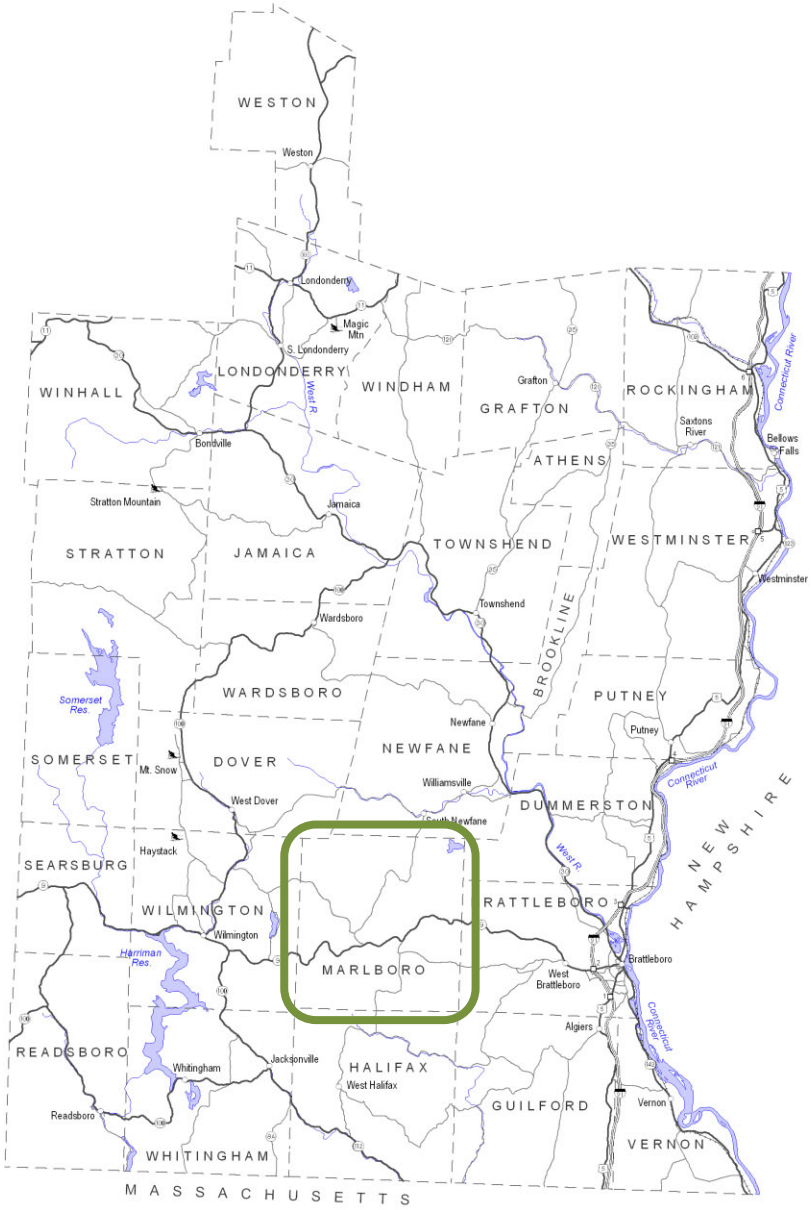
Town of Marlboro
Local Hazard Mitigation Plan



Adopted October 27, 2016
FEMA Final Approved November 29, 2016

Prepared for the Town of Marlboro
By the
Windham Regional Commission

WINDHAM REGIONAL COMMISSION

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INTRODUCTION AND PURPOSE

This Single Jurisdiction Hazard Mitigation Plan is AN UPDATE to a prior hazard mitigation plan approved by FEMA and adopted by the Town of Marlboro.

The purpose of this plan is to assist the Town of Marlboro in identifying all of the hazards facing the town and to identify new and continuing strategies to reduce risks from identified hazards.

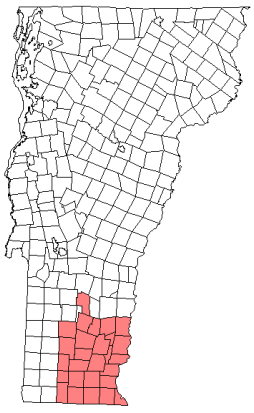
Hazard mitigation is any sustained action that reduces or eliminates risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and state agencies have come to recognize that it is less expensive to prevent damage 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

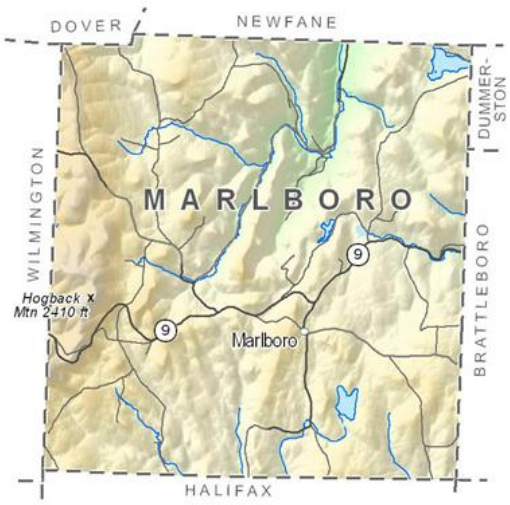
Situated in Vermont's southeastern corner, the Windham Region consists of 23 towns in Windham County, the neighboring towns of Readsboro, Searsburg, and Winhall in Bennington County, and Weston in Windsor County. The region is bordered by Massachusetts to the south and New Hampshire to the east. At over 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.

MARLBORO GEOGRAPHY & TOWN PROFILE



The Town of Marlboro is a rural Southern Vermont hill town of 26,240 acres or 41 square miles in the eastern foothills of the Green Mountains in Windham County. Marlboro is bordered to the north by Newfane and Dover, to the west by Wilmington, Halifax to the south, and Brattleboro and Dummerston to the east. State Route 9 runs east west through Marlboro, passing over Hogback Mountain which is a regionally significant viewpoint known as the "100 mile view".

Marlboro is characterized by a centrally located historic village surrounded by predominantly low-intensity rural residential development, scattered along winding secondary roads, most of which are narrow, unpaved, and often highly scenic. Much of the off-road back-lands have remained undeveloped since the middle of the nineteenth century. The most intensive use of land occurs at Marlboro College and the Marlboro School of Music, located two miles south of the village. Marlboro does not have public water or sewer service, which limits the scale of development that can locate in the town. This suits the town just fine as they wish to remain rural. There are no large businesses in Marlboro and there are a number of small home-based businesses, which the town supports. Forest-related land use is very significant as a category of land use, agricultural land use accounts for very little of the total area. Residential land use is the largest category of land use. Commercial and industrial land use is almost entirely limited to the Route 9 corridor.

The majority of the landscape of Marlboro is forest land. With a few exceptions, the off-road back-lands have remained predominantly undeveloped since the middle of the nineteenth century.


View from fire tower on Hogback Mountain

The largest bodies of surface water in Marlboro are South Pond, 68 acres, and Sunset Lake/North Pond, 95 acres. There are also several brooks, including Gulf, Worden, Bellows, Branch, Harrisville, Hinesburg and Whetstone Brooks. The watersheds are 1) the Rock River, 2) the Deerfield River, 3)the North River, 4) the Green River, 5) the Whetstone Brook, and 6) Stickney Brook. The highest point in Marlboro is Hogback Mountain at approximately 2,400 feet.

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.

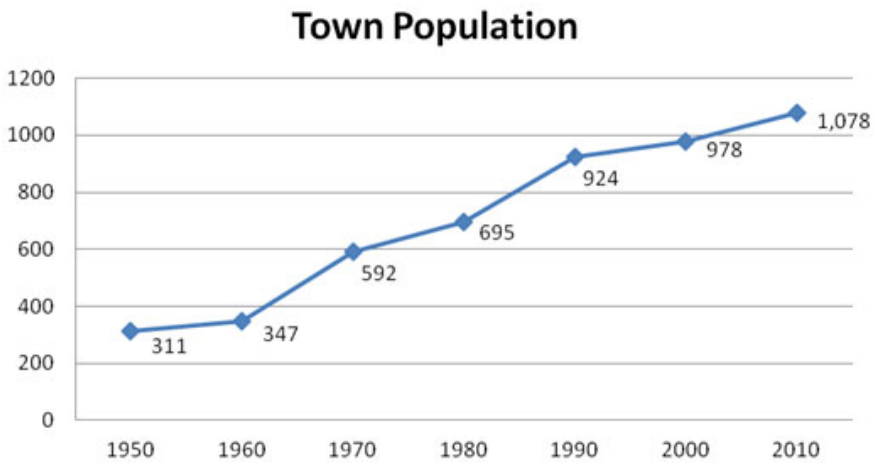
Development Trends

The student population continues to influence the population and economics of the Town. According to the 2010 census, 862 individuals were living in households and 216 in "group quarters", or on-campus college housing. Roughly 20% of the population of Marlboro is college students.

As the following table and graph show, Marlboro has been gaining population in recent years. Between 2000 and 2010, population increased 10% in Marlboro, which is a higher increase than any of the surrounding towns.

Population Trends in Surrounding Towns

Town	1990	2000	2010	% Change 1990-2000	% Change 2000-2010
Marlboro	924	978	1,078	6%	10%
Halifax	588	782	728	33%	-7%
Dover	994	1,410	1,124	42%	-20%
Brattleboro	12,241	12,005	12,046	-2%	0.3%
Newfane	1,019	1,149	1,232	13%	7%
Wilmington	1,968	2,225	1,876	13%	-16%
Dummerston	1,863	1,915	1,864	3%	-3%



Marlboro's population growth has been affected by several factors. Good highway access has made it possible for those working in nearby, more populated areas to live in rural Marlboro. The excellent reputation of the Marlboro Elementary School has attracted families from surrounding communities. In addition, many of Marlboro's formerly seasonal residents have chosen to reside here. Finally, the presence of Marlboro College and the Marlboro School of Music together draw students and visitors, some of whom become new permanent residents. These trends are expected to continue.[1]

Emergency Services

Marlboro is served by the Marlboro Volunteer Fire Company, a private, non-profit organization that operates solely through contributions of time and money. There are currently 12 volunteers (8 active) that run the Fire Company. Given the constraints imposed by this type of support it has neither the financial nor the human resources to provide the level of fire protection that would be required by large-scale development. Marlboro Volunteer Fire Company (MVFC) aims to be the first to arrive on the scene in emergencies: medical calls and motor vehicle accidents comprise the vast majority of responses. MVFC

[1] 2013 Marlboro Town Plan < http://windhamregional.org/images/docs/towns/Marlboro/Marlboro_TownPlan_2013-10-10.pdf>

is a member of Deerfield Valley Fire Mutual Aid and Windham County Firefighters, and is dispatched by Southwestern New Hampshire Mutual Aid. MVFC is operated by a Board of Trustees, as well as the Fire Chief, an Assistant Fire Chief, and officers. MVFC makes all efforts to recruit volunteer fire-fighting personnel to protect Marlboro residents. Members attend training courses sponsored by Vermont Fire Academy and the various mutual aid associations. The Fire Company has been granted a Class C rating by the Vermont Fire Underwriters. The firehouse, located on South Road ½ mile south of the village.[2]

Police protection is provided by the Vermont State Police and the police departments of surrounding towns. The Windham County Sheriff's Department is contracted to provide services on a part-time basis.

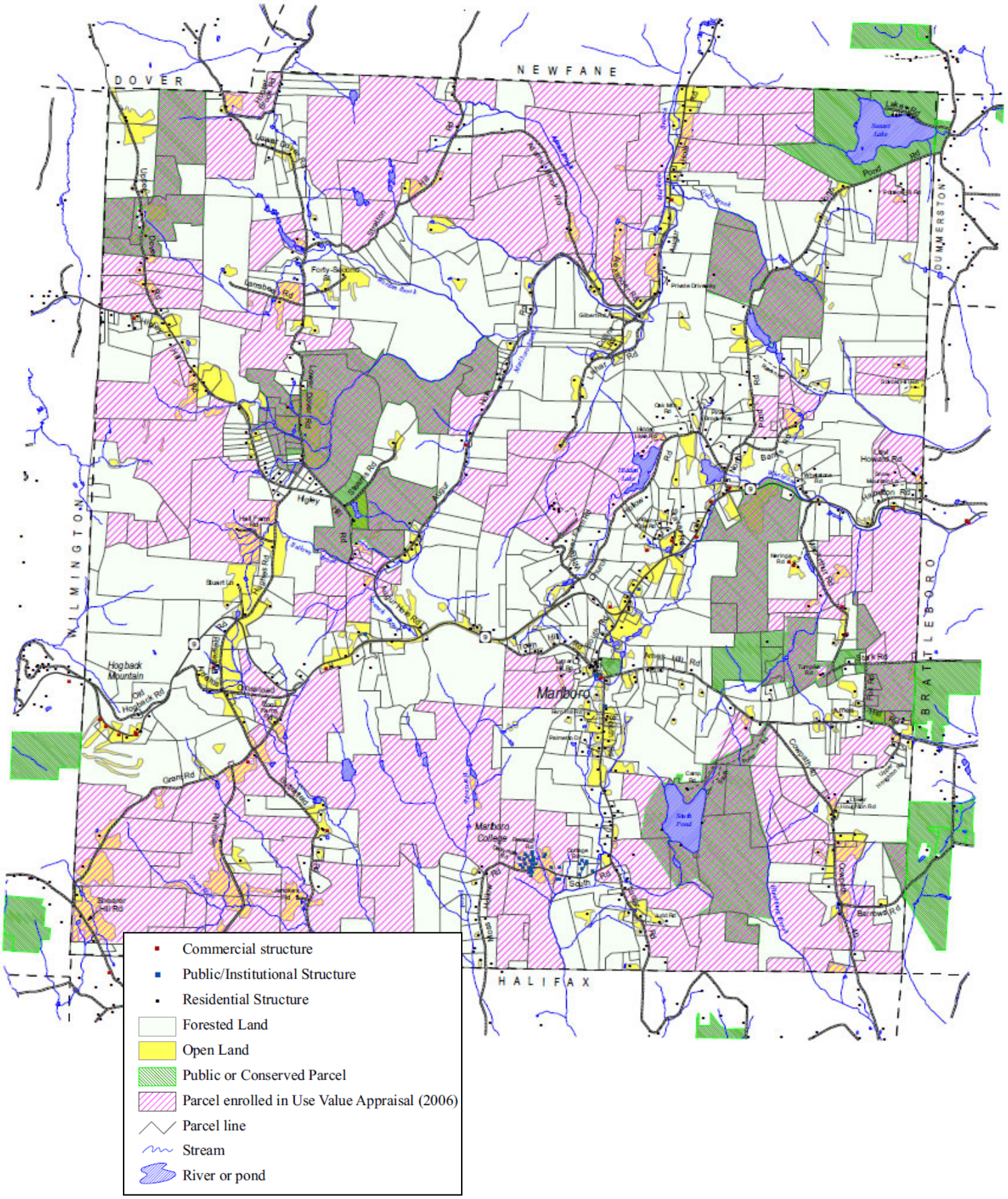
Marlboro Elementary School is the only designated emergency shelter in Marlboro and it is run by the volunteers of Marlboro Alliance. The town would like to get Marlboro College to also be an emergency shelter, but that has not yet happened. For EMS, Rescue Inc. serves the east of the town and Deerfield Valley Rescue serves the western half, the Marlboro Fire Company has seven certified first responders. Additional ambulances and rescue vehicles are available on call from Deerfield Valley Rescue, Inc. in Wilmington, Rescue, Inc. in Brattleboro, and through Mutual Aid Dispatch. The nearest clinics to Marlboro are the Deerfield Valley Campus of the Southwestern Vermont Medical Center and an office of the Windham County Mental Health Clinic in Wilmington, seven miles west from Marlboro's center. The nearest hospitals are Brattleboro Memorial in Brattleboro, Grace Cottage in Townshend, the Southwestern Vermont Medical Center in Bennington, and Dartmouth-Hitchcock Medical Center in Keene, NH, (Cheshire Medical Center) and Lebanon, NH.

There is a lack of cell coverage for much of the town which makes it difficult to get emergency help if needed, depending on where you are. This is a concern for the town and opportunities to remedy it should be seriously considered.

The Road Crew with assistance from some local contractors fashioned an old oil tank to serve as a temporary culvert at Bridge 10 so that Augur Hole Road could be re-opened after TS Irene in 2011. Local ingenuity and a can-do attitude helped Marlboro recover after the devastation. Photo courtesy of Forrest Holzapfel

[2] Town of Marlboro 2013 Town Plan

Existing Land Use Map from the 2008/2013 Marlboro Town Plan



PLANNING PROCESS

Town residents who took part in the planning process for developing the Local Hazard Mitigation Plan for Marlboro 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 AN UPDATE to a prior hazard mitigation plan approved by FEMA and adopted by the Town of Marlboro.

Past Plan

During 2007, Marlboro worked with Windham Regional Commission staff to develop a hazard mitigation plan, which was approved by FEMA and adopted in September 2007. That plan has since expired. This plan update will address progress made on the mitigation actions from the expired 2007 hazard mitigation plan. Between 2007 and present day, the mitigation plan was not updated. Thus, this plan takes what it can from the 2007 plan but is also a significant update from that previous document.

Current Process

The Town commenced the planning process in September 2015. Alyssa Sabetto, Emergency Planner for the Windham Regional Commission, worked with EMD Mike Andreotta to set up a meeting of a hazard mitigation planning committee. The Hazard Mitigation Planning participants later convened on September 22, 2015 at the Marlboro Elementary School and met with Alyssa. Mike invited these attendees directly, and they formed the core planning team. The meeting was also advertised and open to the public.[3] 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

[3] See appendices 8 and 9 for sign in sheet and meeting agenda.

