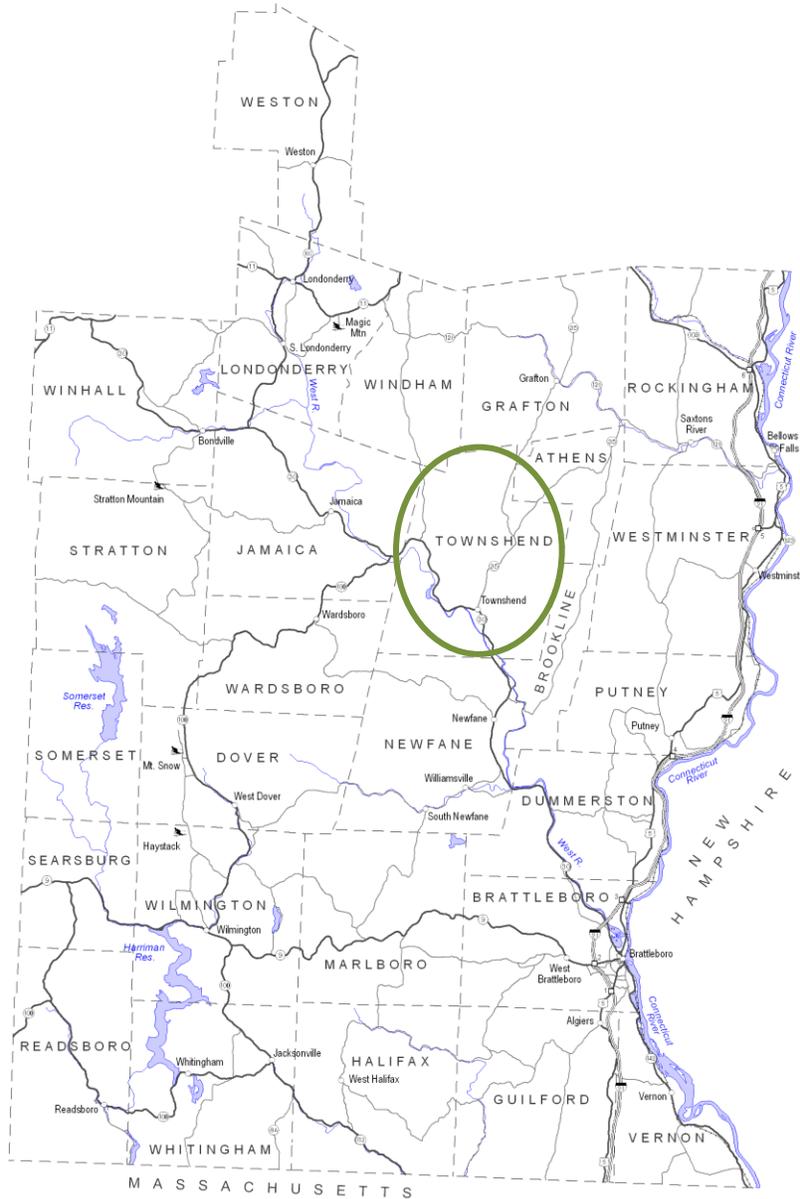


Town of Townshend and Village of Townshend Local Hazard Mitigation Plan



Adopted February 5, 2016; FEMA Final Approved February 26, 2016



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INTRODUCTION AND PURPOSE

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

The purpose of this plan is to assist the Town of Townshend and the Village of Townshend in identifying all of the hazards facing them and to identify new and continuing strategies to reduce risks from identified hazards. The Village lies within the Town and faces the same hazards as the Town, unless otherwise noted. All references to “Townshend” in this plan should be assumed to include the Town and the Village.

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.

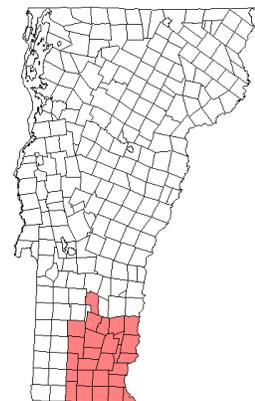
Hazard mitigation strategies and measures alter the hazard by: eliminating or reducing the frequency of occurrence; averting the hazard by redirecting the impact by means of a structure or land treatment; adapting to the hazard by modifying structures or standards; or avoiding the hazard by stopping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

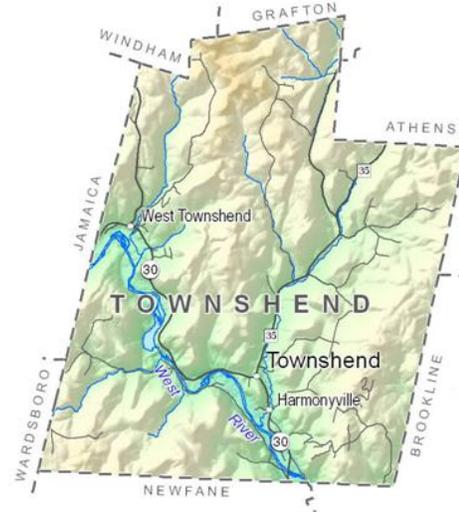


In addition to the Connecticut, other major rivers of the region are the Deerfield, Green, North, Saxtons, West, and Williams, all tributaries of the Connecticut. There are two major flood control reservoirs on the

West River, Ball Mountain and Townshend, and two major storage reservoirs for hydropower generation on the Deerfield River, Somerset and Harriman.

TOWNSHEND GEOGRAPHY & TOWN AND VILLAGE PROFILE

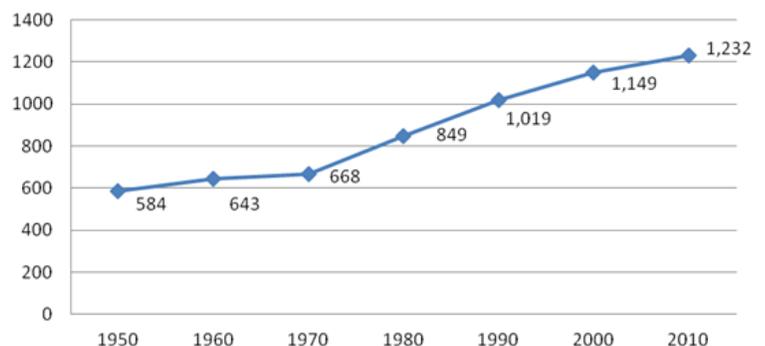
Townshend is a rural Vermont hill town consisting of 27,334 acres or 42.7 square miles in Central Windham County. Townshend is bordered to the north by the towns of Windham, Grafton and Athens; to the West by Jamaica and Wardsboro; to the East by Athens and Brookline; and to the South by Newfane. State Route 30 runs east/west through Townshend and state Highway 35 runs north/south. The topography of Townshend is varied, with Townshend Town Hall at 547 ft. and the highest peak located on Acton Hill at 2,017 ft. The highest point in Townshend is Dummerston Hill—at an elevation of just over 1,600 feet it is a dominant landmark located between the river valleys in the southern part of town. Bald Mountain and the smaller hills of Peaked Mountain, Crane Mountain and Wiswald or West Hill are located throughout the town. The dominant water features in Townshend are the West River, which flows west to east along Route 30, and the Townshend Reservoir which is created by the Townshend dam, a major flood control project operated by the Army Corps of Engineers. The reservoir lies not far upstream from the villages of Townshend and Harmonyville. There are also numerous brooks and streams and throughout Townshend.



It should be noted that though the Village of Townshend is an incorporated Village, the Village has no official function, no staff, and no real distinction, other than settlement pattern, from the Town of Townshend. In fact, it was news to the Deputy EMD that assisted with this plan development that the Village was even incorporated. The town does not act like the village is any separate entity from the town. The town handles all business for the village. There is an email that describes the relationship between the town and the village in the appendix of this plan.¹ In the 1960's Townshend Village simply voted to abandon the village, without any formal ratification of the dissolutions or mergers by the VT General Assembly². The Village of Townshend is the only incorporated Village in Townshend.

Historic development patterns along waterways have meant that a number of structures are in the floodplain. Development in Townshend is characterized by compact settlements, chiefly in Townshend Village and West Townshend Village. Elsewhere homes and commercial establishments are located along rural roadways. As of early 2015, there are no appreciably large scale residential or commercial developments slated for permitting or construction. Woodlands are the most predominant land use in Townshend, covering 86% of the town. Most of this woodland is privately owned, though State Forest covers 1,334 acres. These woodlands provide a scenic backdrop for the villages, as well as wood products, maple products, hunting and recreation opportunities.

Town Population



¹ See appendix 5.

² Gillies, Paul S. Villages. Shown on VT Secretary of State website < <https://www.sec.state.vt.us/archives-records/state-archives/government-history/continuing-issues/villages-and-cities/history-of-incorporated-villages.aspx>>

Townshend's population as of 2010 was 1,232. As the graph on page two shows, population has been increasing steadily since 1950. The chart below shows that Townshend's population growth rate from 2000-2010 has declined from the rate between 1990 and 2000. The latest growth rate for Townshend is also lower than many neighboring communities.

Population Trends in Surrounding Towns	Town	1990	2000	2010	% Change 1990-2000	% Change 2000-2010
	Townshend	1,019	1,149	1,232	13%	7%
Athens	313	340	442	9%	30%	
Brookline	403	467	530	16%	14%	
Grafton	602	649	679	8%	5%	
Newfane	1,555	1,680	1,726	8%	3%	
Wardsboro	654	854	900	31%	5%	
Jamaica	754	946	1,035	26%	9%	
Windham	251	328	419	31%	28%	

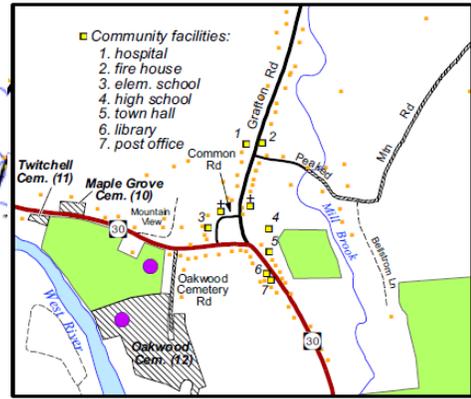
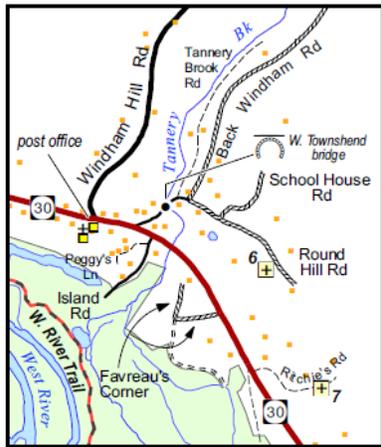
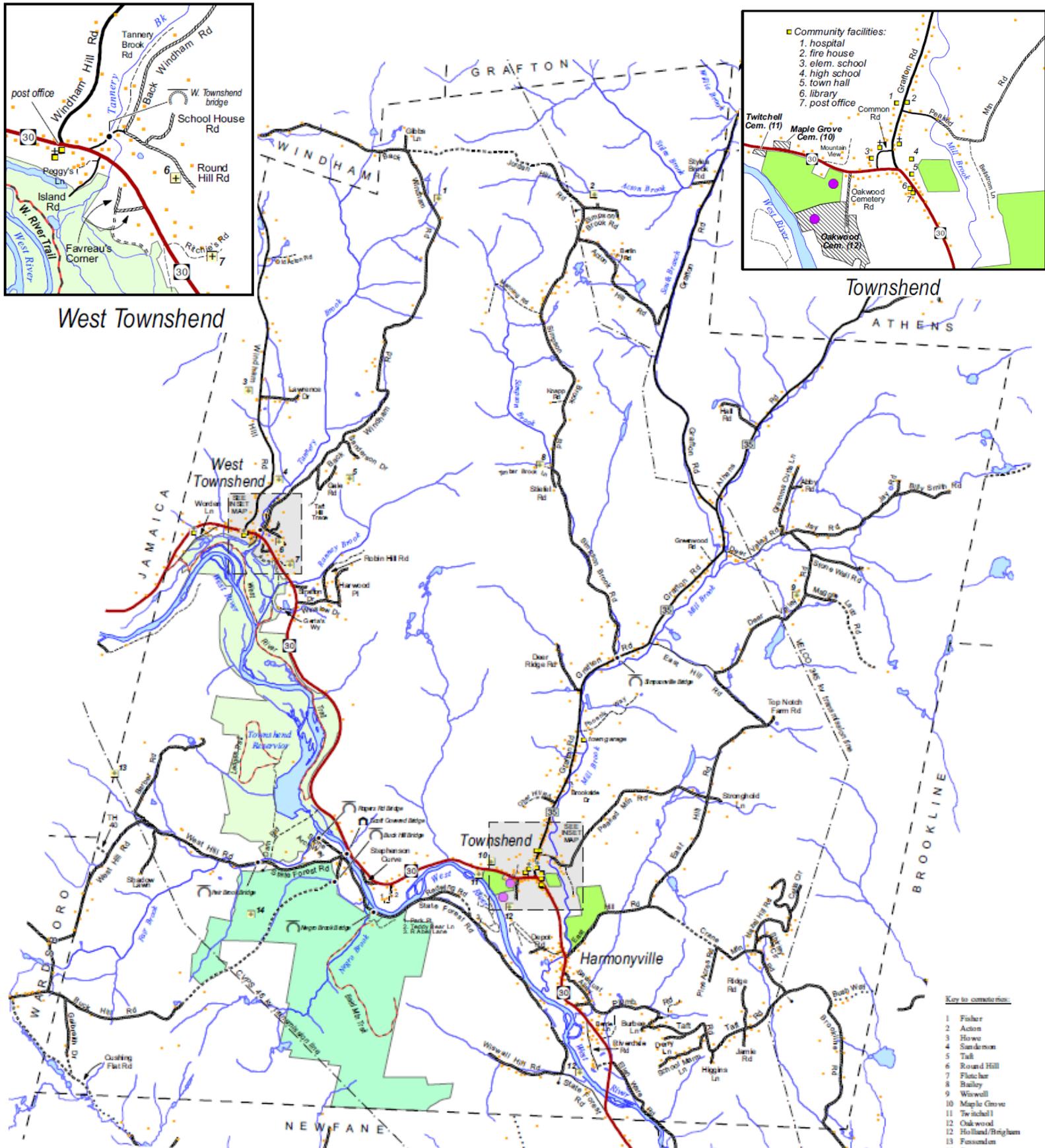
Townshend also has seasonal variation of population due to tourism. Stratton Mountain Resort is located not far from Townshend in the adjacent town of Jamaica. The summer and winter population is much higher than in the off seasons, which makes for a unique situation for emergency management and response. During the off seasons, the permanent residents, who are very self-sufficient, communicate regularly with other town folks and know something about emergency management. The part-timers and seasonal folks are apt to know much less about emergency management. As a result, the percentage of people knowing how to respond in an emergency is reduced during the tourist seasons. The number of emergency management personnel to support people in crisis during peak times does not change. Response times could be instantaneous or could take an hour or more. As a result of the rural nature, people have learned to be self-sufficient and proactive about risks. They store enough wood, food and necessities in the case of power outages or times when they must shelter-in-place. Cross help and self help is prevalent with a great sense of community response by sustaining relationships with neighbors. Workers using trucks who have training in emergency response are constantly listening to their scanners. Often, someone who happens to be working in the field, and happens to be listening to a scanner -- if close to an incident, will respond before a fire truck or ambulance will arrive. This is just the nature of rural Vermont.

