadawga Lake and unknown in other Vermont lakes, according to state consultant Josh Mulhollem.

In May Sadawga Lake residents joined members of the Raponda Lake Greeter program in a workshop conducted by consultants from the State of Vermont to outline procedures for greeting boats at public boat launches. The purpose of the Greeter Program is to deter boaters from bringing invasive species in state lakes. Greeters inspect for plants and animals that may be attached to boats and trailers and advise boat owners about cleaning surfaces every time they enter state waters. Sadawga Lake Association is considering the implementation of this program.

European milfoil is present in Whitingham, and Native species, such as beech trees and hay scented fern, are able to take over and prevent regeneration of more desirable species when an area gets overrun by deer who overeat desirable natives. Beech bark disease is also causing the die off of older beech trees, leading to beech suckers growing from the roots which the deer don't eat by choice, but the tree clone sucker shoots are doomed to die after 10-15 years because of the beech bark disease. This means other healthy trees can't establish themselves, leaving the forest worse off in the long term.²¹

Particular invasive plant concerns for Whitingham are: There are heavy infestations of Japanese Knotweed. This invasive species presents water quality concerns due to the fact that it out-competes other vegetation and dies back in the winter, leaving shorelines susceptible to erosion because there is no other vegetation stabilizing the stream bank (Basin 11 Management Plan, Preliminary Draft 2007). TS Irene eroded the banks so much and allowed for the flourishing of



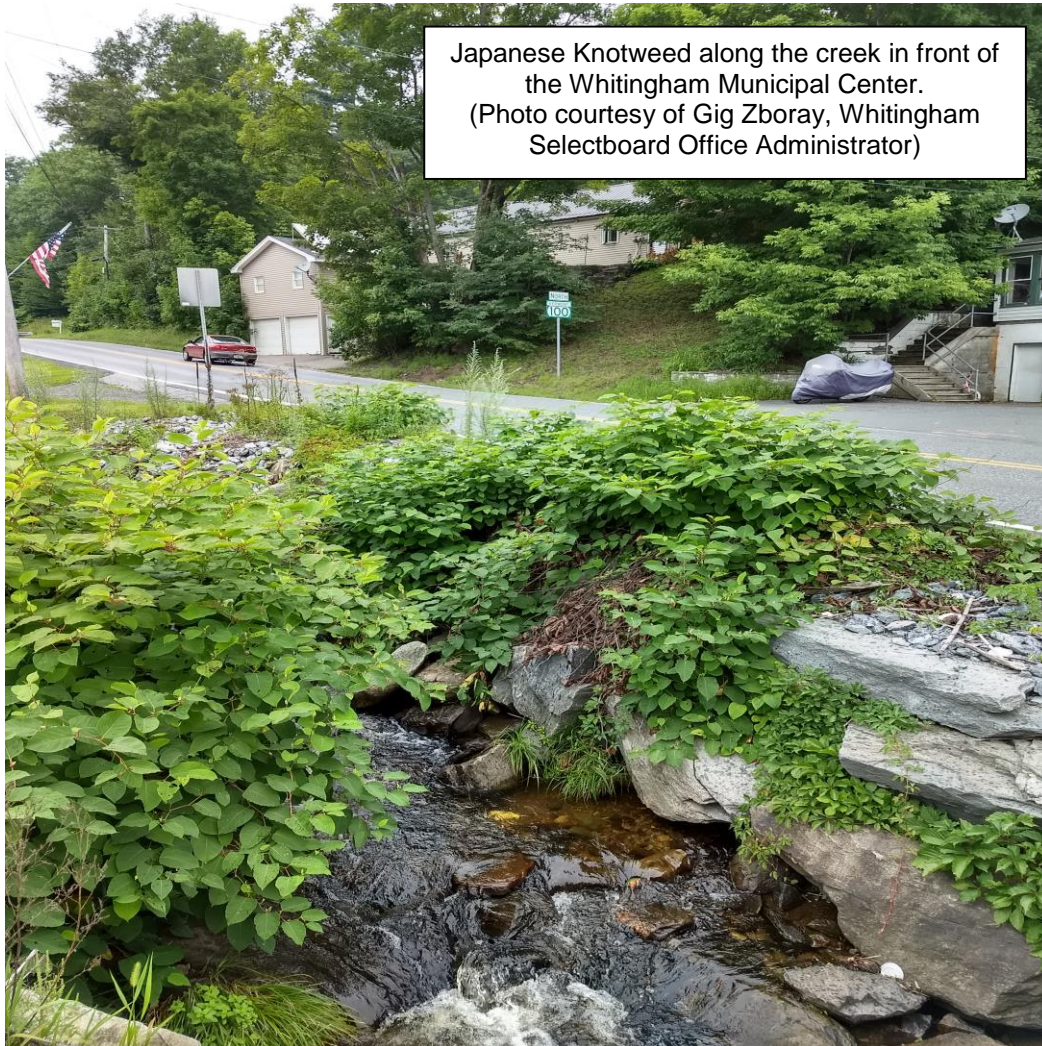
Yellow Rattle, pictured here, is hemi-parasitic on grasses. It can devastate hayfields. It is primarily confined to power line rights of way. (Photo courtesy of John Anderson, Dummerston)

invasives on the bare soil left in its wake. Six years later, the trees are starting to get reestablished in these riparian areas, and they are knocking back the Japanese knotweed somewhat by shading it out. This tree-cover may self-contain it until the next storm. Purple loosestrife is commonly seen in many riparian and wetland habitats in the region. Phragmites is a newer invasive, a tall grass, that invades wet areas to the point where nothing else will grow. It has even been spotted in remote areas away from roadways, so is possibly wind-spread. Other species such as Oriental bittersweet, certain species of honeysuckle, Japanese barberry, yellow flag iris, and common and glossy (European) buckthorn have become well established in many locations. Garlic mustard has been found along roads in Whitingham. Knapweed is semi-invasive that has been found along the power line corridors and railroad tracks—where it seems capable of withstanding spraying. Yellow rattle (pictured

²¹ "Press Release: Sadawga Plant Survey" <http://townofwhitingham-vt.org/press-release-sadawga-plant-survey> accessed 7/31/18.

below) is another invasive flowering plant, a parasite on grass, is now being seen on power lines.

Giant hogweed and tree of heaven have not yet been discovered in Whitingham. Elevations generally below 1,500 feet are most susceptible to invasive species, though any land with some sort of major disturbance (from wind, water, logging, or land clearing and development) could potentially host them. Invasives tend to come up early and flower early, allowing them to get established before native plants have the chance. It may be possible to slow down or even halt the spread of these species by identifying and removing plants as soon as they appear. Early detection is the key. This detection can be aided by educating residents about the identification of and problems caused by invasive species. Several landowners have put control programs in place. Whitingham does not have a Conservation Commission. One local conservationist in the region says it is harder to find native wildflowers now, and sees the future Vermont forest as resembling southern forests more and more—with compositions consisting of sassafras, white oak and gum trees, though he says it's hard to tell what will overtake the hemlock habitat.



The below is a list of invasive plants that the Vermont Fish and Wildlife Department have on the watch list.²²

List of Watch Species in Vermont	
Scientific Name	Common Name
<i>Acer ginnala</i> Maxim.	Amur maple
<i>Acer platanoides</i> L.	Norway maple
<i>Alnus glutinosa</i> (L.) Gaertner	European black alder
<i>Amorpha fruticosa</i> L.	False indigo
<i>Ampelopsis brevipedunculata</i> (Maxim.) Trautv.	Porcelainberry
<i>Anthriscus sylvestris</i> (L.) Hoffm.	Wild chervil
<i>Berberis thunbergii</i> DC.	Japanese barberry
<i>Berberis vulgaris</i> L.	Common barberry
<i>Callitriche stagnalis</i> Scop.	Pond water-starwort
<i>Cardamine impatiens</i> L.	Narrowleaf bittercress
<i>Centaurea maculosa</i> L. Syn.: <i>Centaurea biebersteinii</i> DC	Spotted knapweed
<i>Elaeagnus angustifolia</i> L.	Russian olive
<i>Elaeagnus umbellata</i> Thunb.	Autumn olive
<i>Euonymus alata</i> (Thunb.) Sieb.	Winged euonymus
<i>Euphorbia cyparissias</i> L.	Cypress spurge
<i>Glyceria maxima</i> (Hartman) Holmberg	Reed mannagrass
<i>Hesperis matronalis</i> L.	Dame's rocket
<i>Iris pseudacorus</i> L.	Yellow iris
<i>Ligustrum obtusifolium</i> Sieb. & Zucc.	Border privet
<i>Lonicera xylosteum</i> L.	Dwarf honeysuckle
<i>Lysimachia vulgaris</i> L.	Garden Loosestrife
<i>Marsilea quadrifolia</i> L.	European waterclover
<i>Microstegium vimineum</i> (Trin.) A. Camus	Japanese stilt grass
<i>Najas minor</i> Allioni	Brittle waternymph
<i>Paulownia tomentosa</i> (Thunb.) Sieb & Zucc. Ex Ste.	Princess tree
<i>Phalaris arundinacea</i> L.	Reed canary grass
<i>Polygonum perfoliatum</i> L.	Mile-a-minute vine
<i>Polygonum sachalinense</i> F. Schmidt ex Maxim. Syn: <i>Fallopia sachalinensis</i> (F. Schmidt ex Maxim.) Dcne.	Giant knotweed
<i>Populus alba</i> L.	White poplar
<i>Robinia pseudoacacia</i> L.	Black locust
<i>Rorripa nasturtium-aquaticum</i> (L.) Hayek Syn: <i>Nasturtium officinale</i> Ait. f.	Watercress
<i>Rosa multiflora</i> Thunb. ex Murr.	Multiflora rose

Preventing the spread of invasive plants is something that everyone can assist with. The first step is to not plant non-native plants on your property and to remove invasives that exist. Additionally, it is important that when soil is disturbed, to plant native cover before invasives have a chance to establish themselves. Proper disposal of non-native vegetation is critical to avoid its spread, safely burning the material when possible. Avoid transporting non-native plants, including firewood and garden debris, as this is critical to prevent the spread of non-native seeds and insects. Mowing roadsides from the north to the south can also help prevent the migration of invasive seeds on-site.

²² Vermont Fish and Wildlife Department: Wildlife Action Plan. Developed 11/22/05. Accessed 3/2/15.
http://www.vtfishandwildlife.com/library/reports_and_documents/vermonts_wildlife_action_plan/_report/7_appendix/k_invasive_exotic_and_pest_species.pdf

Top Invasive Forest Pests and their Impacts

Non-native invasive species cause irreversible impacts on tree health, forest composition, and biodiversity. Three non-native insects which currently threaten Vermont are the emerald ash borer (EAB), Asian longhorned beetle (ALB) and hemlock woolly adelgid (HWA). Hemlock woolly adelgid is currently present throughout the state. Having first been discovered in Orange County in February 2018, Emerald ash borer (EAB) has been confirmed in Orange, Caledonia, and Washington Counties so far. Asian longhorned beetle are within fifty miles of Vermont's border. Over half of the trees in Vermont are host species of one of these three insects.²³

Hemlock woolly adelgid

The hemlock woolly adelgid (HWA), *Adelges tsugae*, is a tiny insect from east Asia that attacks forest and ornamental hemlock trees. It feeds on young twigs, causing needles to dry out and drop prematurely. Trees may die in four to six years. Some survive, but with sparse foliage, losing value as shelter for wildlife and their ability to shade streams.

The HWA first arrived in the southeast U.S. and spread to the northeast through the Long Island Sound. Sustained cold leads to kill off of the adelgid insects. Mortality rates of even 91%, however, can still lead to population growth through the warm season because they reproduce asexually so it only takes one for the population to expand.

The HWA mortality rate shifts each year based on temperature patterns throughout the year, especially cold winter temperatures cause die off. In 2014 the mortality rate was only 40%, whereas in 2015 the mortality rate was 98-99% because it was an especially cold winter. Populations build back up in warmer months.



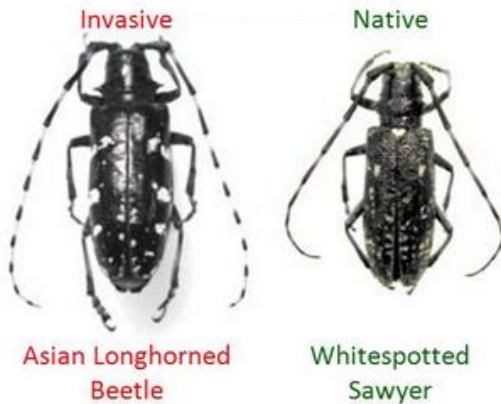
HWA is ubiquitously present in Whitingham. In the Windham region, it was initially found in Brattleboro and the Guilford area. It is now found in 14-15 Windham Region towns, and has been recently found in Springfield in Windsor County. It has not been found in Weston, Winhall, Somerset, Searsburg or Readsboro. HWA is moving south to north in lower elevations first, and is mostly throughout southern Vermont at this point. Dead or dying hemlocks are a sadly regular sight in the region. It was first found at the SIT campus in 2010 and is now found throughout the town of Brattleboro.

Hemlock trees and even whole stands are showing signs of decline, but trees in Vermont have not been reported to have been killed from HWA alone. Foresters have been watching infested trees for eight years, and the trees haven't been killed yet most likely because winter temperatures kill off enough of the HWA to give the tree a temporary reprieve. HWA does weaken the trees to the point that other secondary stresses, such as funguses and disease, may result in their mortality. Another pest, Hemlock elongate scale was found recently for the first time in Guilford, Vernon and Brattleboro.