- 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 expired 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 September 22, 2015 meeting, along with follow-up information gathered in several conversations with the Road Foreman, Town Clerk, former Marlboro EMD, Selectboard Chair, Town Treasurer, and Conservation Committee Chair, 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 March 24, 2016. This internal town review period was from March 24-April 4. Comments, corrections, pictures and some additional information was received back from Mike Andreotta, Lisa Hecht, Forrest Holzapfel, and Dave Emery. Alyssa added pictures, and made the revisions and corrections to finalize the draft for public comment. The public comment draft plan was brought up at the April 12, 2016 Planning Commission meeting. The Planning Commission decided to review the plan individually and offer comment by April 25, 2016.

The revised draft plan was put out for public comment on April 11, 2016. 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. No comments were received from the public during the over two week comment period. It was simultaneously distributed to the adjacent towns of: Brattleboro, Dummerston, Newfane, Dover, Wilmington, Guilford, Whitingham and Halifax for comment via email.[4] There were comments received from Brattleboro and they were incorporated. The plan was finalized by Alyssa Sabetto for submittal to VT Division of Emergency Management and Homeland Security (DEMHS). This submittal allows DEMHS to make suggested revisions on the draft, and allow 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:

Committee (2015)	Affiliations	Home
Mike Andreotta	Emergency Management Director	Marlboro
David Elliott	Marlboro Fire Chief Road Foreman	Marlboro
Bennett Grout	Marlboro Planning Commission	Marlboro
Ann Bartlett	Resident	Marlboro
Marcia Hamilton	Marlboro Emergency Management Team Selectboard Assistant	Marlboro
Matt Tell	Marlboro Planning Commission Chair	Marlboro
Pieter Van Loon	Marlboro Selectboard	Marlboro
Alyssa Sabetto	Planner, Windham Regional Commission	Brattleboro

Public Involvement and Input from Neighboring Communities

Making the Marlboro 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.[5]
- Between 2010 and mid 2014, the Marlboro 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 September 22, 2015 and was open to the public.

[4] See appendix 3 for reach-out and response.
[5] See appendix 7 for town website advertisement of August 20, 2015 meeting.

- The draft hazard mitigation plan was brought to the April 12th Planning Commission meeting for review and comment by the Planning Commission members and the public.
- The draft plan was made available in hard copy for public review and comment at the town office from April 11, 2016 through April 25, 2016.
- A draft of the plan was posted from April 11, 2016 through April 25, 2016 on the town website and Front Porch Forum for public comment.[6]
- Flyers were put up around town for public comment on the draft.[7]
- On April 7, 2016, an invitation was extended via email to neighboring towns to provide a means and opportunity to review and comment on the draft Marlboro Hazard Mitigation Plan.[8] One response was received back from the Zoning Administrator in Brattleboro.[9] 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 affects 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
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

[6] See appendix 2.
[7] See appendix 4.
[8] See appendix 3.
[9] See appendix 3 for response from the Town of Brattleboro.

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 September 22, 2015 Hazard Mitigation Plan meeting. There was also a review of what was developed in 2007; 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 Marlboro 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 Marlboro has decided are pertinent to their community and they have chosen to mitigate for at this time, which are Flooding and Fluvial Erosion. Though fluvial erosion is caused by flooding events, the impacts are significantly different than the impacts of flooding, so the town wishes to address them separately. 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	2	10	Ice storms can be severe and with power outages during the winter can be prolonged and problematic.
Highway Accidents	4	4	2	10	Route 9 is a major east/west thoroughfare. Highway accidents on Route 9 are fairly frequent.
Structure Fire	2	4	2	8	
School Safety Issues	1	4	3	8	Schools have crisis plans in place.
Air crash	1	4	3	8	Marlboro lies under the flight path of the Hermitage airport. This airport is seeking to expand and become a regional airport, which would increase air traffic and the potential for air crashes.
Terrorism	1	4	3	8	
Hazardous material spill	2	4	2	8	Route 9 is a major east/west thoroughfare. Hazardous chemicals are moved through this corridor routinely and the town does not get notification when that occurs. Most of the spills in Marlboro have been fuel spills associated with vehicular accidents. There was a fuel spill at Golden Eagle gas station in recent years.

Possible Hazard	Probability of Future Events	Warning Time	Potential Impact	Score	Most vulnerable facilities and populations
Fluvial Erosion	4	1	3	8	Most of the issues in Marlboro are gradual erosion events located on state or private land. Augur Hole Road has significant fluvial erosion.
Invasive Species / Infestation	4	1	3	8	Problem species in Marlboro include Japanese knotweed, Hemlock wooly adelgid, Emerald ash borer (not confirmed), Asian long horned beetle (not present but a threat), glossy buckthorn (around South Pond), purple loosestrife, cow parsley, and garlic mustard.[10] There are more and more invasive plants moving up along roadways and waterways from lowland areas.
High Wind	3	2	2	7	Ridgetops are especially vulnerable.
Tornado/Microburst	2	3	2	7	Top of Higly Hill and Stratton Road were two events in 1980's and early 90's. Microbursts do sometimes occur in various spots in town.
Winter & Ice Storm	4	1	2	7	East facing higher elevation slopes most vulnerable.
Wildfire	2	4	1	7	Ice storms can leave debris that can increase vulnerability of woodland areas.
Extreme Cold	4	1	2	7	Vulnerable populations and those with only electric heat are most at risk.
Water Supply Contamination	2	4	1	7	Only public water supplies are at Camp Neringa and Marlboro College.
Beaver dams	4	1	2	7	Issues on Grant Road, Adams Cross Road, and Higly Hill Road, North Pond, etc. The town highway department is having to clean out dams every week. Plugging culverts is the problem; beaver dam break flooding has taken out part of Augur Hole Road in the past. Older dams are the concern.
Earthquake	1	4	1	6	The region does lie on a fault line. Earthquakes are very rare. There was a small earthquake in 2009.
Hurricane	2	1	3	6	One occurred in 1985 and another in 1988.
Radiological Incident	1	1	4	6	VY is shutdown, though fuel is still stored on site.
Disease Outbreak	2	1	3	6	Marlboro ranks among the lowest in the state for vaccination rate in children.[11]
Flood	2	1	2	5	Augur Hole Road, Butterfield Road and portions of Route 9 do get flooded. Marlboro is in the headwaters, though, so most flooding occurs downstream in other towns around.

[10] This list is not exhaustive. Species were noted by Hazard Mitigation Plan participants at the September 22, 2015 public meeting.
[11] Vermont Department of Health, 2013-14 rates, <healthvermont.gov/hc/imm/documents/school_imm_data_aggregate_alpha_2013-2014.xls>

Possible Hazard	Probability of Future Events	Warning Time	Potential Impact	Score	Most vulnerable facilities and populations
Ice Jams	2	1	2	5	Branch Brook along Augur Hole and Whetstone Brook along Route 9 east of McArthur Road are two vulnerable spots. In the past, temporary road shutdowns from ice jam flooding have occurred on Route 9.
Drought	3	1	1	5	No major farms in town.
Hail Storm	2	1	1	4	
Dam Failure	1	1	2	4	Neringa dam (privately owned) and Mill Pond (town owned). Both dams are regularly maintained and inspected. Route 9 corridor is most vulnerable from Mill Pond dam failure. Mill Pond dam is a high hazard dam built in the early 1970's primarily for beaver control. Sunset Lake dam is technically in Dummerston, though Sunset Lake is in Marlboro. Most damage and flooding would be downstream if Sunset Lake dam failed.
Landslide	1	1	1	3	Small slides along Augur Hole Road.
Extreme Heat	1	1	1	3	
Railroad Accidents	NA	NA	NA	0	There is no railroad in Marlboro.
Tsunami	NA	NA	NA	0	No coastline.
Volcano	NA	NA	NA	0	No volcanoes in or near Marlboro.

Though the above table shows vulnerability to some natural hazards, such as: tornado/microburst, high winds, wildfire, and winter/ice storms, extreme cold, and water supply contamination, Marlboro—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 beaver dams, Marlboro feels they have already mitigated this hazard as much as possible. Earthquake, hurricane, flood, ice jam, drought, landslide, extreme heat, tsunami and volcano are all low-ranking natural hazards, that Marlboro has low vulnerability for, or not applicable to Marlboro, according to the Hazard Mitigation Planning participants. Marlboro 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 Marlboro and VTrans. Marlboro does not currently have ways of mitigating for winter weather events or extreme cold other than what is currently being done, including having an emergency shelter with a generator heat source. Current methods are deemed adequate at this time, though the town may choose to address these hazards in the future.

Fluvial erosion after TS Irene, 2011, at "Long Corner" on Auger Hole Road. Photo courtesy of Forrest Holzapfel

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 two

highest ranking natural hazards affecting Marlboro.

Fluvial Erosion

Description and Impact

Marlboro is set at a higher elevation and as such is in the headwaters of the Green River, the Rock River and the Whetstone Brook. Headwater streams are generally smaller and have narrower floodplains than rivers in the flatter valley areas. Therefore, most of the destruction from flooding events in Marlboro is due to fluvial erosion rather than inundation, which is the type of flooding targeted through the NFIP. 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. Fluvial erosion hazard mapping was released by the VT Agency of Natural Resources in early December 2014. This mapping assists municipalities in identifying at risk areas and developing bylaws and effective mitigation strategies to regulate development within these fluvial erosion hazard zones. Marlboro does not currently have a fluvial erosion bylaw, but should consider developing one.

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 accompanies these events. Associated issues in Marlboro 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.

Geographic Area of Hazard/Location

In some instances stabilization/mitigation projects in Marlboro have helped. In other areas throughout Marlboro, issues remain. 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. There are several areas in Marlboro with fluvial erosion risks, primarily to roadways. During Tropical Storm Irene in September 2011, Route 9 was cut off from the Collision Center to the Brattleboro town line because of extensive fluvial erosion along the Whetstone Brook that took out the whole road (photos of the current fluvial erosion in this area are contained in the appendix of this plan). Butterfield Road and Augur Hole Road were also significantly damaged during TS Irene. Ames Hill Road, which is one of the only other alternate routes east, was cut down to a single lane because of fluvial erosion, but it was passable.

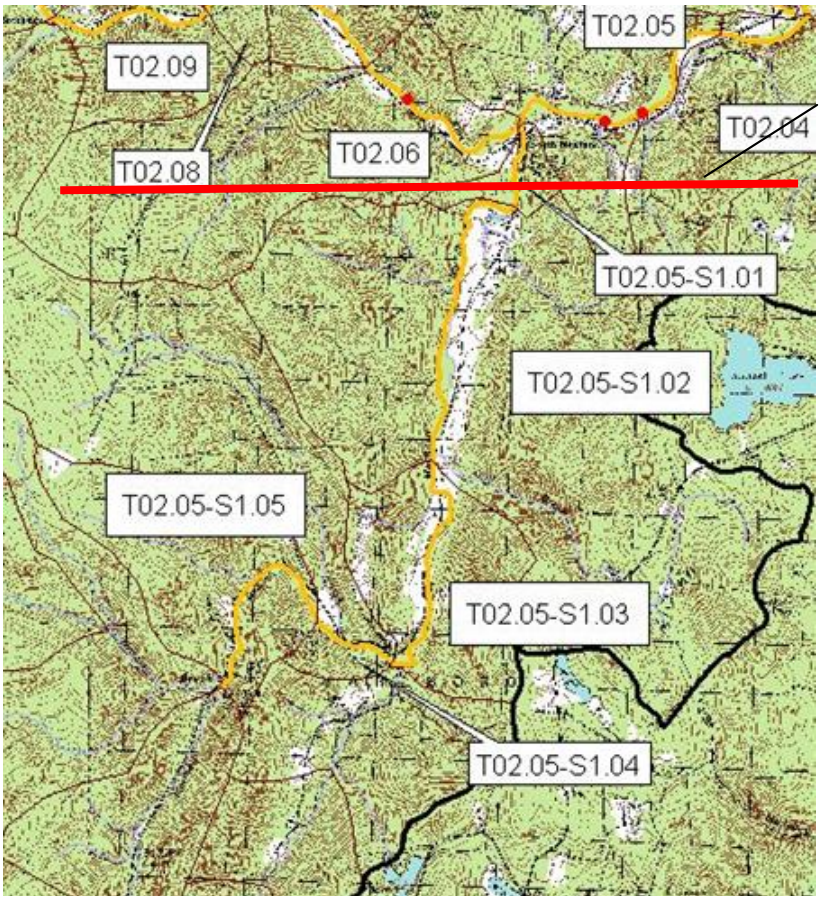
Fluvial erosion after TS Irene, 2011, at on Ames Hill Road. Photo courtesy of Lisa Hecht

There are two main areas of concern for fluvial erosion in Marlboro: (1) Auger Hole Road adjacent to the Marlboro Branch of the Rock River, and (2) Whetstone Brook along Route 9 for portions in the eastern part of town.

The smaller slides along the Auger Hole together contribute more debris and silt into the waterway than the larger slide on Worden Brook (photos of the current fluvial erosion on Worden Brook are contained in the appendix of this plan), which is discussed in the Extent section of the Fluvial Erosion discussion in this plan.

Marlboro Branch

The *Rock River Stream Geomorphic Assessment Phase 2 Report*[12] was reviewed for this hazard mitigation plan as it is an in depth analysis of an area where the town has expressed concern about fluvial erosion—areas of Auger Hole Road adjacent to the Marlboro Branch of the Rock River. The *Report* includes the headwaters of the Marlboro Branch, described in four segments[13].



This is roughly the Marlboro/Newfane town line. Four segments of the Marlboro Branch of the Rock River lie south of this line. They include: T02.05-S1.02, T02.05-S1.03, T02.05-S1.04, and T02.05-S1.05.

The *Rock River Stream Geomorphic Assessment Phase 2 Report* describes the four relevant segments this way[14] (general mitigation actions are bolded). Take note that the *Phase 2 Report* was completed in 2007. The bolded recommendations noted below were discussed for inclusion in this mitigation plan, and largely decided against because of changes that have occurred to the fluent river landscape since that time, particularly because of large scale events such as TS Irene in 2011. They are included here to incoroporate data between plans, and to give an idea of what past recommendations were before TS Irene altered the landscape and the river corridors.

T2.05-S1.02

[12] Landslide, Inc. – Rock River Phase 2 Stream Geomorphic Report May, 2007
[13] Stream reference map taken from Rock River Phase 2 Stream Geomorphic Report May, 2007
[14] The information here is only a portion of the Rock River Phase 2 Stream Geomorphic Report. More information about each of these areas, and the entire Rock River watershed is available in the full Report.

Located in the towns of Newfane and Marlboro, this reach is 1.6 miles long and is in a broad valley type. It is at the western base of the valley and there are numerous historic channels evident, many point bars and flood chutes and it has 3,288' of erosion and over 1,800' of old berms on one bank. There are multiple mass failures on the left bank and an active stream ford crosses the channel. The entire length of it has been straightened. The reference channel width is 46' and the current channel width is 70'.

A review of the historic topographic maps (see Appendix A) reveals that some time between 1935 and 1954 the river was moved toward the left valley wall in this reach. An old channel was noted near the left valley wall in some places during the assessment.

The stream is a C riffle pool type of stream by reference and is currently moderately entrenched and incised to an F stream type. It is in stage III of the F-stage channel evolution process with planform being the dominant adjustment process. Its geomorphic condition is fair and sensitivity is very high. The habitat condition was good. This stream is regaining sinuosity in response to wholesale relocation of the channel.

This reach is a good candidate for passive geomorphic restoration as the channel is naturally re-creating sinuosity, it still has access to floodplain, there is limited development in the corridor and there is potential for increasing floodplain access through the removal of berms.

T2.05-S1.03
This reach begins at Gulf Brook and continues just past the junction of Augerhole Road and Lahar Road. It is located in a semi-confined valley with the left corridor being dominated by the Augerhole Road. The reach has approximately 3,800 of both left and right bank erosion and has over 800' of berming on the left or right bank. The right corridor is forested while the left corridor is dominated by the road. There are two bridges in the reach, both of which are floodplain constrictions. There are numerous mid, point, and side bars in the reach as well as five diagonal bars and five steep riffles. The reference channel width is 42' and the current channel width is 53'.

As with the two previous reaches on the Marlboro Branch, there is evidence that the river was moved and straightened between 1935 and 1954. Please see Appendix A for more information.

The reach is a C riffle pool by reference but is currently entrenched and incised, making it an F riffle pool. It is in stage IV of the F-stage channel evolution model with aggradation and planform adjustment being the current dominant adjustment processes. It is in fair geomorphic condition and the habitat condition is good.

This reach is converted to transport and will need to continue to be managed that way due to road and valley wall constrictions. Conservation of the up and down stream reaches will relieve pressure on it.

T2.05-S1.04
This reach is located along Augerhole Road from Lahar Road upstream to just after Adam's Brook joins the Marlboro Branch. It is a half a mile long and in a very broad valley type, though the valley narrows in the middle of the reach. There is 1,600' of berming and 780' of erosion along the reach. There is one bridge at the downstream end of the reach that is both a channel and floodplain constriction. The reference channel width is 38' and the current channel width is 56'.

The reach is C riffle pool both by reference and currently. It is in stage IV of the F-stage channel evolution process and is in good geomorphic condition with minor planform being the dominant adjustment process. The habitat was also rated in good condition.

This reach is a good candidate for active restoration to remove berms that are restricting access to floodplain and for corridor conservation as it is a sediment and flood attenuation asset.

