

Woodbury, VT Local Hazard Mitigation Plan Update
October, 2011
Prepared by the Town of Woodbury and CVRPC

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1. Introduction

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

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and State agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This Plan recognizes that communities have opportunities to identify mitigation strategies 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 local actions that can be taken to reduce the severity of the hazard.

Hazard mitigation strategies and measures alter the hazard by eliminating or reducing the frequency of occurrence, avert the hazard by redirecting the impact by means of a structure or land treatment, adapt to the hazard by modifying structures or standards, or avoid the hazard by preventing or limiting development.

2. Purpose

The purpose of this Local Hazard Mitigation Plan is to assist the Town of Woodbury in recognizing hazards facing the region and their community and identify strategies to begin reducing risks from acknowledged hazards.

Woodbury strives to be in accordance the strategies, goals and objectives of the State Hazard Mitigation Plan, including an emphasis on proactive pre-disaster flood mitigation for public infrastructure, good floodplain and river management practices, and fluvial erosion risk assessment initiatives.

The 2011 Woodbury Local Hazard Mitigation Plan is an update of the 2007 plan. The plan has been reorganized and new sections have been added regarding:

- Plan Update Process
- Plan Maintenance
- Dam Failure Hazard
- Hurricane/Tropical Storm/Severe Storm Hazard
- Winter Storm/Ice Storm Hazard
- Updates of Local Areas of Concern and Hazard Analysis Map
- Status update of 2007 mitigation strategies
- Identification of new mitigation strategies

3. Community Profile

The Town of Woodbury is a small, rural, residential, and tourism based community located on the northern edge of Washington County. It is bounded to the east by Cabot, to the south by Calais, to the west by Elmore (in Lamoille County) and to the north by Hardwick (in Lamoille County.) According to the 2010 Census, Woodbury has a total population of 906 people living in 713 housing units. 284 of Woodbury's housing units are classified as seasonal ("vacation") units as the abundant water bodies and forests draw visitors from within and outside the State, most of who contribute to the local economy through the purchase of goods and services. The Town's population has increased by 11% from the 2000 Census, while the number of occupied housing units experienced a rapid growth of 20%. Seasonal units are being converted for year-round use, indicating what may be the beginning of a trend, as Woodbury becomes more of a bedroom community for Montpelier, Barre, Hardwick and Morrisville. Approximately 16% of Woodbury's workforce is employed within the Town, while the remaining 84% work outside of the community.

With about 1560 feet of topographical relief inside its boundaries and over 85% of the land forested, Woodbury is rugged and picturesque. Woodbury has more lakes and ponds than any other town in Vermont, and is at a headwater for both the Lamoille and Winooski River Basins. The Town is bisected by Route 14 which traverses a valley formed by Cooper Brook to the north, and Kingsbury Brook from Greenwood Lake south to South Woodbury. Low hills lie to the east while the ridgeline of the Woodbury Range is the dominant topographical feature west of Route 14. The majority of the Town's commercial and dense residential development is located within the villages of Woodbury and South Woodbury. The largest numbers of private residences, however, are widely dispersed throughout the Town's rural lands. This pattern of rural development surrounding dense villages is reinforced by the Town Plan. Woodbury has had limited new development. Development continues to be scattered rural residential. There are no major residential or commercial developments currently in the planning or permitting stages.

In Woodbury, electricity is provided by the Hardwick Electric Department to the majority of residents with the exception of the southwestern portion and the western corner, which is supplied by Washington Electric Cooperative and Green Mountain Power. The majority of Woodbury is dependant upon groundwater for its domestic water supply and individual on-site septic systems for wastewater treatment. There are three public water systems in Woodbury: one serves the church and the Town Office in South Woodbury Village; one serves the Post Office, Town Hall and the Fire Station in Woodbury Village; Woodbury Elementary School has its own system.

The Town's fire coverage is provided by the Woodbury Volunteer Fire Department (WVFD), which provides support to the inter-municipal Capital Fire Mutual Aid System as well as the Hardwick Fire Department. According to Woodbury's 2010 Town Report the WVFD responded to 60 calls for emergency assistance, 19 of which were in Woodbury. Hardwick Rescue provides ambulance service and the Woodbury First Response provides additional medical care to Woodbury residents. The Ambulance Service responded to 491 calls for assistance in its service area in 2010. Hardwick rescue continues to provide CPR/AED and first aid classes for the community.

In regards to law enforcement, the Vermont State Police and Washington County Police provide law enforcement for the Town of Woodbury.

The Town of Woodbury has an approved Rapid Response Plan that was adopted in 2011 and an Emergency Operations Plan, dated 2009 and is currently being updated. An emergency evacuation plan exists for the Woodbury Elementary School.

The Town Plan includes a description, goals, policies and strategies in regards to flooding, groundwater protection, and steep slope development, transportation and emergency services. Woodbury Zoning Regulations, last amended in March 1989, include Shoreline Districts where permitted uses are restricted to agricultural uses (including forestry), single family dwellings, accessory building use and home occupations. Flood hazard regulations are currently being amended to be compliant with the minimum NFIP standards and minimum inundation levels.

4. Planning Process and Maintenance

4.1 Planning Process

The Central Vermont Regional Planning Commission (CVRPC) coordinated the Woodbury Local Hazard Mitigation Plan process. Ann Lindner, Emergency Management Director, contacted CVRPC to set up a hazard mitigation meeting. CVRPC sent Town-Specific hazard mitigation material for review. After assessing the material, Ann and CVRPC staff held a meeting along with members of the community on September 19, 2011 at the Municipal Offices. The Woodbury Hazard Mitigation Meeting focused on assessing past mitigation projects and compiling information on its current and future hazard mitigation programs, projects and activities.