²³ vtinvasives.org (accessed 2/20/15)

Asian longhorned beetle²⁴

The Asian longhorned beetle (ALB), *Anoplophora glabripennis*, is an invasive insect that feeds on certain species of hardwood trees, eventually killing them. Also known as the Starry Sky or Sky Beetle, the ALB is native to eastern Japan, and Korea. It was brought to the US, to New York City first, in packing material from Asia. ALB attacks a variety of native hardwood species, including maple, birch, elm, poplar, horse chestnut and willow. ALB prefers maples and does not like trees in the oak family. Upon hatching, the larvae tunnel through the heartwood of a host tree until fully grown. They then burrow out of the trunk as adult beetles. This process weakens the wood, making it prone to breakage, and can cause tree health to decline. Outbreaks of this beetle pose a severe threat to even perfectly healthy trees in both forests and urban and suburban



landscapes. The beetle has caused tens of thousands of trees to be destroyed in Illinois, Massachusetts, New Jersey, New York and Ohio. Trees that aren't destroyed by people trying to prevent the spread are usually killed by the pest within a couple years. About half of Vermont's trees are susceptible to Asian longhorned beetle. This insect will have a major impact if it becomes established in Vermont.

Signs and Symptoms of Infestation: Oval to round wounds on the bark where the females have chewed out a site to deposit their eggs. Round emergence holes in the trunks and branches of trees. Piles of coarse sawdust at the base of trees.

The closest area to the Windham region that has the pest is Worcester County, Massachusetts in 2008. And they have an active quarantine and public notification campaign about the pest.²⁵ They are having to destroy every host tree, infected or not, and will be replanting in the oaks. Boston had a small outbreak which they believe was caught in time. New York and Ohio also have quarantines in affect in their boundaries to prevent the spread. ALB has not been detected in upstate NY or in NH. It is difficult to spot infected trees from the ground, so inspectors need to climb trees. To treat wood for transport it needs to be heated to at least 160 degrees for longer than 75 minutes.

²⁴ <http://www.maine.gov/dacf/php/caps/ALB/ALBdamagepics.shtml>

²⁵ <http://www.worcesterma.gov/city-manager/asian-longhorned-beetles>. Accessed 3/2/15.

Emerald ash borer (shown to right)

Emerald ash borer (EAB), *Agrilus planipennis*, is an exotic beetle that was discovered in southeastern Michigan near Detroit in the summer of 2002. The larvae feed in the cambium between the bark and wood, producing S-shaped galleries that girdle and kill branches and trees. Emerald ash borer probably arrived in the United States on solid wood packing material



carried in cargo ships or airplanes originating in its native Asia. It first came into Detroit and killed off all the ash trees in the city, which had been planted after the city's elm trees had been killed by Dutch elm disease. The United States Department of Agriculture Animal and Plant Health Inspection Service (APHIS) does inspections at ports and terminals, but only inspects about 7% of materials coming into the US. Emerald ash borer has spread rapidly in the United States, killing millions of trees. In 2018 Emerald ash borer has been confirmed in Orange, Washington, and Caledonia Counties in Vermont. It is currently present in 33 states (most recently in Maine).

White ash is one of the ten most common tree species in Vermont, so this insect will have a major impact when it becomes established in the state. EAB only feeds on Ash trees, but that is 7% of Vermont's tree species. EAB can travel faster than ALB. EAB is often moved around on firewood that people transport. Eradicating the insect on wood requires heating it to at least 140 degrees or higher for greater than 60 minutes.

Signs and Symptoms: Symptoms and signs include D-shaped adult exit holes, bark splitting, serpentine frass-filled (sawdust-like waste) feeding galleries, wood pecker feeding, crown dieback, and epicormic shoots (whips growing off the trunk and branches). Many of these symptoms and signs are similar to other insects and diseases of ash.



Blonding with pecked holes on ash trees is a sign of EAB infestation.

EAB essentially girdles the ash trees, killing them. It lives between the inner bark and the wood, so it isn't that deep. Woodpeckers like feeding on EAB, but the woodpecker population isn't large enough to significantly impact the EAB population. Also the woodpeckers don't generally detect the insects in the trees until they have been present for about two years, which is too late to save the tree. One of the best diagnostic methods for detecting EAB is called "blonding". "Blonding" is a clear symptom of EAB infestation. It occurs when woodpeckers, while foraging for the succulent EAB larvae, flake off outer layers of bark, revealing the lighter or blond-colored inner layers of bark.²⁶

A native ground-nesting wasp, *Cerceris fumipennis*, is providing a handy solution to our beetle detection problem. This wasp will prey on the adult emerald ash borers (as well as related native beetles) and carry them, paralyzed, back to its burrow. The paralyzed beetle is then stored underground as food for the wasp's larva.

²⁶ University of New Hampshire Cooperative Extension – Blonding on Ash trees information sheet. <http://extension.unh.edu/resources/files/Resource004103_Rep5824.pdf> Accessed 3/2/15.

Purple traps have also been put up in Whitingham by the State ANR to catch the EAB for early detection.

Impact

The impacts of invasive species have ripple effects that go on and on. Hemlock is a foundation tree species, and when it goes away invasive plant species tend to take over, causing wildlife habitat and water quality to decrease. Deer use hemlock stands to winter over in because of the cover a healthy tree provides, so there could be a detrimental impact to the deer population, and hunting, caused by the loss of hemlock. Hemlocks provide shade to waterways, so their loss could mean warmer streams and lower water quality, potentially impacting aquatic life. The hemlock isn't a comparatively very valuable wood product, but it is used for logging and wood products, so there are economic threats to its loss. The large deer population is causing the loss of new trees to regenerate the forest hardwoods, thereby leaving vulnerability for invasives to come in.

Ash logs are more valuable than hemlock logs, but the bigger concern with the loss of ash is the cascading ecological impacts. There are over 40 arthropod obligate species that are threatened by the loss of ash trees (they depend on ash for their survival), and ripple effects of the loss of these arthropods and the interrelationships aren't even fully known at this point. Ash is a valuable tree for wood products and logging, so the economic impacts could be severe. Not to mention, the cost to towns for removing dead or dying trees, and the aesthetic and community open space impacts caused by their loss. Ash trees are about 12% of the forest cover in Vermont, and there are pockets of lots of ash in Whitingham. Whitingham has not done an ash tree survey to know where vulnerable trees are located. They have also not completed an EAB plan.

The loss of maple trees to ALB, could mean a devastation to the maple industry, which is a big industry in Vermont, including in Whitingham. A lot of people sugar in Whitingham, not all commercially, but it is a big activity in town. Economic impacts could be great. Sap can't be used once a maple is treated with insecticide, and the lag time before it can be used again is unknown. Fall foliage tourism is a big draw for visitors to Vermont and this would be big loss of "leaf peepers" who are a big driver of the economy for the area.

Probability

As mentioned earlier in this section, only hemlock woolly adelgid is currently known to be present in the state of Vermont; confirmed populations of emerald ash borer and Asian longhorned beetle have been found within fifty miles of Vermont's border. EAB surrounds Vermont and some believe it is already in the state, but hasn't yet been detected. So the probability is high that EAB and ALB will affect the region. HWA has been confirmed in Whitingham and 13-14 other towns in the Windham region. Additionally, certain invasive plant species are present in every town in the region.

Extent

Over half of the trees in Vermont are host species of one of these three main pests, so the potential impact is great. EAB only feeds on Ash trees, which are 7% of Vermont's tree species and a strong component of beech/birch forest stands. Southeastern Vermont has primarily white ash and green ash, while black ash are less common here, they are found more so to the north. Green ash is common in urban environments because they are good shade trees and do well in an urban setting. Newfane is an example of a town in the Windham region that has planted a lot of green ash trees, so they are particularly vulnerable to EAB.

Ash planted on roadside rights of way have the highest potential for infestation of EAB. There is the potential for hundreds of dead Ash trees along roadways throughout the state and near extinction of Ash trees. The current mortality rate is 99.8% of trees. Cutting dead trees is a very hazardous activity and the potential for a lot of dead trees along road ways is a concern for protecting public safety and infrastructure.

Being proactive is key for stopping, or at least curtailing, the spread when pests are detected. Inventories of roadside ash trees are a good thing for towns to do now. Training road crews to identify threats and who to alert of outbreaks is also a good idea. Numerous towns (including Brattleboro) in Vermont have developed EAB preparedness plans. Ash trees can be treated to prevent EAB, and weighing the cost of proactive treatment versus removal of dead trees and replacement is something a community must weigh.

There are EAB insecticides that are registered for use in VT and they are fairly effective at protecting trees, but they have to be applied to each tree individually so this isn't practical to protect all ash trees in a forest environment, but is a good option for an urban tree canopy. Additionally, trees have to be retreated every one to two years because of the insect's life cycle. ALB eradication is to cut and chip all the trees that are infested. There is another insecticide that works for ALB, but it is only effective if the tree is treated before the larvae burrow too deeply into the wood beyond the tree's vascular system. The ALB larvae spend a lot of time in the interior wood, out of the vessel system of the tree so they aren't exposed to the insecticide.

The worst example of the potential impact of ALB infestation in the U.S. is Worcester County, Massachusetts. This problem has been going on for about seven years. It was well established before discovery, as much as 15 years went by before it was discovered. It had gotten out of the Worcester City and into the surrounding natural landscapes around the city, which has made eradication difficult.

ALB can be eradicated when discovered early. It is usually found in industrial settings, because it usually arrives in pallets from an Asian shipment. ALB is now being moved around through human activities, especially through the movement of firewood. It is easier to detect ALB than EAB because the ALB is larger.

Invasive plants are also a threat to the ecology and economy of Whitingham. Invasive plants are present in Whitingham. Long-standing and spreading forest threats in the Windham Region are glossy buckthorn, purple loosestrife, Japanese barberry, multi-flora rose, Japanese knotweed, cow parsley, and garlic mustard, and Asiatic bittersweet. There are more and more invasive plants moving up along roadways and waterways from lowland areas. All threaten forest regeneration, and multi-flora rose and Asiatic bittersweet can destroy mature trees. Smaller invasive plants such as garlic mustard, purple loosestrife, and goutweed present a threat to native herbaceous plants. The health threat posed by Japanese barberry should be noted: According to Jeffrey Ward, Chief Scientist at the Connecticut Agricultural Experiment Station, a forest infested with Japanese barberry harbors an average of 120 black-legged ticks per acre while a forest without barberry harbors an average of only 10 black-legged ticks per acre. Black-legged ticks are known to transmit the causal agents of several diseases, including Lyme disease. TS Irene spread a lot of invasive plants around the region through the transport of seed material from various sources, including flood waters. Logging, and particularly clear cutting, create areas that are particularly susceptible to invasives. Logging is a frequent

occurrence in Whitingham as +43% of the town is in the Current Use program. Logging is recognized as an important industry in Whitingham and statewide.

VTinvasives.org is a great resource for towns interested in engaging in activities around invasives, including using their template to develop a custom invasive species plan for your town.²⁷ The idea is to continue to create as much awareness as you can so residents know who to call when they see things. The sooner an outbreak is found, the better the chances of containment. Bio-controls are being worked out currently but aren't yet a solution. Insect pests are often found first by concerned citizens, arborists and foresters.

Sources Used

Interview with Windham County forester Bill Guenther on 3/2/15 (802-257-7967 or bill.guenther@vermont.gov); Interview with VT State Forester Jim Esden on 3/4/15 (802-885-8822 or jim.esden@vermont.gov); Interview with First Detector Jordan Fletcher on 4/29/15; VT Fish and Wildlife website; VTinvasives.org; Cerceris.info webpage; Main Forest Service webpage²⁸; Images courtesy of Google images and Maine Forest Service.