T2.05-S1.05

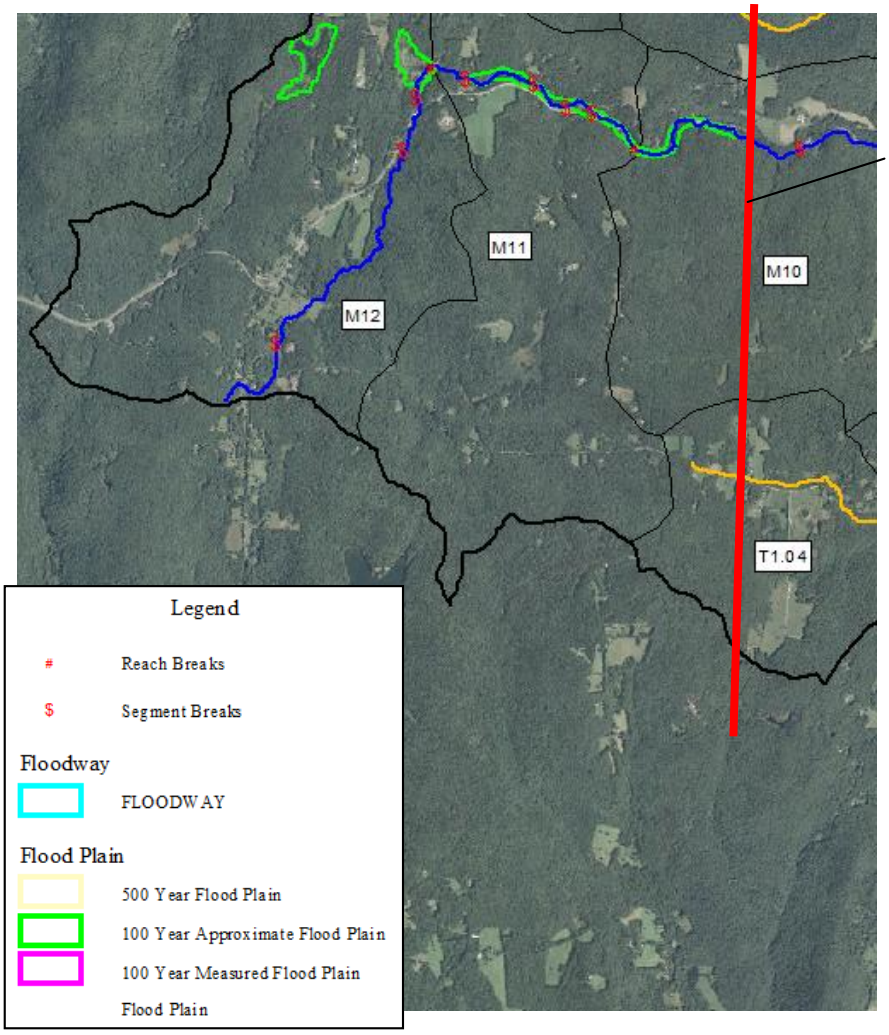
This reach begins just past the confluence with Adam's Brook, and runs 1.1 miles to just past the confluence with Worden Brook. It is located in a semi-confined valley and is dominated by ledge on the right bank and road encroachment along the left bank. There are abundant springs and seeps and some wetlands located along this reach. Eleven-hundred feet of erosion are along the left bank, numerous mid, point and side bars, four flood chutes and six steep riffles in the channel. The reference channel width is 36' and the current channel width is 36'.

The reach is a B step-pool currently and by reference. It is in stage IV of the F-stage channel evolution model and its geomorphic condition is good. It is moderately sensitive and has good habitat.

Removing berms where floodplain access would be improved is recommended for this reach.

Whetstone Brook

The other main fluvial erosion concerns in Marlboro lie along the Whetstone Brook, which runs adjacent to Route 9 in portions, and down to near the town center. The Whetstone Brook Corridor Plan studied the corridor in depth, so this plan will pull relevant information from that Plan[15].



The red line is approximately the Marlboro/ Brattleboro town line, with Marlboro to the west. Stream segments in Marlboro include: M10, M11 and M12. The channel between M12 and M10 has a 4.1% channel slope.

The *Whetstone Brook Corridor Plan* describes the relevant segments this way[16] (general mitigation actions are bolded):

[15] Landslide Natural Resource Planning - Whetstone Brook Watershed Stream Geomorphic Assessment and River Plan, May 2008.

M10 – *There is significant erosion on both banks: 29% on the left bank and 24% on the right bank. Route 9 causes a change in the valley width, though this segment is very broad. There is one undersized bridge at the downstream end that is both a floodplain and channel constriction with deposition above and below. There are multiple gravel bars and seven flood chutes and an old mill dam site with extensive berming and channelization toward the upstream end of the segment. The upstream segment has multiple flood chutes, steep riffles, stormwater inputs, four mass failures, and significant encroachment from Rt 9.*

Conservation of the right bank is critical for this reach.

M11 – *This reach is 1.2 miles long and located in a narrowly confined valley. It is Cb Cobble by reference and it has a small run of river dam at the head of it. The riparian buffer is >100' on both banks and groundwater inputs are abundant. Downstream area of this segment is semi-confined due to a human caused change in the valley width (Rt. 9). There is one undersized bridge with deposition above and below it. It is nearly 100% straightened. The habitat is in good condition and it is in fair geomorphic condition. Upstream was historically straightened and bermed, though it has grade control at the downstream end and ledge along the left bank, preventing bed and bank erosion. There is one undersized double culvert at the downstream end with deposition below it. There are multiple flood chutes, though both habitat and geomorphic condition are good.*

Because much of the Whetstone Brook and its tributaries are either deeply incised, making tree planting in-effective until the stream is able to move toward equilibrium) currently forested or adjacent to roads, opportunities for tree planting are limited. ***Engaging the community in tree planting projects can be an effective means of educating citizens about watershed based restoration efforts, which raises the priority of the few stream planting projects identified.***

M12 – *It is 2.3 miles long and it has a small run or river dam at the head of it. Both watershed and stream corridor land cover is predominantly forest with buffer widths on both banks being greater than 100'. Groundwater inputs and wetlands are abundant. This is a meandering stream that travels through wooded and shrubby forests with one beaver pond in the middle and a ROR dam at the u/s end. Both the habitat and geomorphic conditions are good.*

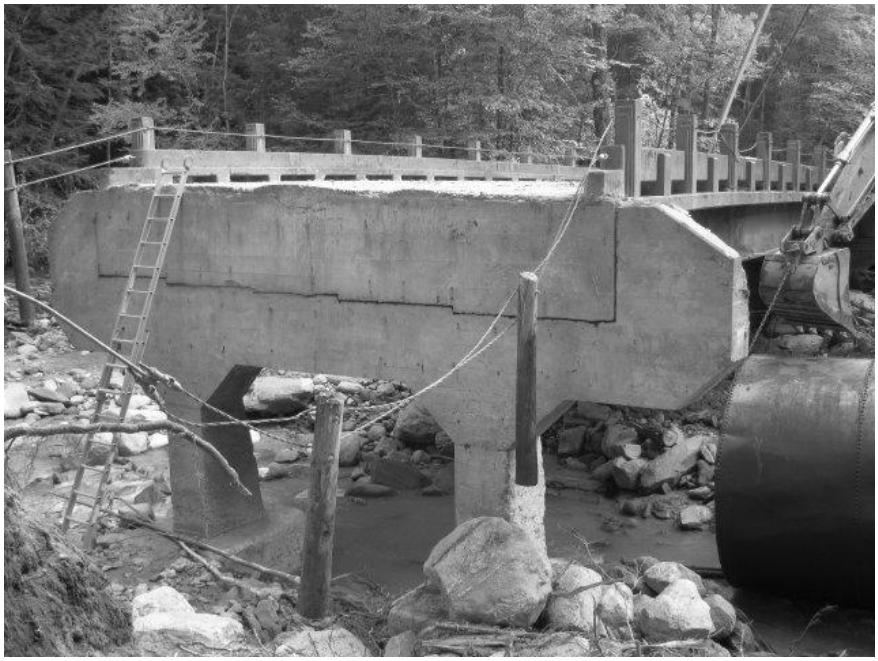
There are numerous undersized structures on the Whetstone Brook that have been recommended for replacement. These structures need to be assessed to determine if the deposition above them is creating a constriction that is actually moving the stream toward equilibrium more quickly by re-creating gravel bars and increasing sediment and flood attenuation. In cases where the undersized structure is impeding the flow of water and sediment, leading to disequilibrium, the structure should be prioritized for replacement. *A higher priority has been placed on structures that are derelict, however, there are some old abutments that may be historically significant, requiring another level of social consideration before their removal.*

<u>*Extent*</u>
Extent for fluvial erosion: The biggest area of fluvial erosion an approximately 300 feet wide and 100 feet high event along Worden Brook on private land (photos of the Worden Brook erosion in this area are contained in the appendix of this plan). There is no bank stabilization in place for this event.

[16] The information here is only a portion of the Whetstone Brook Corridor Plan. More information about each of these areas, and the entire Whetstone Brook watershed is available in the full Plan.

Bridge 10 is on the bottom of the area of this event, and there has been some shoring up around that bridge. Debris from Worden Brook washed down and plugged the bridge, which didn't take the bridge out, but took the land out all around it. The bridge was not upgraded in the repair. The riprap was put back and the channel was put back in place. This bridge could potentially be a hazard again, though much of the debris came down with TS Irene, though more debris is created all the time and fluvial erosion Worden Brook remains an issue.

Bridge 10 is pictured below after TS Irene in 2011. Residents were using the ladder in the photo to get across the bridge. Photo courtesy of Forrest Holzapfel



To the west of Lower Dover Road, beside Worden Brook, there are several private ponds. When the dam washes out they run into Worden Brook. The excess water from these ponds could be contributing to fluvial erosion on Worden Brook.

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 Marlboro Branch feeds into the Rock River, which is a tributary to the West River. The closest gauge on the West River is in Jamaica. The highest recorded measurement there was 14.87 feet, which was measured on December 31, 1948.[17] Average height for this reach is about 6.13 feet.

The highest recorded measurement at the nearest stream gauge on the Green River (which drains the southern portion of Marlboro) was 13.98 feet, which was measured during TS Irene on August 28, 2011.[18] Average height for this reach is about 5.62 feet.

Extent for thunderstorms/heavy rain events: The table below shows the top 10 rain events at the Windham County National Weather Service Cooperative station at Ball Mountain Lake (in the Town of Jamaica). 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 the below data, for a 1-day period a 50-year event is 3.96-6.15 inches, a 100-year event is 4.40-7.49 inches, a 200-year event is 4.89-9.11 inches, and a 500-year event is 5.63-11.84 inches. If we base on lower confidence limits, the below listed # 1 event that occurred in 1973 is a 500-year event and TS Irene, which is #2 in the table is a 200-year event. It is important to remember that precipitation levels vary throughout the region.

[17] USGS Stream gauge 01155500 Tributary to West River Tributary near Jamaica, VT <http://waterwatch.usgs.gov/index.php>
[18] USGS Stream gauge 01170100 GREEN RIVER AT COLRAIN, MA <http://waterwatch.usgs.gov/?id=wwchart_ftc&site_no=01170100>

Maximum 1-Day Total Precipitation[19] for BALL MTN LAKE		
Rank	Value (inches)	EndingDate
1	5.6	1973-06-30
2	4.9	2011-08-29
3	4.36	1999-09-17
4	3.97	2005-10-09
5	3.32	1987-06-23
6	3.3	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 2015-04-02		

Probability

Fluvial erosion is highly likely and exists in Marlboro, 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 35 flood events in Windham County, Vermont. Marlboro experiences routine spring flooding, but this is not always documented. There have been 15 Presidential Disaster Declarations in Windham County since 1953. Of these, 6 were severe storms, 5 were floods, 2 hurricanes, 1 snow event and 1 severe ice storm.[20]

Disaster Declarations for Windham County, VT

Disaster Number	Incident Begin Date	Incident End Date	Declaration Date	Incident Type	Title	Disaster Close Out Date
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, &	11/12/1976

[19] 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.

[20] 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 10/16/15

					LANDSLIDES	
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 Marlboro:

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.

Remnants of Tropical Storm Lee – Sept 5-8, 2011 - Roads were closed due to flooding in Marlboro including: Augur Hole Road between 3800 and 5200 cutting off 25 houses, Collins Road, Lahar Road, Gilbert Road, Adams Brook Road, Adams Crossroad, Hunter Brook Road and Stratton Hill Road.

Tropical Storm Irene – August 28, 2011 - Route 9 was closed from Bennington to Brattleboro due to numerous reports of flooding. Portions of Route 9 remained closed after the flood waters receded due to damage. The Route 9 bridge in Woodford was reopened to traffic on September 9th, fully opening the main east-west connection across southern Vermont. Some portions of the road are dirt between Marlboro and West Brattleboro. Auger Hole Road damage is descrided in this video (it's mistakenly titled "South Newfane" but it is in Marlboro https://www.youtube.com/watch?v=8lXN5lwTIDE.

There were 50 people stranded in Marlboro for about a week after TS Irene. They were located mainly on Auger Hole Road north of the first bridge when driving north. The water just came down and washed out everything. This occurred in Worden Brook and Branch Brook. People north of the southern-most bridge were the folks that were cut off. The town was transporting rations to the residents in that area. They were isolated except for walking out. The people in this area that had excavators just started working to repair the road. Ames Hill Road was also badly damaged in the southern portion of Marlboro. Route 9 and Ames Hill were both cut off for a time, which together cut off the whole western portion of the region. To remedy this, many towns volunteered to bring in gravel to restore Ames Hill Road to a passable one-lane level. Without this, Wilmington and Marlboro and all the other western towns would have been unreachable. Pharmacies in Wilmington were already running out of medications by the time the town was reconnected. The worst areas were Ames Hill and Old Turnpike Road.[21] Marlboro received $938,525.05 in reimbursement from FEMA for 19 large projects in town, including two large bridge projects and miles or roads that had to be rebuilt.[22]

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. The snow caused a berm at the Town Offices holding in the rainwater which caused a lot of inundation flooding. Rain and snow caused damage to roads and utility lines across Windham County and Halifax. Across the state, nearly $3.6 million was obligated as part of the FEMA Public Assistance Program.

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.

[21] Interview with former Marlboro EMD Lisa Hecht 3/3/16.
[22] Information provided by Marlboro Treasurer Linda Peters, 3/21/16.

August 30, 2004 - Flash flooding resulted in washouts of small bridges at Ames Hill, Hescock and Cook Roads. Canoe Brook Road in Dummerston impassable, with a culvert washed away, and a 20-foot wide by 20-foot deep hole in the road. Presidential Disaster Declaration DR – 1559.

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 time. The torrential rains took a toll, washing out roads in the city of Londonderry. County Highway 121 was washed out in the Town of Windham. Massive flooding occurred in the city of Grafton at the base of Fire Pond and Hinkley Brook roads, where water, debris and mud washed those roads out. The raging debris knocked a house off its foundation and damaged several other ones. This was the same area affected by the infamous Flood of 96 which was even more severe. Heavy rains also washed away a small covered bridge in Grafton. FEMA Declaration DR – 1488 was associated with this event. Many roads were washed out and culverts needed replacing throughout Marlboro.

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.

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, 3.89 inches in Sunderland, 4.54 inches at Peru 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. Water from the Millbrook in Weathersfield washed away a portion of State Route 5. The World's Fair in Tunbridge was cancelled for the first time in many years. 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. A woman was injured on Tavern Hill in Putney, Windham County when a tree came crashing down on her Volvo, destroying the vehicle. 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. Flooding also occurred in the Putney area and at Rawsonville. 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, including low-land flooding along the Hoosic River in Bennington County. 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.[23] The Rock River experienced major flooding. After this event, there was extensive dredging, berming and windrowing in an attempt to control channel location and reduce future flood impacts.

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. During this flood alone, the main street of Hooksett, New Hampshire was 18 to 20 feet underwater.

Sources used
Local knowledge of areas of concern and impacts, Discussions and emails with former Marlboro EMD, Marlboro Treasurer, and the Road Foreman during March 2016

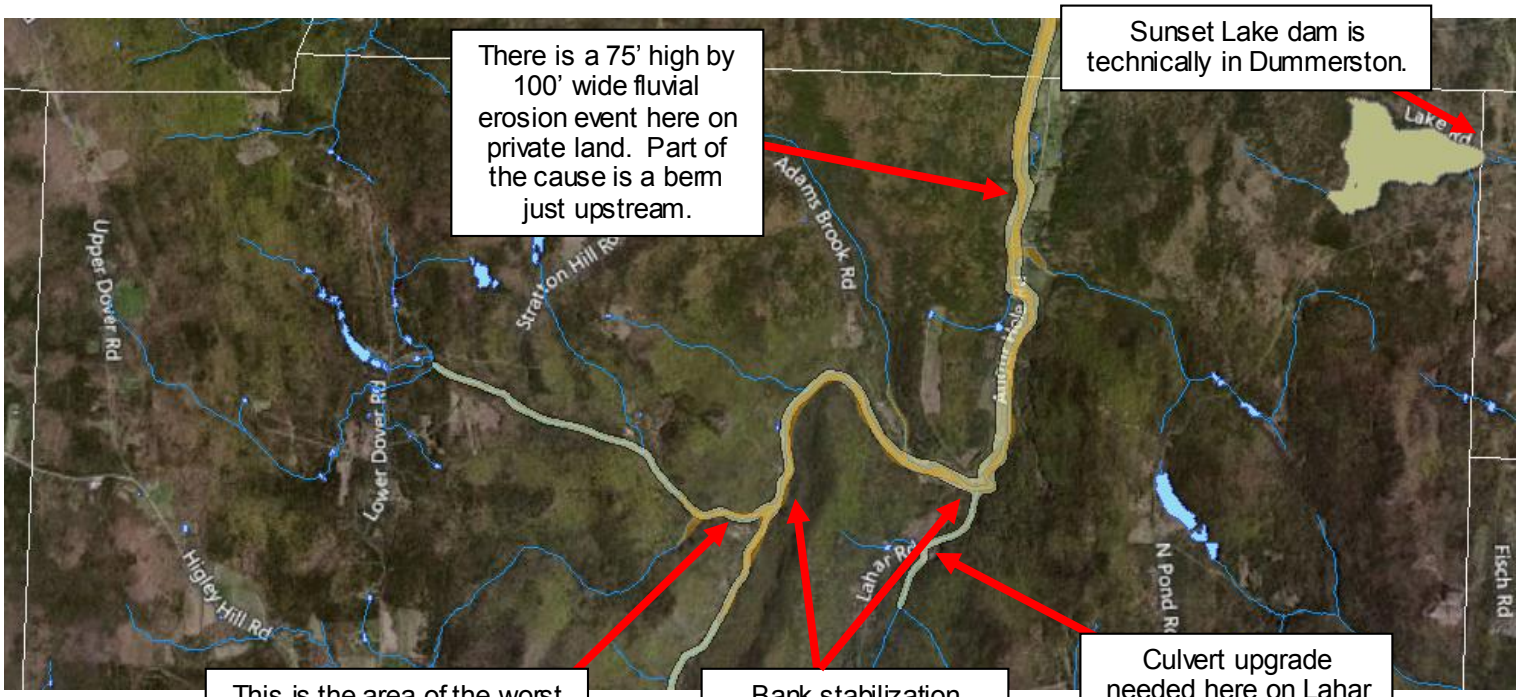
Location / Special Flood Hazard Area and River Corridor Mapping
FEMA has mapped "A" zones in Marlboro. "A" zones do not have Base Flood Elevations determined. These zones comprise the Special Flood Hazard Area (SFHA). Properties within the SFHA, that have a mortgage, are required to purchase flood insurance. Marlboro's participation in the NFIP gives residents access to discount flood insurance through the NFIP. The Flood Hazard Summary Sheets on FloodReady Vermont's website says there are 10 structures in the Special Flood Hazard Area and 30% of these structures have flood insurance.[24]

The below maps were created using the Vermont Agency of Natural Resources 'Natural Resources Atlas' which is an online mapping tool. These maps are snips showing all of the special flood hazard areas (SFHAs) that FEMA has designated in Marlboro. They are shown in orange, red and red hatching. The floodplains shown in these maps are based on the FEMA Flood Insurance Rate Maps (FIRMs) available through the FEMA Map Service Center.[25] The map effective date for the latest FIRMs for Windham County is 9/28/2007. The 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. The ANR defined River Corridor also includes a 50 foot buffer on all streams shown on the Vermont Hydrologic dataset. The only mapped River Corridors are for streams with a watershed of two square miles or greater, so for unmapped streams one must assume the buffer.