In light of that, there are still populations of people who are dependent and will need help from others. A prime example of this population is the part-time second home owner. Most likely coming from urban environments, these people in particular have an expectation of emergency service that simply is not provided in the remote regions of Vermont. For instance, cell service is not dependable and may not be available at all. Even though these part-time property owners may have a vehicle that is four-wheel drive, they may not be accustomed to driving in serious winter storm conditions, so accidents are more rampant. Drivers may depend on GPS for directions, and will take short cuts in winter, not knowing that the short cut may be a Class 4 road, which isn't necessarily plowed in winter. This is just the nature of rural Vermont.

Emergency Services

Grace Cottage Hospital is located in Townshend and is a small hospital with only 19 beds. There is a volunteer fire department in Townshend. There is no EMS in the fire department. For EMS first response, Townshend is covered by Rescue Inc. For police protection, Townshend contracts with the Windham County Sheriff Department. Leland and Gray High School is the emergency shelter for Townshend.

Existing Land Use Map from 2011 Town Plan

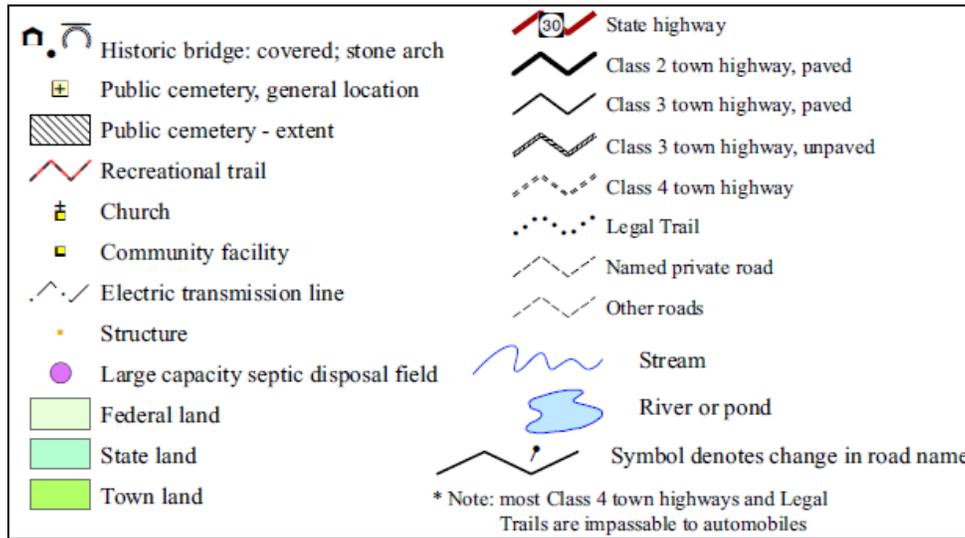


West Townshend

Townshend

- Key to cemeteries:
- 1 Fisher
 - 2 Acton
 - 3 Howe
 - 4 Sanderson
 - 5 Tall
 - 6 Round Hill
 - 7 Fletcher
 - 8 Bailey
 - 9 Wiswell
 - 10 Maple Grove
 - 11 Twitchell
 - 12 Oakwood
 - 13 Hoiland/Brigham
 - 14 Fossenden

The key to the map on the previous page:



PLANNING PROCESS

Town residents who took part in the planning process for developing the Local Hazard Mitigation Plan for Townshend 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 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 Multi-Jurisdiction Hazard Mitigation Plan is NEW, and has never been approved by FEMA or adopted by the Town of Townshend.

Past Process

In 2010, representatives from Townshend participated in a regional public participation planning event held by the Local Emergency Planning Commission (LEPC 6). Since the Windham Regional Commission was writing Hazard Mitigation Plans for 20 towns within its region, two public participation events were scheduled as "joint events" to be held at the September and October monthly meetings of the LEPC 6. These events were meant to educate the towns about the hazard mitigation planning process and identify hazards in their towns. A presentation was made at the September meeting explaining the process and the meaning of a hazard analysis, with time for questions. The October meeting



provided an informal map exercise where numerous maps were posted for each town, and comment sheets provided for participants to write ideas/comments about areas in their towns facing potential negative impacts from hazards.³

On September 27, 2010 local town officials, people involved in emergency management and other people active in Townshend’s community formed a Hazard Mitigation Planning Committee and met to discuss the town’s vulnerability and risks to natural and man-made hazards. Subsequent meetings were held by the hazard committee on December 8, 2010 and February 9, 2011 to determine which hazard mitigation strategies would best serve the community. The following hazard mitigation planning meetings were held:

- September 27, 2010 – Townshend Elementary School, Townshend, VT
- December 8, 2010 – Townshend Town Offices, Townshend, VT
- February 9, 2011 – Townshend Town Offices, Townshend, VT
- March 20, 2012 – phone conversation and email exchange with Townshend EMD

A draft plan was developed out of these meetings, but the document was never completed or submitted to Vermont Division of Emergency Management and Homeland Security (DEMHS) or FEMA. The planning process was put on hold for several years, largely because assistance was required for towns that were more severely damaged by Tropical Storm Irene, which occurred in September 2011.

Current Process

The Town commenced the planning process again in January 2015 when the draft that was worked on in 2010 through 2012 was picked back up for update and completion. Alyssa Sabetto, Emergency Planner for the Windham Regional Commission, worked with Craig Hunt (Townshend Deputy EMD) to schedule a public meeting to discuss hazards in the community and mitigation ideas. The Hazard Mitigation Planning participants, which included Craig, selectboard members and the planning commission, reconvened on January 28, 2015 at the Townshend Town Hall and met with Alyssa Sabetto. This meeting was open and advertised to the public.⁴ It lasted for several hours and involved:

- a detailed review of the draft document with discussion of more recent hazard events,
- progress made in mitigation efforts that were noted several years ago,
- development of new hazard mitigation projects,
- discussion of areas in the Town where hazard events are causing repeated or large scale damage, and
- general overview of the draft for relevancy and updating purposes.



There were numerous changes that came out of that meeting. Alyssa subsequently met with Craig to get more questions answers and detailed settled on for various items in the plan. They also reviewed a large map of Townshend to discuss areas that were mentioned at the meeting, and additional areas that Craig knows have had repeated or large problems during hazard events. Alyssa Sabetto updated the draft per

³ See appendices 10-13 for information on the LEPC meetings.
⁴ See appendices 7 and 8 for meeting agenda and sign-in sheet.

these meetings, and presented the updated draft for review by the group of plan participants that attended the January 28th meeting. The draft plan was simultaneously put out for public comment. This was done by posting and having a hard copy of the plan advertised and made available at the town office for public review and comment. It was also simultaneously distributed to adjacent towns for comment via email.⁵ Comment was received back from the Town of Athens, though they did not propose any changes to the plan. The plan was then finalized for submittal to Vermont Department of Emergency Management and Homeland Security (DEMHS) and FEMA.

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

Committee (2015)	Affiliations	Home
Bob DeSiere	Planning Commission	Townshend
Art Monette	Planning Commission	Townshend
John Evans	Planning Commission	Townshend
Susan LeCours	Planning Commission	Townshend
Dale Wet	Selectboard, Road Crew, Townshend Volunteer Fire Department	Townshend
Carole Melrs	Townshend Selectboard	Townshend
Kathy Hege	Townshend Selectboard	Townshend
Craig Hunt	Selectboard Administrative Asst.	Townshend
Alyssa Sabetto	Planner, Windham Regional Commission	Brattleboro

Public Involvement and Input from Neighboring Communities

Making the Townshend 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.⁶
- Between 2010 and mid 2014, the Townshend Draft Plan was posted on the Windham Regional Commission website for public review and comment. No comments were received during this time.
- The draft plan was made available in hard copy for public review and comment at the town office from April 11 through April 27, 2015.
- Flyers were put up around town for public comment on the draft.⁷
- On April 13, 2015, an invitation was extended via email to neighboring towns to provide a means and opportunity to review and comment on the draft Townshend Hazard Mitigation Plan.⁸ One response was received back from the Town of Athens, with no changes suggested. No comments were received from Townshend. Inter-town communication will repeat for future revisions of this Plan.

⁵ See appendix 3.

⁶ See appendix 6 for flyer advertising January 28, 2015 public meeting.

⁷ See appendix 2.

⁸ See appendix 3.

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? How likely are they to occur? What will be affected by these hazards? How will these hazards affect you? 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 |

Frequency of Occurrence: Probability

- | | |
|-------------------|---|
| 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
- 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, Frequency of Occurrence and Warning Time was used to determine the hazard ranking score for each hazard.

The **Potential Impact, Frequency of Occurrence and Warning Time** for each hazard was discussed at the January 28, 2015 Hazard Mitigation Plan meeting. There was also a review of what was developed in 2010-12; 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.

The Village lies within the Town and faces the same hazards as the Town, unless otherwise noted. All references to “Townshend” in this plan should be assumed to include the Town and the Village. While all hazards listed in the below table were discussed and considered for inclusion in this plan, it is not feasible to study each in depth. The hazards not profiled in this plan are considered to be unlikely (<1% probability of occurrence per year) to occur in Townshend and therefore will not be profiled in this plan. The plan participants filled in the below table and decided which hazards they would like this plan to focus on. The hazards not addressed in this plan are: highway accidents, power failure, school safety issues, structure fire, hazardous material spill, wildfire, high wind, air crash, terrorism, Vermont Yankee/radiological incident (Townshend is outside 10 mile radius EPZ), water supply contamination, tornado, microburst, hurricane, earthquake, dam failure, ice jams, drought, hail storm, extreme heat, railroad accident and tsunami. Townshend does not have mitigation actions beyond what they currently do to prevent these hazards. They feel that the current management actions they take to deal with these hazards are adequate at this time. Ice jams and severe weather associated with hurricanes are both covered in the flooding section. Power failure is briefly addressed in a separate section. For hazards that are not profiled in this plan, the reader is directed to the Vermont State Hazard Mitigation Plan.

Possible Hazard	Frequency of Occurrence	Warning Time	Potential Impact	Score
Flood / Flash flood	4	4	3	11
Landslide / Mudslide / Rockslide	4	4	3	11
Highway Accidents	4	4	2	10
Power Failure	4	4	2	10
School Safety Issues	2	4	3	9
Invasive Species / Infestation	4	1	4	9
Structure Fire	3	4	1	8
Hazardous material spill	1	4	3	8
Winter & Ice Storm	4	1	3	8
Wildfire	2	4	2	8
High Wind	3	3	2	8
Air crash	2	4	2	8
Terrorism	1	4	3	8
Radiological Incident	1	4	2	7
Water Supply Contamination	1	4	2	7
Tornado/Microburst	2	2	2	6
Hurricane	2	1	3	6
Earthquake	1	4	1	6
Dam Failure	1	1	4	6
Ice Jams	2	1	3	6
Drought	2	1	2	5
Hail Storm	1	2	1	4
Extreme Heat	2	1	1	4
Railroad Accidents	N/A	N/A	N/A	0
Tsunami (Vermont is landlocked)	N/A	N/A	N/A	0
Volcano (VT has no active volcanoes)	N/A	N/A	N/A	0

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 for Flooding/Fluvial Erosion, Landslide, Winter/Ice Storm and Invasive Species.

Flooding/Fluvial Erosion

Description

Flooding is the most widespread and destructive hazard in the United States. Flooding has also been the most common and costly hazard to affect Townshend. Flooding can occur anytime of the year as a result of heavy rains, thunderstorms, tropical storms, hurricanes or Nor'easters. It can result from the overflow of major rivers and their smaller tributaries, or inadequate local drainage. Historically, floods have been a factor in over 80 percent of all federally declared disasters. People living in close proximity to bodies of water such as rivers, lakes, and streams are at greater risk from flooding than those not living in the floodplain. There is a 26 percent chance of experiencing a flood during the life of a 30-year mortgage compared to a 4 percent chance of a fire. Townshend has an NFIP compliant floodplain ordinance, which gives residents access to discount flood insurance and enables the Town to regulate development within the Special Flood Hazard Area (SFHA). SFHAs are subject to inundation by the 1% annual chance flood (100-year flood). Maps of these areas can be found in the vault at the Town Office or online at the FEMA Map Service Center.⁹

Impact

Most of the destruction from flooding in Townshend is due to fluvial erosion rather than inundation, which is the type of flooding targeted through the NFIP. Most streams in Vermont today are not in an equilibrium condition, because riverside development, channelization practices, and other historic land uses have prevented the river from assuming its most stable natural shape (meander pattern, slope, channel width and depth, sediment bars, etc.).¹⁰ Fluvial erosion, or the destruction of river banks caused by the movement of rivers and streams, is caused by disequilibrium. This erosion 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. River Corridor mapping was released by the VT Agency of Natural Resources (ANR) in December 2014. This mapping can assist municipalities in developing bylaws and effective mitigation strategies to regulate development within river corridors. ANR has only mapped river corridors for rivers and streams with watersheds over two square miles. For small streams, with watersheds less than two square miles, the extent of the River Corridor will be measured on the ground as fifty (50) feet from the top of the stream bank. Townshend does not currently have a River Corridor bylaw, but should consider developing one.