Dam Failure

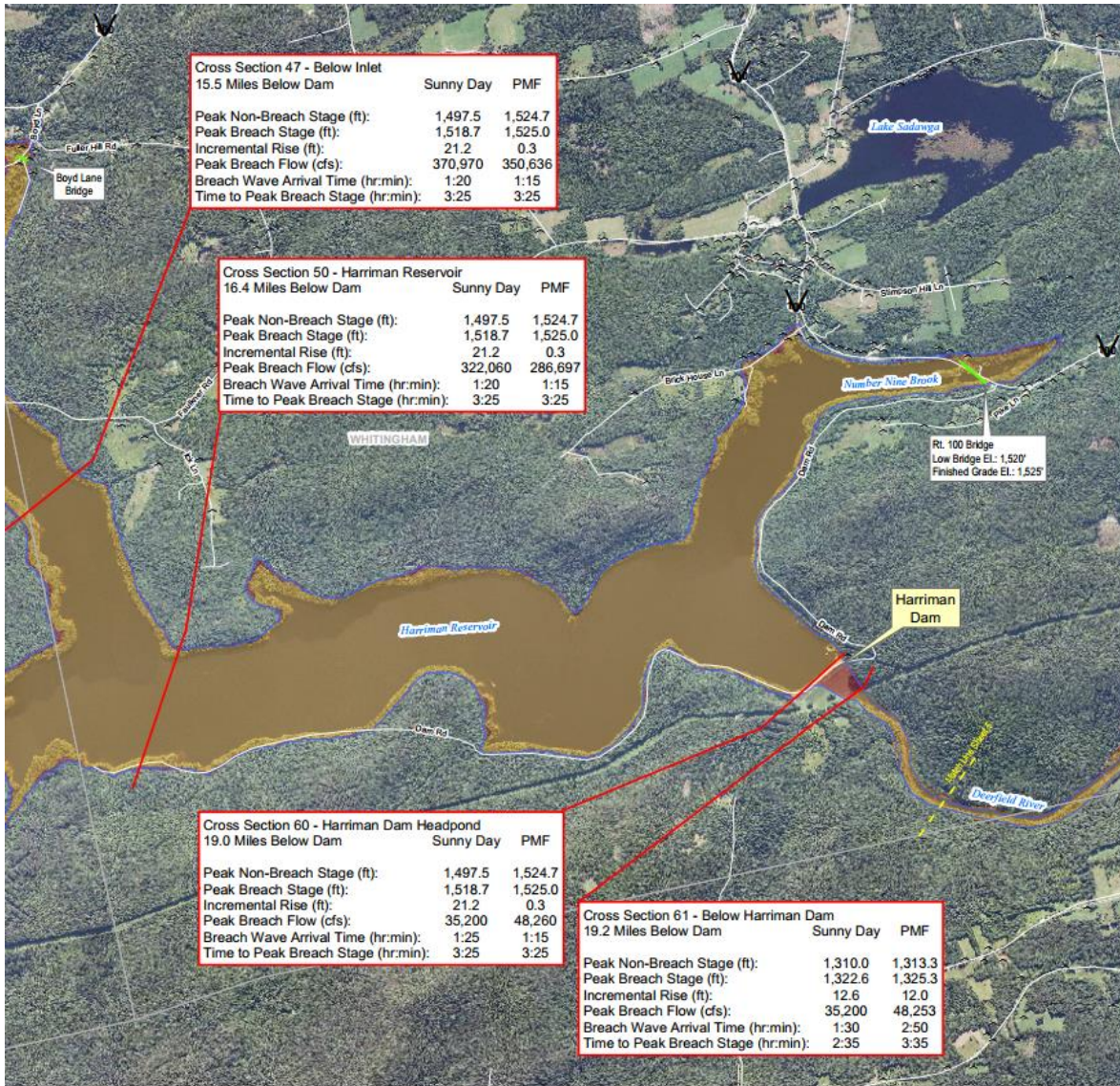
There are two dams that affect Whitingham, Somerset Dam, located upstream in the Town of Somerset, and Harriman Dam in Whitingham. Somerset Dam failure would have more of an impact within Whitingham than failure of the Harriman Dam would cause. Inundation mapping is shown below and does not indicate any buildings would be inundated in Whitingham by either dam failing. Failure of Harriman Dam would cause significant damage in neighboring Readsboro particularly in the downtown. Only panels related to Whitingham are included in this plan. Though dam failure is not a natural disaster, it should be understood as it would impact the town.²⁹

²⁷ < <http://www.vtinvasives.org/tree-pests/community-preparedness> >

²⁸ http://www.maine.gov/dacf/mfs/forest_health/invasive_threats/index.htm

²⁹ More and detailed information about Emergency Action Planning for the Deerfield and Somerset dams can be obtained by contacting Great River Hydro LLC or Matt Cole at mcole@greatriverhydro.com.

Somerset Dam failure inundation mapping (only panels related to Whitingham are included here). The inundation is shown in orange and red tint. The map shows that the water level of the Harriman Reservoir would rise. In a fair weather "Sunny Day" scenario assumes the Somerset dam at its spillway crest. The PMF failure assumes the dam at its maximum PMF elevation at the onset of a breach. The map shows that it would take approximately 1 hour and 15 minutes for a dam breach wave to reach Whitingham. It would raise the water level approximately 21.2-21.5 feet in the Harriman Reservoir depending on the scenario. It would also overflow the Harriman dam.



Legend

- Cross Section
- PMF Non-Breach Condition
- Sunny Day Breach Condition
- PMF Breach Condition
- Railroad
- Bridge/Culvert Road Crossing
- Railroad Bridge
- Municipal Boundary
- School
- Hospital
- Structure

NOTE:
 THE METHOD, PROCEDURES, AND ASSUMPTIONS USED TO DEVELOP THE FLOODED AREA. THE LIMITS OF FLOODING SHOWN AND FLOOD WAVE TRAVEL TIMES ARE APPROXIMATE AND SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES. ACTUAL AREAS INUNDATED WILL DEPEND ON ACTUAL BREACH CONDITIONS AND MAY DIFFER FROM AREAS SHOWN ON THE MAP.

BASE MAPPING IS 1-METER RESOLUTION NATIONAL AGRICULTURE IMAGERY PROGRAM AERIAL PHOTOGRAPHY, 2009.

ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

FOR ADDITIONAL CROSS SECTION DATA, SEE THE ELECTRONIC INUNDATION MAP APPLICATION.

Scale In Feet

Kleinschmidt Project No. 1352014.01
 January 2011

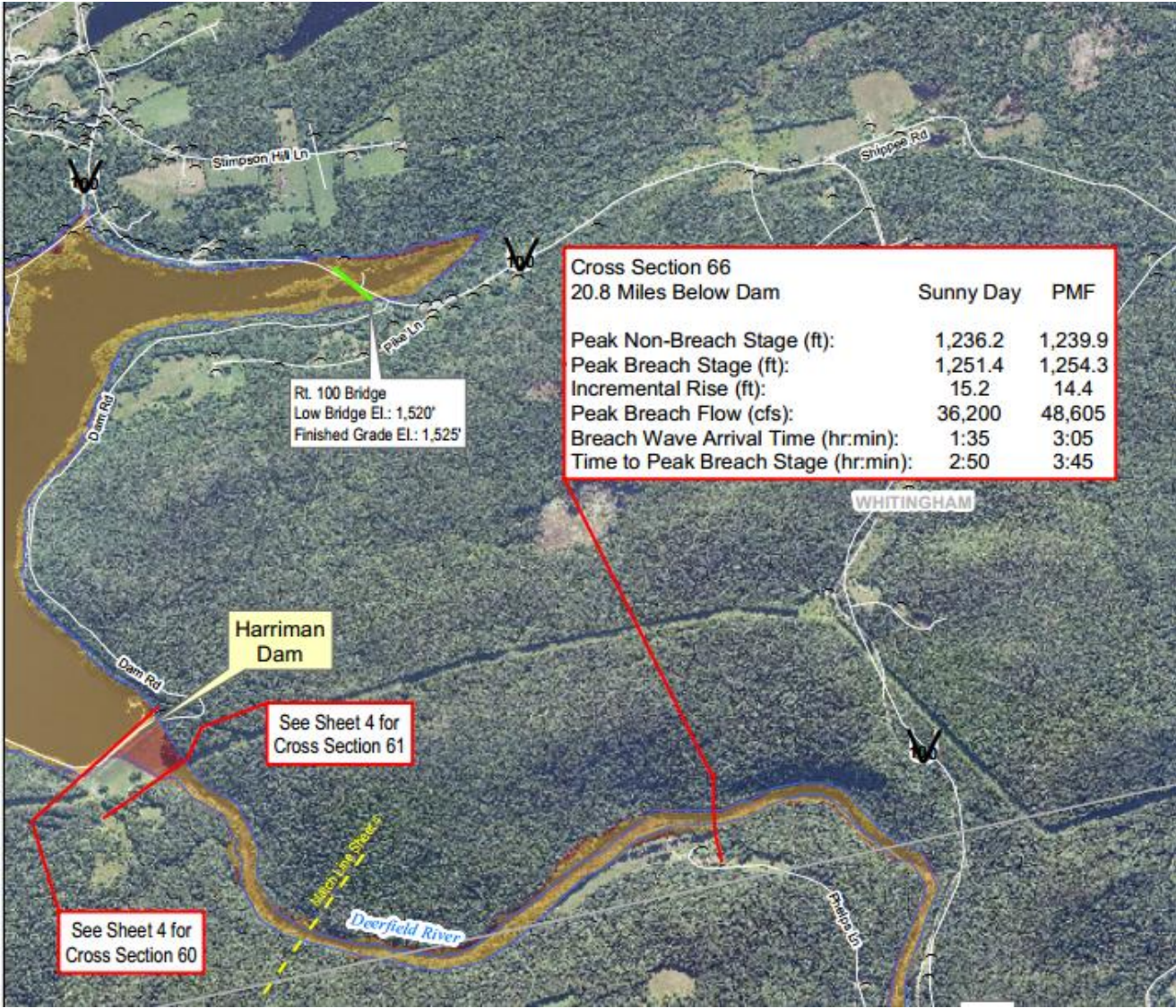
TRANSCANADA HYDRO NORTHEAST

**SOMERSET DAM
 FERC NO. 2323-VT**

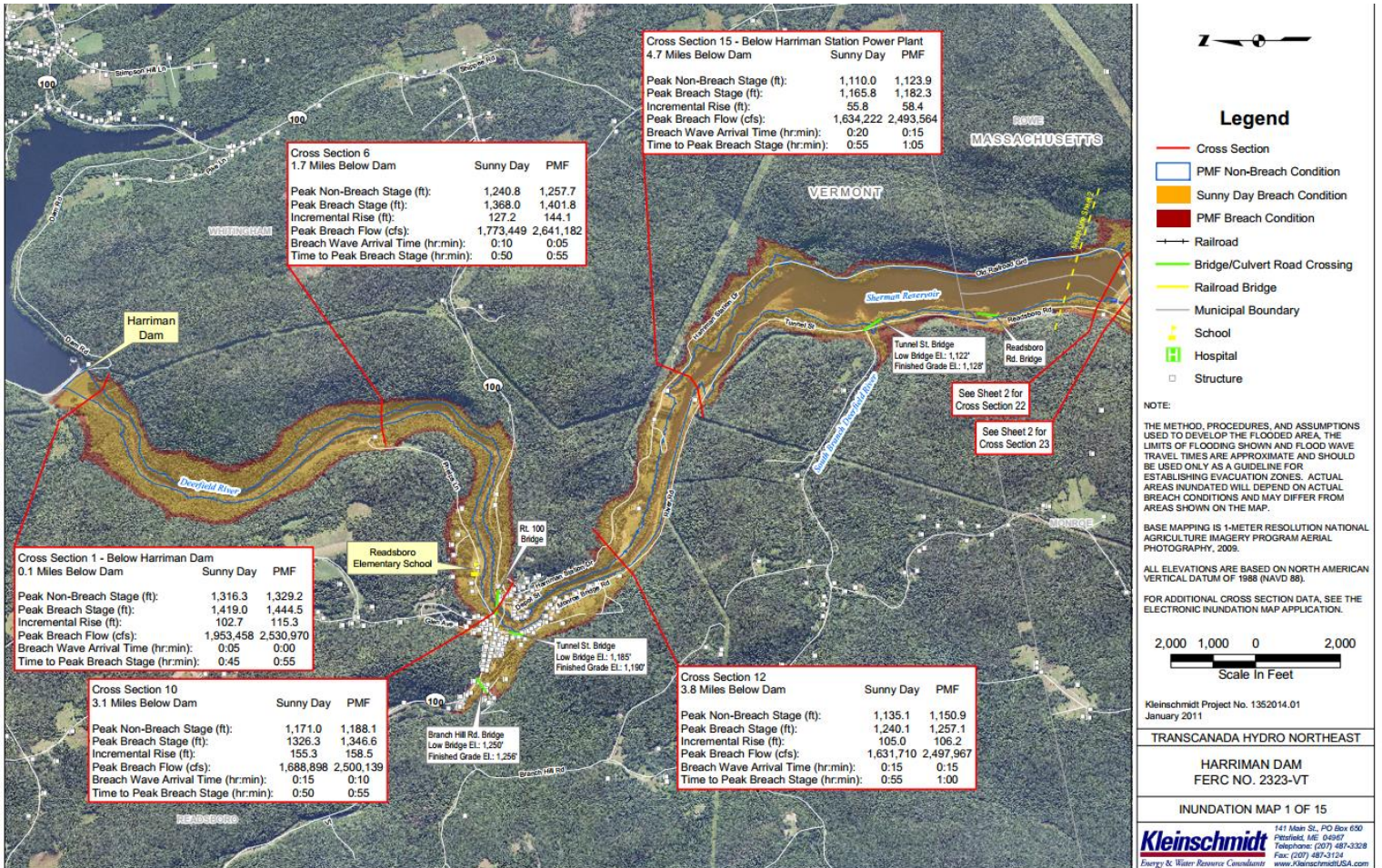
INUNDATION MAP 4 OF 18

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 Pittsfield, ME 04967
 Telephone: (207) 487-3328
 Fax: (207) 487-3124
 www.KleinschmidtUSA.com



Harriman Dam failure mapping is shown below. Though the detail may not be easily seen, the scale of potential flooding impact is evident (only panels related to Whitingham are included here). However most of the impact is out of the town of Whitingham and is downstream in Readsboro and Massachusetts. In Whitingham, Harriman dam failure would impact Sherman Reservoir within 15-20 minutes depending on if the weather was good or if water levels were already raised by rain. It would raise the Reservoir water level between 55 and 59 feet.