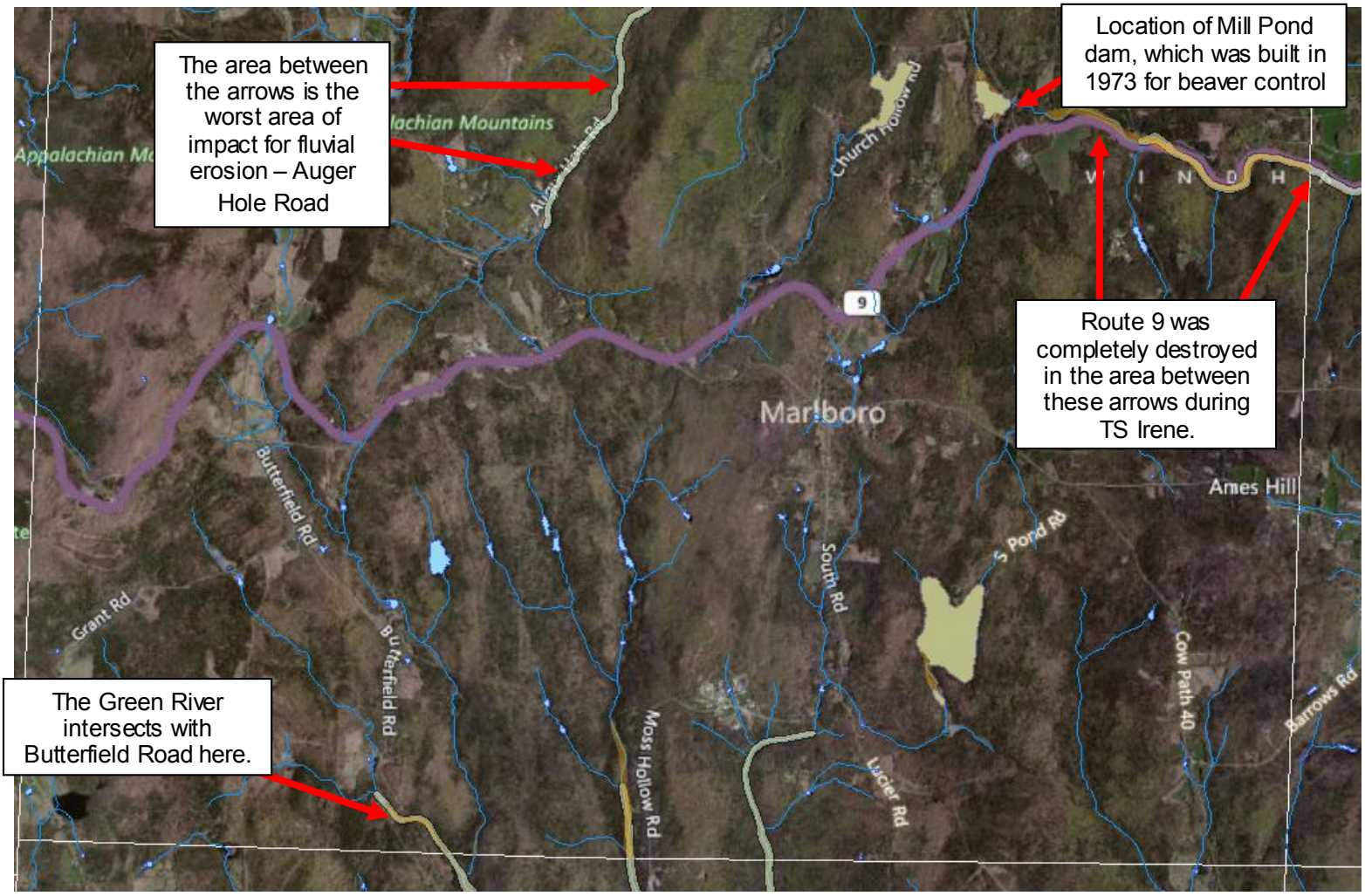
[23] USGS "Vermont Floods and Droughts" information page http://md.water.usgs.gov/publications/wsp-2375/vt/. Accessed 4/3/15.
[24] Flood Hazard Summary Report for Marlboro, accessed 2/22/16 < https://anrweb.vt.gov/DEC/FoFReports/SSRSReportViewer.aspx?RepName=ExpandedCommunityReport&Municipality=Marlboro>
[25] FEMA Map Service Center https://msc.fema.gov/portal

The below map shows the Special Flood Hazard Areas (SFHAs) in orange (A zone), and the River Corridors in cream color, for Marlboro north of Route 9. Note that the orange SFHAs may be difficult to see as they are almost entirely within in the cream shaded River Corridor. There is floodplain going along the Marlboro Branch, along Auger Hole Road south to roughly where it hits Worden Brook and then about a quarter mile farther on both waterways. The River Corridor extends in the same areas, but goes farther up both waterways. There is also floodplain on Sunset Lake, though this Lake has a dam to control water height.

There is a strong correlation between the low lying SFHA areas and the transportation routes in Marlboro, with the main travel road in the northern part of Marlboro being Auger Hole Road. This can lead to road washouts and culvert issues during storm events. Marlboro has done a number of stabilization projects in areas subject to fluvial erosion, such as a along some areas of Auger Hole Road and Lahar Road. Some issues are more difficult to deal with because they are on private land.



The below map shows the Special Flood Hazard Areas (SFHAs) in orange (A zones) and the River Corridors in white, for the southern portion of Marlboro. SFHAs are along the Whetstone and Route 9 in the east, around South Pond and near the southern border along Harrisville Brook and The Green River. The River Corridor is in the same locations at the SFHA, with the exception of also being along Pond Brook on the southern border. Harrisville Brook and Pond Brook do not affect any roadways, but the Green River does impact a portion of Butterfield Road.



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 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.

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 outcompete 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 to the west because these towns are more populated, contain major transportation routes such as I-91, 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 plants. Some varieties of invasive plants were also brought here inadvertently through the importation of goods from overseas. In the Windham region, Deerpark Road, in Halifax, is a particular example of an area with a lot of Asiatic honeysuckle that is impeding growth of other native plants.

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, as this critical to prevent the spread of non-native seeds and insects.

Particular invasive plant concerns for Marlboro are: Multiflora rose and Japanese knotweed along the banks of several streams. The Marlboro Conservation Committee monitors and removes invasives from town owned lands, as time and funding allow. Protecting areas at the top of watershed from invasives is a big concern for the Conservation Committee. When invasives get to headwaters they can follow these pathways to infect other areas downstream. For the Conservation Committee, awareness is a big part of the strategy that is being used to mitigate for invasive plants currently. The Committee has also done some identification of invasives during site visits and a limited amount of active management with chemicals in limited targeted way to prevent spread of invasives in areas where watersheds are at risk.

The below is a list of invasive plants that the Vermont Fish and Wildlife Department have on the watch list.[26]

[26] 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

List of Watch Species in Vermont

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

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 wooly adelgid (HWA). Only hemlock wooly adelgid is currently present in the state; emerald ash borer and 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.[27]

Hemlock woolly adelgid (shown below to right)

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.

[27] vtinvasives.org (accessed 2/20/15)

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 that cause die off. In 2014 the mortality rate was only 40%, whereas in 2015 the expected mortality rate is 98-99% because it has been an especially cold winter. Populations build back up in warmer months.

HWA has not been found yet in Marlboro, but that doesn't mean it is not present.[28] In the Windham region, it was initially found in Brattleboro and the Guilford area. It is now found in 14-15 Windham Towns, and has been recently found in Springfield in Windsor County. It has not been found in Weston, Winhall, Somerset, Searsburg or Readsboro.

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. Marlboro has not identified or trained any First Detectors for the town.

Asian longhorned beetle (shown to right)

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.

The closest area to the Windham region that has the pest is Worchester County, Massachusetts. And they have an active quarantine and public notification campaign about the pest.[29] They are having to

[28] Conservation with Marlboro Conservation Committee Chair, Adam Gebb. March 2, 2016.
[29] http://www.worcesterma.gov/city-manager/asian-longhorned-beetles. Accessed 3/2/15.

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.

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, and is expected to reach Vermont. It is currently present in 23 states. The closest infestations are in south-central NH (now present in 4 counties in NH – first found there 2 years ago near Concord), Berkshire County Massachusetts, New York's Hudson Valley, and just 30 miles north of the Vermont border (near Highgate) in Quebec. This means Vermont is essentially surrounded. There are no known populations in Maine as of now.

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

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.

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.[30]

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

Impact

[30] 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.

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 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.

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 Marlboro. The Marlboro Conservation Committee should host a first detector training and do an inventory of ash trees along roadways.

The loss of maple trees to ALB, could mean a devastation to the maple industry, which is a big industry in Vermont, including in Marlboro. A lot of people sugar in Marlboro, 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 wooly 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 Marlboro 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 for road crews in identification 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 good option for an urban tree canopy. Additionally trees have to be retreated every one to two years because of the insects 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 its time in the interior wood, out of the systemic 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 Worchester 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 Worchester 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 setting, 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 Marlboro. Invasive plants are present in Marlboro. The Conservation Commission has noted glossy buckthorn, purple loosestrife, Japanese barberry, multi-flora rose, Japanese knotweed, cow parsley, and garlic mustard, and Asiatic bittersweet as long-standing and spreading forest threats[31]. 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 occurring in Marlboro.

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.[32] 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. No one on the Conservation Committee is a trained first detector. Insect pests are often found first by concerned citizens who pay attention to these things, rarely by professionals.

Sources Used
Interview with Windham County forester Bill Guenther on 3/2/15 (802-257-7967 or bill.guenther@state.vt.us); Interview with VT State Forester Jim Esden on 3/4/15 (802-885-8822 or jim.esden@state.vt.us); Interview with First Detector Jordan Fletcher on 4/29/15; Interview with Marlboro Conservation Commission Chair Adam Gebb on 3/2/16; VT Fish and Wildlife website; VTinvasives.org; Cerceris.info webpage; Images courtesy of Google images.

Power Outages
Power failure is a common condition associated with high winds, ice storms, downed trees, and other hazards. It can occur anywhere in town. Power failures are typically the result of power lines damaged by high winds or heavy snow/ice storms. Power failures may also result from disruptions in the New England

[31] This list is not exhaustive. Species were noted by Hazard Mitigation Plan participants at the September 22, 2015 public meeting.
[32] < http://www.vtinvasives.org/tree-pests/community-preparedness>

or National Power grid, as indicated by the widespread power outages in 2003. Dead or dying trees in close proximity to power lines pose a particular threat for power failure. Green Mountain Power serves Marlboro. Power outages can be viewed on their website.[33]

There are a number of businesses that don't have generators, particularly inns and lodges. Extended power outage would be a problem if there were a lot of tourists that couldn't leave the area. There is a need for tourists to be alerted not to come to town when bad weather is expected. Residents that don't have access to a generator are of concern in winter months if there is no alternate heat source other than electric. The need to educate residents about the proper installation and use of generators to prevent accidents was acknowledged.

There are a number of buildings in Marlboro that are served by their individual renewable power generators, solar and wind, and these buildings will be more resilient during power outages. Promotion of small scale renewable power generation at homes and businesses is advantageous so as to increase individual resiliency and decrease reliance on the grid. This also means less reliance on generators which produce harmful emissions and are a safety concern if not properly used.

TS Irene in 2011 and the December 2008 ice storm were major weather events that caused extended power loss. Some areas were out of power for 10 days. There was another long power outage during the summertime in the late 1990's when the power was out for two days due to equipment failure at a substation.

Potential loss estimates from power failures are difficult to predict, as they typically are isolated in geographic area and short in duration. Therefore, they often have only minimal impact to people and property. Power failures usually result in minor inconveniences to residents; however, longer duration events can result in the loss of perishable items and business losses. Power outages in winter months can result in the loss of home heating, bursting water pipes and resulting structural water damage.

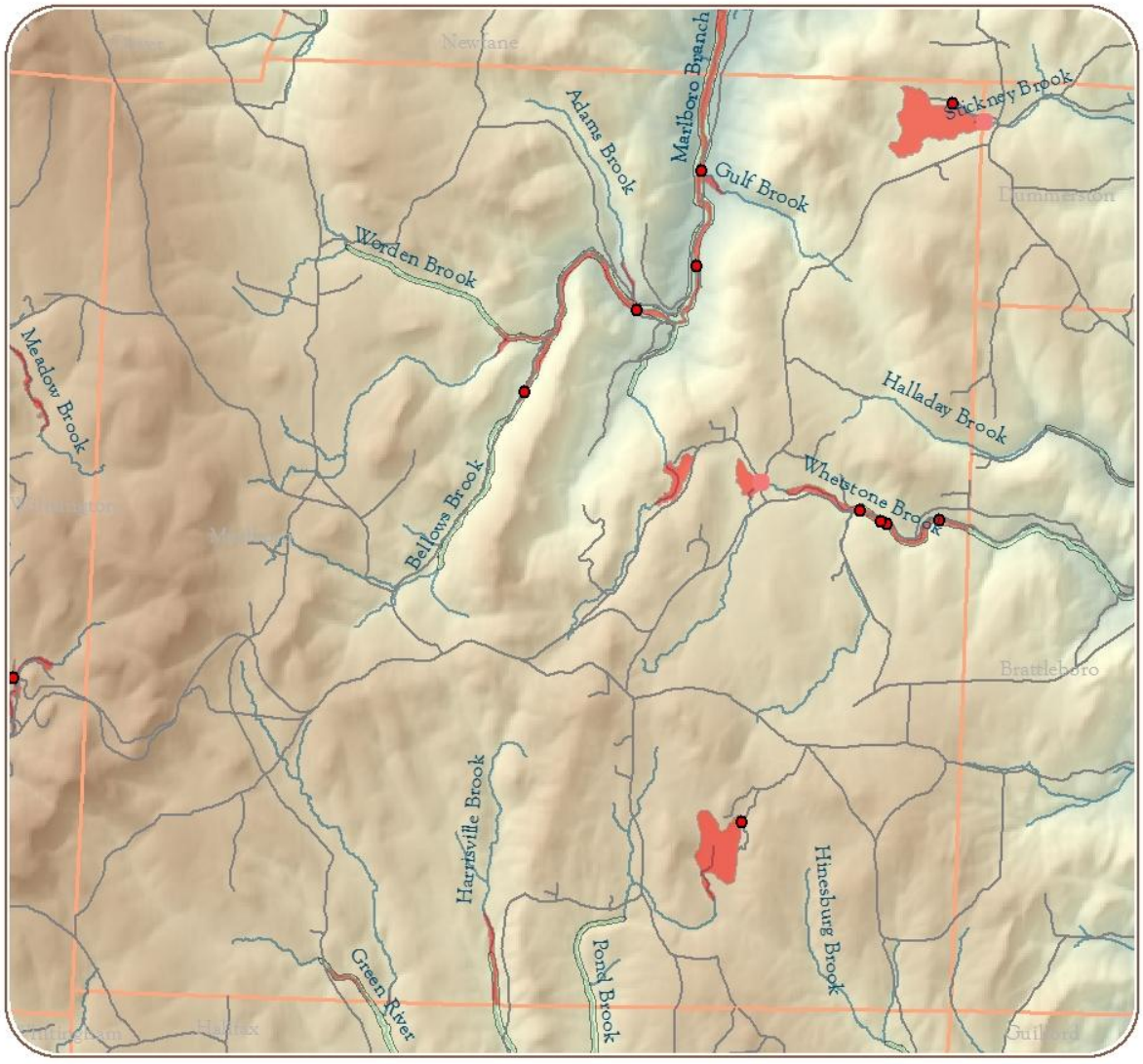
ASSESSING VULNERABILITY

Structures in the SFHA

There are approximately 10 buildings within FEMA-designated Special Flood Hazard Areas (SFHAs).[34] The map on the following page shows structures (red dots on map) that are located in the SFHA. The 10 are spread along Auger Hole Road, and Route 9, with two others on ponds. These structures are particularly vulnerable to flooding and fluvial erosion hazards described in this plan.

Properties within SFHAs, that have a mortgage, are required to purchase flood insurance. Marlboro'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 Marlboro's floodplain regulations, which is part of their zoning ordinance and was adopted in March 2007.