Ice jam flooding is fairly common



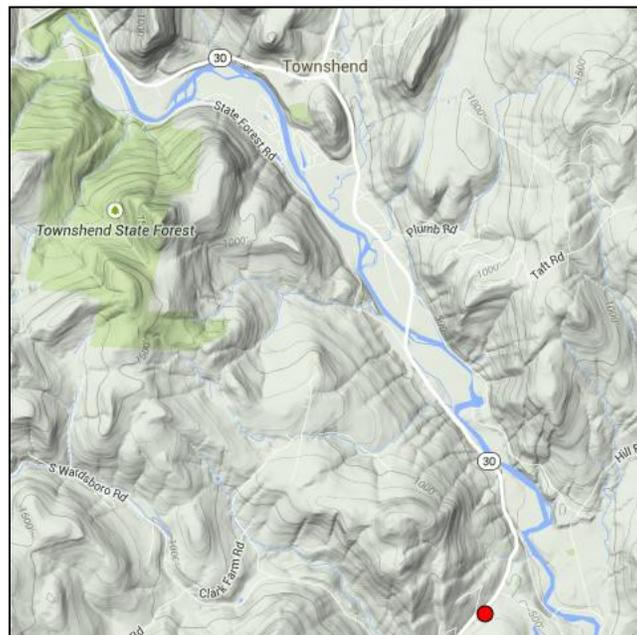
⁹ <https://msc.fema.gov/portal>

¹⁰ VT ANR http://floodready.vermont.gov/flood_protection/river_corridors_floodplains/river_corridors

in the early springtime, around March timeframe. The heavy rainfall, combined with runoff from snowmelt due to the mild temperatures, results in flooding of rivers, streams and creeks, mainly from the formation of ice jams. Townshend doesn't have mapped ice jams in its borders, but there are two jams in close proximity upriver and downriver on the West River.¹¹ These are shown below.



The mapped ice jam shown above has one known occurrence. It is located where River Road bounds the West River in East Jamaica. This jam could influence western Townshend because it is upstream.



The ice jam shown above has eleven known occurrences. It is located along Route 30 in Newfane, just south of Harmonyville in Townshend.

¹¹ CRREL Ice jam database/map <<http://rsgisias.crrel.usace.army.mil/apex/f?p=273:9:0::NO>>

Flash floods typically occur in high elevation drainage areas as a result of summer thunderstorm activity. Damage from flash floods is difficult to predict since flash flood areas are not mapped at this time. Infrastructure and structures along higher elevation streams and drainage areas are most susceptible to damage from flash flooding. Drainage ditches and culverts are the biggest concern for local flash flooding events. Townshend has particular vulnerability because it has a lot of mountainous terrain and its main transportation routes are along streams because these areas are the flatter areas available. Thus, there are numerous residences along the roads near the streams, and in areas vulnerable to flash floods and fluvial erosion. Areas subject to flooding are Simpson Brook and its adjacent Simpson Brook Road. There is flood risk along most of the Brook, and there are two undersized bridges on the southern end of the road which are at risk of jams. There is a lot of fluvial erosion along Simpson Brook Road, with trees falling into the Brook, increases the risk of jams. Additionally, West Hill Road off of State Forest Road and Fair Brook near West Hill Road are both known for flooding. These are mountain streams and flash floods impact them particularly because of the elevation of their watershed. There are a number of other mountain streams in Townshend, including Mill Brook, which crosses under Route 30 in Harmonyville and frequently floods. There are also flooding issues along Grafton Road/Route 35 south of the intersection of Deer Valley Road going into Townshend.

During TS Irene, Acton Hill Road was shut down, leaving 40-50 people stranded at their homes for about a day. East Hill Road, at the top of the road, also had a culvert blow out and the brook changed its direction and flooded the road. TS Irene also caused a major culvert located on federal land on Dam Road to blow out and take out the whole road. That was the most significant Irene damage in Townshend. Townshend wasn't that hard hit compared to other towns in the region. Most damage was repaired within 24 hours, though some repairs took years because they weren't needed immediately.

Route 30 and Route 35 are the main transportation routes in Townshend, and are primary routes for the entire region. There is a flooding problem that frequently occurs on Route 30 south of the River Bend Market. This is a low lying area, not in the Special Flood Hazard Area, but just outside it. This section of Route 30 gets inundation flooding on the road, making it impossible to cross and cutting off a main road. Blowing snow is also an issue in this section. The southern portion of Townshend, Harmonyville is particularly susceptible to flooding, including inundation flooding, due to poor drainage and the flat topography of the river valley. Townshend Village and West Townshend are relatively protected from flooding.

Fluvial erosion is an issue in many of the same places that flooding is an issue—Simpson Brook; Mill Brook upstream by Barber Road; and Roaring Brook on Plum Road. The primary cause of the fluvial erosion in Townshend is road cuts into steep valleys that were created by mountain streams, which tend to incise—taking the road and the trees with them. The roads were put in these valleys, along the streams, because it was easier to put roads there than in the mountains. The roads are also not properly armored or maintained. This is an ongoing issue for the town.



Fluvial erosion in Townshend after TS Irene in 2011

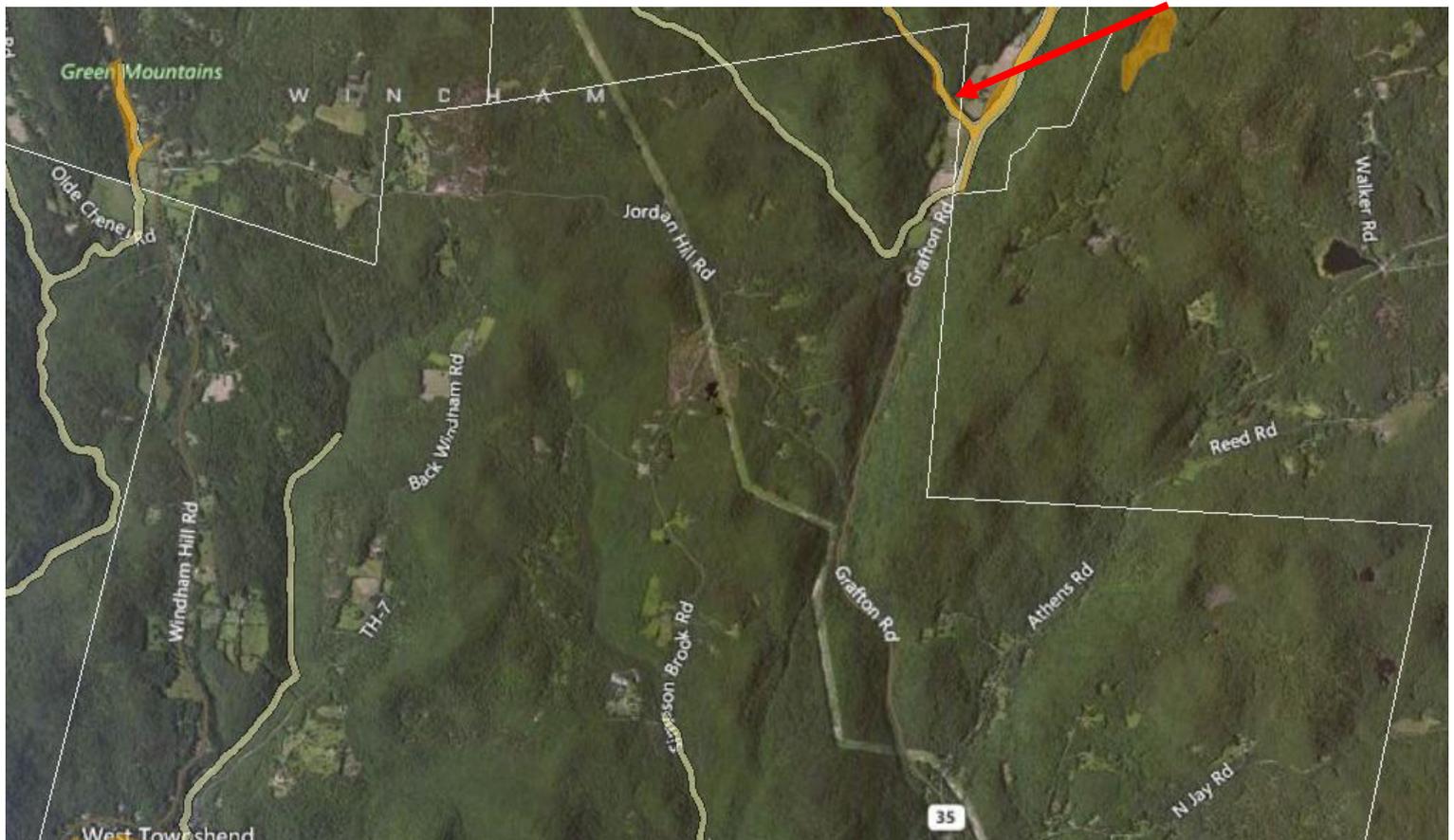
Another potential flood hazard is dam failure of the Townshend Dam. The dam is owned and maintained by the Army Corps of Engineers (ACE). It is a flood control dam and it creates the Townshend reservoir, which is 4-5 miles long and is a recreation area and a wildlife preserve. Dam inspections are done regularly by the ACE, and the two full time staff at the dam, but inspection reports are not provided to the

Town. Plan participants do not have a lot of concern about the safety of the dam. There is more concern about Ball Mountain dam, which is in Jamaica. If Ball Mountain dam burst, it would take out Townshend dam, causing a major disaster. An issue of concern with Townshend dam is that TS Irene caused silt to build up in the reservoir; ACE has not dredged it out, partially because the silt would be contaminated by debris and oil from TS Irene debris. This issue has degraded habitat and water quality of the wildlife preserve.

Location / Special Flood Hazard Area and River Corridor Mapping

All SFHAs in Townshend are “A” zones, which are the lowest risk flood hazard areas that FEMA maps. There are no floodways. Properties within the SFHA, that have a mortgage, are required to purchase flood insurance. Townshend’s participation in the NFIP gives residents access to discount flood insurance through the program. The Flood Hazard Summary Sheets on FloodReady Vermont’s website says there are 15 structures in the Special Flood Hazard Area.¹²

The below maps was 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 Townshend (shown in orange). The floodplains shown in these maps are based on the FEMA Flood Insurance Rate Maps (FIRMs) available through the FEMA Map Service Center.¹³ The map effective date for the latest FIRMs for Windham County is 9/28/2007.



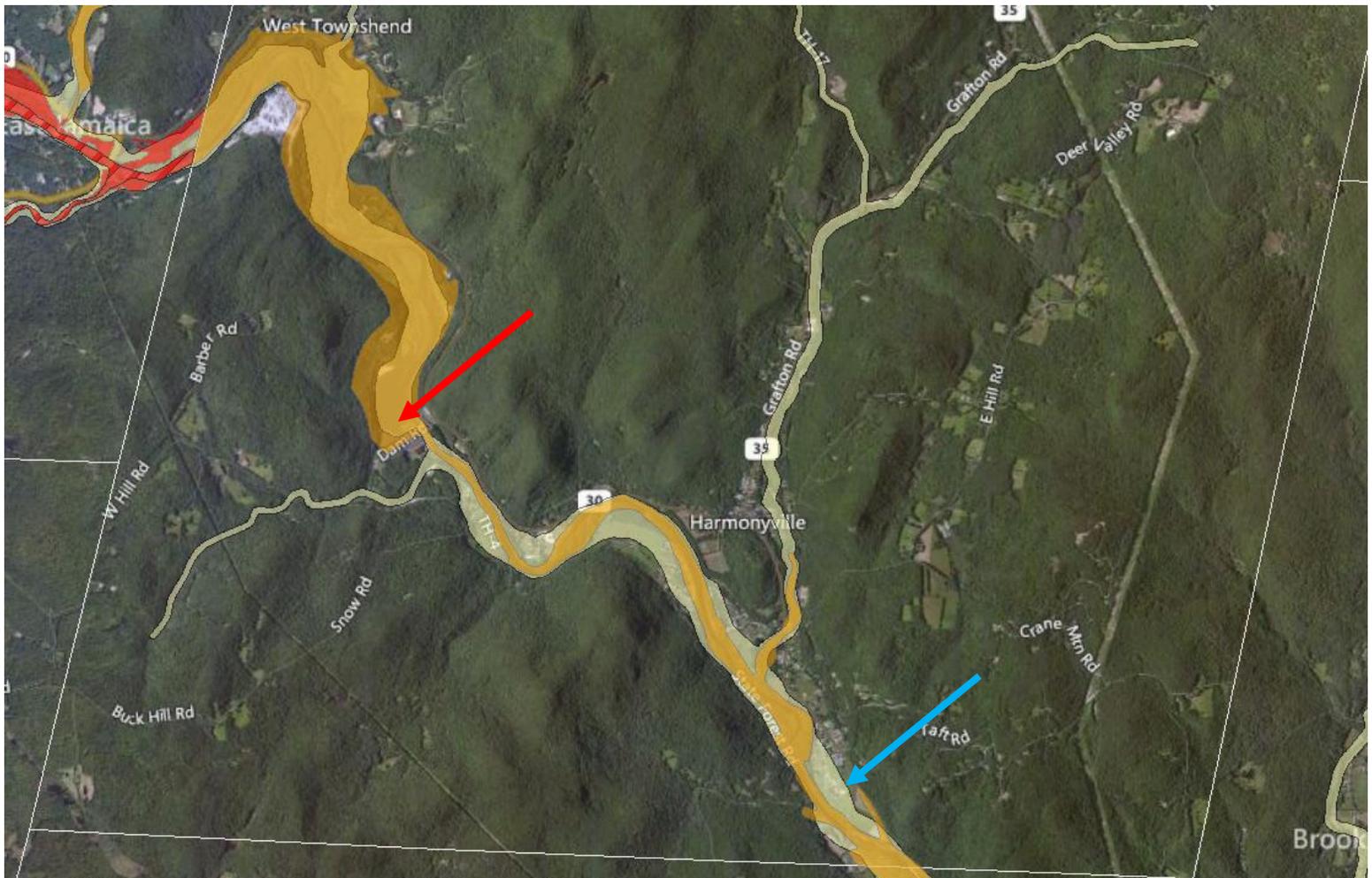
¹² Flood Hazard Summary Report for Townshend, accessed 1/6/15
<<https://anrweb.vt.gov/DEC/FoFReports/DisplayFloodHazardReport.aspx>>

¹³ FEMA Map Service Center, accessed 12/18/14
<<https://msc.fema.gov/portal/search?AddressQuery=wndham%2C%20vermont>>

The River Corridors shown on the map on the previous page are shown as the shaded white areas. In Townshend, these lie along Stiles Brook, Simpson Brook and Tannery Brook, in the map shown below of the northern half of Townshend. Keep in mind that ANR has only mapped river corridors for rivers and streams with watersheds over two square miles. For small streams, with watersheds less than two square miles, the extent of the River Corridor will be measured on the ground as fifty (50) feet from the top of the stream bank. The SFHAs, in orange, for the northern half of Townshend are also shown (red arrow pointing to it). There is only a small area in the very north, near Grafton Road that is defined as a Special Flood Hazard Area. This SFHA is connected to the SFHA to the north in Grafton.