ASSESSING VULNERABILITY

Structures in the SFHA

There are approximately 36 buildings within FEMA-designated Special Flood Hazard Areas (SFHAs).³⁰ There are 55 structures that lie in the River Corridor. Some of these structures may lie in both SFHA and River Corridor. The maps on the following pages show structures that are located in the SFHA or the River Corridor. The affected structures are clustered in the Villages of Whitingham and Jacksonville. Outside of the villages, there are two affected structures on Lake Sadawga and several along Route 112 south of Jacksonville. Outside of this, there are no

³⁰ 2018 Flood Hazard Summary Sheet for Whitingham

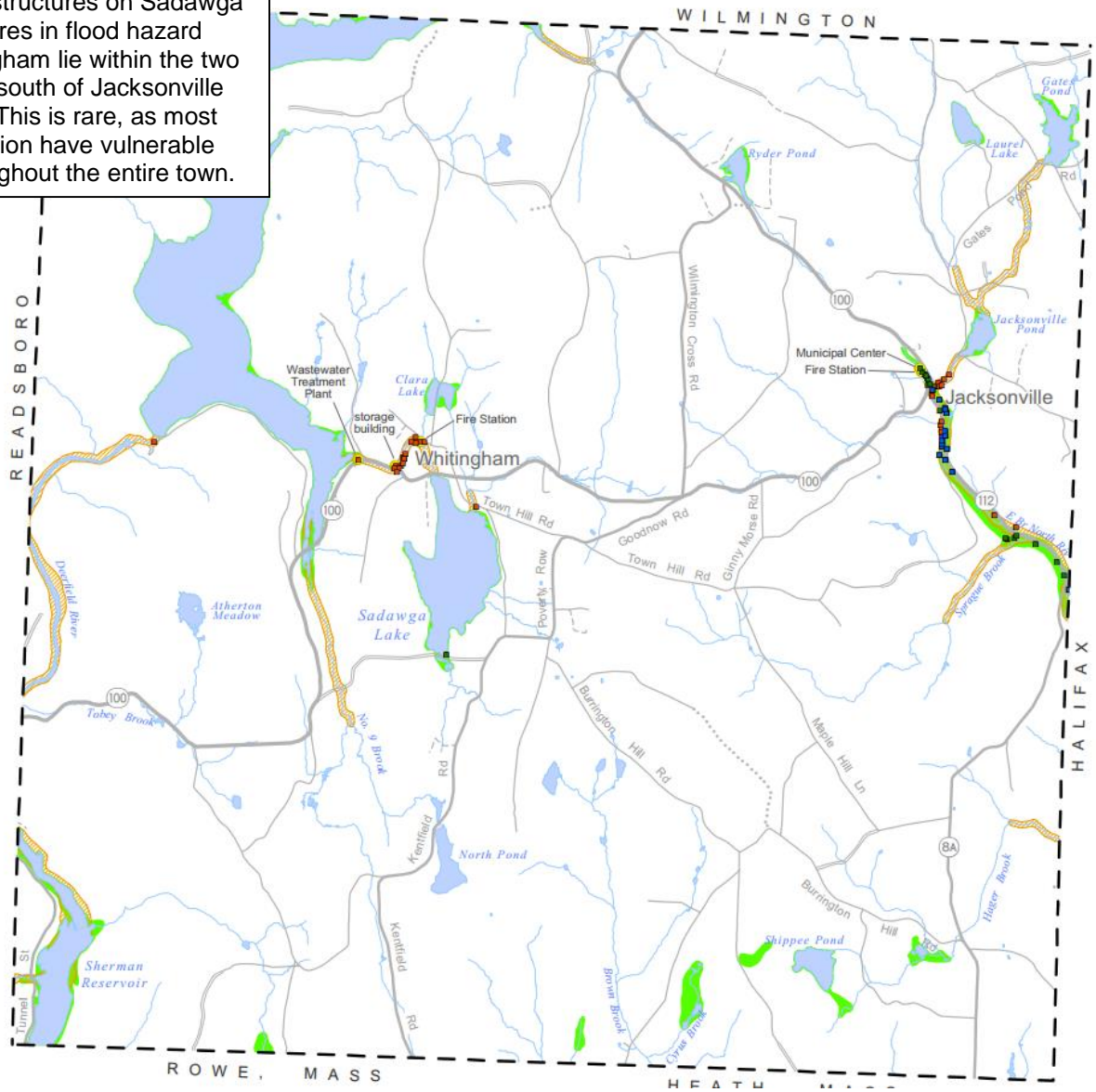
structures in Whitingham that are in either the River Corridor or the Floodplain. Vulnerabilities outside of the villages, to flooding, are primarily roads and other associated infrastructure.

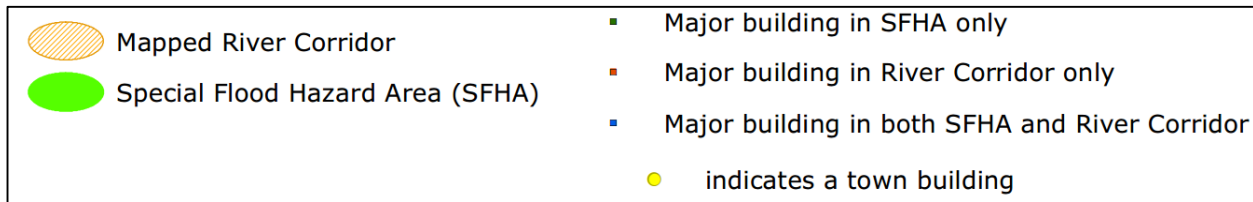
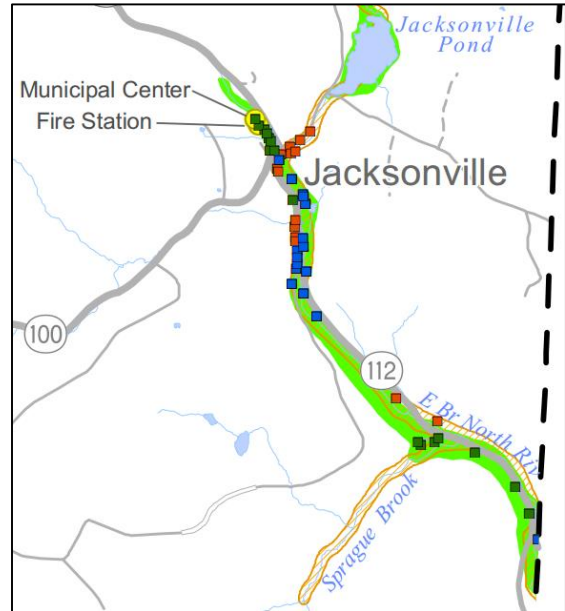
Overall, there isn't a lot of development in the floodplain and it is concentrated where it exists. There was extensive flooding in the Villages during Tropical Storm Irene. There are a significant number of structures in the river corridor. The affected structures in the Village of Whitingham are all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

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

Properties within SFHAs, that have a mortgage, are required to purchase flood insurance. Whitingham's participation in the National Flood Insurance Program (NFIP) gives residents access to discount flood insurance through the National Flood Insurance Program. Flood insurance can still be purchased privately, however, it is more expensive. Development in SFHAs must meet additional construction standards as outlined in Whitingham's floodplain regulations, which is part of their zoning ordinance and was most recently adopted in 2014.

Outside of two structures on Sadawga Lake, all structures in flood hazard areas in Whitingham lie within the two villages, or just south of Jacksonville on Route 112. This is rare, as most towns in the region have vulnerable structures throughout the entire town.





Repetitive Loss Structures

According to FloodReady.Vermont.gov, Whitingham has no repetitive loss claims.³¹ A Repetitive loss structure is an NFIP-insured structure that has had at least 2 paid flood losses of more than \$1,000 each in any 10-year period since 1978.³² Severe repetitive loss (SRL) structures are NFIP-insured buildings that, on the basis of paid flood losses since 1978, meet either of the loss criteria described in the SRL section. SRL properties with policy effective dates of January 1, 2007 and later will be afforded coverage (new business or renewal) only through the NFIP Servicing Agent's Special Direct Facility (SDF) so that they can be considered for possible mitigation activities. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- 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
- 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.

³¹ Report listing repetitive losses is available here:

<<http://floodready.vermont.gov/sites/floodready/files/documents/VT%20RL%20Report%201.26.15.pdf>>

³² <https://www.fema.gov/national-flood-insurance-program/definitions>

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

The National Flood Insurance Program (NFIP) is a voluntary program organized by FEMA that includes participation from 20,000 communities nationwide 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.

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

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

While the NFIP floodplain management criteria are administered by states and communities through their floodplain management regulations, FEMA's role is to provide technical assistance and to monitor communities for compliance with the minimum NFIP criteria. Whitingham joined the NFIP on September 18, 1985 and is a member in good standing (CID 500141). The latest floodplain ordinance was adopted on November 19, 2014 and is in the zoning ordinance. The latest Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) referred to in the development of this plan have an effective date of September 28, 2007.

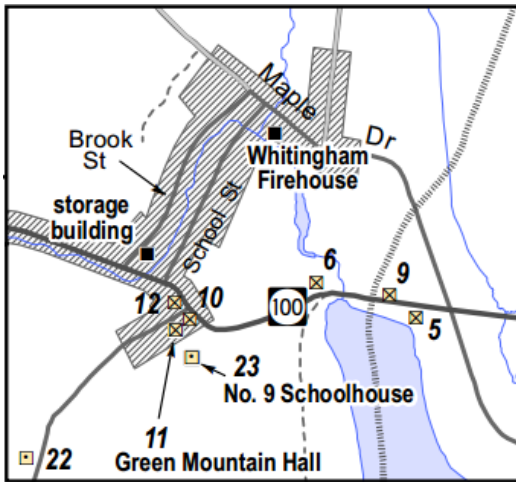
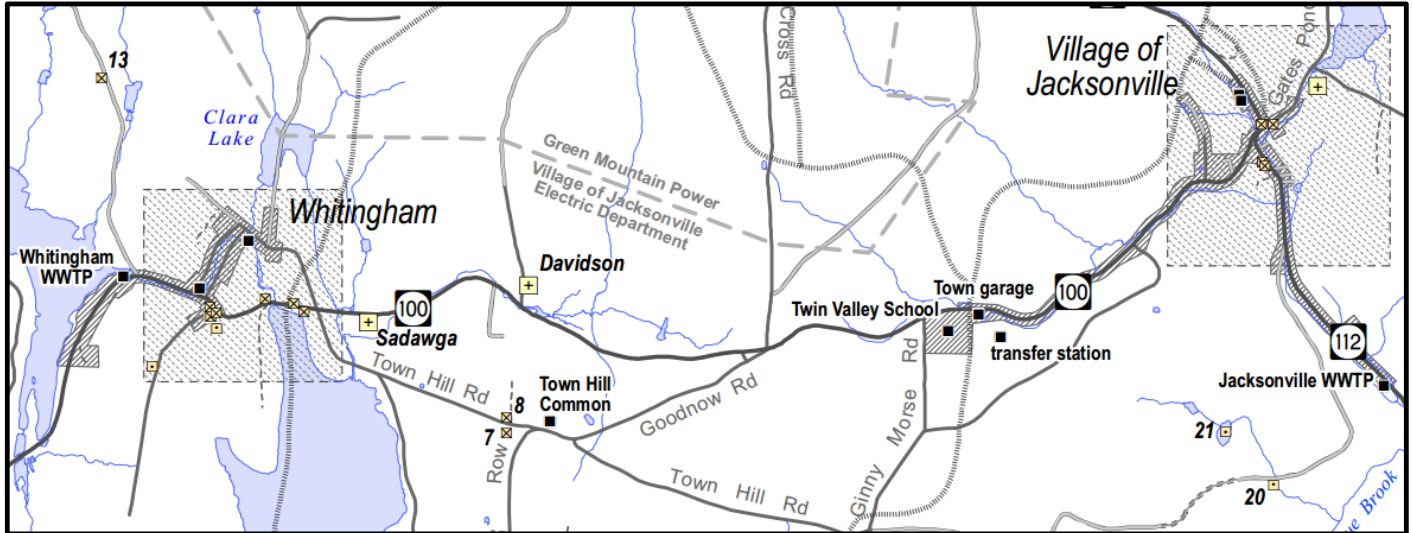
The latest record indicates that there are sixteen (16) active NFIP policies in Whitingham. These policies have a total value of \$2,428,600. There have been eleven (11) NFIP claims filed in Whitingham since they joined the NFIP, with a total of \$161,772 paid out.³³ Whitingham may want to do public outreach to encourage the purchase of flood insurance for people in the River Corridor and the FEMA 500-year floodplain (Zone X on the FIRMs). Flood insurance is reasonably priced in these areas, and covers damage from fluvial erosion, as well as inundation flooding. Nearly 20% of flood insurance claims nationally are for flood damage to buildings located outside the SFHA.

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

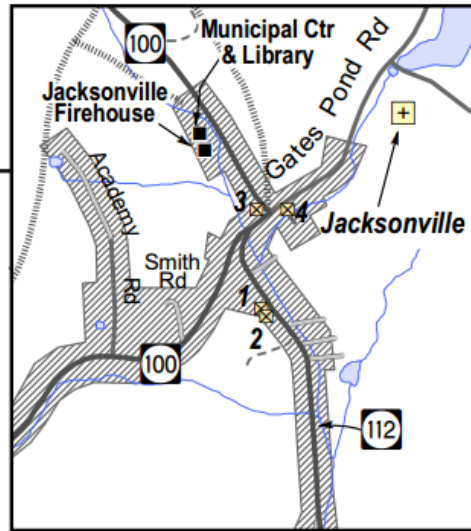
³³ FEMA NFIP Insurance Report, January 2015, accessed June 12, 2018.
<http://floodready.vermont.gov/sites/floodready/files/documents/NFIP%20Insurance%20Report%20VT%201.26.15.pdf>

Vulnerable Community Assets in Whitingham

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



Whitingham detail



Jacksonville detail

Vital community facilities in Whitingham include:

- Municipal Center in Jacksonville
- Town Garage
- Twin Valley School
- 2 Fire Stations
- Green Mountain Hall (Historical Building in Whitingham)
- Whitingham Post Office
- Jacksonville Post Office
- Jacksonville Store
- 2 Sewer Plants

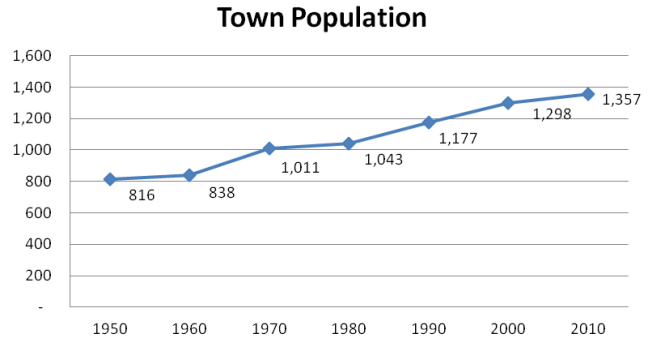
Market Values of Structures in Whitingham

The total Grand List in the Town of Whitingham: \$275,753,700.00**

** \$2,679,301.00 = Grand List Adjusted for Exemptions (voted and legal)
These counts do not include non-taxable structures. There are 28 (nontaxable) locally exempt properties.