[33] https://wss.greenmountainpower.com/customers/outages/
[34] 2016 Flood Hazard Summary Sheet for Marlboro



Town of Marlboro
Critical Structures and Buildings in Hazard Areas

- Dam - Significant Hazard Potential
- Buildings in Special Flood Hazard Areas
- Flood Hazard Areas
- River Corridors

8.26.15 VT DEC

Special Flood Hazard Areas are mapped by FEMA for the National Flood Insurance Program (NFIP).
www.msc.fema.gov

River Corridors and Flood Hazard Areas can be viewed on the Vermont Flood Ready Atlas - tinyurl.com/floodreadyatlas

Building locations from e911 site locations 12/12

For current data on flood risks and mitigation actions in the community please see please see Community Reports on www.floodready.vt.gov

0 0.5 1 2 3 Miles

Repetitive Loss Structures

According to FloodReady.Vermont.gov, Marlboro has no repetitive loss claims.[35] 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.[36] 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.

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. Marlboro joined the NFIP on September 18, 1985 and is a member in good standing (CID 500283). The latest floodplain ordinance was adopted in March 2007 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.

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[35] Report listing repetitive losses is available here:
<http://floodready.vermont.gov/sites/floodready/files/documents/VT%20RL%20Report%201.26.15.pdf>

[36] https://www.fema.gov/national-flood-insurance-program/definitions

The latest record indicates that there are three (3) active NFIP policies in Marlboro. These policies have a total value of $1,272,800. There have been three (3) NFIP claims paid in Marlboro since they joined the NFIP, totaling $56,975.[37]

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.

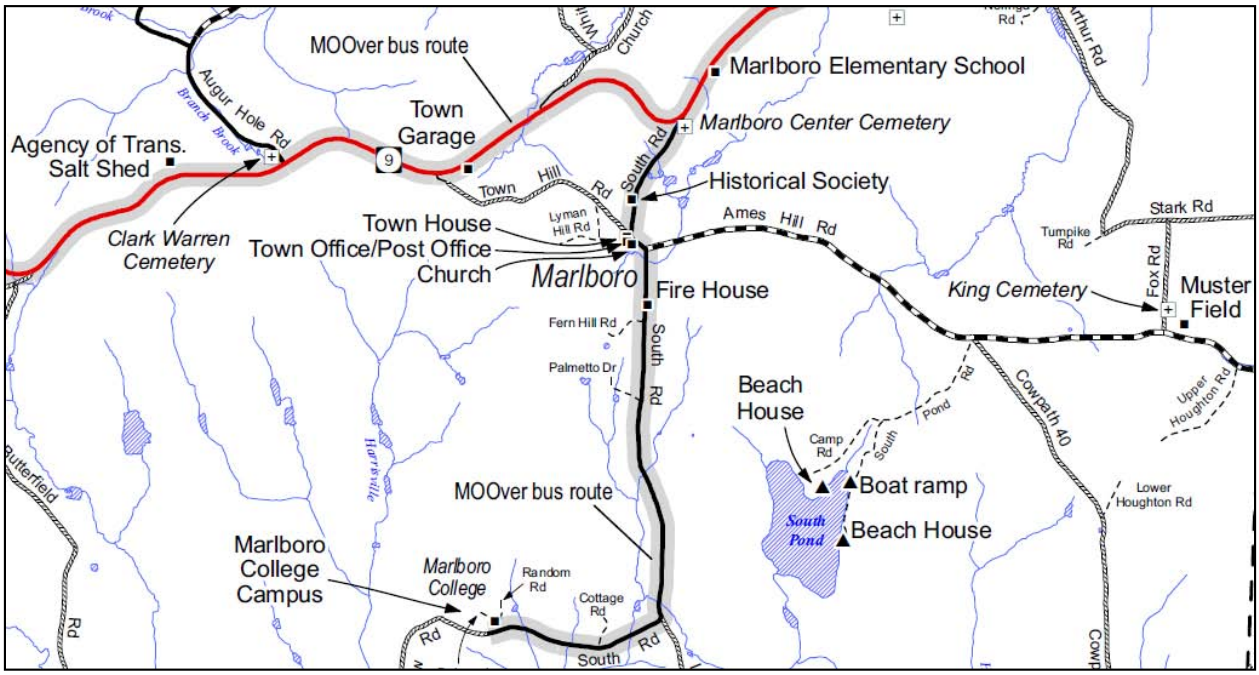
Vulnerable Community Assets in Marlboro

There are not a lot of vulnerably located structures in Marlboro. All of the municipal buildings are on high ground. The village area, where most of the community facilities are located, is not near any streams and there is no floodplain in that area. Some of the primary assets noted by the town are:

- Marlboro town office and post office
- Town House (Town Meeting Day location) next to town office
- Volunteer Fire Department on South Road
- Elementary School on Route 9
- Marlboro College on South Road
- Route 9 is a major local and state roadway – this is a vulnerable road
- Hogback Mountain gift shop/Natural History Museum
- Hogback conservation Area
- Whetstone Inn (private Inn)
- South Pond – big community recreation area on private property

There is a fire pond behind the Meeting House Church (on private property). This is a man-made pond that sits behind the Church in the village center. If the fire pond stand pipe is working fine, the pond is fine, but potentially the fire pond could flood and put the town at risk. Because this is on private property, the town is limited in what it can do to mitigate this risk. There were beavers in this area, but they have since left.

[37] FEMA NFIP Insurance Report, January 2016, accessed February 22, 2016. http://floodready.vermont.gov/sites/floodready/files/documents/NFIP%20Insurance%20Report%20VT%201.26.15.pdf



Market Values of Structures in Marlboro

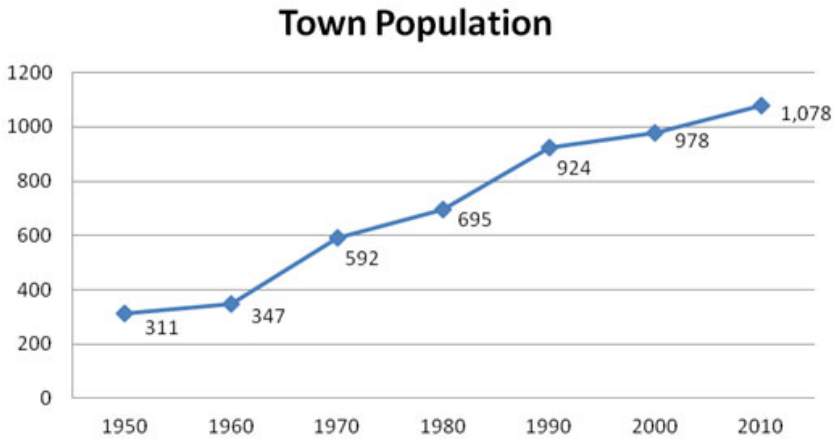
The total Grand List in the Town of Marlboro:	$162,586,500.00**
Common Level of Appraisal:	100.87 (Dec 2015)

** $1,493,300.00 = Grand List Adjusted for Exemptions (voted and legal)
These counts do not include non-taxable structures. There are 17 (non taxable) locally exempt properties.

Development Trends

To reiterate what was stated in this report introduction, the population of Marlboro increased between 2000 and 2010, from 978 to 1,078 people. Population has been slowly growing over the years, as the chart below shows. What the graph doesn't show is that based on historic levels the current population is about equal to its former height of 1,087 in 1800. Population dropped dramatically to a low of 225 in 1940, and then slowly rose again until today's level was reached.[38] This expansion is due in large part to Marlboro College being built in the 1940's.

Slow and steady growth is also typical of the new development that has been taking place in Marlboro in recent years. The town sees an average of 4 permit applications for new homes each year.[39] This slow growth pattern decreases vulnerability of residents, as people know their neighbors (most folks stay in the area for a long time), things don't change all that much, and people can easily help each other out. The self sufficient attitude of residents serves the town well. When



[38] 2013 Marlboro Town Plan
[39] Discussion with Town Clerk, Forrest Holzapfel, on March 2, 2016.

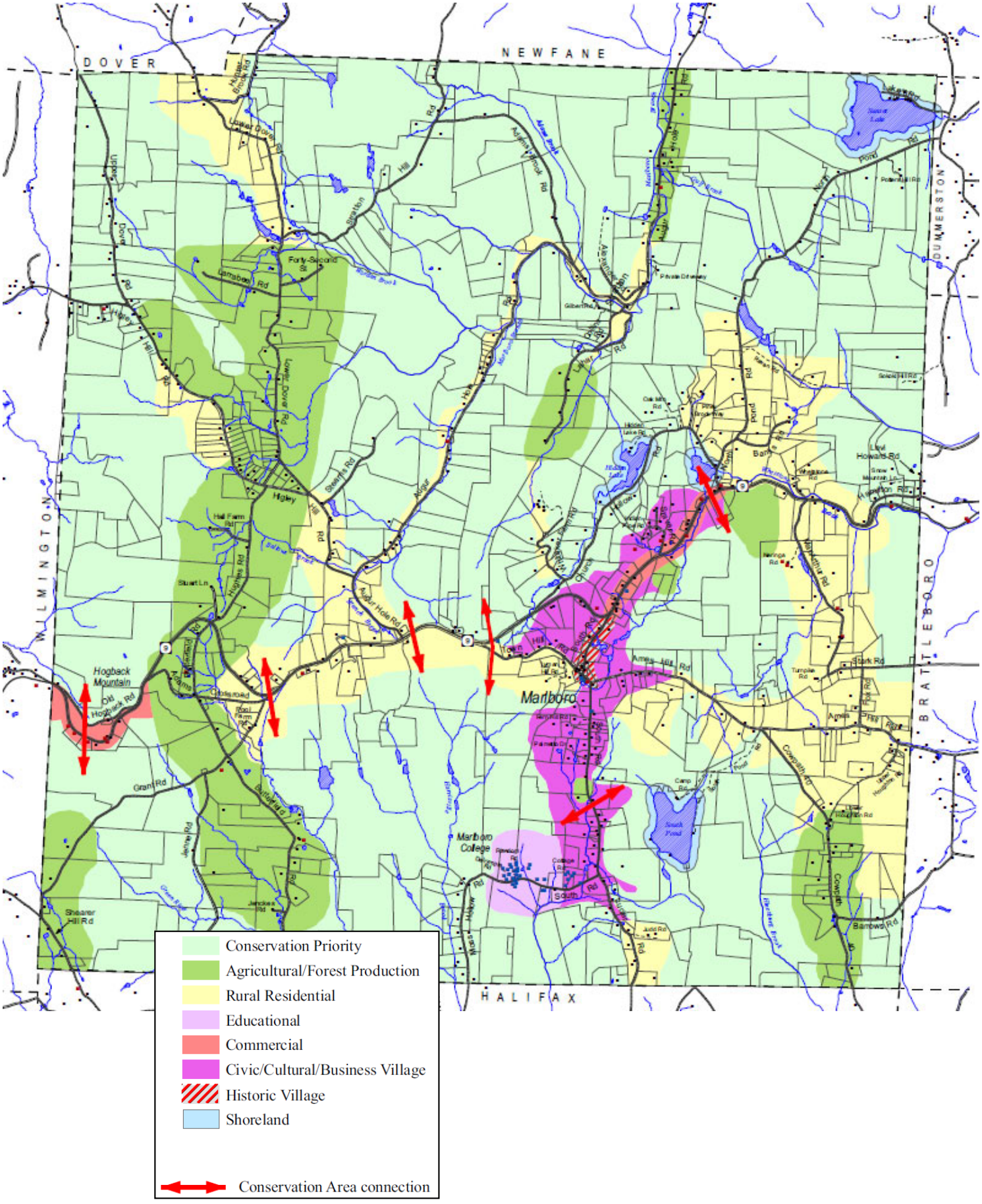
hazards strike people know their neighbors, and know who has what equipment that can help the situation out. This is fairly typical of most small southern Vermont towns, where changes come slowly.

There has been a lot of development on Ames Hill Road in the past thirty years, and even more within the last ten years. This is an area of concentration of new development. Marlboro College has been a presence in the town since the 1940's. Marlboro itself is a town that likes to remain the same. They are not looking to grow and change. It is a rugged town, of mainly dirt roads and scattered houses.

There is not a lot of commercial development in Marlboro. There are a lot of home based businesses, artisans, and creative individuals in town. A lot of people commute to the Brattleboro and Massachusetts areas for work. Unless you're working for yourself or for Marlboro College, it can be difficult to get a job without working elsewhere out of the town. There are a lot of people that have lived in town for many years and have land that has been passed down for generations.

TS Irene damage near Bridge 23 on Augur Hole Road
Photo courtesy of Forrest Holzapfel

Proposed Land Use Map from 2013 Marlboro Town Plan



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. These goals remain the same as the goals identified in Marlboro's previously adopted hazard mitigation 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 Basic Emergency Operation Plan
- Ensure that members of the general public continue to be part of the hazard mitigation planning process.

Town Plan (2013) Policies that Support Mitigation

Community Development, Facilities, and Services Policies

6. Developments and major subdivisions are responsible for providing adequate water resources, sewage disposal, dry hydrants, and satisfactory year-round emergency access to the property.

7. The Town should encourage the creation of additional small private ponds for fire protection as well as for recreation. Private fire ponds and hydrants should be better maintained by their owners; additional impoundments should be encouraged.

8. Dry hydrants of approved design should be installed in areas of concentrated development.

Fire Protection and Emergency Services Action Steps

1. The Town will make all efforts, in coordination with the Marlboro Volunteer Fire Company, to recruit fire-fighting personnel to protect Marlboro residents adequately.

2. The Town will make all efforts to equip the Town Office with needed emergency equipment as specified in the Emergency Plan.

3. In conjunction with volunteer organizations such as Marlboro Cares, the Town will conduct an assessment to determine the individual emergency needs and resources.

Transportation Policies

2. When improving Town roads, the scenic value of the road, potential fluvial erosion hazards, and the impact that greater traffic speed and volume will have on the rural character of the Town must be considered. Roads should be improved only when necessary for safety and year-round maintenance.

3. The Town advocates continued gradual Route 9 improvements as long as design speeds to limit traffic speed, volume, traffic noise, and potential fluvial erosion hazards are used in engineering and construction phases of all roadway projects

Transportation Action Steps

7. The Town shall review current zoning in areas near roads at risk for fluvial erosion, and rewrite Article VI of the zoning Bylaws to include fluvial erosion hazard regulations.

Natural Resource Policies
5. Maintain undisturbed buffers of vegetation along watercourses, lakes, ponds and wetlands to protect shorelines, to minimize effects of erosion, sedimentation and other sources of pollution, to maintain scenic and recreational values, and to preserve riparian corridors as links between upland habitat areas.

6. Maintain wetlands in their natural condition by ensuring that vegetative buffers consistent with state standards are established along wetland boundaries to protect the beneficial functions of the wetlands. Wetlands mapping prepared by the National Wetlands Inventory, showing Class I and II wetlands, is available in digital GIS format for the town. The limited number of wetlands in Marlboro should be protected from development, and should not be drained for development purposes or significantly altered in any way unless there is a long-term public benefit that heavily outweighs the irretrievable loss of resource value.

9. Lands within flood and fluvial erosion hazard areas shall be limited to agricultural and open-space use whenever feasible. When these uses are not feasible, ensure that the location and design of development in flood and fluvial hazard erosion areas does not impede the flow of floodwaters or endanger the health, safety, and welfare of the public.
Only those forms of development that will not restrict or divert the flow of floodwaters or endanger the health, safety, and welfare of the public or of other landowners during periods of flooding shall be permitted.

11. Minor streams subject to flash flooding or serious washouts shall be considered flood and fluvial erosion hazard areas, although it may not be practical to delineate the precise limits of the 100-year flood on available contour maps.

12. Structural measures to control downstream flooding, for example the dams proposed for the Whetstone Brook Watershed in 1975, shall not be constructed in or allowed to flood any part of the Town of Marlboro. The Town should participate in regional study efforts on this, or other, Marlboro watersheds.

13. Where practical, watercourses, lakes, ponds, shorelines and existing public access shall be retained and maintained in a natural state.

14. Advocate that recreation, road maintenance practices, and development activities be conducted in accordance with respective "Best Management Practices," to reduce sedimentation, chemical pollution, and disturbance to surface waters.

Soils and Topography Policies
1. Avoid development on wet soils because it can cause basement flooding and failure of footings, foundations, underground piping, and septic systems. Road construction on wet sites can be damaging and prohibitively expensive. Drainage of excessively wet soils is often not an acceptable solution because of expense, rate of failure, and potential for environmental damage.

Soils and Topography Action Steps
2. Consider whether additional measures are required to minimize areas of earth disturbance, grading and vegetation clearing on slopes over 15% and avoid intensive development in areas dominated by slopes exceeding 25%, especially where steep slopes occur with shallow soils.

Progress between 2011 and 2016

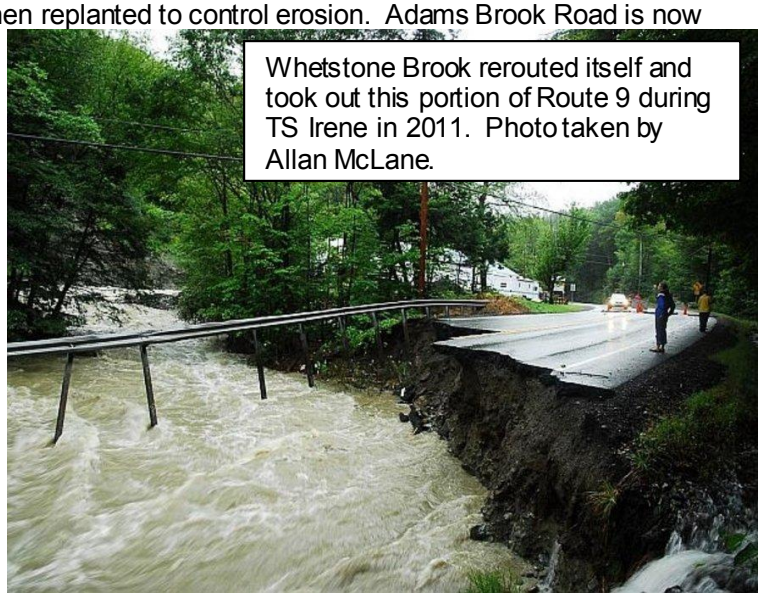
Marlboro's most recent hazard mitigation plan was approved by FEMA in January of 2011. There were only four "actions" identified in the previous plan and the below table discusses them and their current status.