The below map shows the Special Flood Hazard Areas (SFHAs) in orange for the southern half of Townshend. SFHAs are along the West River and around and upstream of the Townshend Dam and the Townshend Reservoir (the red arrow is pointing to the location of the Townshend Dam). As the map shows based on the SFHA shape, the Townshend Dam provides flood control for areas downstream. Part of West Townshend Village is in the SFHA, though plan participants said flooding isn't an issue there because of the dam. Route 30, one of the main transportation routes in Townshend, runs along the West River, and is in the floodplain in portions. The blue arrow in the south points to the area of Route 30 that sees inundation flooding and snow drifting that cause issues and sometimes block the road. Townshend Village is outside of the SFHA. Harmonyville doesn't show to be in the SFHA by much, but experiences flooding more than the other villages.

The River Corridors are shown as the white shaded areas. Note that the primary transportation routes in Townshend are all within mapped River Corridors. As discussed previously in the Impact section of Flooding, road damage due to fluvial erosion is an issue in Townshend.



Extent

There are two stream gauges that relate to waters in Townshend:

- Gauge on the West River below Townshend Dam near Townshend Village - highest recorded measurement was 8.89 feet, which was measured on April 24, 1996. Tropical Storm Irene elevations are not in the top rankings of gauge height. According to the National Weather Service, flood stage at this gauge is 11 feet.¹⁴ Townshend Dam is a flood control dam.
- Gauge on the Saxtons River at Saxtons River, VT – highest recorded measurement was 19.58 feet, measured during TS Irene on August 28, 2011. According to the National Weather Service, flood stage at this gauge is 10 feet.¹⁵

Probability

Flooding and fluvial erosion events are highly likely, as determined by the Deputy EMD and other members of the Hazard Mitigation Planning Committee. There are frequent road washouts every year, especially during spring snow melt and late summer season rains.

Past Occurrences

Since 1996, when National Climatic Data Center detailed records start, there have been 35 flood events in Windham County, Vermont. Townshend experiences routine spring flooding, but this is not always documented. There have been several Presidentially Declared Disasters in recent years for Windham County which have included severe thunderstorms and associated flooding. Windham County, including the Town of Townshend, experienced nearly constant rain and thunderstorms in the late summer of 2003. The storms affected Townshend from the period of July 21 through August 18. FEMA Declaration DR – 1488 was associated with this event. Many roads were washed out and culverts needed replacing throughout town. The following year, another severe period of flooding and thunderstorms, which lasted from the period of August 12- September 12 engendered Presidential Disaster Declaration DR – 1559. In 2007, Windham County was part of DR – 1698, and DR-4043 in May 2011, and DR-4022 in September 2011.

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

Aug. 28, 2011 – Tropical Storm Irene – The Federally Declared Disaster DR-4022, Tropical Storm Irene, tracked northeast across eastern New York and western New England during Sunday, August 28th, producing widespread flooding, and damaging winds across the region, including Townshend. The greatest impact from Irene across southern Vermont was due to heavy to extreme rainfall, which resulted in catastrophic flooding. Rainfall amounts generally averaged 4 to 8 inches. Much of the rain which fell occurred within a 12 hour period, beginning early Sunday morning, and ending Sunday evening. Route 9, the main route across southern Vermont was closed. Numerous evacuations were reported. During TS Irene, Acton Hill Road was shut down, leaving 40-50 people stranded at their homes for about a day. East Hill Road, at the top of the road, also had a culvert blow out and the brook changed its direction and flooded the road. TS Irene also caused a major culvert located on federal land on Dam Road to blow out and take

¹⁴ USGS Stream gauge 01155910 West River below Townshend Dam near Townshend, VT
<<http://waterwatch.usgs.gov/index.php>>

¹⁵ USGS Stream gauge 01154000 Saxtons River at Saxtons River, VT <<http://waterwatch.usgs.gov/index.php>>

out the whole road. That was the most significant Irene damage in Townshend. Total damage in Townshend for TS Irene was \$ 1,121,214.99.¹⁶ FEMA gave \$1,009,093.50. The image below shows a piece of the TS Irene damage in Townshend.¹⁷



Every road suffered damage from TS Irene and emergency repairs were quickly done following the storm although full recovery took two years with the last work being the culvert upgrades on East Hill Road. They were lucky that there were no structure fires or injuries during TS Irene. Overall, Townshend fared pretty well in comparison to other towns in the region. This was due in large part to flood protection provided by the Townshend Dam.

May 20, 2011 - A vertically stacked upper level low moved slowly over eastern Pennsylvania, New Jersey and southern New York on Friday, May 20th. The surface low moved to near Long Island by the early afternoon. Showers and thunderstorms developed in a moist and unstable airmass across the region. Storms repeatedly moved over the same areas across a portion of Windham County resulting in flash flooding in the Saxtons River area. DR – 4043.

March 6-7, 2011 - A cold front moved gradually southeastward across the region during the day Monday, March 7th, as a wave of low pressure moved northeastward along the boundary. To the south of the boundary, it was mild as the area was in the warm sector of the low pressure system. The storm tapped into both Atlantic and Gulf moisture, resulting in heavy rainfall of 1 1/2 to 3 1/2 inches across southern Vermont Sunday, March 6th, into Monday, March 7th before the precipitation transitioned to a wintry mix then snow early Monday morning. The heavy rainfall, combined with runoff from snowmelt due to the mild temperatures, resulted in flooding of rivers, streams and creeks, mainly from the formation of ice jams. An ice jam on an unnamed stream near Plumb Road along Route 30 caused water to flow across Route 30 near Ellen Ware Road in Townshend. Also, flooding of numerous basements was reported in the area.

April 15-21, 2007 – Major spring flooding. Rain and snow caused damage to roads and utility lines across Windham County and Townshend. Across the State, nearly 3.6 million dollars was obligated as part of the FEMA Public Assistance Program. While it is not normal for the town to receive this type of damage from severe flooding and thunderstorms on an annual basis, road washouts and culvert repairs from these associated events have ranged in the ballpark of \$200,000 to \$400,000 in some communities

¹⁶ Information provided by Deputy EMD Craig Hunt.

¹⁷ Photo shown in the 2011 Town Report.

in Windham County. Rain and snow caused damage to roads and utility lines across Windham County and Townshend.

June 29, 2006 - After being nearly stationary while deepening for several days, an upper-level trough from the Great Lakes to the lower Ohio Valley was accelerating eastward at daybreak on June 29. An associated weak low pressure over Lake Erie trailed a cold front through the Ohio Valley. During the day, this system moved rapidly eastward and touched off thunderstorms in the warm, humid air mass over western New England in the early evening. Torrential rainfall produced flash flooding in Windham County. An emergency manager reported that Route 35 and other roads were washed out near Townshend.

October 8, 2005 - 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.

March 31-April 2, 2004 - As much as three inches of rain fell between March 31 through April 2 across southern Vermont. This rain combined with the last of the snow melt to produce an excessive runoff of water. As a result, flooding took place in Bennington County. The Manchester Schools were closed due to flooding. The gage on the Batten Kill River in Arlington, rose to 6.90 feet, nearly a foot above the 6-foot flood stage during the predawn hours of April 3. Also in Bennington County, flooding was observed at the Paper Mill Village along the Waloomsac River. In Windham County, flooding was reported in West Brattleboro, where the Ames Brook and Whestone Creek both rose over their banks and impacted nearby roads.

August 12-September 12, 2004 - Presidential Disaster Declaration DR – 1559 resulted in severe period of flooding and thunderstorms. 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. These two 2004 events allowed for funding from the FEMA Public Assistance Program to flow into Windham County and help pay for the costs associated with debris removal and other emergency protective measures.

July 21 through August 18, 2003 nearly constant rain and thunderstorms affected Townshend. 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 town. \$250,000 of damage county-wide.

In 1996, Between Saturday morning July 13 to Sunday morning July 14 three to five inches of rain 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.

On June 12, 1996, a very moist and unstable atmosphere was situated over Vermont. This resulted in torrential rains from training thunderstorms which dumped approximately 6 inches (radar estimate) of rain near Grafton in Windham County. Flash flooding occurred at Grafton during the late afternoon and early

evening. Several roads were washed out. Route 35 between Grafton and Townshend was closed and some sections were washed out. A home near Stiles Brook, about 3 miles south of Grafton, was inundated with water and mud as the brook jumped its banks. This event left \$150,000 of damage.

During 1976, flooding occurred throughout New England causing millions of dollars in damage.

The Vermont Flood of 1927 was the deadliest natural disaster 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 town knowledge and records, VT ANR online mapping, FEMA FIRM maps, US ACE's CRREL Ice Jam mapping tool, USGS stream gauge data, National Climatic Data Center storm event database data for Windham County¹⁸, VT ANR Flood Ready website

Landslide

Description and Geographic Area of Hazard/Occurrences

Landslides are a serious geologic hazard common to almost every state in the United States. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide movement include: saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, removal of trees and other vegetation and earthquake shaking. Landslides 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. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Landslides in Townshend are related to road cutting and fluvial 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.

In some instances stabilization/mitigation projects in Townshend have helped some landslides. In other areas throughout Townshend, issues remain. Because so much of the landslide issues in Townshend are related to fluvial erosion, much of what was mentioned in the flooding section of this plan is relevant here as well, in terms of areas of concern. On Simpson Brook Road, there is a fairly large section on the lower portion of the road that is experiencing landslide into Simpson Brook. This is a slow slide caused by fluvial erosion and the road cut. This slide is such an issue that there is talk of opening up Deer Ridge Road, a class 4 road, to give a secondary route and that may in the future become a permanent route. Another area of concern is in western Townshend in the area of West Hill and Barber Road.

Impact

There are several areas in Townshend with landslide risks, primarily to roadways that would cut off residences. All of the landslides in Townshend that are issues of concern are along roadways and disturbance is often more of a risk than letting them alone. Risks with these landslides are to passing drivers and residents being cut off by landslide debris covering roadways. The deeper layer of the soil is clay based composition which stays in place, but the soil with vegetation on top of it, if inundated by water, will slither off the clay based soil and erode into the stream or land on a road shutting it down. Repeatedly having to repair roadways, slow erosion areas with short term stabilization methods, and clean out culverts that fill with erosive debris are a threat to the town budget.

Extent

The largest landslide situation in Townshend is the slide on Simpson Brook Road between Pasture Place and Stiefel Road.

¹⁸ < <http://www.ncdc.noaa.gov/stormevents/>> accessed January 5, 2015

Probability

Highly likely, 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.

Sources used

Local knowledge of areas of concern and impacts

Winter/Ice Storm

Description and Geographic Area of Hazard

The Region has a long history of severe winter storms and blizzards and usually experiences at least one or two Nor'easters each year with varying degrees of severity. There have been 232 winter/ice storm or extreme cold events in Windham County since 1996.¹⁹ A typical event begins as a low-pressure system that moves up the Atlantic Coast, into the Canadian Maritimes, dumping heavy snow across parts of Vermont. Snowfall accumulations are generally three to six inches in the valleys and 6 to 12 inches in the mountains. Winter storms and ice storms can cause power lines to fail, damage trees and impede access to homes and businesses. Athens has not received any financial assistance from the State or FEMA for recovery from severe winter weather.

Heavy wet snows of early fall and late spring, as well as ice storms, often result in loss of electric power, leaving people without adequate heating capability. The other threat from winter storms is downed trees, resulting in power failures and impassable roads or driveways. An ice storm crossed the region in December of 2008 causing widespread downed trees and power outages in Windham County. The total cost of damages across the region surpassed the one million dollar threshold triggering a Presidential Disaster Declaration DR-1816. Damage across the region consisted of roads being blocked for shorts periods of time due to downed trees and utility lines. Thousands lost power for varying lengths of time and several shelters were opened in Windham County. Compared to neighboring southern New Hampshire communities, Townshend and Windham County fared relatively well from the damage inflicted by the ice storm.

Impact

Damage from heavy snow and ice storms can vary depending upon wind speeds, snow or ice accumulation, storm duration, and structural conditions (such heavy snow and ice accumulation on large, flat roofed structures). The assessed value of all property in Townshend is \$189,725,121. Assuming a range of town-wide damage of 1% to 5%, a heavy snow or ice storm could result in \$1,897,251 to \$9,486,256 of total damage.

Extent

The severity or magnitude of winter storm to occur in southeast Vermont can range from moderate to very severe. The southeastern region of VT typically receives over 60 inches of snowfall per year, and most Vermonters are prepared to handle large amounts of snowfall. Athens experiences significant snow storms every year but according to the town they are manageable. During the major snowfall of winter 2010-2011, where the region received well over 100 inches of snow, the biggest problem was that snow never melted off during the season, only accumulated, making it difficult to find space to store the mounds of snow. But in the season of 2010-2011, the problem arose with finding locations to deposit huge quantities of snow during the season because there wasn't the typical mid-season melt off. Snow amounts are not necessarily a problem for Vermonters, but heavy, wet snow, or the event of rain on snow or frozen ground, are usually very problematic.

Seasonal Snowfall records per the Burlington, VT Weather Service:

¹⁹ National Climatic Data Center, 1996-2014 storm events database < <http://www.ncdc.noaa.gov/stormevents/>>

**Seasonal
(Jul 1st – Jun 30th)**

Maximum Minimum

Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	145.4"	1970-71	1	31.8"	1912-13
2	132.0"	1886-87	2	32.0"	1904-05
3	128.4"	2010-11	3	37.7"	2011-12
4	122.4"	2000-01	4	38.3"	1928-29
5	120.2"	2007-08	5	38.7"	1926-27
6	116.9"	1992-93	6	39.6"	1979-80
7	113.5"	1887-88	7	40.4"	1988-89
8	111.6"	1965-66	8	40.7"	1948-49
9	108.9"	1971-72	9	42.5"	1990-91
10	107.2"	1993-94	10	43.0"	1903-04

Probability

The Hazard Mitigation Planning Committee in Townshend deems winter storm / ice storms to be highly likely any given year. Every winter there is a weather related incident where people in town will lose power for a few days.

Past Occurrences

The Region has a long history of severe winter storms and blizzards and usually experiences at least one or two Nor'easters each year with varying degrees of severity. There have been 209 winter/ice storms in the Region since 1996.²⁰ There have been three winter storms in recent history in Windham County that were Disaster Declarations:

- Ice Storm (DR-1201) – January 6-16, 1998
- Snowstorm (EM-1358) – December 16-18, 2001
- Winter Storm (DR-1816) – December 11-18, 2008

LOCAL EVENTS

February 13, 2014 - This precipitation moved from south to north across the region for the overnight hours. In addition, lightning and thunder accompanied the precipitation in a few areas as well. The precipitation tapered off from west to east during the morning hours on February 14th, as the storm moved northeast towards eastern New England and Atlantic Canada. By the time snow ended, 8 to 21 inches of snow was reported in southern Vermont.