Development Trends

The Town population has been slowly and steadily increasing over the years. Whitingham does still remain a rural small town with a population of 1,357 in 2010.



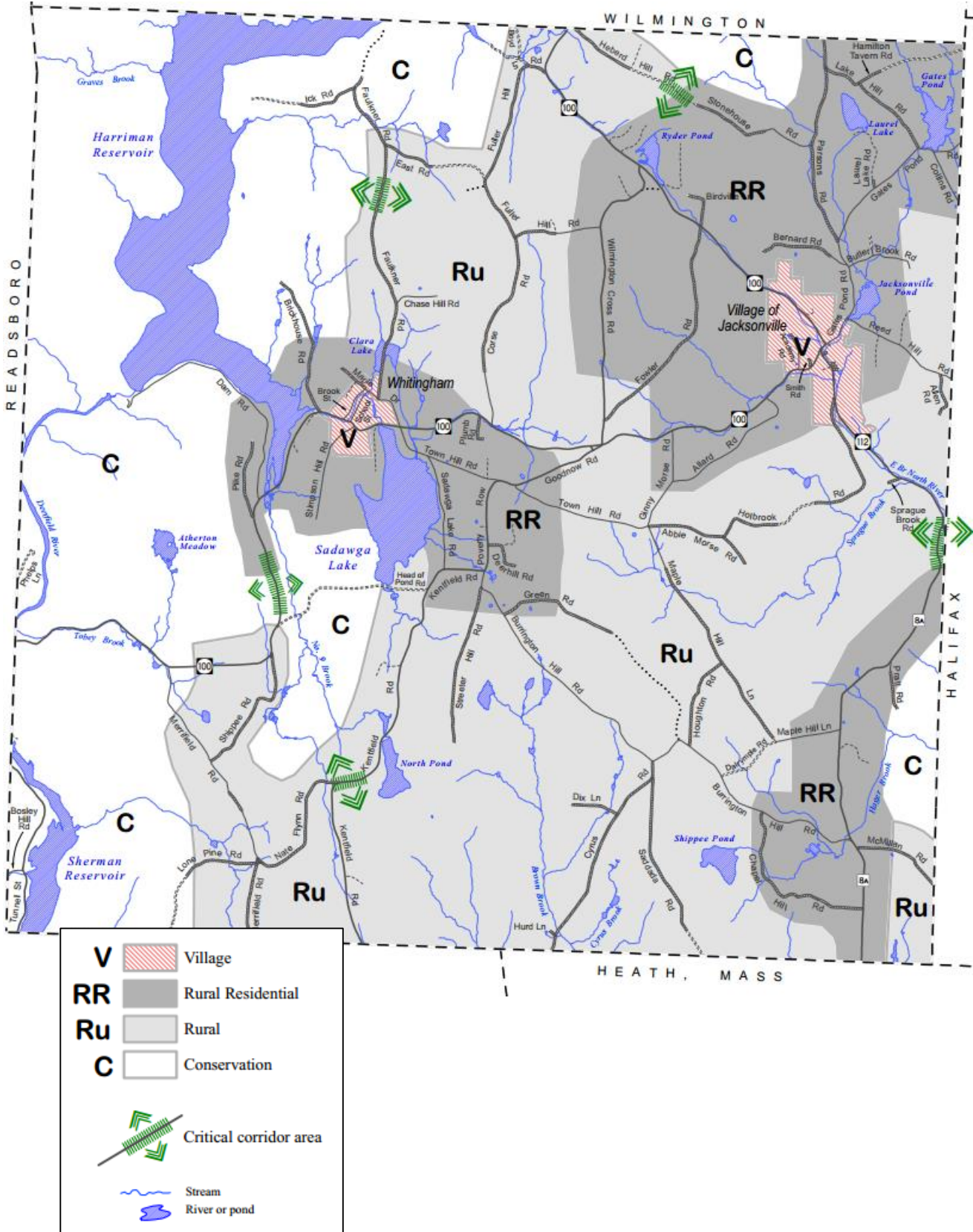
The school age population is shrinking and the population overall is aging. Most of the newly built homes are for second home owners. There is a significant aging and vulnerable population in Whitingham that the townspeople recognize and work to support. There is also a sector of the Whitingham population that is quite self-sufficient. There is another sector of the town's changing population that expects services that aren't always available in a small town. Proximity to ski areas as well as relatively lower housing prices are bringing more second homeowners to Whitingham. So, there are a wide variety of people in Whitingham, and each has their own set of needs and vulnerabilities.

The development pattern has not changed appreciably over the years; development has merely extended along the road frontages in all sections of town. The Existing Land Use map, shown earlier in this Plan, shows the dominant land use on each parcel. Residential development is occurring primarily along the town's rural roads. More recently (post 2001), residential development has been spreading into previously undeveloped areas located further off town roads. The densest concentration of residences can be found in and around Jacksonville Village, around Lake Sadawga and along Route 100 and Route 112. There is not much development pressure. There are about 3-4 new home building permits issued yearly. There are a lot of people that have lived in town for many years and have land that has been passed down for generations. The land use pattern is predominantly single family homes spread out into rural areas³⁴.

Commercial development is scattered along Route 100 and Route 112, and in Jacksonville Village. There is not a lot of growth in commercial development in Whitingham. There is also not a lot of existing commercial or industrial development in Whitingham. There are numerous home based businesses, artisans, and creative individuals in town. A lot of people commute to the Brattleboro and Massachusetts or Bennington for work. Unless you're working for yourself, it can be difficult to get a job without working elsewhere out of the town. There are varying views of new development in town, which promotes healthy discussion when new development is proposed. The map below shows that nearly half of the town is proposed to remain in conservation.

³⁴ 2018 draft Whitingham Town Plan, page 16.

Proposed Land Use Map from 2018 Draft Whitingham Town Plan



V		Village
RR		Rural Residential
Ru		Rural
C		Conservation
		Critical corridor area
		Stream
		River or pond

MITIGATION STRATEGY

Local Hazard Mitigation Goals for this Plan

The Hazard Mitigation Goals as outlined below were agreed on by consensus among the Hazard Mitigation Planning Committee during meetings for the development of this plan.

- Reduce the loss of life and injury resulting from all hazards.
- Reduce the impact of hazards on the town's water bodies, natural resources, and historic resources.
- Reduce the economic impacts from hazard events.
 - Minimize disruption to the road network and maintain access,
 - Mitigate financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to disasters,
 - Ensure that community infrastructure is not significantly damaged by a hazard event.
 - Being proactive in implementing any needed mitigation projects for public infrastructure such as roads, bridges, culverts, municipal buildings, etc.
- Encourage hazard mitigation planning to be incorporated into other community planning projects, such as the Town Plan, Capital Improvement Plan, and Town Local Emergency Operations Plan.
- Ensure that members of the general public continue to be part of the hazard mitigation planning process.

Town Plan (2018) Policies and Recommendations that Support Mitigation

The following recommendations and policies are contained in the 2018 Whitingham Town Plan and pertain to mitigation in Whitingham.

Transportation

Recommendation 1.1: Review and update road and bridge condition statuses annually to reflect the priority of needed improvements. Make recommendations for short and long-term improvements. (Selectboard and Road Commissioner)

Policy 6: Continue to support community services that provide transportation for elderly and physically handicapped residents of Whitingham.

Natural Resources

Policy 2: Maintain the natural course, condition, or function of watercourses and shore lands except for necessary crossings for adequate bridges or culverts.

Recommendation 2.1: Provide information about best management practices that can be implemented voluntarily to comply with state water quality standards or to address water quality problems. (Conservation Commission, when established)

Recommendation 2.2: Continue to use road maintenance methods and materials that will maintain or improve water quality, such as those described in the Vermont Better Backroads Manual. (Selectboard and Road Commissioner)

Policy 3: Maintain undisturbed buffers of native vegetation along streambanks and shorelands.

Recommendation 3.1: Review and develop land use and development controls to ensure that development along stream banks and shorelines is controlled to prevent point and non-point pollution, minimize adverse aesthetic impacts, and to protect riparian habitats. (Planning Commission)

Policy 4: Foster the protection and restoration of river corridors, floodplains, wetlands, and upland forested areas that attenuate and moderate flooding and fluvial erosion.

Recommendation 4.1: The town should be familiar with up-to-date ANR river corridor maps that delineate the land areas adjacent to streams and rivers that are required to accommodate a stable channel. (Selectboard, Planning Commission, Zoning Board of Adjustment, and Zoning Administrator)

Policy 5: Protect floodplains, river corridors, land adjacent to streams, wetlands, and upland forests through adoption and administration of flood hazard area regulations governing development in designated Special Flood Hazard Areas and River Corridors, in order to reduce the risk of flood damage to infrastructure, improved property, people, and the environment.

Recommendation 5.1: The town should be familiar with Flood Insurance Rate Maps (FIRMs) that delineate areas that could be covered or inundated by water during flooding. (Selectboard, Planning Commission, Zoning Board of Adjustment, and Zoning Administrator)

Policy 6: Avoid new development in identified flood hazard, fluvial erosion, and river corridor protection areas. If new development is to be built in such areas, it should not exacerbate flooding and fluvial erosion.

In order to protect roads and buildings it is important to be sure that the river is able to function as well as possible upstream and downstream. We need functional streams and rivers with room to adjust (River Corridors) and intact floodplains to moderate the impact of high water events.
– Whitingham Town Plan 2018

Recommendation 6.1: The town should regulate any new development in identified flood hazard areas, fluvial erosion hazard areas, and/or River Corridors to ensure that development does not exacerbate flooding and fluvial erosion, and extend these provisions to development activities that might increase the amount and/or rate of runoff and soil erosion from upland areas. (Selectboard, Planning Commission, Zoning Board of Adjustment, and Zoning Administrator)

Policy 7: Encourage the protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion.

Recommendation 7.1: The town should update the Flood Hazard Area Regulations to include regulation of River Corridors, and include provisions for advance notification of and specific limits on new development activities in identified flood hazard areas, fluvial erosion areas, River Corridors and/or upland forested areas based on regulatory templates developed by the ANR Department of Environmental Conservation Rivers Program. (Selectboard, Planning Commission, Zoning Board of Adjustment, and Zoning Administrator)

Policy 8: Encourage flood emergency preparedness and response planning.

Recommendation 8.1: The town should pursue a flood resilience management approach whose essential components are to identify and map flood hazard areas, fluvial erosion hazard areas, and river corridor protection areas based on stream geomorphic assessment studies and maps provided by the Vermont ANR Rivers Program, and designate those areas for protection to reduce the risk of flood damage to infrastructure and private property. (Selectboard, Planning Commission, Zoning Board of Adjustment, and Zoning Administrator)

Progress between 2011 and 2018

Due to the length of time between when development of the previous draft plan, and this current plan, it is important to recognize progress made on previously identified mitigation actions. The old draft plan identified several actions and the below table discusses them and their current status.

2011 Mitigation Action	Responsible Party	Expected Completion Timeframe/Year	Priority	Current Status
Holbrook Road – Embankment stabilization, culverts upgraded, road stabilization, geo-engineer consultant assessment	Road Commissioner	2011	High	There have been minor stabilization attempts, but these have failed during spring floods and the problem remains. Stone-lined ditches and larger culverts were installed on Holbrook; this included adding two culverts. So the fluvial erosion issues have lessened, but the landslide issues remain.
Burrington Hill Road – New box culvert, road elevation over stream	Road Commissioner	2011	High	This has not been done. The Road Foreman has gotten a grant to upgrade one culvert. The problem culvert is still in discussion.
Head of Pond Road – New box culvert	Road Commissioner	2011	High	This issue was resolved when the state made a bigger dam spillway in 2016 which prevented the need for the culvert upgrade on Head of Pond Road.
Beaver gates installed on numerous culverts throughout town	Road Commissioner	2012	Medium	There are a bunch installed and they are put in as needed. They are also cleaned out as needed. The town welds their own and they work well.

Ongoing Efforts

1. Senior Solutions holds weekly lunches for seniors in the community at the Whitingham Municipal Center as a way to stay connected with them and give them a social event. The volunteers for this luncheon assist these residents during non-emergencies. The Town also update the “vulnerable population” list yearly and check on those residents during emergencies.