2011 Mitigation Action	Responsible Party	Expected Completion Timeframe/Year	Priority	Current Status
Re-grade Adams Brook Rd	Selectboard	As funding allows	1 - Low	The worst section of the road was relocated.
Annual culvert program based on inventory	Selectboard	Not defined	2 - Low-Mid	They have a culvert inventory and it gets updated yearly. They use this as a starting point for attention on culverts in the worst condition.
Maintain ditches	Selectboard	Not defined	2 - Low-Mid	Part of regular road crew maintenance schedule.
Interoperable Communication	Emergency Management Committee	Not defined	4- High	Radios were purchased for the Fire Department, school buses and town trucks, and they have a dedicated channel. There is one cell tower on Hogback. Lack of cell reception and broadband internet is still an issue throughout town. VTAlert will assist with this issue.

These additional mitigation efforts were undertaken in Marlboro since 2011, though they were not identified in the previous Marlboro Hazard Mitigation Plan:

1. Adams Brook Road relocation – The problem was that Adams Brook Road was getting continually washed out. There was a rain event on top of snow and ice that occurred April 17, 2007 and a previous large-scale flood in 1996. They were both spring runoffs associated with heavy rains and wet snow. The washouts were occurring at the beginning section of Adams Brook Road where there was an 18-21% grade. This steep section of the road would wash completely out and onto Auger Hole, and would cause Auger Hole Road to be shut off entirely until it could be resolved. That problem was the basis of getting a FEMA Hazard Mitigation Grant to relocate the steepest section of the road to an adjacent path that was less steep. The abandoned section of the road was then replanted to control erosion. Adams Brook Road is now less steep and doesn't erode onto Auger Hole Road.

2. The bridge immediately east of where McArthur Road meets Route 9 was completely washed out by TS Irene in 2011 (pictured to the right). The bridge was then upgraded with a larger concrete arch precast bridge upon replacement. VTrans did this upgrade, as the bridge is on a State road.



Whetstone Brook rerouted itself and took out this portion of Route 9 during TS Irene in 2011. Photo taken by Allan McLane.

3. Beaver baffle put on North Pond Road at the second pond on the right when driving north. The issue was the culvert was regularly plugged by beaver activity which

was causing the road to continually get flooded. The baffle was installed in 2014 and it has mitigated the issue. Beavers are still in the area, but aren't causing issues now.

4. Rehabbed bridge 3 on South Road with shored up footings, but the majority of this upgrade was maintenance.

5. Better Back Roads grant received in 2014 to upgrade a section of McArthur Road. This upgrade included reestablished ditch, drainage, redid culverts and retopped road. The road is now getting less damage and the water quality has been improved in that area.

6. June 2004 - Box culvert upgrade put in on South Road (culvert 21) - This was a four foot culvert that was upgraded to a box culvert per the state regulations. This upgrade has prevented water from backing up and on the lower side the building there no longer gets basement flooding.

Ongoing Efforts

1. Marlboro Cares was established as an independent organization that assists residents that are at high risk during emergencies. They assist these residents during non-emergencies, but 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. Marlboro updates their culvert inventory with new culverts installed every year and directly updates the state website with that information. The last major update was done in 2014 and they are replacing culverts as needed and updating the database again now in 2016.

4. Marlboro is still part of the Radiological Emergency Response Planning (RERP) zone until June 2016. Marlboro has eight people who respond to and do RERP exercises around Vermont Yankee.

5. The EMD has met with area schools, including nursery schools and Marlboro College, to discuss emergency management planning. Marlboro School does have a school crisis plan in place.

6. The town manages a local emergency operations center (EOC) during disasters.

7. The town maintains one emergency shelter at the Marlboro Elementary School. The EMD would like to set up a formal shelter at Marlboro College, and has been in talks with the College and Red Cross about doing so.

8. Marlboro 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 Marlboro 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 2015 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.

- 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: There are mitigation actions also noted on page 13-16 of this plan, that were taken from the *Whetstone Brook Corridor Plan*. Marlboro is encouraged to refer to the *Corridor Plan* and complete those actions, as well as what is identified here. Those actions are not included in the Mitigation Actions Table on the following page because they were not provided in enough detail in the *Corridor Plan* to allow for their inclusion here.

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, Marlboro 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

Mitigation Actions Identified by the Hazard Mitigation Planning participants

HAZARD	ACTION	RESPONSIBLE PARTY	TIME-FRAME	FUNDING SOURCE	MITIGATION OR PREPAREDNESS	COST / BENEFIT	PRIORITY	STATUS
All Hazards	Sign up with VTAlert and do outreach to residents to sign-up. Having VTAlert in place will allow for faster notification to residents and responders, and faster evacuation and response to future events.	EMD	Begin November 2015 - Complete by June 2016	Town budget	Mitigation / Preparedness	Low/High	High	In discussion with VT DEMHS
Flooding	Mill Pond dam repairs – skim resurfacing will suffice for now, but more may need to be done in the future	Road Foreman	Start investigation of needed repairs Fall 2015; skim resurfacing in 2016 or 2017 which will take a couple days to complete	Town budget	Preparedness	Low/High	High	State made a number of recommendations as part of their regular inspection. There are cracks in the facing on the inlet size. The town has gotten a hydraulic study on the dam done that shows skim resurfacing should solve it. Dam removal is not seen as politically feasible at this time.
Fluvial Erosion	Update Floodplain bylaw to include River Corridors	Planning Commission and Windham Regional Commission	Started Fall 2014 - complete for vote TMD 2017	Town budget	Mitigation	Low/High	High	The town has been working on this update. They have met VT ANR about this and have sent draft language to WRC.
Fluvial Erosion	Extend arch or put in new larger arch at Bridge 2 on Higley Hill Road to stop imminent bridge collapse, road failure and fluvial erosion caused by inadequate structure (see details after table)	Road Foreman and Contractor	Depends on grant funding; Ideally Summer 2017; can be completed in one month	VTrans Structures grant or FEMA HMGP grant	Mitigation	Medium / High	High	Road Foreman is planning to start seeking bids. A hydraulic study has already been done. Existing culvert will fail within three years without action.
Fluvial Erosion	Culvert upgrade on Lahar Road to either a box culvert or open bottom arch culvert	Road Crew	Funding dependent, but needs done within 2 years;	VTrans Structures Grant	Mitigation	High / Low	Medium	Hydraulic study received back; If this didn't happen, the trees would fall into the river and the river overflows onto the road.
Fluvial Erosion	Berm removal along the Marlboro Branch of the Rock River just before Adams Brook (see details after table)	Town Road Crew	Start Spring or Summer 2017, would take about a week to complete	Town Budget	Mitigation	Low / High	Medium	Town will need to talk to landowner for permission and then get appropriate permits from ANR and US Army Corps of Engineers.

HAZARD	ACTION	RESPONSIBLE PARTY	TIME-FRAME	FUNDING SOURCE	MITIGATION OR PREPAREDNESS	COST / BENEFIT	PRIORITY	STATUS
Fluvial Erosion	Bank stabilization and upgrade of culvert 18 (from current 2' squashed to 6' arch culvert) to protect Higley Hill Road erosion and accommodate bank-full capacity (see details after table)	Contractor and Road Foreman	Start by 2020	VTrans Structures grant or FEMA HMGP grant	Mitigation	Medium / Medium	Medium	Hydraulic study has been completed; Road Foreman is seeking grant funding now
Flooding and Fluvial Erosion	Installation of sensors on bridges to give audio and visual warning to drivers when water levels reach certain heights	EMD	Started research June 2016; Hope to install by November 2017	Town budget	Preparedness	Low /High	Low / Medium	The EMD has been researching the price of purchasing and installing these devices. EMD will be reaching out to VTrans to assist with height determination.
Fluvial Erosion	Berm removal along the Marlboro Branch of the Rock River at the northern end of Auger Hole Road before the Newfane town line (see details after table)	Town Road Crew	At any point in the next three years; Action will take about two weeks to complete; could be done gradually to take fill material as needed for other jobs elsewhere	Town Budget	Mitigation	Low / High	Low	Town will need to talk to landowner for permission and then get appropriate permits from ANR and US Army Corps of Engineers.
Fluvial Erosion	Box culvert repair/rebuild and realignment on Auger Hole Road at Higley Hill Road (see details after table)	Contractor and Road Foreman	Start by 2021	VTrans Structures grant or FEMA HMGP grant	Mitigation	High / High	Low	Road Foreman will be asking VTrans for a Hydraulic study.
Invasive Species	Complete the town-wide invasive species assessment and implement the Conservation Commission's plan around invasive species	Marlboro Conservation Commission	Started assessment in May 2015; Complete Spring 2017	Town budget and volunteer hours	Mitigation	Low / Medium	High	In progress
Invasive Species	Host a first detector training to raise awareness and train first detectors to spot invasive insects in Marlboro	Marlboro Conservation Committee; VT State Forester Jim Esden	Hold training in Fall 2016 or Summer 2017	Volunteer hours	Mitigation	Low / Medium-Low	High	Without more attention to invasive insects, Marlboro runs the risk of an infestation. Reach out to the State Forester to host this training.

HAZARD	ACTION	RESPONSIBLE PARTY	TIME-FRAME	FUNDING SOURCE	MITIGATION OR PREPAREDNESS	COST / BENEFIT	PRIORITY	STATUS
Invasive Species	Hold a public event around the cleanout of glossy buckthorn around South Pond	Marlboro Conservation Commission and Ames Hill Association	First cleanout to be held spring 2016; Yearly cleanout through 2025 will be needed because of seed-bank	Town budget; volunteer hours	Mitigation	Low / Medium	Medium	In planning stages. The Conservation Commission has done some control around town beach at South Pond.
Invasive Species	Invasive species management at Town Forest at Hogback Mountain	Hogback Mtn. Conservation Assoc and Town Selectboard	Assessment Fall 2015 and start management in 2016; Ongoing thereafter	Town budget; volunteer hours	Mitigation	Low / Medium	Medium	Town is currently considering this action and will be approaching Hogback Mtn. Conservation Assoc. about the idea.

Culvert/Structure Upgrades for Mitigation and Flood Resilience

Upgrading or upsizing of undersized culverts is a primary mitigation action that towns can take to better withstand larger storm events—100-year or greater events—without having road damage, while also allowing for natural stream stability processes to occur and better aquatic organism passage through the structure. Upgrade projects should be designed to accommodate the bankfull width of the stream. Vermont ANR River Engineers, VTrans staff, regional planning commission staff, and others can work to direct and assist towns through the permitting and grant process so that the proper design is chosen and permitted. Improperly sized and installed cause upstream and downstream erosion as floodwaters are unable to flow naturally through undersized structures, and thus have to flow around them in unintended ways.

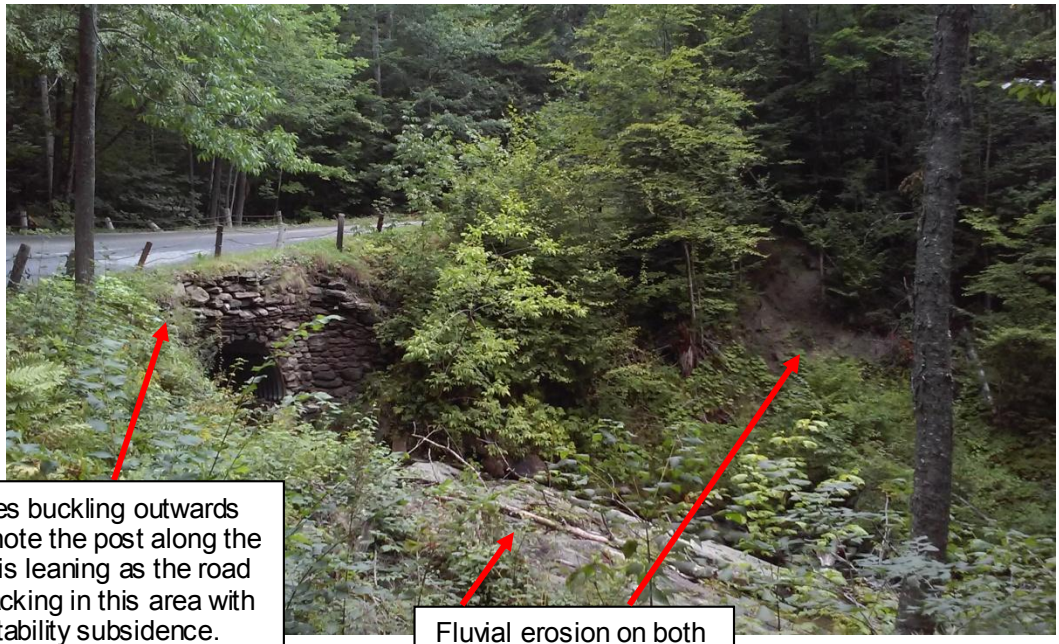
Installing larger and more resilient structures is more costly in the short term, but they hold up to larger events and allow for debris to flow through, which prevents damage, disruption and repair costs into the future. Over the long term it is more cost effective to have a larger structure that will prevent river and road conflicts. Additionally, Vermont Department of Transportation standards require larger culverts in an effort to ensure that they are mitigating future damage with every newly permitted structure.

For towns, the first step is to inventory all culverts, then assess and prioritize them for upgrade and work with VTrans, ANR, environmental groups, FEMA, and others to find the funding for the work. An important piece of the whole process is to recognize which culvert upgrades will provide the most mitigation benefits and to understand how these upgrades individually and collectively achieve greater flood resilience. Those structures whose upgrade will provide the most mitigation benefit are included in the Mitigation Actions Table of this plan.

Details on Mitigation Actions

<u>Bridge 2 extension on Higley Hill Road</u>

Problem: The structure size is inadequate and it narrows the flow channel which in turn is causing downstream fluvial erosion and bank failure. A large event could cause a debris jam to plug the culvert and the water to overtop the road. Not addressing the issue will enlarge the downstream fluvial erosion and threaten the south bend of the road. In addition, the culvert is overlain with rocks which form the structure that the road is on. This is a steep curved road and the inner curve of the road is already sinking and the road is starting to fail. The rocks forming the structure are buckling outward on the downstream side and it is predicted the structure/road will fail within three years without action. If this were to happen, the road would collapse into the stream. This is a major travel corridor in the area with around 450 cars traveling it per day. There is no easy short-cut



for this road being out, but no one would be trapped.

Solution: Either (1) extending the existing arch plate outward to stabilize the rocks at a wider point so the road isn't at the top edge with the rocks buckling over the edge of the culvert (this won't correct the issue of the culvert being too narrow to accommodate bankfull width); or (2) putting in a new larger, longer and wider, arch culvert to accommodate the before stated and bankfull width.

Berm removal along the Marlboro Branch of the Rock River just before Adams Brook

Problem: Old main stem channel has been bermed off by debris and rocks from TS Irene cleanup, and floodwaters from that storm created a new channel closer to the road. This new channel alignment is putting some downstream homes and a bridge at increased risk. This berm is on private property so permission will need to be given from property owner to remove the berm.

Solution: Removing this berm will allow floodwaters to access the old channel and more floodplain area and thus dissipate floodwaters, because floodwater will have a larger area to cover. Material removed could be used by the road crew for fill.

View of channel looking upstream

Looking downstream shows the approximate extent of berm to be removed

This undersized 2' culvert is also collapsing.

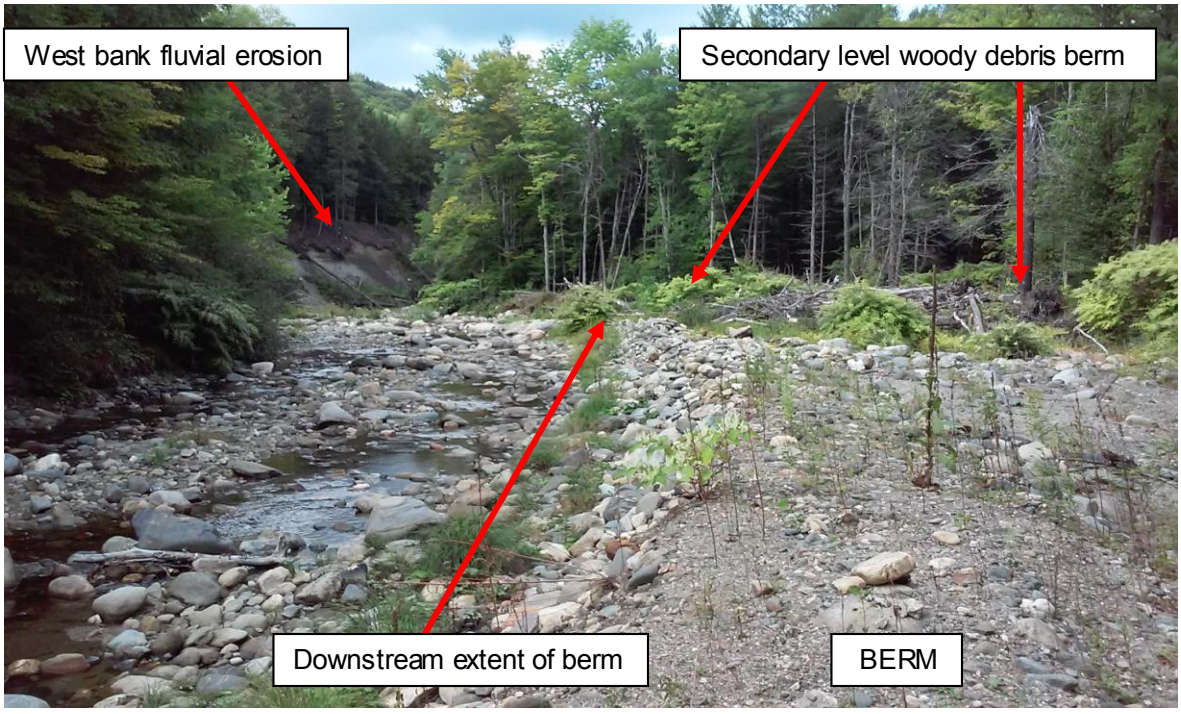
Upgrade of Culvert 18

Problem: Stormwater is eroding the road top from the stream running alongside the roadway. Due to this the road is being undercut by the stream. Undersized 2' culvert underneath road for the stream is not capable of supporting bankfull width, leading to the road being overtopped during large events. A wetland is directly downstream across the road.