December 27, 2012 - Snow, heavy at times, fell across much of southern Vermont from the evening of the 26th into the day on the 27th. Total storm snowfall amounts varied greatly from just a few inches in down-sloped valley areas to 27 inches in the Green Mountains. In addition, southeast winds were strong and gusty, especially across the high terrain. Woodford gusted to 43 mph and Bennington Airport gusted to 46 mph. This storm resulted in very slow travel during the holiday season, especially on the evening of the 26th and morning on the 27th.

February 29, 2012 - A complex multi-part long duration (24 to 36 hour) storm blanketed southern Vermont with 8 to 16 inches of snow and sleet Wednesday, February 29th and Thursday, March 1st with lower amounts of 4 to 8 inches across southeastern Bennington County.

Feb. 25, 2011 - A storm system produced a widespread swath of heavy wet snow across southern Vermont during the day Friday. Snowfall rates of 1 to 2 inches per hour occurred, beginning during the early morning hours, and persisting until late afternoon. Snowfall amounts of 12 to 17 inches occurred

²⁰ National Climatic Data Center, 1996-2014 storm events database < <http://www.ncdc.noaa.gov/stormevents/>>

across much of southern Vermont. The heavy wet snow created treacherous travel conditions for both the morning and evening commutes on Friday, and also led to numerous school and business closings.

Jan. 19, 2011 - Snow and sleet accumulations across southern Vermont varied from 3 to 9 inches, with ice accumulations of up to a half of an inch.

Jan. 12, 2011 - Heavy snow fell across southern Vermont with snowfall accumulations ranging from 14 inches up to 3 feet. A mesoscale snowband set up across the western New England, including southern Vermont, Wednesday morning resulting in snowfall rates of 3 to 6 inches an hour.

January-February 2010 - The snow fall during this time was severe, averaging over 100 inches throughout the region, to include the Town of Athens. There were a number of large storms during this timeframe. No reported dollar amount of damage.

December 11, 2008 - A significant mix of snow, sleet and freezing rain occurred from Thursday afternoon into early Friday afternoon. Snow and sleet amounts of 1 to 3 inches fell, along with ice accretion of one half to three quarters of an inch from freezing rain, leading to widespread downed trees, tree limbs and power lines. The hardest hit areas included Bellows Falls and Brattleboro. In Bellows Falls, one tree reportedly fell through the roof of a house. Athens was out of power for 5-6 days, but some towns experienced outages for several weeks.

December 17, 2007 - Snow developed during the early morning hours of Sunday, December 16th, and persisted intermittently before ending early Monday morning on December 17th. The snow was heavy at times, and also mixed with a bit of sleet Sunday afternoon and evening. Total snow and sleet accumulations ranged from 8 to 11 inches, with 10.8 inches reported at Townshend, and 9.6 inches reported at Putney. The heavy snow and sleet resulted in numerous school and business closings Monday morning, and also created treacherous travel conditions for the Monday morning commute.

December 3, 2007 - Snow, some moderate to heavy at times, developed across eastern Windham County Sunday evening, and persisted into much of Monday. Some sleet and freezing rain did mix in at times, particularly within valley locales. Snowfall amounts of 6 to 10 inches fell from this storm system, with 9.5 reported at Townshend, 8 inches at Bellows Falls, and 6.3 at Putney.

March 2, 2007 - A significant mixture of snow, sleet and freezing rain began early Friday morning, and ended Friday evening. Snowfall accumulations of 6 to 10 inches fell during this storm, with 10 inches reported at Athens, and 6 inches at Brattleboro. In addition, ice accretions of up to one half inch occurred from freezing rain, mainly within sheltered valley locales.

February 6, 2001 - In Windham county, 15 inches of snow accumulated at Ball Mountain, 19 at Townshend Lake and 21 at West Wardsboro.

November 22, 1997 - A low pressure system south of Long Island on November 22, 1997 produced heavy wet snow across southern Vermont. Snowfall averaged 4 to 8 inches in Bennington and Windham Counties. The heavy wet snow downed trees and power lines, which produced scattered power outages. The power outages were most widespread in Windham County.

March 31, 1997 - This system produced rain across Bennington and Windham Counties during the morning hours of March 31. The rain changed to heavy wet snow by early afternoon. Snowfall amounts were highly elevation dependent. Some specific snowfall totals included: 12 inches at Shaftsbury and 13 inches at Peru in Bennington County and 23 inches at West Wardsboro and 12 inches at Grafton in Windham County. The wet snow brought down many trees and power lines causing widespread power outages and road closures. Some areas remained without power for several days. Route 9, between Bennington and Brattleboro was closed for much of the night. \$750,000 of damage in Windham County.

Nov. 26, 1996 - On November 26, a low pressure system brought a combination of snow and freezing rain to southern Vermont. Over Bennington and Windham Counties, snow and heavy freezing rain

downed trees and power lines and caused numerous accidents. Across southern Vermont approximately 10,000 customers lost power.

Jan. 2, 1996 - A major winter storm developed over the Gulf coast states on January 2nd and tracked northeast along the eastern seaboard during January 3rd. Heavy snow fell across southern Vermont with the average snowfall ranging from 10 to 12 inches.

Sources used

Local town knowledge and records, National Climatic Data Center, FEMA's Presidential Disaster Declarations search page, Burlington, VT Weather Service historic weather events page

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 provides poor habitat for native animals, which 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.

The below is a list of invasive plants that the Vermont Fish and Wildlife Department have on the watch list.²¹

²¹ 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
<i>Acer ginnala</i> Maxim.	Amur maple
<i>Acer platanoides</i> L.	Norway maple
<i>Alnus glutinosa</i> (L.) Gaertner	European black alder
<i>Amorpha fruticosa</i> L.	False indigo
<i>Ampelopsis brevipedunculata</i> (Maxim.) Trautv.	Porcelainberry
<i>Anthriscus sylvestris</i> (L.) Hoffm.	Wild chervil
<i>Berberis thunbergii</i> DC.	Japanese barberry
<i>Berberis vulgaris</i> L.	Common barberry
<i>Callitriche stagnalis</i> Scop.	Pond water-starwort
<i>Cardamine impatiens</i> L.	Narrowleaf bittercress
<i>Centaurea maculosa</i> L. Syn.: <i>Centaurea biebersteinii</i> DC	Spotted knapweed
<i>Elaeagnus angustifolia</i> L.	Russian olive
<i>Elaeagnus umbellata</i> Thunb.	Autumn olive
<i>Euonymus alata</i> (Thunb.) Sieb.	Winged euonymus
<i>Euphorbia cyparissias</i> L.	Cypress spurge
<i>Glyceria maxima</i> (Hartman) Holmberg	Reed mannagrass
<i>Hesperis matronalis</i> L.	Dame's rocket
<i>Iris pseudacorus</i> L.	Yellow iris
<i>Ligustrum obtusifolium</i> Sieb. & Zucc.	Border privet
<i>Lonicera xylosteum</i> L.	Dwarf honeysuckle
<i>Lysimachia vulgaris</i> L.	Garden Loosestrife
<i>Marsilea quadrifolia</i> L.	European waterclover
<i>Microstegium vimineum</i> (Trin.) A. Camus	Japanese stilt grass
<i>Najas minor</i> Allioni	Brittle waternymph
<i>Paulownia tomentosa</i> (Thunb.) Sieb & Zucc. Ex Ste.	Princess tree
<i>Phalaris arundinacea</i> L.	Reed canary grass
<i>Polygonum perfoliatum</i> L.	Mile-a-minute vine
<i>Polygonum sachalinense</i> F. Schmidt ex Maxim. Syn: <i>Fallopia sachalinensis</i> (F. Schmidt ex Maxim.) Dcne.	Giant knotweed
<i>Populus alba</i> L.	White poplar
<i>Robinia pseudoacacia</i> L.	Black locust
<i>Rorripa nasturtium-aquaticum</i> (L.) Hayek Syn: <i>Nasturtium officinale</i> Ait. f.	Watercress
<i>Rosa multiflora</i> Thunb. ex Murr.	Multiflora rose

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.²²

Hemlock woolly adelgid (shown 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.

²² 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 been found in several locations in Townshend. 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 trees 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. This is another secondary stressor for Hemlocks and the trees with both of these pests really suffer.

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 Worcester County, Massachusetts. And they have an active quarantine and public notification campaign about the pest.²³ They are having to destroy every host tree, infected or not, and will be replanting in the oaks. Boston had a small outbreak

²³ <http://www.worcesterma.gov/city-manager/asian-longhorned-beetles>. Accessed 3/2/15.

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.²⁴

Impact

The impacts of invasive species have ripple effects that go on and on. Hemlock is a foundation tree species, and when it goes away invasive plant species tend to take over, causing wildlife habitat and water quality 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

²⁴ 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.

economic threats to its loss. Townshend State Park has an area that is infested with HWA, and this area is being monitored.

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 towns for removing dead or dying trees, and the aesthetic and community open space impacts caused by their loss. Townshend has many ash trees, and they will likely treat some of their trees on public land. Luckily, there aren't any ash on the town common. Tree Warden, Bob DeSiervo, along with State Forester Jim Esden and the Townshend ATV club will be doing a tree survey along their roadways. This information will be used in developing an EAB plan for Townshend (which is described in the Mitigation Actions Table in this plan).

The loss of maple trees to ALB, could mean a devastation to the maple industry, which is a big industry in Vermont, including in Townshend. A lot of people sugar in Townshend, not all commercial, but it is a big activity in Townshend. 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. Townshend has a lot of maple trees in the town common (that aren't sugared), which aren't in the best health now.

Probability

As mentioned earlier in this section, only hemlock woolly adelgid is currently known to be present in the state of Vermont; confirmed populations of emerald ash borer and Asian longhorned beetle have been found within fifty miles of Vermont's border. EAB surrounds Vermont and some believe it is already in the state, but hasn't yet been detected. So the probability is high that EAB and ALB will affect the region. HWA has been confirmed in Townshend 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 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 Worcester County, Massachusetts. This problem has been going on for about seven years. It was well established before discovery, as much as 15 years went by before it was discovered. It had gotten out of the Worcester City and into the surrounding natural landscapes around the city, which has made eradication difficult.

ALB can be eradicated when discovered early. It is usually found in industrial 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 Townshend. Invasive plants are present in Townshend. 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, are particularly susceptible to invasives, any time there is disruption. Logging is occurring in Townshend.

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.²⁵ 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. Townshend is privileged to have tree warden Bob DeSeirvo, who is well versed in these issues, has gone through training on detection of pests, and is active in the state's first detector group. 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 Townshend Tree Warden Bob DeSiervo on 3/4/15; VT Fish and Wildlife website; VTinvasives.org; 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 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.

TS Irene in 2011 and the December 2008 ice storm were major weather events that caused extended power loss. 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. Three different power companies in town mean that sometimes only portions of the town are down.

Potential loss estimates are difficult to predict for power failures, which 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. Townshend does have a snowmobile club and equestrians that can go out and check on people in snow events with power failure situations. People are generally looking out for each other in Townshend.

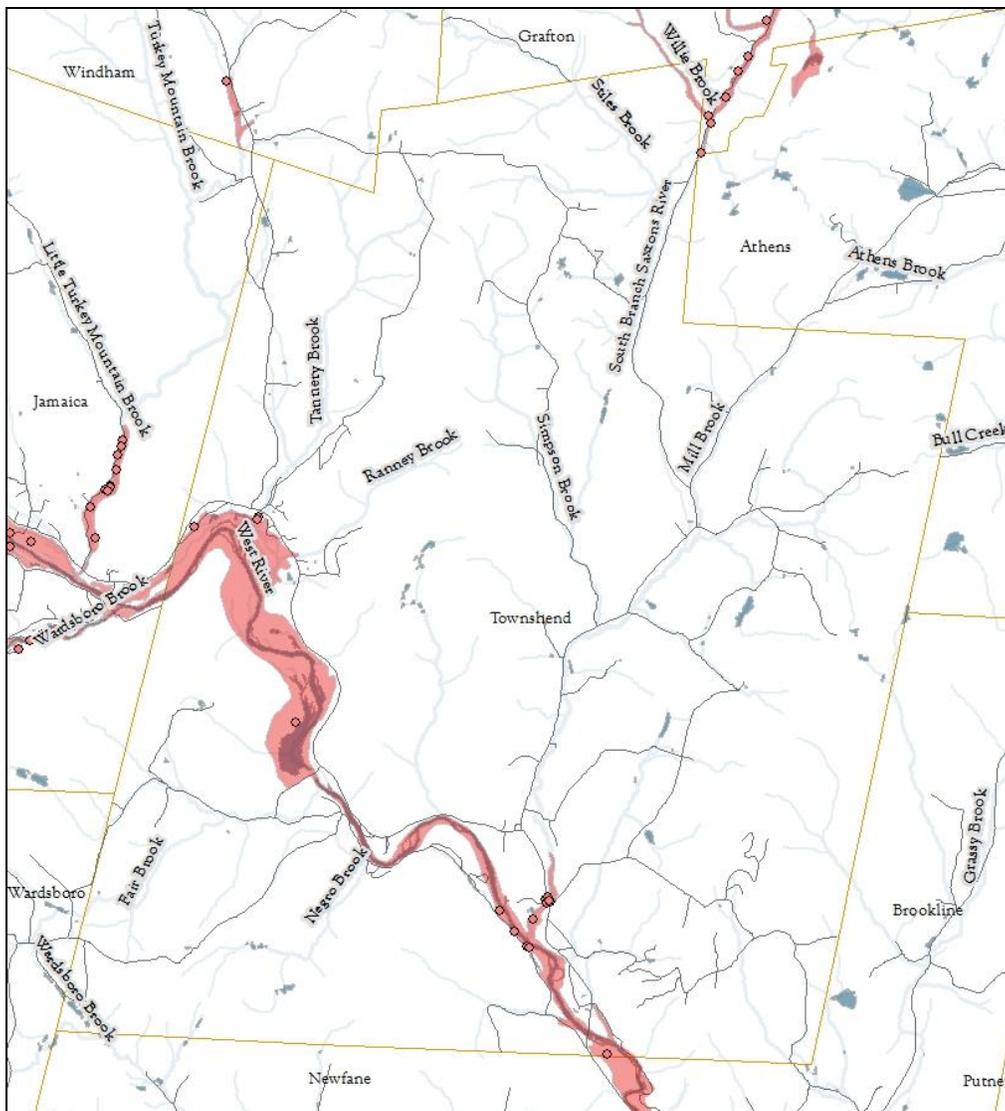
²⁵ < <http://www.vtinvasives.org/tree-pests/community-preparedness> >

ASSESSING VULNERABILITY

Structures in the SFHA

There are approximately 10 buildings within the FEMA-designated Special Flood Hazard Areas (SFHAs) in Townshend.²⁶ The below map shows structures (red dots on map below) that are located in the SFHA. The 10 are spread throughout Townshend, but a concentration is in the village of Harmonyville. 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. Townshend'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 Townshend's floodplain regulations, which are a stand-alone ordinance revised in 2007.