2. Leaf removal and ditch cleaning are maintenance activities done every spring by the road crew. If ditches are being eroded, the crew may also stone line them.
3. The town manages a local emergency operations center (EOC) during disasters.
4. The town maintains three emergency shelters; one at the High School, another at the Jacksonville Fire Department, and a day shelter at the Municipal Center.
5. Whitingham is a member in good standing of the National Flood Insurance Program. The floodplain ordinance is kept compliant and the town maintains SFHA maps at the town office.

Identification of Mitigation Actions

The Whitingham Hazard Mitigation Planning participants identified the following hazard mitigation activities based on an evaluation of hazard event vulnerability not addressed by existing hazard mitigation initiatives and the feasibility of new activities. As a part of the ongoing plan process, these were updated in 2017 by the Hazard Mitigation Planning participants to reflect progress and new ideas.

Mitigation actions are listed in priority order by hazard. Actions were prioritized by the plan participants. These are new actions so any shifts in prioritization of actions came out through the multi-year plan development process. The following criteria were used in establishing project priorities. The ranking of these criteria is largely based on the best available information and best judgment as many projects are not fully scoped out at this time. Prioritization was done during the meetings for the plan development in discussions among participants and guided by WRC's Emergency Planner. Actions relating to future development were considered, but the plan participants did not find them to be feasible at this time due to lack of political will/community support.

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures or structures critical to town operations?
- Can the action be implemented quickly?
- Is the action socially acceptable?
- Is the action technically feasible?
- Is the action administratively possible?
- Is the action politically acceptable?
- Is the action legal?
- Does the action offer reasonable benefits compared to its cost of implementation?
- Is the action environmentally sound?

NOTE: Whitingham is encouraged to refer to the *River Corridor Plan for the East Branch of the North River in Halifax and Whitingham, Vermont* and complete those actions, as well as what is identified here. Most of those actions are included in the Mitigation Actions Table on the following page but the Corridor Plan provides much more reasoning and detail on each action and its context.

Cost-Benefit Analysis

As part of public involvement discussions, there was a rough cost/benefit analysis done for each action listed in the table and those results are shown in the table. The below cost and benefits tables address the priorities for the mitigation strategies that are stated in the Mitigation Actions Table. This was how the mitigation actions were assessed by the Hazard Mitigation Planning participants. Priority was assessed somewhat independently of cost/benefit and was based more on the perceived need of each action and availability of funding, versus what the action costs and benefits.

At the time of applying for FEMA’s PDM-C, FMA or HMGP grant programs, each project listed below will undergo full benefit-cost analysis (BCA) methodology, version 5.1 or higher to maximize savings. Whenever possible, Whitingham will utilize 406 mitigation funding.

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



Fluvial erosion damages to Brick House Road due to flooding of an upland stream in Tropical Storm

Mitigation Actions Identified by the Hazard Mitigation Planning participants

HAZARD	ISSUE AND ACTION	RESPONSIBLE PARTY	TIME-FRAME	FUNDING SOURCE	MITIGATION OR PREPAREDNESS	COST / BENEFIT	PRIORITY	STATUS
Fluvial Erosion	Holbrook Road landslide - Stabilizing wall needs to be designed and probably bored into the bank to hold it in place. Engineering phase	Road Commissioner is applying for grant; Town would contract with an engineer for the design	Begin 2019- complete by the end of 2020	Better Back Roads grant?	Mitigation	Low	High	Road Foreman will be starting grant application as things calm down.
Fluvial Erosion	Holbrook Road landslide - stabilizing wall needs to be designed and probably bored into the bank to hold it in place. Building phase	Road Commissioner is inquiring about grant funding; Contractor would complete work	Depends on if grant awarded; begin 2021 or 2022 and would be complete in one season - entire project would ideally be finished in 2025	Seeking grant funds	Mitigation	High	High	The selection of a contractor will begin after the engineering phase is complete and approved
Flooding and Invasive Species	Develop and distribute educational material for residents about protecting and enhancing riparian buffers on their property. There are lots of lakeside homes and properties.	Selectboard Officer/ ZA/ Health Officer	The first article will appear in the 2019 town newsletter and at least once per year thereafter.	Town Funds	Mitigation	Low/Low	High	Gig (Selectboard Assistant) is going to write this newsletter article.
Invasive Species	Petition VTrans to put up a sign near the state border with Massachusetts about Vermont laws prohibiting transport of firewood over state lines. Invasive tree pests are on the rise in VT.	Selectboard	Letter to be sent fall 2018	State funds for sign	Mitigation	Low/ Medium	Medium	

HAZARD	ISSUE AND ACTION	RESPONSIBLE PARTY	TIME-FRAME	FUNDING SOURCE	MITIGATION OR PREPAREDNESS	COST / BENEFIT	PRIORITY	STATUS
Invasive Species	Do a town-wide survey and map of Ash trees on public land; this is important to be able to understand the potential impact of EAB infestation and to plan ahead to save and inoculate any trees	Town Tree Warden and trained volunteers; VTInvasives.org and vtcommunityforestry.org	Summer 2019	Town Funds	Mitigation	Low/High	High	It is more cost effective to plan ahead for how to manage EAB over time than to be forced to respond after infestation is discovered. Selected trees should be treated before EAB is present. vtcommunityforestry.org has a lot of tools to assist with surveys and management planning ³⁵
Invasive Species	Educational campaign for private land owners about identifying Ash trees and EAB infestation	Town Staff using VTInvasives.org developed resources	Start Spring 2019; ongoing	Town Funds	Mitigation	Low/High	High	VTInvasives.org and vtcommunityforestry.org both have a lot of information already developed;
All Hazards	Get Whitingham set up with VAlert	EMD	Complete Spring 2019	Town Funds and VEM assistance	Preparedness	Low/High	High	VAlert is a way for the town to stay better connected with its citizenry during and before an event; VEM can assist with set up.

The *River Corridor Plan for the East Branch of the North River in Halifax and Whitingham, Vermont* is a detailed study of the entire stream corridor. Findings from the Plan are discussed in the flooding/fluvial erosion section of this plan. Part of the *Corridor Plan* outlines specific projects in Whitingham. For this Hazard Mitigation Plan, the projects addressed there have been pulled out and put in this report as a secondary place for them, and to make the connection between the two plans. The table below lists the actions in the way that they are laid out in the Corridor Plan. The map following the table identifies the reach segment (listed in the first column of the table) where the action is located at on the waterway.

³⁵ Elise Schadler with VTcommunityforestry.org; elise.schadler@uvm.edu

Site-level Project Opportunities Identified in the River Corridor Plan for the East Branch of the North River in Whitingham³⁶

Project ID, Location, Reach, Lat/Long	Type of Project	Site Description Including Stressors and Constraints	Project or Strategy Description	Hazard Mitigation Priority	Ecological Benefits Priority	Project Benefits	Costs	Potential Partners & Funding
NR-12 Route 112 Reach M06.A 42.78783 N -72.81725 W	Active Restoration Berm Removal & Buffer Planting	A 250ft long and roughly 3ft tall historic berm is reducing access to a mowed floodplain along Route 112 extending down to the wastewater plant. T.S. Irene floodwaters accessed the floodplain downstream of the berm	Assess the accessibility of the floodplain downstream of the berm to see if berm removal is beneficial, if so, remove the berm. Buffer plantings could be incorporated into the floodplain area.	Moderate	Low	Improve accessibility to a relatively large floodplain.	Low to Moderate	Private Landowner, VTANR ERP, WCNRCD Trees for Streams
NR-13 First Stop Convenience Store Segment M06.B 42.79314 N -72.8201 W	Active Restoration Floodplain Restoration and Infrastructure Resiliency	The channel is narrow and deeply incised as it flows past the First Stop convenience store and several commercial buildings before crossing under Route 112. The floodplain across the channel from the gas station was accessed during T.S. Irene and is slightly lower in elevation., but has large Irene sediment deposits The existing bank armor appears undersized.	Reshape the east bank to lower the elevation of the floodplain to increase accessibility and attenuate flood flows and sediment. Replace the existing bank armor with a stacked stone wall to increase slope protection and increase bankfull width. Follow guidance in VTANR Standard River Management Principles and Practices.	High	Moderate	Improve accessibility to a medium-sized floodplain. Protect gas station and convenience store from erosion hazard and reduce inundation risk	Moderate	Private Landowner (stabilization project), VTANR ERP (floodplain reconnection project)
NR-15 Route 112 Segment M06.B 42.79562 N -72.82126 W	Passive Restoration Buffer Planting	The stacked stone wall and parking area along Route 112 have no woody vegetation to shade the channel.	Plant willow cuttings along the base and the top of the stone wall where possible. Additional plantings could be installed along the edge of the parking area, requiring some excavation and topsoil.	Low	Moderate	Increase channel shading, improve aesthetics, provide some opportunity for stormwater treatment.	Low	VTANR ERP, WCNRCD Trees for Streams

³⁶ River Corridor Plan for the East Branch of the North River In Halifax and Whitingham, Vermont, completed December 2017, Fitzgerald Environmental Associates, <https://anrweb.vt.gov/DEC/SGA/finalReports.aspx>

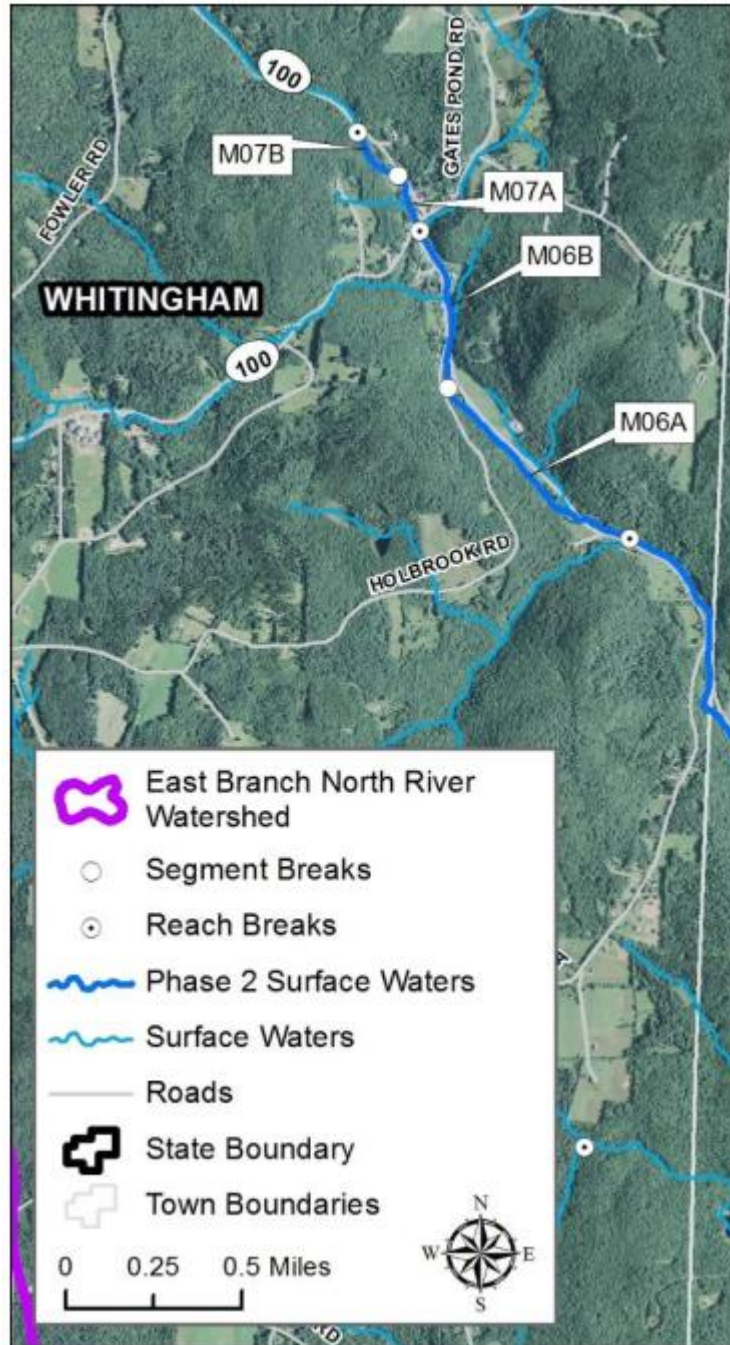
Town of Whitingham, VT 57
Local Hazard Mitigation Plan