Solution: Install rip rap along the embankment alongside the road to protect the road and upsize the culvert from 2' to 6' to support larger events at bankfull width to prevent road from overtopping during large events. This is a highly travelled road.

Roadside upstream of Culvert 18: Stream alongside Higley Hill Road is eating away the road embankment. The leaning trees and post are evidence of this fluvial erosion. Part of the problem is also stormwater flowing off of the road surface.

Berm removal along the Marlboro Branch of the Rock River at the northern end of Auger Hole Road



Problem: Two levels of berms have formed because of TS Irene debris and rock material. The berm closest to the waterway is about 700 cubic yards of material. This blocks floodwaters from accessing much floodplain area which, if they could access,

would dissipate floodwaters and lessen flooding downstream. Floodwaters unable to access their floodplain on the east bank are also causing fluvial erosion problems on the west bank, as they attempt to cut more floodplain access.

Upstream view of berm

Solution: Removal of the berm closest to the waterway will allow significantly more floodplain area to be accessed by floodwaters. This will lessen downstream flooding, protect houses and the road, and help to cut down on the amount of fluvial erosion occurring on the west bank slopes. The second level of berm, farther away from the waterway, is much closer to the forested area and consists mainly of woody debris. The closer berm is mainly fill and rock material. It was determined by VT ANR that the second berm can remain while still allowing the benefits discussed by removing the first and closer berm to the waterway.

Box culvert Repair/Rebuild on Auger Hole at Higley Hill Road

Problem: The current box culvert is misaligned on the waterway causing downstream fluvial erosion and upstream scour, which will eventually put the structure in jeopardy. Trees are coming down on the downstream banks and one of the wing walls on the culvert on the downstream side has collapsed.

Solution: Install realigned box culvert, which will direct heavy flows in the existing and correct channel path, thus not causing the heavy waters to hit the banks upstream and down and eroding them.

Fluvial erosion evident on the downstream bank

View from standing on the culvert shows the collapsed wing wall

Implementation of Mitigation Actions / Capabilities

Barriers to Implementation:

1. Financial constraints of town budget
2. Limited staff at town level
3. Emergency staff in Marlboro is all volunteer – though they function well, reliance upon all volunteers can be risky
4. Marlboro will soon be losing emergency planning funding from VY. The town would have to allocate budget to emergency planning after this point in 2016. The town should consider doing this.
5. Small population means limited tax base
6. Marlboro does not currently regulate development in the River Corridor, which limits control of this hazardous area.

Capabilities to build upon for implementation:

1. Town cohesion and social capital – people have equipment and a willingness to help
2. Active Selectboard

3. Active Planning Commission
4. Conservation Committee in place
5. Two town employee positions, engaged employees
6. Three full-time Road Crew employees
7. Great volunteer base, like the EMD, to carry out projects - though they function well, reliance upon all volunteers can be risky
8. Windham Regional Commission assistance when needed
9. Floodplain ordinance in place, and engaged zoning administrator who has training in floodplain administration. Town could update floodplain ordinance to include River Corridors and/or more restrictive standards.
10. Strong tourism base which brings financial capital into town – Marlboro Music Fest
11. Development Review Board
12. There are a number of residents that are self sufficient, and even off the grid, and that number is growing. This increases the vulnerability of those residents.

Recognizing that there is no place that doesn't have barriers to overcome in project implementation, Marlboro is in a good position overall. There are committed volunteers and staff who make this town function well. They are invested and plan to remain in the area. Marlboro also has good relationships with the businesses in town. The Marlboro Music Fest takes place yearly in town, and this is a revenue generator for the community. Marlboro is not struggling financially, though they have a limited real estate tax base because they have a small population. They are also located on a major travel corridor 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 Marlboro positively. Their vulnerable transportation routes could increase vulnerability during a major event, or conversely it could protect Marlboro because the state would be prioritizing repairs for Route 9.

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 VTrans Road Standards for road/culvert/bridge improvement projects.

With the support of these agencies and the Commission, Marlboro 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 Marlboro. The Hazard Mitigation Planning participants analyzed these programs for their effectiveness and noted improvements needed. Marlboro 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 Marlboro just competed updating their culvert inventory in 2015. In the development of this plan, the latest 2013 Town Plan was used.

As Marlboro 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. At the Town Meeting every March, policies and action items in the Town Plan are reviewed and integrated into hazard mitigation as needed. 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 identified. 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.

Marlboro is not yet updating the Town Plan, but when they do it is recommended that they address flood resiliency. The hazard mitigation plan will be considered and incorporated as appropriate. The Planning Commission is currently working with the Windham Regional Commission to update the floodplain ordinance to include a Fluvial Erosion Hazard bylaw and Community Identified Floodplain area overlay district. The LEOP is updated yearly and was updated last in 2016. 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 not addressed	Town Plan adopted in 2013; Next plan should incorporate flood resiliency. Town Plan update will be completed by Planning Commission with assistance from the Windham Regional Commission.
Town Local Emergency Operation Plan	Municipal procedures for emergency response	Incident Command; Hazard Annexes included	LEOP and adopted by Town Select board in 2016; next LEOP should include all of the appendices. LEOP is completed by Town EMD and Selectboard.
School Emergency Response Protocol	School procedures for emergency response	School Crisis Plan in place at Marlboro Elementary and Marlboro College	Town should review the plans with the school administration; plan should 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. Marlboro is participating in the Municipal Shared Services meetings hosted by WRC.
Road Standards	Design and construction standards for roads and drainage systems	Adopted new VTrans Road Standards in 2013.	No gaps identified. Halifax Road Crew will continue to comply with the most recent Town Road and Bridge standards set by VTrans.
Zoning regulations	Regulates the division of land, standards for site access and utilities	Zoning in place, currently being updated	Zoning update occurring now and will be voted on Town Meeting Day 2017. PC plans to update floodplain bylaw to include River Corridors and

			possibly create Community Identified Flood hazard area overlay map.
Type of Existing Authority / Policy / Program / Action	**Description**	**Effectiveness/Enforcement/ Hazard that is addressed**	**Gaps in Existing Protection/Improvements Needed**
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. Being 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 2015 Completed Annually	None Identified
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 Emergency Management Director in Marlboro, 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 Marlboro Emergency Management Director with this review, as requested by the Town. Progress on actions will be kept track using a table that WRC will provide to the Emergency Committee 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 Marlboro 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, constable/police chief, 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 there affect 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 there affect 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.

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 Coordinator, 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:
    - Select board
    - Planning Commission
    - Public Works
    - School
    - Fire & Rescue
    - Emergency Mgt/ 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, *The Mixer*, Facebook, etc.

APPENDIX

1. Adoption Sheet
2. Website and Front Porch Forum advertisement for Draft Hazard Mitigation Plan (posted 4/11/16-4/25/16)
3. Email sent to adjacent towns for public comment on the draft plan, and response from Brattleboro
4. Flyer advertising availability of Draft Hazard Mitigation Plan for public comment
5. Email sent 3/23/16 to town staff and Hazard Mitigation Planning Committee for review of the draft
6. Responses received from 3/24/16 comment solicitation from town and Hazard Mitigation Planning Committee on the draft plan
7. Website advertisements for September 22, 2015 Hazard Mitigation Committee meeting at Marlboro Elementary School (town website and Front Porch Forum)
8. September 22, 2015 Hazard Mitigation Committee meeting sign-in sheet
9. September 22, 2015 Meeting agenda
10. September 22, 2015 Meeting flyer that was posted around town
11. Fluvial Erosion Images taken March 2016 (courtesy of Road Foreman David Elliot)

1. PREREQUISITE

Adoption by the Local Governing Body

Certificate of Adoption
Town of Marlboro, VT
Selectboard

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

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

WHEREAS, the Town of Marlboro, 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 Marlboro, 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 Marlboro, 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 Marlboro, VT adopts the *Town of Marlboro 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 _____ day of _____.
date *month, year*

Selectboard

_____
Tyler Gibbons, Chair

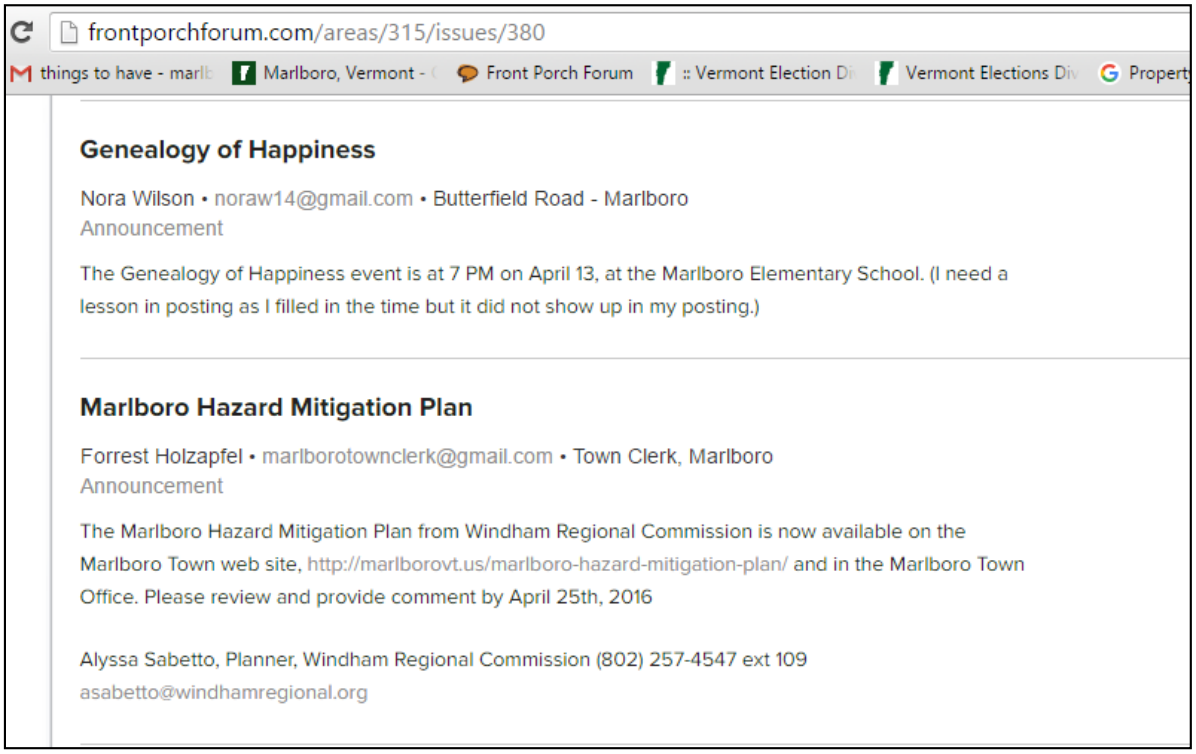
_____
Pieter Van Loon, Vice Chair

_____
Patti Smith

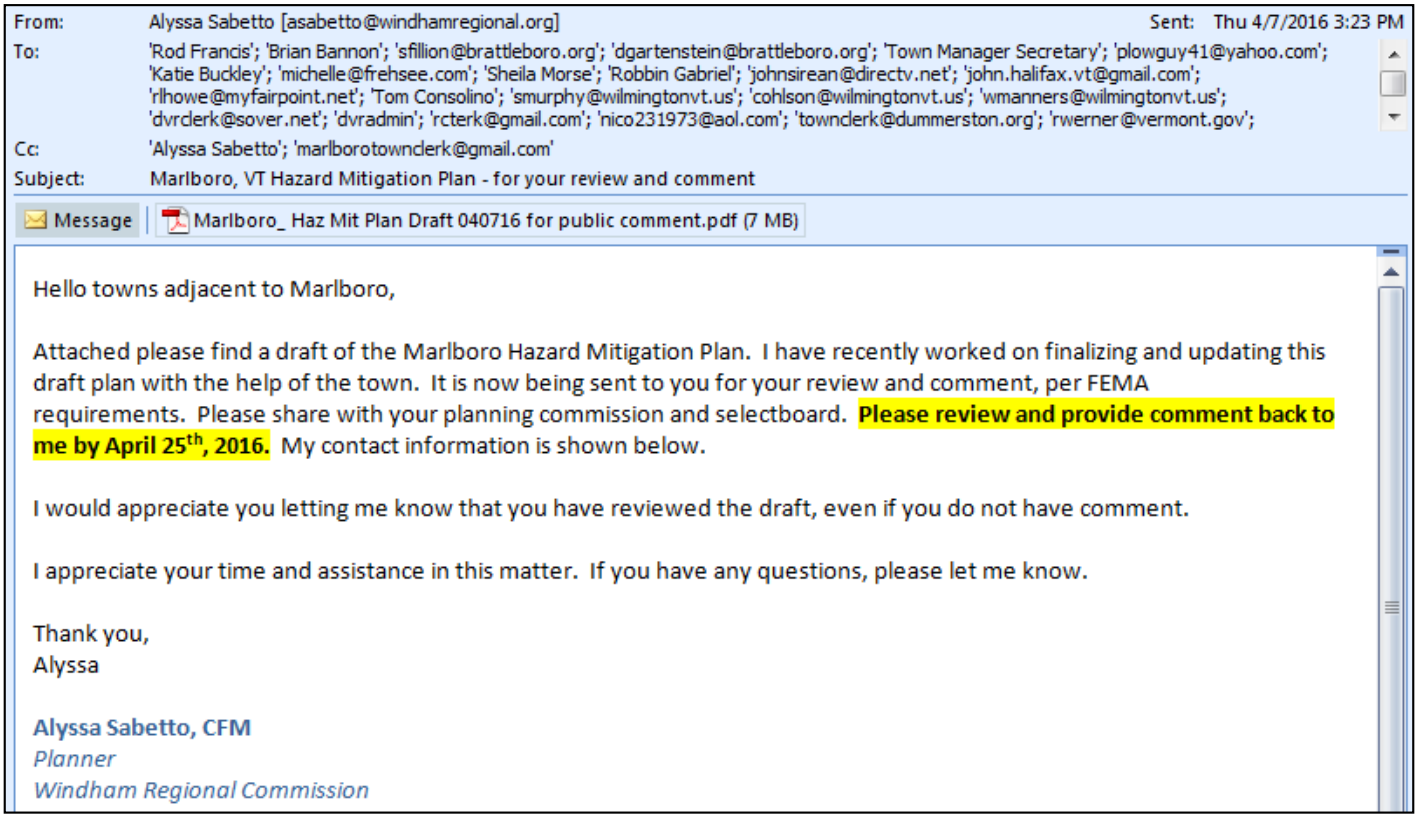
ATTEST

_____
Marcia Hamilton, Selectboard Assistant

2. Website and Front Porch Forum advertisement for Draft Hazard Mitigation Plan (posted 4/11/16-4/25/16)



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



From: Alyssa Sabetto [asabetto@windhamregional.org] Sent: Thu 4/7/2016 3:23 PM
To: 'Rod Francis'; 'Brian Bannon'; 'sfillion@brattleboro.org'; 'dgartenstein@brattleboro.org'; 'Town Manager Secretary'; 'plowguy41@yahoo.com'; 'Katie Buckley'; 'michelle@frehsee.com'; 'Sheila Morse'; 'Robbin Gabriel'; 'johnsirean@directv.net'; 'john.halifax.vt@gmail.com'; 'rlhowe@myfairpoint.net'; 'Tom Consolino'; 'smurphy@wilmingtonvt.us'; 'cohlson@wilmingtonvt.us'; 'wmanners@wilmingtonvt.us'; 'dvrclerk@sover.net'; 'dvradmin'; 'rcterk@gmail.com'; 'nico231973@aol.com'; 'townclerk@dummerston.org'; 'rwerner@vermont.gov';
Cc: 'Alyssa Sabetto'; 'marlborotownclerk@gmail.com'
Subject: Marlboro, VT Hazard Mitigation Plan - for your review and comment

Message | Marlboro_ Haz Mit Plan Draft 040716 for public comment.pdf (7 MB)

Hello towns adjacent to Marlboro,

Attached please find a draft of the Marlboro 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 April 25th, 2016.** My contact information is shown below.

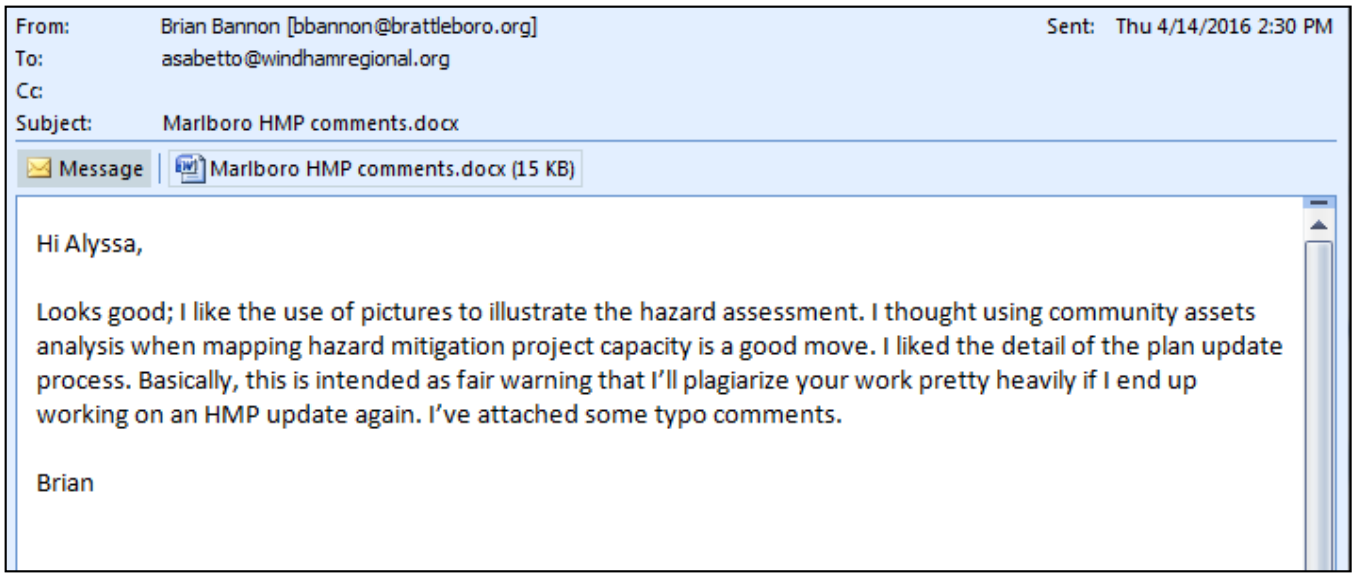
I would appreciate you letting me know that you have reviewed the draft, even if you do not have comment.