²⁶ 2015 Flood Hazard Summary Sheet for Townshend

It is important to note the number of structures in the VT ANR mapped River Corridor. There are 85 structures in the River Corridor, or 11% of the structures in Townshend are in the River Corridor.²⁷ Structures with a mortgage outside of the Special Flood Hazard Area are not required to purchase flood insurance, but they nevertheless can be at risk for damage from flooding events. As noted in this plan, most of the destruction caused by flooding in Vermont is caused by fluvial erosion, which is the hazard mapped by the River Corridor. As far as community facilities/critical structures, the Townshend Town Garage is in the River Corridor around Mill Brook. This structure, and all structures in the River Corridor are vulnerable to fluvial erosion events.

Repetitive Loss Structures

According to FloodReady.Vermont.gov, Townshend has no repetitive loss claims.²⁸ 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 1978.²⁹ 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

²⁷ GIS analysis performed by staff at Windham Regional Commission.

²⁸ Report listing repetitive losses is available here:

<<http://floodready.vermont.gov/sites/floodready/files/RL%20community-report%209.26.14.pdf>>

²⁹ <https://www.fema.gov/national-flood-insurance-program/definitions>

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. Townshend (including the Village of Townshend) joined the NFIP on September 18, 1985 and is a member in good standing (CID 500136). The latest floodplain ordinance was adopted September 28, 2007 and is a stand-alone ordinance.

The latest record indicates that there are ten (10) active NFIP policies in Townshend. These policies have a total value of \$3,255,000. There has been one NFIP claims paid in Townshend since they joined the NFIP, but nothing was paid out.³⁰

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.

Critical Facilities in Townshend

- Grace Cottage Hospital
- Leland and Gray High school (emergency shelter)
- Townshend Elementary
- Valley Cares Retirement Home
- Townshend Town Hall
- Town Garage (in the River Corridor)
- Townshend Volunteer Fire Company
- Riverbend Market and gas station (only gas/diesel/propane station and grocery in town)

Market Value of Structures in Townshend

The total Grand List in the Town of Townshend:	\$189,725,121.00**
Common Level of Appraisal:	103.31 (FY 2014-15)

** Taxable properties only. There are 38 (non taxable) locally exempt properties.

Development Trends / Capabilities

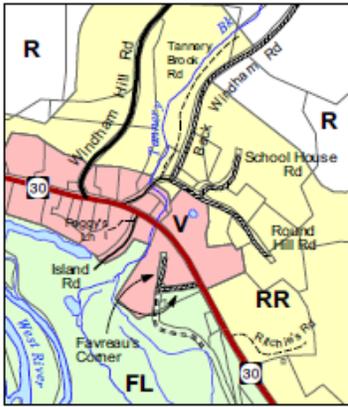
To reiterate what was stated in this report introduction, Townshend’s population as of 2010 was 1,232. As the graph below shows, population has been increasing steadily since 1950 but the rate of increase between 2000 and 2010 was lower than most adjacent towns in the region (7%). Testimony from plan participants is that there is little to no new growth in Townshend, and most of the resident population is older. There have not been more than two new homes built per year for the last 4-5 years. Most of the development that there is tends to be large lot residential development. Because of its location, Townshend is not a bedroom community for resorts. Stratton, which is the closest resort, is about 20 miles away. There is hardly any business growth, and as such economic development is slow in Townshend. The town does not get tax revenue from the non-profit hospital or Valley Cares Retirement Home. Additionally, a lot of land (1,000 acres) is taken up by the dam which was built in 1959-61. This doesn’t leave a lot of room for economic growth. The two primary employers are the high school and Grace Cottage Hospital. Many young people leave because of lack of jobs. Despite this lack of growth, without zoning Townshend leaves itself more vulnerable to at risk development.

³⁰ FEMA NFIP Insurance Report, Septemer 2014, accessed January 6, 2015.
<http://floodready.vermont.gov/sites/floodready/files/NFIP%20Insurance%20community-report%209.26.14.pdf>

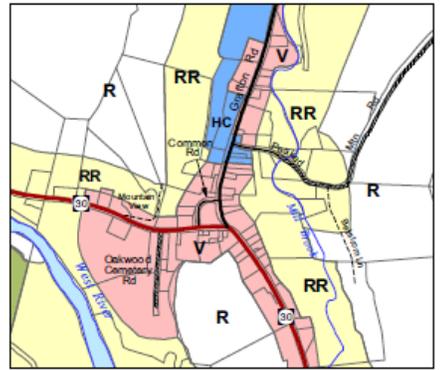
In terms of the impacts of this growth picture on hazards, lack of growth means limited new vulnerability to hazards. In terms of the effects of this growth on mitigation, limited economic growth and new development limits the town budget affecting the amount of money that can go towards mitigation. Also not having an influx of new residents can mean that those involved in town functions (largely on a volunteer basis) can get burned out because they don't have enough others to assist so they end up playing multiple roles. Having new projects is a stress for the town government structure at the current time. Townshend has had a problem with losing some key players (including their EMD in 2014) in recent years and difficulty with finding replacements. They currently do not have someone serving as a floodplain administrator. These together, the limited town budget and the limited number of people they have to assist, are primary limiting factor in terms of Townshend's capabilities.

As far as capabilities that Townshend has, they have two part time staff members, 3 full time highway crew members, a Deputy EMD, a selectboard and planning commission. They are working toward getting a town administrator. Townshend is a member of the Windham Regional Commission, a regional planning commission that offers assistance to towns on a variety of matters related to planning/coordination. Townshend has a volunteer fire department. They also have a snowmobile club that can assist with emergency response. The community atmosphere is one of support and people understanding the importance of being a good neighbor in rural Vermont. UPDATE – A new EMD, Kyle Lapointe was appointed in March 2015. Kyle comes to the position with Rescue experience and will be an asset to Townshend's capabilities to carry out this plan.

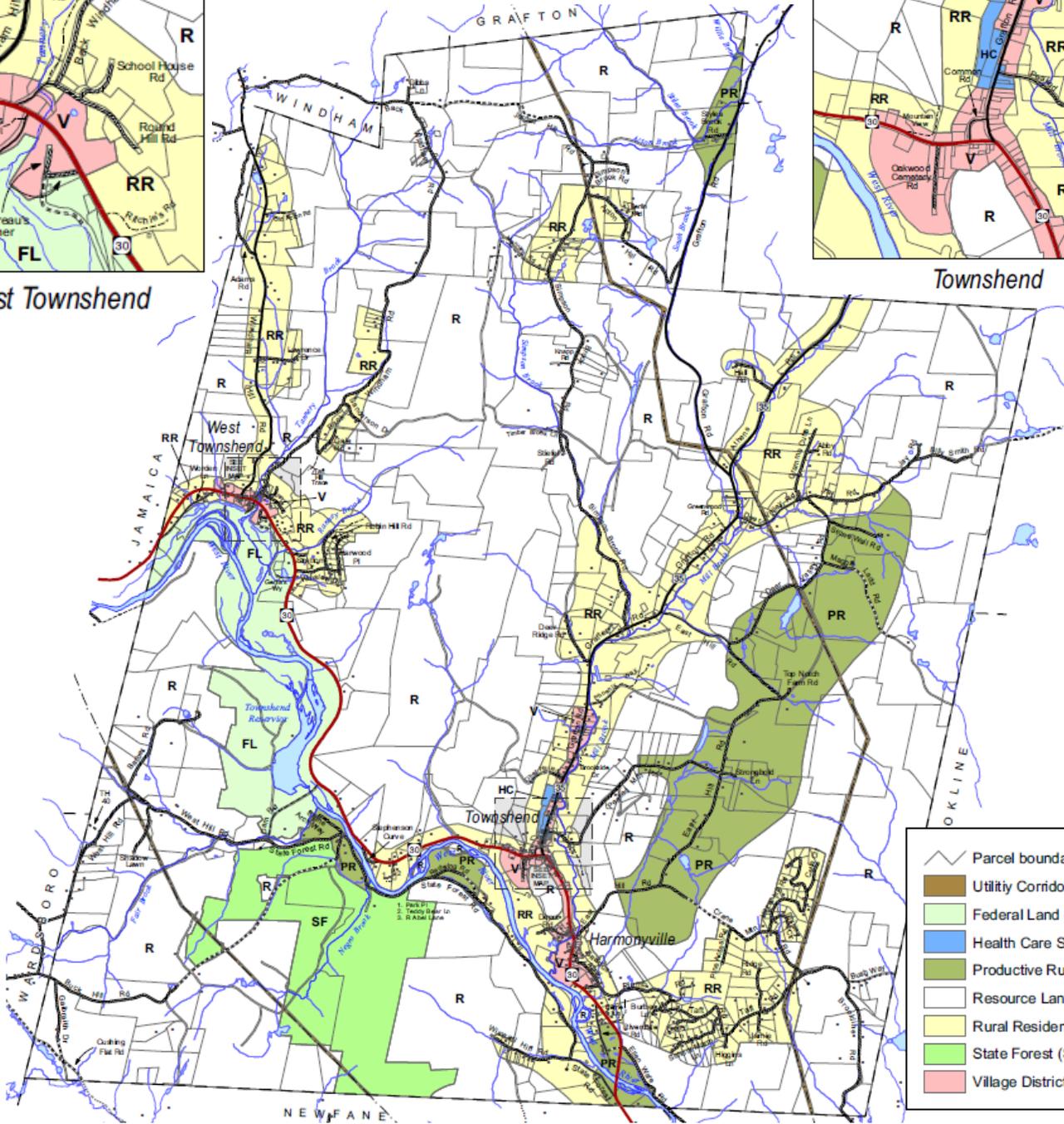
Proposed Land Use Map from 2011 Town Plan



West Townshend



Townshend



	Parcel boundary (1991)
	Utility Corridor
	Federal Land (FL)
	Health Care Services District (HC)
	Productive Rural Lands (PR)
	Resource Lands (R)
	Rural Residential (RR)
	State Forest (SF)
	Village District (V)

MITIGATION STRATEGY

Local Hazard Mitigation Goals Developed for this Plan

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

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

Town Plan Goals that Support Mitigation

There are a number of goals in Townshend's 2011 Town Plan that relate to hazard mitigation. These specific policies are being highlighted here to show the relationship between town policies and hazard mitigation. For example, a town policy of protecting floodplains is also a mitigation policy because it discourages development in high risk areas, while simultaneously encouraging the protection of floodplain access for high water.

Overall Town Plan Policies that support mitigation:

3. To maintain a sustainable pattern of settlement typified by villages within a rural setting surrounded by contiguous undeveloped corridors to preserve forests and agricultural soils.
4. To plan the town's growth in a manner consistent with the town's ability to provide and pay for public services such as education, highway maintenance, fire protection, without placing an undue burden upon taxpayers or otherwise leading to excessive increases in the town tax rate.
8. To protect significant natural areas and locations of special educational, scientific, historical, scenic, architectural, and archeological significance from adverse development through appropriate conservation measures.

Land Use Policies

8. Mountain ranges and steep valley walls are intolerant of development. Ridge tops and steep slope highlands are designated to accommodate only very low density development. Land development in this kind of location should be limited to the proposed site's physical limitations.

Rural Residential District Policies

3. Ensure that new development avoids important natural resource areas located within the rural residential lands.

Productive Rural Lands Policies

5. Encourage protective buffers along streams and rivers, and protection of other important lands that are valued for trails, open space, wildlife habitat and scenic enjoyment.

Resource Lands Policies

2. Protect fish and wildlife habitats; federally identified endangered and threatened species; unique and fragile natural areas; wetlands; shore lands; floodplains; aquifer recharge areas; steep slopes and high elevations; ridgelines; and essentially undeveloped forest lands that have limited access to an improved public road from development that would negatively impact the resource.

3. Encourage protection of green space, particularly along streams and rivers, and other important lands that are valued for trails, open space, wildlife habitat and scenic enjoyment.

Transportation Policies

10. Discourage development in remote areas of town in order to minimize the need for more road construction, maintenance, and consequent increased cost to the town.

Natural Area, Fragile Area and Wildlife Resource Policies

3. Support state, federal, and conservation group acquisition of land and/or conservation easements to protect critical wildlife habitats. Encourage designation of State Natural and Fragile Areas for significant features and resources.

4. Encourage private and public landowners to recognize the importance of protecting, maintaining and enhancing fish and wildlife habitats and ecosystems by supporting a variety of community, regional and state programs and incentives.

Surface Water Policies

1. Maintain undisturbed buffers of vegetation along watercourses, lakes, ponds and wetlands in order to protect shorelines, minimize effects of erosion, sedimentation and other sources of pollution, and maintain scenic, recreational, and habitat values.

5. Ensure that the location and design of development in flood hazard areas does not impede the flow of flood waters or endanger the health, safety and welfare of the public.

6. Identify and address any adverse environmental impacts of development proposals which could alter the stream channel or its floodplain.

Wetlands Policies

1. Protect important wetlands, including the area surrounding them, from land uses that would result in runoff or direct discharge or otherwise diminish the benefits and functions that wetlands provide.

2. Significant Wetlands should be protected from development by maintaining an undisturbed, naturally vegetated buffer strip around the wetland edge sufficient to ensure the integrity of the wetland.

Floodplain Policy

1. The Town shall continue to enforce its Flood Hazard Regulations to ensure the health, safety, and welfare of Town residents and assure continued participation in the National Flood Insurance Program.

Soils and Topography Policy

1. Take special precautions on slopes to avoid environmental damage, including negative consequences associated with erosion. Minimize areas of earth disturbance, grading and vegetation clearing on slopes over 15%; avoid intensive development in areas predominated by slopes exceeding 25%.

3. Design developments on slopes over 15% so as to minimize the potential impacts of slides and earthquakes.

Progress since 2012 on Mitigation Actions

Though there was no hazard mitigation plan in place, Townshend was busy doing things to make their town a safer place to live and visit. These are some of the main achievements they have made in the years that this plan was in development.