Project ID, Location, Reach, Lat/Long	Type of Project	Site Description Including Stressors and Constraints	Project or Strategy Description	Hazard Mitigation Priority	Ecological Benefits Priority	Project Benefits	Costs	Potential Partners & Funding
NR-16 Floodplain Reconnection and Driveway Bridge Segment M06.B 42.79619 N -72.82157 W	Active Restoration Berm Removal and Bridge Replacement	The steel driveway bridge located at the confluence of the EB North River and the Gates Pond drainage is undersized (55% wbkf). A large cobble berm along the east bank of Gates Pond Outlet restricts access to the floodplain immediately upstream of the confluence.	Replace the bridge with a larger structure. Remove portions of the cobble berm to allow floodplain access during large flow events. The driveway may require additional stabilization to reduce damage during floods.	High	Low	Improve conveyance of floodwaters, sediment, and debris through downtown Jacksonville.	High	Private Landowner, VTANR ERP
NR-17 Route 100 and Route 112 Segment M07.A 42.79677 N 72.82193 W	Active Restoration Bridge Replacement	The 90-foot long crossing under the intersection of Route 100 and Route 112 in downtown Jacksonville is severely undersized. The bridge and downstream channel have an approximate width of only 6ft, or 38% of bankfull width. Electric conduits on the downstream end of the bridge are exposed and could catch debris.	Replace the bridge with a larger structure when it is up for replacement. The downstream channel should also be enlarged to match the capacity of the bridge.	High	Low	Increase capacity of the bridge to reduce flood risk.	Very High	VTRANS, Town of Whitingham, Private Landowner
NR-18 Whitingham Municipal Center Segment M07.A 42.79843 N -72.82262 W	Active Restoration Culvert Replacement	The 8.5ft wide squash CMP culvert under the southern entrance to the municipal center is a significant bankfull width constriction at 53% and the culvert is in poor condition. However, the upstream and downstream bridges have significantly lower capacity.	Replace with a larger structure when this culvert comes up for replacement. Investigate the option for consolidating the two entrances to the municipal building and only having one bridge.	High	Moderate	Increase capacity of crossing to reduce flood risk.	High	Town of Whitingham; VTrans
NR-19 Whitingham Municipal Center Segment M07.A 42.79855 N -72.82271 W	Active Restoration Bridge Replacement/ Removal	The concrete bridge at the northern entrance to the municipal center is an extreme bankfull constriction (34%) and was the location of major overbank flooding during T.S. Irene.	Replace with a larger structure. Consider removing the bridge and replacing the downstream culvert (Project NR-18) with a larger bridge or culvert. Any increases in structure capacity need to consider the downstream channel and bridge capacity under Route 100 and Route 112.	High	Low	Increase capacity of crossing to reduce flood risk	High	Town of Whitingham; VTrans

Town of Whitingham, VT 58
Local Hazard Mitigation Plan

Project ID, Location, Reach, Lat/Long	Type of Project	Site Description Including Stressors and Constraints	Project or Strategy Description	Hazard Mitigation Priority	Ecological Benefits Priority	Project Benefits	Costs	Potential Partners & Funding
NR-20 Route 100 Segment M07.B 42.7993 N -72.82439 W	Passive Restoration Corridor Protection	The forested floodplain upstream of the Whitingham Municipal Center provides important storage capacity for floodwaters before they reach the developed corridor. The channel is slightly incised and lacks large substrate and LWD to encourage bed aggradation.	Protect the floodplain from future development and consider the installation of bed roughening structures (large boulders or LWD tied in to the banks) to encourage bed aggradation and increase floodplain accessibility.	Moderate	Moderate	Protect an important floodplain area from future development.	Low to Moderate	VTANR ERP, Private Landowners; VLT; VRC
NR-21 White House in Jacksonville Segment M07.A 42.79792 N -72.82255 W	Active Restoration Floodplain Restoration	Downstream of the town offices and fire department, the East Branch of the North River passes underneath a house. The opening at the house is a bankfull constriction (45%) and was filled with sediment and debris following T.S. Irene. The adjacent lawn is elevated and restricts access to the downstream floodplain.	The section of the house over the channel could be removed. The backyard of the house is sloped, potentially from fill used in the construction of the municipal complex. This filled area could be excavated to allow floodwaters to access the adjacent floodplain.	High	Low	Protect house and upstream areas from damage due to flooding or debris snagging and increase floodplain area and access to existing floodplain.	Moderate	Private Landowner, FEMA

East Branch of the North River Reach Location Map – Whitingham section



The reach segment designations on the map above are listed in the prior project identification table.

Implementation of Mitigation Actions / Capabilities

Barriers to Implementation:

1. Financial constraints of town budget
2. Large aging population
3. Limited staff at town level

4. Emergency staff (EMD) is primarily volunteer – though they function well, reliance upon all volunteers can be risky
5. Small population means limited tax base. There is about 19% of land in Whitingham that is enrolled in current use program (which is a very low tax rate per acre)
6. Not a lot of industry or second home owners that add to the tax base, and all land in conservation zone is permanently preserved, so development opportunities are limited.
7. Whitingham does not currently regulate development in the River Corridor, which limits control of this hazardous area.
8. Limited emergency response training for town staff and volunteers.
9. Grant writing capacity is limited. Grant process is cumbersome without full time assistance.
10. No designated assistance organization for the town elders.
11. There is no Conservation Commission in town.

Capabilities to build upon for implementation:

1. The population is close knit and looks out for each other. There are two churches, a Lions Club and senior meals. The vulnerable population list is updated yearly by the town with assistance from these organizations. The senior meals are held twice a week in the Municipal Center. This provides support for needy residents. EMD would check in on them, with assistance from the Road Commissioner and the Fire Department.
2. Active Selectboard
3. Active Planning Commission
4. Two full-time town employee positions and one part-time, engaged employees
5. Six full-time Road Crew employees
6. Well-functioning EOC
7. Dedicated EMD to carry out emergency planning projects for the Town
8. Windham Regional Commission assistance when needed
9. Floodplain ordinance in place. Town could update floodplain ordinance to include River Corridors and/or more restrictive standards.
10. Zoning Board of Appeals
11. Residents are generally the hearty and self-sufficient type.

Recognizing that there is no place that doesn't have barriers to overcome in project implementation, Whitingham should focus on engaging around emergency management at the town level. There are a limited number of committed volunteers and staff who make this town function well. They are invested and plan to remain in the area. The Town has a hard time recruiting new volunteers. Whitingham is not struggling financially, though they have a limited real estate tax base because they have a small population. They are located on two major travel corridors of the region, yet most residents live on back dirt roads that can be difficult to access during certain times of the year. This lends to a "do it yourself" mentality that serves Whitingham positively. Their vulnerable transportation routes could increase vulnerability during a major event. The vulnerability of Jacksonville to flooding is an ongoing concern that needs to be addressed.

The town looks to and works closely with the Windham Regional Commission. They look to the Regional Plan policies for guidance on land use decisions which influence their town plan policies and goals. The town works closely with VT Department of Environmental Conservation Agency of Natural Resources and the Army Corps of Engineers when mitigating any work in streams or rivers. Additionally, the town adopts the latest VTtrans Road Standards for road/culvert/bridge improvement projects. With the support of these agencies and the

Commission, Whitingham is capable of carrying out all of the mitigation actions outlined in this plan.

Existing Planning Mechanisms / Integration

The following policies, programs and activities related to hazard mitigation are currently in place and/or being implemented in the Town of Whitingham. The Hazard Mitigation Planning participants analyzed these programs for their effectiveness and noted improvements needed. Whitingham uses all of the tools listed below to help plan for current and future activities with the town. For example: the Local Emergency Operation 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. Town Road and Bridge Standards are followed by the town and Whitingham completed their last culvert inventory in 2004. In the development of this plan, the latest 2018 draft Town Plan was used.

As Whitingham goes through the update process for the planning mechanisms outlined in the table below, they 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. They have agreed to this. The Local Emergency Operations Plan contact list is 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 identified responsible party. 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.

Whitingham is updating the Town Plan currently, in part to address flood resiliency. The hazard mitigation plan will be considered and incorporated as appropriate. The LEOP is updated yearly and was updated last in 2018. Other mitigation/emergency planning related documents and their status are outlined in the below table:

Type of Existing Authority / Policy / Program / Action	Description	Effectiveness/Enforcement/ Hazard that is addressed	Gaps in Existing Protection/Improvements Needed
Town Plan	Plan for coordinated town-wide planning for land use, municipal facilities, etc.	Flood Resilience is addressed	Current draft Town Plan incorporates flood resiliency. Town Plan update being completed by Planning Commission with assistance from the Windham Regional Commission. Expected fall 2018.
Town Local Emergency Operation Plan	Municipal procedures for emergency response	Incident Command; Hazard Annexes included	LEOP and adopted by Town Select board in 2018; next LEOP should include all of the appendices. LEOP is completed by Town EMD and Selectboard Office.

Town of Whitingham, VT 62
Local Hazard Mitigation Plan

Type of Existing Authority / Policy / Program / Action	Description	Effectiveness/Enforcement/Hazard that is addressed	Gaps in Existing Protection/Improvements Needed
School Emergency Response Protocol	School procedures for emergency response	School Crisis Plan in place at the Twin Valley Middle High School	EMD should review the plans with the school administration; plan should continue to be routinely exercised with town participation.
LEPC 6 Hazardous Materials Plan	Procedures for hazmat emergency response at regional level	LEPC 6 has the plan	Continued involvement with the LEPC; LEPC should update their hazmat event plan.
Mutual Aid – Emergency Services	Agreement for regional coordinated emergency services	Keene (NH) Mutual Aid – written agreement/contract for Fire/Ambulance and HazMat	None identified
Mutual Aid – Public Works / Road Crew	This would address sharing of equipment or services between towns.	There are no formal agreements in place at this time. As needs arise towns help each other.	It would be beneficial for all towns to have formalized agreements in place before needs arise. Not having this creates unnecessary legwork during and following events. Whitingham doesn't have anything formalized, but towns help each other out.
Road Standards	Design and construction standards for roads and drainage systems	Adopted new VTrans Road Standards in 2013.	No gaps identified. Whitingham Road Crew will continue to comply with the most recent Town Road and Bridge standards set by VTrans.
Zoning Regulation	Regulates the division of land, standards for site access and utilities	Zoning in place, updated fairly often	Zoning was adopted in 2014 to be in compliance with the town plan. Next zoning update should include River Corridors.
Sewage Regulations	Regulates on-site sewage systems	State Regulations apply	None Identified
Flood Hazard Area Regulations	Regulates development in FEMA identified SFHAs	In zoning bylaw	Revised in 2007 to include new FEMA DFIRM's. Will be updated to include River Corridors.
National Flood Insurance Program (NFIP)	Provides ability for residents to acquire flood insurance	NFIP member since 1985	Further training for Floodplain Administrator recommended
Maintenance Programs	Bridge & Culvert Inventory	Updated in 2004	Town should update their culvert inventory.
Building Code	Regulates building construction standards	No building codes in place	NA
Wetland protection – VT Wetland Rules	Protected by 1990 Vermont Wetland Rules	Protection of environment, water resources, wildlife, biota	None identified

PLAN MAINTENANCE PROCESS

Monitoring and Updating the Plan – Yearly Review

Once the plan is approved and adopted, the EMD along with the Selectboard Office Administrator in Whitingham, along with interested and appointed volunteers and stakeholders, will continue to work with the Windham Regional Commission to monitor, evaluate, and update the plan throughout the next 5-year cycle. The plan will be reviewed annually before Town Meeting Day at a Selectboard meeting along with the review of the town's Local Emergency Operations Plan (LEOP). This meeting will allow town officials and the public to discuss the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects that can help mitigate future 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. Windham Regional Commission's emergency planner will assist the EMD along with the Selectboard Office Administrator in Whitingham with this review, as requested by the Town. Progress on actions will be kept track using a table that WRC will provide to the Town 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. To ensure that the plan remains current and relevant, it is important that it undergo a major update periodically as required in 44 CFR § 201.6(c)(4)(i). This update process will be thorough and occur every five years. This update will include a thorough evaluation of the plan and incorporate any new requirements that FEMA has for Hazard Mitigation Plans. Participants outlined below will work with the Emergency Planner at the Windham Regional Commission (WRC) in accordance with the following procedure:

1. The Whitingham Selectboard will appoint a team to convene a meeting of the hazard mitigation planning committee. The town's Emergency Management Director will chair the committee, and other members should include local officials such as Selectboard members, fire chief, zoning administrator, road commissioner, Planning Commission members, health officer, interested stakeholders, etc. The Emergency Management Director will work with the Windham Regional Commission Emergency Planner and be the point person for the Town.
2. The WRC Emergency Planner will guide the Committee through the update process. This update process will include several advertised public meetings. At these meetings the Committee will use the existing plan and update as appropriately guided by the WRC Emergency Planner to address:
 - Update of hazard events and data gathered since the last plan update.
 - Changes in community and government processes, which are hazard-related and have occurred since the last review.
 - Changes in community growth and development trends and their effect on vulnerability.
 - Progress in implementation of plan initiatives and projects.
 - Incorporation of new mitigation initiatives and projects.

- Effectiveness of previously implemented initiatives and projects.
 - Evaluation of the plan for its effectiveness at achieving its stated purpose and goals.
 - 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.
 - Evaluation of hazard-related public policies, initiatives and projects.
 - How mitigation strategy has been incorporated into other planning mechanisms
 - Review and discussion of the effectiveness of public and private sector coordination and cooperation.
 - Impacts of climate change and how the local environment is changing due to climate impacts
3. From the information gathered at these meetings, and other interactions the Emergency Planner has with the Town, along with data collected independently during research for the update, the WRC Emergency Planner will prepare the updated draft in conformance with the latest FEMA Region 1 *Local Hazard Mitigation Plan Review Crosswalk* document.
 4. The Selectboard will review the draft report. Consensus will be reached on changes to the draft. Emphasis in plan updates will be put on critically looking at how the plan can become more effective at achieving its stated purpose and goals.
 5. Changes will be incorporated into the Plan by the WRC Emergency Planner.
 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 provide comments both electronically and in hard copy. The draft plan will simultaneously be distributed electronically to adjacent towns for review and comment.
 7. Public and adjacent town comments will be incorporated by the WRC Emergency Planner. The final draft will be provided to the Emergency Management Director, and interested individuals that participated in the update, for final review and comment, with review comments provided to the Committee and incorporated into the plan.
 8. WRC Emergency Planner will finalize the plan with any remaining comments from the Emergency Management Director and others, and submit electronically to DEMHS and FEMA.
 9. The Plan will be reviewed by the DEMHS State Hazard Mitigation Officer (SHMO) and FEMA Region 1.
 10. SHMO and FEMA comments will be addressed in the plan by the WRC Emergency Planner.
 11. The plan will be resubmitted as needed until the plan is approved pending adoption. Once the plan is approved by 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 the WRC Emergency Planner to DEMHS and FEMA.
14. FEMA will issue final approval of the adopted plan and the five year clock will begin again.