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

One response with changes was received from the adjacent Town of Brattleboro (the attached information in the email was incorporated into text of the plan)



From: Brian Bannon [bbannon@brattleboro.org] Sent: Thu 4/14/2016 2:30 PM
To: asabetto@windhamregional.org
Cc:
Subject: Marlboro HMP comments.docx

Message | Marlboro HMP comments.docx (15 KB)

Hi Alyssa,

Looks good; I like the use of pictures to illustrate the hazard assessment. I thought using community assets analysis when mapping hazard mitigation project capacity is a good move. I liked the detail of the plan update process. Basically, this is intended as fair warning that I'll plagiarize your work pretty heavily if I end up working on an HMP update again. I've attached some typo comments.

Brian

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

Marlboro Hazard Mitigation Plan

PUBLIC COMMENT PERIOD

The draft Marlboro Hazard Mitigation Plan is now available for public review at the Marlboro Town Office and on the town website: www.marlborovt.us

The Plan will be available for comment until the end of the public comment period on April 25, 2016.

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 x109 or email at asabetto@windhamregional.org. We encourage your review and participation!

5. Email sent 3/23/16 to town staff and Hazard Mitigation Planning Committee for review of the draft

From: Alyssa Sabetto [asabetto@windhamregional.org] Sent: Wed 3/23/2016 2:45 PM
To: mike.andreotta@gmail.com; marlborotownclerk@gmail.com; 'Marlboro Select Board'; marlborofirechief@myfairpoint.net; lkhecht@mac.com; 'Edie Mas'; M8RCIA@gmail.com; abartlettvt@gmail.com; mattlu869@gmail.com
Cc: 'Alyssa Sabetto'
Subject: Draft Marlboro Local Hazard Mitigation Plan - for internal town review and comment

Message | Marlboro_ Haz Mit Plan Draft 032316.docx (9 MB)

Hi Marlboro,

Attached is the first draft of the Marlboro 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 April 4th.** I'll incorporate comments and then put the plan out for public comment. If you have any pictures, get them to me ASAP, so I can incorporate them. I have put in some that Lisa got me – Thanks!!

You can call me with comments, email me back comments, or make comments directly in the document using track changes or highlighting them somehow.

Please note that the yellow highlighted sections of the plan are not yet completed and are awaiting further information as the process continues.

Forrest and Mike – If there is anyone that attended the Hazard Mitigation Plan meeting that is not getting this email from me, please forward it on to them. Also, if any town officials or hazard mitigation meeting attendees want to review a hard copy, please provide that to them.

Thank you for your time and input!
Alyssa

Alyssa Sabetto, CFM
Planner
Windham Regional Commission
139 Main Street, Suite 505

6. Responses received from 3/24/16 comment solicitation from town and Hazard Mitigation Planning Committee on the draft plan

From: Lisa K. Hecht [lkhecht@mac.com] Sent: Fri 3/25/2016 1:23 PM
To: Alyssa Sabetto
Cc:
Subject: MVFC

Emergency services: 12 on MVFC 8 active. None hired all volunteer SWNHMA is our dispatch, Deerfield valley FIre mutual aid (DVFMASI) along with Windham County Fire Fighters are mutual aid organizations.
Marlboro, MVFC is run by board of trustees as admin and the fire chief and his officers on an operational level.

Lisa K. Hecht
Sent from my iPad=

6. Responses received from 3/24/16 comment solicitation from town and Hazard Mitigation Planning Committee on the draft plan (cont'd)

From: Forrest Holzapfel [marlborotownclerk@gmail.com] Sent: Thu 3/24/2016 12:11 PM
To: Alyssa Sabetto
Cc:
Subject: Re: Draft Marlboro Local Hazard Mitigation Plan - for internal town review and comment
Message | Building temporary detour at Bridge 10.jpg (8 MB) | Augur Hole Rd near Bridge 23.jpg (10 MB)

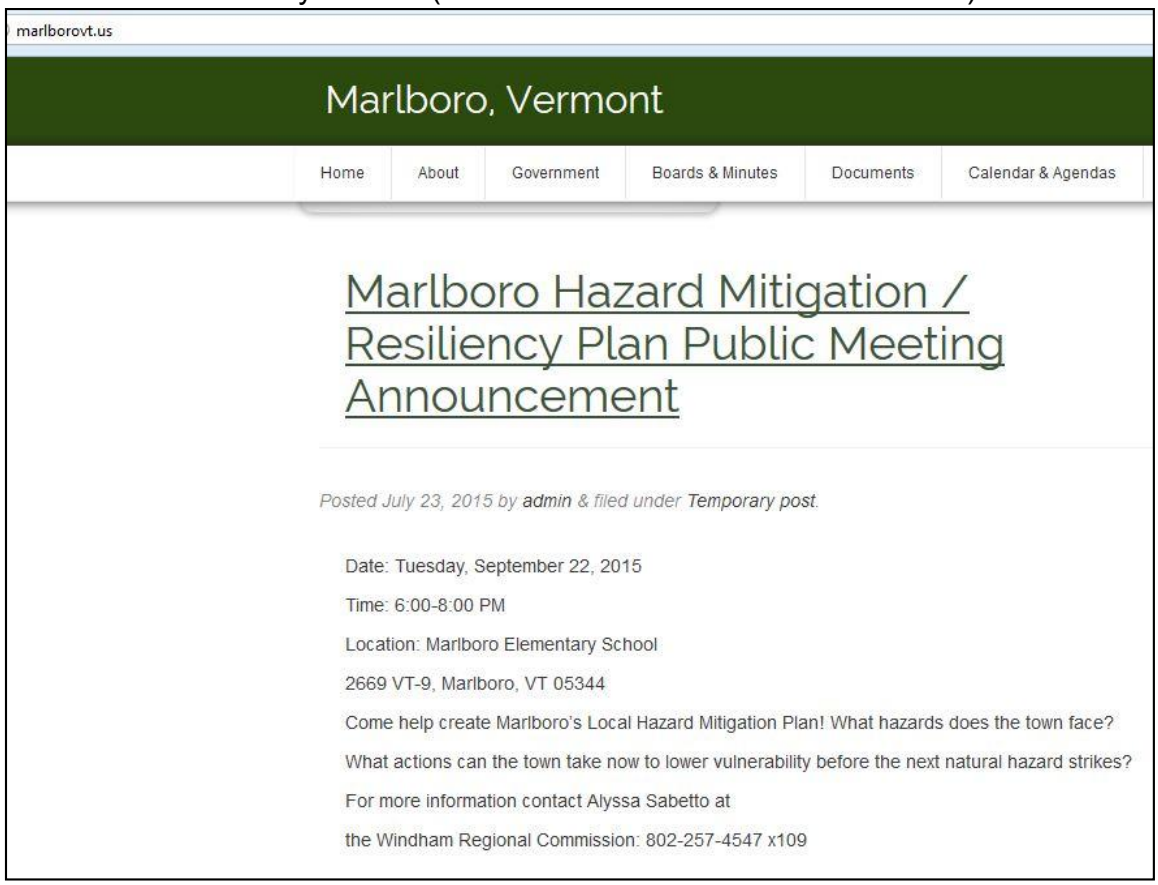
Here are the images...the temporary detour image is significant since the men working consist of both private contractors with excavators and the road crew. They fashioned an old oil tank to serve as a temporary culvert so that the road could be re-opened to traffic. They didn't wait around for someone else to show up and fix it, but found solutions to problems immediately. This is the best of a can-do attitude that helped our town immensely after Irene.

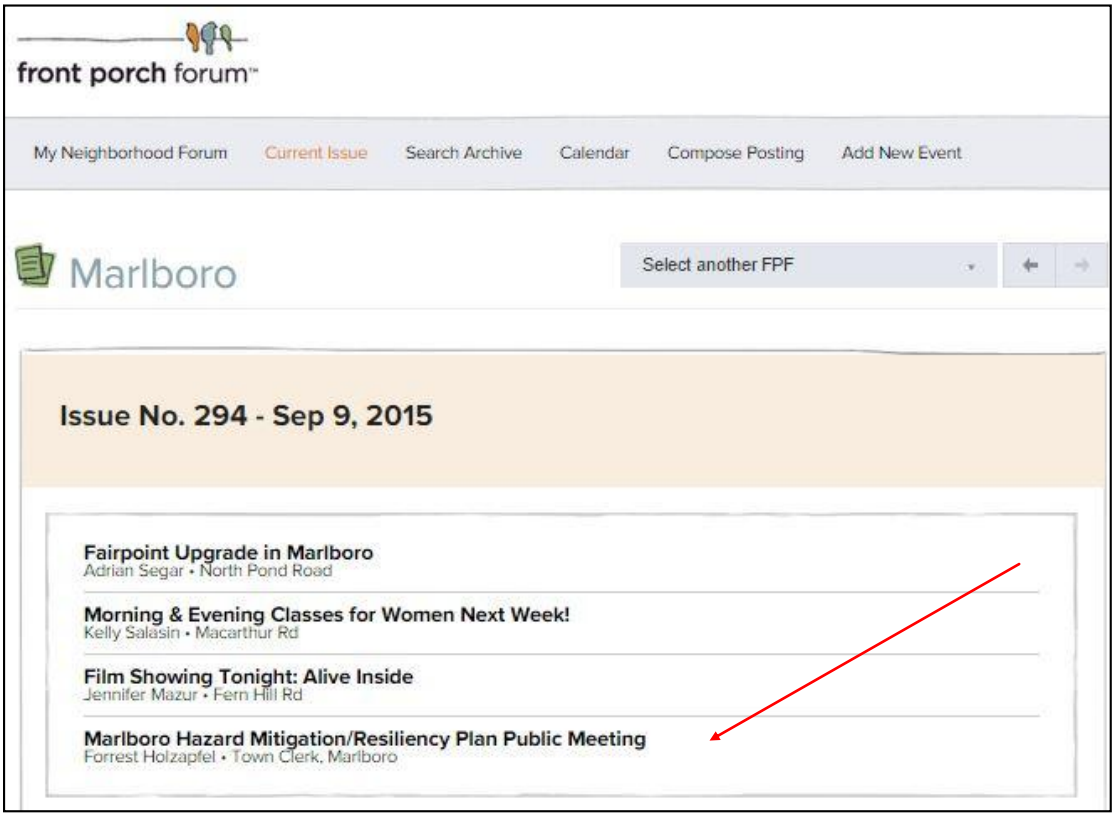
Best, Forrest

From: marlborofirechief@myfairpoint.net Sent: Sun 3/27/2016 8:40 PM
To: Alyssa Sabetto
Cc:
Subject: Marlboro Pictures Info

Hi Alyssa
Here are some pictures of fluvial erosion in Marlboro.
Picture number 4284 jpg is from Whetstone brook Pictures # 4286 #4287 #4288 #4289 #4290 #4294 are from the branch brook.
Pictures #4291 #4292 are from Worden brook.
All of these were taken in the last week or two.
If you need the original Larger files I can get them to you on a thumb drive.
David Elliott, Road Foreman
Town of Marlboro Highway Department
PO Box 76
Marlboro, VT 05344
802-257-0252
marlborofirechief@myfairpoint.net

7. Website advertisements for September 22, 2015 Hazard Mitigation Committee meeting at Marlboro Elementary School (town website and Front Porch Forum)





8. September 22, 2015 Hazard Mitigation Committee meeting sign-in sheet

Marlboro
~~Halifax~~, VT - HAZARD MITIGATION PLAN UPDATE MEETING
September 22, 2015
Location: Marlboro Elementary School

SIGN IN SHEET

Name and email address	Affiliations – Please list all	Town where you live
mike.andreotta@gmail.com Mike Andreotta	MARLBORO EMS	MARLBORO
David Elliott	Marlboro Fire Chief@myfairpoint.net Fire / Highway	Marlboro
Bennett Grout	Marlboro Planning Commision	
abartlettvt@gmail.com ANN BARTLETT		MARLBORO
mbrcia@gmail.com Marcia Hamilton	Marlboro Emergency Mgt team Select Board Assistant	Marlboro
Matt Jell mattb869@gmail.com	Marlboro Planning Commission Chair	Marlboro
Pieter van Loon vlselectboard@myfairpoint.net	Marlboro Select Board	Marlboro

9. September 22, 2015 Meeting agenda

Marlboro Hazard Mitigation Plan Update & Community Resiliency Meeting

Marlboro Elementary School – September 22, 2015

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 Marlboro in 2008
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. September 22, 2015 Meeting flyer that was posted around town

Marlboro Hazard Mitigation / Resiliency Plan

Public Meeting Announcement

Date: Tuesday, September 22, 2015

Time: 6:00-8:00 PM

Location: Marlboro Elementary School
2669 VT-9, Marlboro, VT 05344

Come help create Marlboro'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 x109

WINDHAM REGIONAL COMMISSION

12. Fluvial Erosion Images taken March 2016 (courtesy of Road Foreman David Elliot)

Whetstone Brook behind Marlboro Collision – area of major damage in TS Irene

Worden Brook – largest fluvial erosion impact in Marlboro

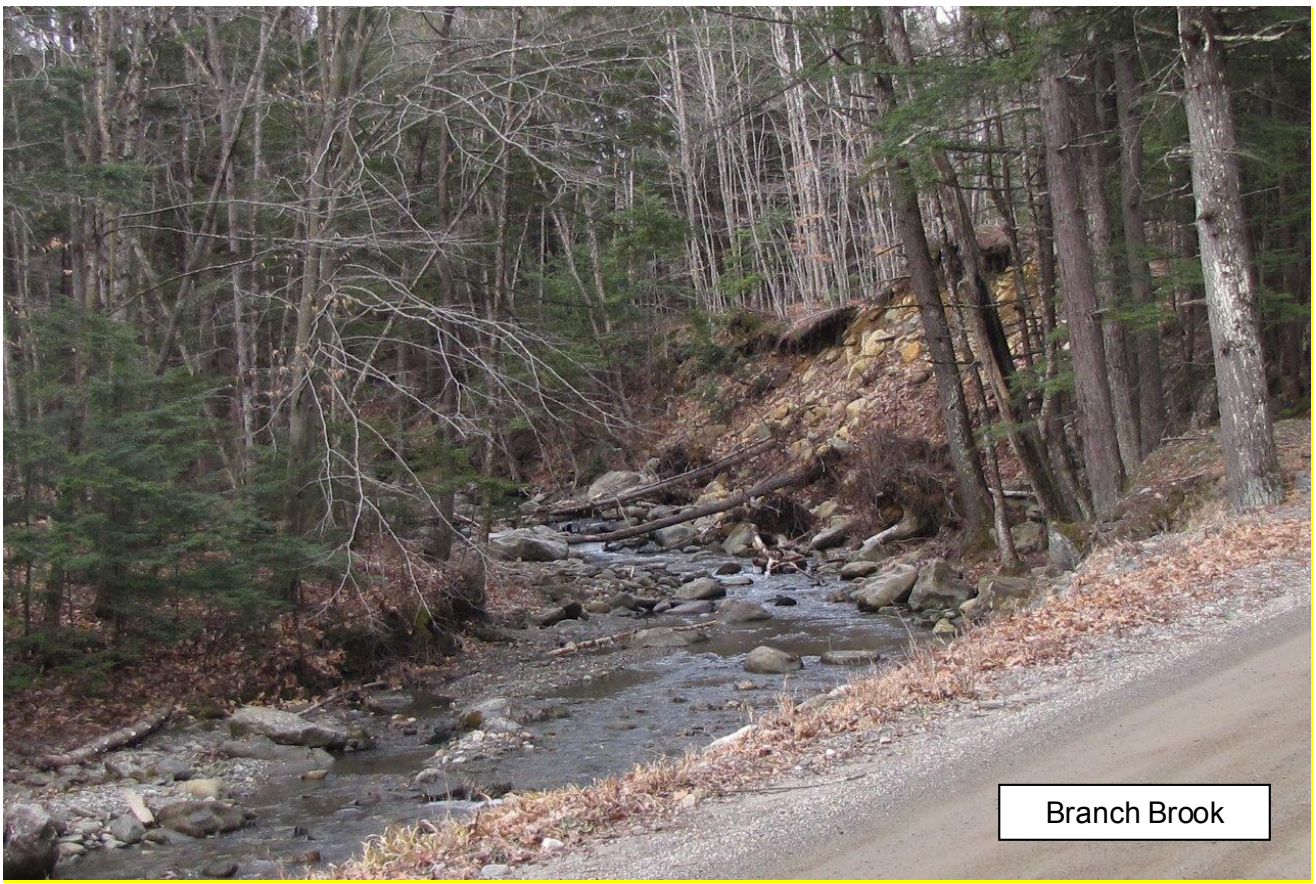
Worden Brook – largest fluvial erosion impact in Marlboro

Branch Brook


Branch Brook


Branch Brook


Branch Brook


Branch Brook

Branch Brook – notice proximity of road to this event, this is an active event, as trees are coming down