- Culvert upgrades
 - Dam road/state forest road culvert was upgraded in 2012.
 - Several culverts on east hill road were upgraded in 2013.
- There had been a major landslide behind Leland and Gray High School so a contractor was hired to move trees that had come down into the brook and he also did some excavating.
- Debris removal from TS Irene was done in Spring/Summer 2012.
- Holland Brigham Cemetery – there had been an erosion issue caused by TS Irene damage that was eating away the hillside. Tree removal, putting in a new access road, channel cutting, and armament on the banks to protect the road were the mitigation actions that were taken to protect the cemetery. The channel that the stream cut during TS Irene would have created a problem for the cemetery. Completed Fall 2012.

Identification of New Mitigation Actions

The Townshend Hazard Mitigation Plan Committee 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.

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?

Cost-Benefit Analysis

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 assess the cost effectiveness and maximize savings. Whenever possible, Townshend will utilize 406 mitigation funding.

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.

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 Mitigation Planning Committee

HAZARD	ACTION	RESPONSIBLE PARTY	TIME-FRAME	FUNDING SOURCE	MITIGATION OR PREPAREDNESS	COST / BENEFIT	PRIORITY	STATUS
Flood	Deer Ridge Road culvert is an old stone culvert that needs to be upsized	Highway Dept and Vtrans	Spring 2015 start, Summer 2017 finish upgrade	Town budget	Mitigation	Medium / Medium	High	Emergency repairs being done in Spring 2015, but it needs to be upsized and that will be done 2017
Flood	Replace decking on West Hill bridge (bridge 42)	Highway Dept and Vtrans	Begin late summer/fall 2015 and end that season	Structures grant	Mitigation	Medium / Medium	High	Been engineered, but still seeking funding.
Flood	Grafton Road culvert at Deer Ridge Road needs to be upsized - Major connection route for the county; not imminent risk of failure, but second on the list of needs	Highway Dept and Vtrans	Planning to start in 2016, Construction throughout Summer 2017	Town and Vtrans	Mitigation	High/ High	Medium	Saving and seeking funding
Invasive Species	Host a presentation at Town Meeting Day to educate people about not moving firewood	Tree warden	Town Meeting Day every year	Grant from UVM	Mitigation	Low/	Medium	This is something that happens and will continue to happen.
Invasive Species	Develop plan to address trees along the roadways right of ways, and how to mitigate and minimize impacts of invasive species.	Tree warden and Highway Dept.	Began in 2012; Plan expected completion Summer 2015	Grant from UVM; other grants being sought	Mitigation	Low/ Medium	Medium	In Progress; There is a Committee in place and the planning process began in 2012, and is continuing. They now want to travel roads and map trees along roads.
Landslide	Bank stabilization on Simpson Brook Road; plantings and erosion control through armament. The bank is coming down slowly.	Highway Dept	Summer 2016, begin and end	Structures grant being sought	Mitigation	Medium / High	High	Seeking funding
Landslide	Bank stabilization on West Hill; plantings and erosion control through armament	Highway Dept	Summer 2017, begin and end	Grant through FEMA or VTrans	Mitigation	High/ High	Medium	Not yet in the planning phase
Winter / Ice Storm	Develop program for regular tree checks and trimming as needed	Tree warden	Spring/Summer 2015	Town budget	Mitigation	Low/High	High	In development stage

HAZARD	ACTION	RESPONSIBLE PARTY	TIME-FRAME	FUNDING SOURCE	MITIGATION OR PREPAREDNESS	COST / BENEFIT	PRIORITY	STATUS
Winter / Ice Storm	Install snow fence and discuss with landowner and Vtrans about planting trees on State Route 30 at Riverbend Farm. The state maintains the roadway, but if the state doesn't have someone in the area, and there is a flooding or snow blowing problem, then the town has to block the road with a fire truck because it's unsafe to use at times. This causes a big impact to residents across the region.	Vtrans	Summer 2016 begin and end	Vtrans and landowner	Mitigation	Low/ High	Medium	In development stage

Existing Planning Mechanisms

The following policies, programs and activities related to hazard mitigation are currently in place and/or being implemented in the Town of Townshend. The Hazard Mitigation Planning participants analyzed these programs for their effectiveness and noted improvements needed. Townshend 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 Townshend updated their culvert inventory in 2012. In the development of this plan, the latest 2010 Town Plan was used.

As Townshend 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 by the responsible party identified in the table. There is no timeframe for updating the below referenced plans and regulations to better incorporate hazard mitigation, however, as each document is updated the hazard mitigation plan will be reviewed for incorporation. The goals of this hazard mitigation plan will be incorporated in the upcoming town plan update to ensure that emergency preparedness and mitigation planning efforts are included in the Town Plan, with particular attention to including the projects in the Mitigation Actions Table. This will assist with ensuring that this plan is utilized and project follow-through occurs.

Townshend's next town plan update will include a new required flood resiliency element. The hazard mitigation plan will be considered and incorporated as seen appropriate. The next time the floodplain ordinance is updated, it will be encouraged that that update include a Fluvial Erosion Hazard bylaw. The LEOP is updated yearly and was updated last in 2014. Other mitigation/emergency planning related documents and their status are outlined in the below table.

It is important to note that there is a need for better coordination between the town, schools and hospital as far as emergency planning and evacuation planning. There is a definite lack of communication between the entities. There was an instance in the last several years where the hospital had to evacuate to the town hall because they didn't have a secondary key to access the high school, which is where they are supposed to evacuate to. This highlights the lack of communication and coordination. The entities should schedule emergency planning meetings to address this issue. Too often, the need is seen too late. Additionally, having plans in place is pivotal in a place like Townshend where emergency communications can be difficult because of poor cell and radio reception.

Type of Existing Protection	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.	Flooding will be addressed; Emergency management is not addressed in current plan.	Town Plan adopted in 2011; Next plan will be adopted 2016
Town Local Emergency Operation Plan	Municipal procedures for emergency response	Incident Command; Hazard Annexes included	LEOP and adopted by Town Selectboard in 2014
School Emergency Response Protocol	Develops protocol for use during emergencies	There are no school crisis plans in place.	There is a need for development of school crisis plans and better radio communications between schools and local government. Check with Windham Central supervisor!!!

LEPC 6 Hazardous Materials Plan	Procedures for hazmat emergency response at regional level	LEPC 6 has the plan	Continued involvement with the LEPC
Mutual Aid – Emergency Services	Agreement for regional coordinated emergency services	Keene (NH) Mutual Aid – written agreement/contract for Fire/Ambulance and HazMat Rescue Inc are the first responders.	Lack of EMD to oversee these plans and coordinate. There are a lot of territorial issues and could be addressed through training and drills.
Mutual Aid – Public Works	Agreement for regional coordinated emergency highway maintenance services	Public Works MAA is in the works with Grafton, Athens and Newfane to share resources.	No Public Works director; this position is being contemplated now.
Road Standards	Design and construction standards for roads and drainage systems	Adopted new VTrans Road Standards in 2013.	No major gaps identified
Zoning/Subdivision Regulations	Regulates the division of land, standards for site access and utilities	The Town does not have zoning or subdivision regs	NA
Sewage Regulations	Regulates on-site sewage systems	The town does have sewage regulations and relies on the state	NA
Flood Hazard Area Regulations	Regulates development in FEMA identified SFHAs	Stand Alone Ordinance	Revised in 2007 to include new FEMA DFIRM's. Need to identify and train floodplain administrator; there is an ordinance update that has been in process for several years and needs to be completed.
Maintenance Programs	Bridge & Culvert Inventory	Updated in 2012, updated yearly	None Identified, just needs to be maintained
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
Hospital evacuation plan		There is an evacuation plan in place but the town is unaware of the details.	Lack of communication between hospital and town government. This should be addressed so everyone is clear and has what they need before disaster happens.

PLAN MAINTENANCE PROCESS

Monitoring and Updating the Plan – Yearly Review

Once the plan is approved and adopted, the Emergency Management Director or Deputy EMD in Townshend, along with interested and appointed volunteers, in Townshend 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 at an April Selectboard meeting along with the review of the town's Local Emergency Operations Plan (LEOP). This meeting will allow town officials and the public to discuss the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects that can help mitigate future 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. Progress on actions will be kept track using a table that WRC will provide to the town EMD to update. Windham Regional Commission's emergency planner will assist the Townshend Emergency Management Director with this review, as requested by the Town. 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. Participants outlined below will work with the Emergency Planner at the Windham Regional Commission (WRC) in accordance with the following procedure:

1. The Townshend 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, 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.
 - 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.
 - 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 plan development committee and town staff for final review and comment, with review comments provided to the EMD and incorporated into the plan.
8. WRC Emergency Planner will finalize the plan, with any remaining comments from the plan committee and town staff incorporated, and then submit the draft 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
- Scheduling and advertising 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
 - Town Administrator
- 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, newsletter, newspaper, Facebook, Front Porch Forum, etc.

APPENDIX

1. Adoption by the Local Governing Body
2. Flyer advertising availability of Draft Hazard Mitigation Plan for comment
3. Email sent 3/31/15 to adjacent towns for comment on draft and response
4. Email sent 3/31/15 to Town and Hazard Mitigation Committee for comment on draft
5. Email from Deputy EMD, Craig Hunt, describing relationship between the Town of Townshend and the Village of Townshend
6. Flyer advertisement for January 28, 2015 Hazard Mitigation Committee meeting at Townshend Town Hall
7. January 28, 2015 Hazard Mitigation Committee meeting agenda
8. January 28, 2015 Hazard Mitigation Meeting sign in sheet
9. September 27, 2010 Hazard Mitigation Committee meeting sign-in sheet
10. October 19, 2010 LEPC 6 meeting with program about Pre-Disaster Hazard Mitigation Plans (Townshend had a representative)
11. Flyer advertising October 19, 2010 LEPC 6 meeting
12. October 19, 2010 LEPC 6 meeting - overview and photographs showing public interaction
13. September 21, 2010 LEPC 6 meeting with program about Pre-Disaster Hazard Mitigation Plans (Guildford had a representative)

1. PREREQUISITE

Adoption by the Local Governing Body

Certificate of Adoption
Town of Townshend, VT
Selectboard

**A Resolution Adopting the Local Hazard Mitigation Plan
for the Town of Townshend, VT and the Village of Townshend, VT**

WHEREAS, the Town of Townshend, VT including the Village of Townshend, VT have 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 Townshend, VT Including the Village of Townshend, VT Local Hazard Mitigation Plan analyzes natural hazards and assesses risks within the communities; and

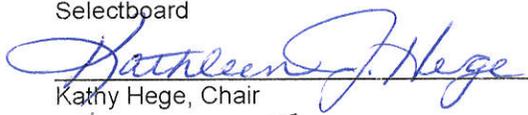
WHEREAS, the Town of Townshend, VT Including the Village of Townshend, VT Local Hazard Mitigation Plan recommends the implementation of action(s) specific to the communities to mitigate against damage from natural hazard events; and

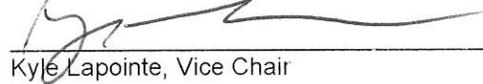
WHEREAS, the Town of Townshend, VT including the Village of Townshend, VT are committed to an on-going hazard mitigation effort for the purposes of long term risk reduction and increased community resiliency;

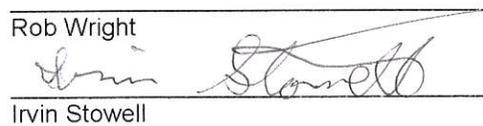
NOW, THEREFORE BE IT RESOLVED that the Town of Townshend, VT adopts the *Town of Townshend Including the Village of Townshend Local Hazard Mitigation Plan* as well as future revisions and maintenance required by 44 CFR 201.6 and FEMA for a period of five (5) years from the date of this resolution.

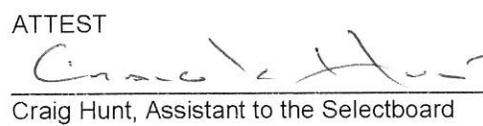
Duly adopted this 5TH day of February 2016
date month, year

Selectboard


Kathy Hege, Chair


Kyle Lapointe, Vice Chair

Rob Wright

Irvin Stowell

ATTEST

Craig Hunt, Assistant to the Selectboard

2. Flyer advertising availability of Draft Hazard Mitigation Plan for comment

Townshend Hazard Mitigation Plan

The draft Townshend Hazard Mitigation Plan is now available for public review at the Townshend Town Office



The Plan will be available for comment until the end of the public comment period on April 27, 2015.

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!



3. Email sent 4/13/15 to adjacent towns for comment on draft and response

From: Alyssa Sabetto [asabetto@windhamregional.org] **Sent:** Mon 4/13/2015 10:07 AM
To: townofathens@hotmail.com; david.bemis@state.vt.us; 'Tim Stevenson'; 'Sandi Capponcelli'; guytanza@earthlink.net; sindy@sover.net; brookline.selectboard@comcast.net; kbourne24@comcast.net; 'Shannon Meckle'; pvl@marlboro.edu; 'Jodi French'; tclerknewfane@svccable.net; tristamb@sover.net; wardsborotownoffice@myfairpoint.net; 'jack cunningham'; barb_vinci@wsesu.org; 'Donna Sebastian'; chrissiller@yahoo.com; jamaicatownderk@svccable.net; lexasteve@gmail.com; 'Paul Fraser'; legged@gmail.com; ericstev@vermontel.net; grafton@vermontel.net; skip_lisle@yahoo.com; mfb@vermontel.net; hmboyer@vermontel.net; windham.town@gmail.com; 'Frank Seawright'; 'Kord Scott'; 'John Lingley'
Cc: 'Kyle Lapointe'; 'Craig Hunt'; 'Alyssa Sabetto'
Subject: Draft Townshend Hazard Mitigation Plan - for your review and comment

Message |  Townshend_MJ Haz Mit Plan 040915 for public comment.pdf (5 MB)

Hello towns adjacent to Townshend,

Attached please find a draft of the Townshend 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 review and provide comment back to me by April 27th, 2015.** 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

From: Town of Athens [townofathens@hotmail.com] **Sent:** Mon 4/20/2015 1:27 PM
To: asabetto@windhamregional.org
Cc:
Subject: Hazard Mitigation Plan

In response to your email regarding the Townshend Hazard Mitigation Plan.
Everything looks good.
Darlene Wyman
Athens Town Clerk

4. Email sent 4/9/15 to Town and Hazard Mitigation Committee for comment on draft

From: Alyssa Sabetto [asabetto@windhamregional.org] Sent: Thu 4/9/2015 5:02 PM

To: 'tndk@svcable.net'; 'cknowles@svcable.net'; 'Craig Hunt'; 'bhorn@sover.net'; 'daviddz@sover.net'; 'kathy.hege@shepherdsflock.com'; 'Dale West'; 'rlecours@myfairpoint.net'; 'plan@townshendvt.net'; 'artmonette@svcable.net'; 'safebobde@aol.com'; 'gmtents@svcable.net'; 'spenholt@svcable.net'; 'Kyle Lapointe'; 'susanlecours@barettandvalley.com'; 'tnlst@svcable.net'; 'cducks@svcable.net'; 'meliscj@yahoo.com'; 'townshendfd@townshendvt.net'; 'townshendgarage@svcable.net'; 'townshend@vermontel.net'; 'susanlecours@barettandvalley.com'

Cc:

Subject: Townshend DRAFT Hazard Mitigation Plan now open for comment

Message |  Townshend_MJ Haz Mit Plan 040915 for public comment.pdf (5 MB)

Hello Townshend,

Attached is the revised and updated draft hazard mitigation plan for Townshend. **Please have your comments on this draft plan back to me by Monday, April 27, 2015.** If it's easier to call me to go over your comments, that's fine too. I welcome all of your comments and now is the time to get them to me. The draft is also available in hard copy at the Town office. The draft is available for the public to view and comment on.