Post-Disaster Review/Update Procedure

Should a declared disaster occur, a special review will occur amongst the Selectboard, the Emergency Management Director, the WRC Emergency Planner, 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.

Continued Public Participation

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

- Provide hazard mitigation information at Town Meeting
- Schedule and advertise a planning meeting each year, soon after Town Meeting
- Seeking participation from key players in addition to general public interest:
 - Selectboard
 - Planning Commission
 - Public Works
 - School

- Fire & Rescue
 - Emergency Management/ 911 Coordinator
- Post the hazard mitigation plan on the town website
- Selectboard will review past hazard mitigation committee members and consider whether new members should be added. Representatives of local businesses, nonprofits, academia, etc. should especially be considered.
- Notify the public of committee meetings through town bulletin board, website, newspaper, Facebook, etc.

APPENDIX

1. Adoption Certificate
2. Website advertisement for Draft Hazard Mitigation Plan (posted 8/24/18-9/14/18)
3. Email sent to adjacent towns for public comment on the draft plan and comments back.
4. Flyer advertising availability of Draft Hazard Mitigation Plan for public comment
5. Email sent 8/8/18 to town staff and Hazard Mitigation Planning Committee for review of the draft
6. Response received from 8/8/18 comment solicitation from town and Hazard Mitigation Planning Committee on the draft plan
7. Website advertisement for October 18, 2017 Hazard Mitigation Committee meeting at Whitingham Municipal Center
8. October 18, 2017 Hazard Mitigation Committee meeting sign-in sheet
9. October 18, 2017 Meeting agenda
10. October 18, 2017 Meeting flyer that was posted around town

Certificate of Adoption
Town of Whitingham, VT
Selectboard

**A Resolution Adopting the Local Hazard Mitigation Plan
for the Town of Whitingham, VT**

WHEREAS, the Town of Whitingham, VT has worked with the Windham Regional Commission to identify natural hazards, analyze past and potential future damages due to natural disasters, and identify strategies for mitigating future damages; and

WHEREAS, The Town of Whitingham, VT Local Hazard Mitigation Plan analyzes natural hazards and assesses risks within the community; and

WHEREAS, the Town of Whitingham, VT Local Hazard Mitigation Plan recommends the implementation of action(s) specific to the community to mitigate against damage from natural hazard events; and

WHEREAS, the Town of Whitingham, VT authorizes responsible agencies to execute their responsibilities to implement this plan for the purposes of long term risk reduction and increased community resiliency and;

WHEREAS, the Town of Whitingham, VT will follow the Plan Maintenance Process outlined in this plan to assure that the plan stays up to date and compliant; and

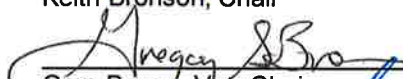
NOW, THEREFORE BE IT RESOLVED that the Town of Whitingham, VT adopts the *Town of Whitingham Local Hazard Mitigation Plan* as well as future revisions and maintenance required by 44 CFR 201.6 and FEMA for a period of five (5) years from the date of this resolution.

Duly adopted this 7th day of November, 2018
date month, year

Selectboard




Keith Bronson, Chair



Greg Brown, Vice Chair



Allan Twitchell

Karl Twitchell


Robin Kingsley

ATTEST



Gig Zboray, Assistant to Selectboard

2. Website advertisement for Draft Hazard Mitigation Plan (posted 8/24/18-9/14/18)

townofwhitingham-vt.org

TOWN OF WHITINGHAM, VERMONT
Village of Jacksonville

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EVENTS AND HAPPENINGS

Hazard Mitigation Plan draft for public review

The draft Whitingham Hazard Mitigation Plan is available for public review at the Whitingham Town Clerk's Office (link...)

TOWN OF WHITINGHAM, VERMONT
Village of Jacksonville

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Hazard Mitigation Plan draft for public review

The draft Whitingham Hazard Mitigation Plan is available for public review at the Whitingham Town Clerk's Office ([link here](#)).

The Plan will be available for comment until the end of the public comment period on September 14, 2018.


Anyone who would like to comment on the plan should contact Alyssa Sabetto at the Windham Regional Commission at (802) 257-4547 x113 or via email at asabetto@windhamregional.org.

We encourage your review and participation.

Date and time:
September 14, 2018 (All day)


Calendar:
[Events & Happenings](#)
[Town Calendar](#)

3. Email sent to adjacent towns for public comment on the draft plan

 Wed 8/22/2018 1:15 PM
Alyssa Sabetto <asabetto@windhamregional.org>
Draft Whitingham Local Hazard Mitigation Plan for your review and comment by 9/14/18

To readsto@gmail.com; admin@readsborovt.org; readsboroselectboard@gmail.com; bailesm@myfairpoint.net; canangel15@hotmail.com; 'Jessica DeFrancesco'; stucker@wilmingtonvt.us; cohson@wilmingtonvt.us; tftzgerald@wilmingtonvt.us; 'Scott Moore'; 'Robbin Gabriel'; peggyrafushalifaxemd@gmail.com; townclerk@townofheath.org; admin@rowe-ma.gov

Cc gig@whitinghamvt.org; 'Alyssa Sabetto'; jaelburnell@yahoo.com; krisswe1@msn.com

 Whitingham_Haz Mit P...
7 MB

Hello towns adjacent to Whitingham,


Attached please find a draft of the Whitingham Hazard Mitigation Plan. I have recently worked on finalizing and updating this draft plan with the help of the town. It is now being sent to you for your review and comment, per FEMA requirements. Please share with your Planning Commission and Selectboard. **Please review and provide comment back to me by September 14th, 2018.** My contact information is shown below.

I would appreciate you letting me know that you have reviewed the draft, even if you do not have comment.


I appreciate your time and assistance in this matter. If you have any questions, please let me know.

Thank you,
Alyssa

Alyssa Sabetto, CFM
Planner
Windham Regional Commission

 Thu 9/13/2018 2:02 PM
Robbin Gabriel <halifaxsecretary@gmail.com>
Re: Draft Whitingham Local Hazard Mitigation Plan for your review and comment by 9/14/18


To Alyssa Sabetto

 You replied to this message on 9/13/2018 2:14 PM.


Hello Alyssa--

Thank you for forwarding Whitingham's LHMP, which I shared with the Halifax Selectboard. The Board has asked me to let you know they have no comments to contribute.

Regards,
Robbin

 Wed 8/22/2018 2:20 PM
Town Administrator <admin@rowe-ma.gov>
RE: Draft Whitingham Local Hazard Mitigation Plan for your review and comment by 9/14/18

To 'Alyssa Sabetto'

 You replied to this message on 8/22/2018 3:46 PM.

Hi Alyssa,

I will forward to the Select Board and Planning Board.
Thank you,

Janice Boudreau
Executive Secretary
Town of Rowe

4. Flyer advertising availability of Draft Hazard Mitigation Plan for public comment

Whitingham Hazard Mitigation Plan

PUBLIC COMMENT PERIOD

The draft Whitingham Hazard Mitigation Plan is now available for public review at the Whitingham Town Office and on the town website: www.townofwhitingham-vt.org




The Plan will be available for comment until the end of the public comment period on September 14, 2018.

Anyone who would like to comment on the plan should contact Alyssa Sabetto at the Windham Regional Commission. She can be reached via phone at 802-257-4547 x113 or email at asabetto@windhamregional.org. We encourage your review and participation!


5. Email sent 8/8/18 to town staff and Hazard Mitigation Planning Committee for review of the draft

Wed 8/8/2018 11:29 AM

 Alyssa Sabetto <asabetto@windhamregional.org>
Draft Whitingham Local Hazard Mitigation Plan for internal town comment by August 22

To whitingham1@yahoo.com; gig@whitinghamvt.org; almira@whitinghamvt.org; selectboard@whitinghamvt.org; jaelburnell@yahoo.com; krisswe1@msn.com; sbkbronson@hotmail.com; brogre77@yahoo.com; sbatwitche@aol.com; ktsericerepair@yahoo.com; sbrkingsley@yahoo.com; yman11@myfairpoint.net; linda.donaghue@gmail.com; peter@barus.com; phil.edelstein@yahoo.com; kbree012@gmail.com; marylee@whitinghamvt.org; woody82a@gmail.com; hwy@whitinghamvt.org

Cc 'Alyssa Sabetto'

 Whitingham_Haz Mit P...
6 MB

Greetings Whitingham,

Attached is the first draft of the Whitingham Local Hazard Mitigation Plan. **This draft is just being passed around at this point for internal town review and is not yet out for public comment. Please review the attached draft and provide comment back to me by August 22nd.** I'll incorporate comments and then put the plan out for public comment. If you have any pictures of flooding/fluvial erosion events in Whitingham or invasive plants or insects in Whitingham, please get them to me ASAP, so I can incorporate them. You can call me with comments or email me back a list of comments.

Please note that the yellow highlighted sections of the plan are not yet completed for Whitingham and are awaiting further information.

Gig – If there is anyone that is not getting this email that should, please forward it on to them.

Thank you,
Alyssa

Alyssa Sabetto, CFM
Planner
Windham Regional Commission

6. Response received from 8/8/18 comment solicitation from town and Hazard Mitigation Planning Committee on the draft plan

Sat 8/18/2018 3:02 PM

 gig@whitinghamvt.org
Hmp

To asabetto@windhamregional.org

 You replied to this message on 8/20/2018 3:26 PM.



Hi, I finished reading the hazard mitigation plan. I put a draft with notsitions in the mail to you. Here are photos of Japanese knotweed in front of the whitingham municipal center.

7. Website advertisement for October 18, 2017 Hazard Mitigation Committee meeting at Whitingham Municipal Center

The screenshot shows a web browser window with the URL www.townofwhitingham-vt.org/hazard-mitigation-planning-meeting. The page header features the text "TOWN OF WHITINGHAM, VERMONT" and "Village of Jacksonville". A navigation menu includes links for Home, Municipal Calendar, Town Directory, About Whitingham, Businesses, Town Depts, and Visiting Us. A left sidebar contains sections for "VISIT US" (Photos and Video, History, Events and Happenings, Library), "OUR TOWN" (About Whitingham, Town Directory, Business Directory, Civic Organizations), and "CONTACT US" (Contact Whitingham). The main content area displays a breadcrumb "Home >" followed by the heading "Hazard Mitigation Planning Meeting". The announcement text reads: "Come help create Whitingham's Local Hazard Mitigation Plan on Wednesday, **October 18, 2017 from 6-8:30pm** in the Whitingham Municipal Center, 2948 VT Route 100, Jacksonville, VT. We will compile a list of specific hazards the Town faces and what actions can be taken to lower our vulnerability. All are welcome! See flyer attached." Below this, the "Date and time:" is listed as "October 18, 2017 6:00 PM". The "Additional Information:" section includes a PDF link: "Hazard Mitigation Planning meeting flyer 10.18.17.pdf". The "Location:" is "Whitingham Municipal Center, 2948 VT Route 100, 05342 Jacksonville, VT". The "Calendar:" section includes links for "Events & Happenings" and "Town Calendar".

8. October 18, 2017 Hazard Mitigation Committee meeting sign-in sheet

Whitingham, VT - HAZARD MITIGATION PLAN UPDATE MEETING

October 18, 2017

Location: Whitingham Town Office

SIGN IN SHEET

Name and email address	Affiliations – Please list all	Town where you live
Karl Witte II ktservice@earthlink.net	select Board	Whitingham
KEITH BRONSON BBINCO@HOTMAIL.COM	SELECT BOARD	WHITINGHAM
Stanley Janovsky stanjan@publicworks.org	ROAD COMMISSIONER	Whitingham
Gig Zboray Gig@whitinghamvt.org	SB office admin/ZA	Rdsb.
Robin Kingsley sbrkingsley@yahoo.com	Selectboard	Whitingham

9. October 18, 2017 Meeting agenda

**Whitingham Hazard Mitigation Plan &
Community Resiliency Meeting**
Whitingham Selectboard Office – October 18, 2017

Agenda

1. Introduce the Hazard Mitigation Plan

- a) Purpose
- b) Process
- c) Review of past involvement

2. Hazards

- a) Complete Hazard Ranking Table
- b) Discuss events that have happened that should be included in the plan
- c) Mapping of vulnerable areas – mark up map as a group

3. Mitigation Actions

- a) Review and update Mitigation Goals
- b) Review Mitigation Actions table developed by Whitingham in 2012
- c) Discuss progress made since the plan was last worked on
- d) Discuss Existing Hazard Mitigation Projects, Programs & Activities
- e) Update Mitigation Actions Table
- f) Gaps and capabilities with Implementation

4. Other Updates

- a) Development trends – new developments, upcoming developments
- b) Review of other elements of the draft plan and questions that weren't discussed

5. Next Steps

10. October 18, 2017 Meeting flyer that was posted around town

Whitingham Hazard Mitigation / Resiliency Plan Public Meeting Announcement



Date: Wednesday, October 18, 2017

Time: 6:00-8:30 PM

Location: Whitingham Town Office, 2948 VT-100,
Jacksonville, VT 05342

Come help create Whitingham's Local Hazard Mitigation Plan! What hazards does the town face? What actions can the town take now to lower vulnerability before the next natural hazard strikes?

For more information contact
Alyssa Sabetto at 802-257-4547 x113