Please plan to discuss the draft plan at upcoming Selectboard and Planning Commission meetings before the 27th. Please let me know of any comments that come out of those meetings. If you can also let me know the dates of those meetings, I'll put that information into the plan as another public comment opportunity for the plan.

After the comment period, I'll finalize and send the draft to the state and FEMA. I'll copy the town on this transmittal, for your records. At that time, you will be considered ERAF compliant by the State. Any questions, just ask. The plan is not to be adopted at this point.

Thanks for your input and involvement! Please comment!

Alyssa Sabetto, CFM
Planner
Windham Regional Commission

5. Email from Deputy EMD, Craig Hunt, describing relationship between the Town of Townshend and the Village of Townshend

From: Craig Hunt [craig@townshendvt.net] Sent: Wed 3/25/2015 1:41 PM
To: Alyssa Sabetto; kylelapointe@gmail.com; Kathy Hege
Cc:
Subject: Townshend EOP Info

Hi Alyssa,
Apparently, you are working with Kyle LaPointe and had some questions.

1. Townshend's CLA for FY2015 was 103.31
2. The total amount of Irene damage (Project amount / FEMA approved amount) was;
\$1,121,214.99 / \$ 1,009,093.50
3. The Hazard Mitigation meeting at Townshend on 2/28/15 was a Planning Commission meeting, and issues raised were briefly discussed by the Planning Commission on March 11, 2015.
4. Three Select Board members did attend that meeting on 2/28/15, but two were not re-elected on 3/03/15, and the matter has not yet been discussed by the Select Board.
5. There is no differentiating relationship or division of authority between the Village of Townshend and the Town of Townshend. No Emergency Operations or Harzard Mitigation plans would not deal differently with the two.

Craig

6. Flyer advertisement for January 28, 2015 Hazard Mitigation Committee meeting at Townshend Town Hall

Townshend Hazard Mitigation Plan Public Meeting Announcement



Date: Wednesday, January 28, 2015

Time: 6:30-9:00 PM

Location: Townshend Town Hall
2006 VT Route 30, Townshend

Come share experiences and ideas regarding natural hazards facing Townshend. What actions can Townshend take now to lower vulnerability before the next natural hazard strikes?

For more information contact
Alyssa Sabetto at 802-257-4547 x109



7. January 28, 2015 Hazard Mitigation Committee meeting agenda

Hazard Mitigation Plan – Update & Plan Development
Townshend Town Hall – January 28, 2015

Agenda

1. Introduction of the Hazard Mitigation Plan

- a) Purpose
- b) Process

2. Hazard Identification

- a) Completion of hazards ranking table
- b) Discussion of major and recent hazard events
- c) Discussion of areas in town that experience repeated or severe damage
- d) Mapping of vulnerable areas – mark up map as a group

3. Mitigation Actions

- a) Ongoing Hazard Mitigation Projects, Programs & Activities
- b) Progress made since 2011 on mitigation projects
- c) Develop new Mitigation Actions
- d) Gaps and capabilities with Implementation

4. Other Updates

- a) Development trends
- b) Critical facilities
- c) Existing planning mechanisms

5. Next Steps and Questions

8. January 28, 2015 Hazard Mitigation Meeting sign in sheet

Townshend, VT - HAZARD MITIGATION PLAN MEETING
January 28, 2015
Location: Townshend Town Hall

SIGN IN SHEET

Name and Email	Affiliations - Please list all	Town where you live
SAFEbobde@AOL.com Bob DeSiro	Planning Comm	Townshend
Art Morette	Planning Comm	Townshend
Jovan Evans	" "	" "
Susan LeCours	susankours@barrettkandvalley.com Planning Commission	Townshend
Dale W...	Townshend VT	Townshend
Cande Melis	Townshend - Select Bd	Townshend
Kathy Hege	Townshend Select Board	Townshend
Craig Hill	SB Admin Assis.	Townshend

9. September 27, 2010 Hazard Mitigation Committee meeting sign-in sheet

TOWNSHEND / JAMAICA / ATHENS - PRE-DISASTER HAZARD MITIGATION PLANNING MEETING

September 27, 2010
Location: Townshend, VT -- Townshend Elementary School

SIGN IN SHEET

Name	Affiliations - Please list all	Home address	Phone	email
Carole Y. Hunt	Deputy Health Officer Townshend School Board Select Board - Admin. Assist.	1895 Gordon Townshend Vermont	365- 4251	CYHUNTS@ SUSANLE-NEI
GAILA GULACK	PACESIC (PT) Rep. Director and wind. storm & alert-dispatch	1350 GAFFIN RD Townshend 05333	365- 4536	gogulack@ notmail.com
DONALD CAPPONCELLI	ASSISTANT TO EMERGENCY MGR. D. RECIFE	142 REED RD ATHENS, VT. 05143	869 2590	dcappon@ marlboro.edu
DAVID DEZENDORF	TOWNSHEND EMD	P.O. BOX 68 TOWNSHEND VT 902 VT RT30 05353	802-365-4625	DAVIDDEZ@SOWER.NET
TONY MARQUES	Grace Cottage Hospital - Emergency Flup.	100 Morgan Rd Richmond NH 03470	802-365- 3700	tony.marques@ gracecottage.org
Dana West	Grace Cottage Hospital - EMC Jamaica Fire & Rescue	P.O. Box 474 Jamaica, VT 05343	802-365- 7140 ext 267	DWest@gracecottage.org
Paul Ferris Jr	Jamaica - EMJ - Selectboard member	171 Pikes Falls Rd Jamaica VT 05343	802-874- 4674	FERRISPAUL@AOL.COM
Dinah Reed	WRC Assistant Planner	95 Chestnut Hill Burlington, VT	451-6070	dreed@vermont.gov

11. Flyer advertising October 19, 2010 LEPC 6 meeting

SAFE COMMUNITIES—RESILIENT TOWNS

Meeting Oct. 19th—Windham Region VT Towns Pre-Disaster Hazard Mitigation Plans

WHAT'S HAPPENING?

The Windham Regional Commission is working with 18 towns to complete their Pre-Disaster All Hazard Mitigation Plans. The plans will address flooding, winter storms, wildfire/structure fire, power failures, high winds and other emergencies that towns may face.

WHY PARTICIPATE?

Local Knowledge is important!
We want to know:

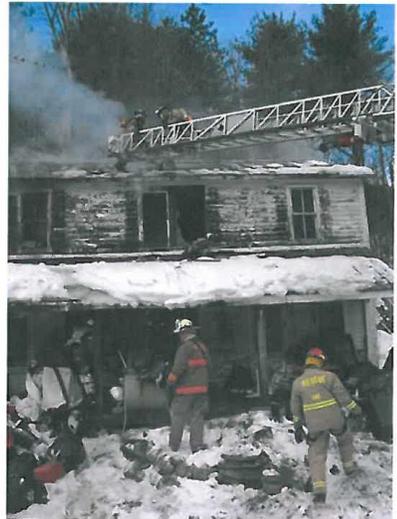
- The hazards of greatest concern to you;
- How have natural hazards affected you or your community in the past;
- How you think damage can be prevented or mitigated in the future?

HOW CAN YOU PARTICIPATE?

Come to the LEPC 6 Meeting on Tuesday, October 19th

LOCATION: Brattleboro Retreat – Edu. Conf. Ctr. In Admin. Bldg. (75 Linden Street)

- 5-5:30 pm LEPC Business Meeting
- 5:30—8 pm Public Participation Opportunity
- 5:30 pm: Dinner Buffet (Complementary)
- 5-7 pm: View New Red Cross Moving Shelter



12. October 19, 2010 LEPC 6 meeting - overview and photographs showing public interaction

On the evening of October 19, 2010 representatives from eleven towns in the Windham Region came together to talk about proactive planning mechanisms they should consider to become better informed about making infrastructure decisions and land use decisions as they relate to hazard mitigation planning across town boundaries. The following towns were represented:

1. Westminster – County Sherriff
2. Londonderry – Emergency Mgmt. Director (EMD), Selectboard member, Town Administrator
3. Windham – EMD
4. Marlboro – EMD
5. Jamaica – EMD, Selectboard member
6. Townshend – EMD, Environmental Consultant, CERT/RACES
7. Guilford – EMD, Selectboard Chair, Road Foreman
8. Grafton – EMD
9. Vernon – County Fire Fighter
10. Newfane – EMD
11. Brattleboro -- Brattleboro Retreat

The invitation for the meeting went out to all members of the LEPC 6 (Local Emergency Planning Committee), and to all Town Clerks and Town Managers, and all EMDs in the Windham region. The email asked that they bring anyone from their respective towns that they know to participate.

The first part of the meeting was to look at a series of maps of the region. There were two very large maps displayed of the entire region, showing hydrology, relief, development patterns, public land, conservation land, wetlands, resort centers, villages and hamlets, and all classes of roads.

Several other smaller theme maps of the region were displayed showing; utilities, broadband and cell coverage, government facilities, watersheds, and health and social services facilities. Participants were asked to use sticky notes to write down problem areas and post them on those locations on the maps. Most of the problems identified were local, smaller, but reoccurring problem areas. The map exercise was followed by a group discussion with WRC staff prompting the group with questions. Main points from the discussion are as follows:

- 1) An exchange of contact information needs to take place between towns so they have one another's phone numbers.
- 2) An inventory of resources available by adjacent towns would be very useful. Sometimes towns reach out further than they need to when it might be next door. Knowledge of smaller companies that can help towns; such as, environmental firms, contractors, etc.
- 3) Communication from upstream towns to downstream towns about debris in streams that pose a problem during the next hard rain. A debris pile in their town may cause ponding, and once it releases it could potentially wreak havoc on roads, culverts and/or bridges in downstream towns.
- 4) Contact list of who to call regarding hazardous debris in streams.
- 5) Coordinating future road construction projects so there is always a through path from town to town.
- 6) MOU's regarding emergency shelter space – if one town cannot provide enough, that adjacent towns can take in folks as overflow.
- 7) Mapping of tanks for *regulated* substances that are on personal property. Many towns do not have a clear understanding of where propane tanks are located in relationship to water ways that could potentially pose a problem during flash flood events.
- 8) Working with towns in adjacent counties, Regional Planning Commissions and/or bordering states.

There were EMDs and Selectboard officials in adjacent towns who met for the first time. As they were departing, several people stated they felt the meeting was very important, and did not really realize the positive impact they would have by having a cross-town discussion about proactive planning for hazard events. See Appendix C for documentation on the evening forum.



TOWN	COMMENT
GUILFORD	Needs Culvert MAP
GUILFORD FLOOD HAZARD (WINDMILL)	1st 1/2 mile West on State Rock Rd River Rd - 1 mile so of Hinesburg Rd (East side) Stone Brook Rd - between Rte 58 & 191 9200
NEWFANE	James Hill Rd Dam SMITH BROOK SWARDS BROOK BRACK DAM Porch Bange South FANE STATE BRIDGE

TOWN	COMMENT
Done	Commonly have two different weather systems High elevations different Limey better access to the East
Wilmington	Top of Highley Hill Rd/ Lake Rapids Rd High Elevation -> Freezing Rain frequently icy roads



13. September 21, 2010 LEPC 6 meeting with program about Pre-Disaster Hazard Mitigation Plans (Guildford had a representative)

VOLUNTEER FORM TO DOCUMENT IN-KIND SERVICES - MATCH INFORMATION								
PROGRAM: LEPC VI - EMPG								
DATE OF MEETING: September 21, 2010								
MEETING LOCATION: Brattleboro Fire Station								
TOPIC: Hazard Mitigation Planning - Public Participation Involvement								
MEETING TIME: 5:00 PM								
VOLUNTEER ATTENDEES - CLAIMED								
NAME	SIGNATURE	AFFILIATION 1	AFFILIATION 2	AFFILIATION 3	MILEAGE ROUND TRIP	MEETING HOURS	TOTAL MILEAGE	TOTAL TIME
Chris Company	<i>[Signature]</i>	WRC	Wilmington		N/A		0.955	\$20.00
Ken March	<i>[Signature]</i>	Wilmington Fire	Wilmington EMD		N/A			
David Mosca	<i>[Signature]</i>	Windsor Fire	Windsor EMD		N/A			
David Desrosiers	<i>[Signature]</i>	Townshend EMD	Townshend School	NEVER VERMONT PUBLIC PARTICIPATION	N/A			
Boris Faloux	<i>[Signature]</i>	Red Cross			N/A			
Michael Bussisi	<i>[Signature]</i>	Brattleboro Fire Chief	Town of Brattleboro Emergency Management					
Lisa Hegert	<i>[Signature]</i>	Town of Northboro EOC	FF					
Sindy Martel	<i>[Signature]</i>	Brattleboro EOC						
Mark Considine	<i>[Signature]</i>	Rescue Inc	VT EMS D13					
Paula Carcetti	<i>[Signature]</i>	VT Dist Health			N/A			
Caroline Sturmen	<i>[Signature]</i>	Gullford Road officer	VTIL special needs		N/A			
Andrew Hill	<i>[Signature]</i>	Brattleboro Memorial Hospital						
Peter Coffey	<i>[Signature]</i>	VENI						
Jim Tenkovich	<i>[Signature]</i>	VT DA	VENI/VY JK					
JAY KARPIN	<i>[Signature]</i>	SELECTMAN GRAFTON VT	TOWN HEALTH OFF	WRC SHELTER MD				
Anthony Simard	<i>[Signature]</i>	Brattleboro Retreat - EOC	Coordinator		N/A			
Diane Champion	<i>[Signature]</i>	VT Dept Health						