Attendees included:

- Paul Cerutti, Fire Chief
- Brian Shatney, Select Board
- Ann Lindner, Emergency Management Director
- Elizabeth Stratton, Select Board
- Steve Freihofner, Select board

The meeting indicated that the Town is most vulnerable to dam failures, extreme cold/winter storm/ice storms, flash floods/floods/fluvial erosion, and hurricane/tropical storm/severe storms. Previously identified hazards include flooding, power shortages, hazardous materials and transportation accidents. Woodbury feels power shortages, hazardous materials and transportation accidents are no longer significant hazards because of Town wide changes that have been made over the course of the past 5 years (see appendix A for description of previous hazards.) The Town is now focusing on flooding hazards as these events are the most common.

Once the draft was updated, CVRPC placed a notice for public comments of the draft update on the CVRPC blog and newsletter. The draft update was also available at Woodbury Municipal offices and by request from CVRPC for public review and comments from 10/18/2011 to

11/14/2011 (see appendix). The announcement of the draft update in the CVRPC newsletter reached over 150 people and businesses in the Region's 23 towns, including the adjacent towns of Calais, Cabot, and Marshfield. No comments were received. Public comments submitted in the future will be reviewed by the Emergency Management Director (and CVRPC Staff dependant on funding) and attached as an appendix. In the future, the draft plan will be made available during Town Meeting Day and local meetings with State and local officials to allow for more public comment and review. Once the plan is conditionally approved by FEMA, the plan will go before the Select Board for adoption.

4.2 Plan Update Process

The Woodbury Local Mitigation Plan was originally adopted by the Town as an Annex to the Central Vermont Regional Pre Disaster Mitigation Plan in June 2007 and received FEMA final approval in September 2007. The 2011 update is intended to be submitted as a standalone town local mitigation plan.

The current plan is an extensive update of the 2007 plan. Below is a list of the revisions that have been made from the past plan and the appropriate sections for reference. New hazards identified include dam failures and hurricanes/tropical storms/severe storms.

General Updates

- General reorganization/restructuring of the plan according to future FEMA/VEM checklist
 - New sections added – 4.2 Plan Update Process, 4.3 Plan Maintenance, 5.2 Dam Failures, 5.2 Severe Storms, 5.3 Non Worst Threat Hazards
- Update of all data and statistics using 2010 Town Report and US Census Data (Section 3)
- Revaluation, identification and analysis of all significant hazards (Section 5)
- Acknowledgment of implemented mitigation strategies since 2007 – see matrix below (section 4.2)
- Identification of on-going mitigation projects and strategies – see Existing Mitigation Programs, Projects and Activities section (section 4.2)

Hazard Analysis Updates (Sections 5 and 6)

- New hazards added – dam failures, severe storms
- Added location/vulnerability/extent/impact/likelihood table for each hazard to summarize hazard description (Section 5.1-5.3 – after each hazard)
- Review of Vermont Hazard Mitigation Plan (Section 5 – hazard analysis table)

Maps

- Review of 2007 Areas of Concern map and Local Hazards Analysis map – combined, removed data regarding high transportation accidents and hazardous materials, added beaver dam locations.

Preparation for the meeting included a review of Woodbury's adopted planning documents, including the Woodbury Town Plan, the Woodbury Zoning Regulations, the Woodbury Rapid Response Plan, Kingsbury Branch Corridor Plan, and the 2011 Woodbury Emergency Operations Plan.

The following chart provides an overview of Woodbury’s proposed 2007 local hazard mitigation actions along with their current status. Additionally since the 2007 plan, the Town is in the process of updating their flood regulations to be compliant with basic NFIP regulations to maintain NFIP compliance.

2007 Mitigation Action	2011 Status
Up-grade fire station facilities to increase communication with other emergency service responders and town officials.	Obtained narrow broadband license for 2012. Installed signal repeater on building and on vehicles. All radios are programmed with VCOMM. Installed high speed internet at fire station. Installed radio at Town Clerk’s office.
Relocate fire station to location outside flood prone areas.	Still interested, but there is lack of funding. Has been flooded three times this year.
Raise roads and replace culverts to ensure safe travel and adequate drainage during flooding.	Upgraded 6 culverts. Replacement and upgrades are ongoing – working with CVRPC culvert inventory to prioritize projects
Purchase cots and blankets for emergency shelter.	Still have an interest, lack of funding
Purchase cameras and visibility vests for road crews to ensure appropriate documentation of road related disasters and worker safety.	Bought vests and disposable cameras. Interested in purchasing digital camera to allow for more comprehensive incident reporting and data management.
Conduct public awareness campaign about emergency preparedness.	Low interest level – have handouts in Town Offices and at Annual Town meeting of State publications and occasional flyers
Increase radio coverage throughout Woodbury to aid in communication between local service providers, volunteers and other agencies.	Installed repeaters. Cell phone service would be GREAT! Submitted grants for new radios. Old radios would be passed down to Town Officials

Existing Hazard Mitigation Programs, Projects & Activities

The ongoing or recently completed programs, projects and activities are listed by mitigation strategy.

Community Preparedness Activities

- Emergency Operations Plan – **2011**
- Rapid Response Plan – **2011**
- Elementary School Evacuation Plan – **reviewed annually**

Hazard Control & Protective Works

- Culvert & Bridge Inventory – **performed every 3 years with CVRPC**
- Mutual Aid Agreement - **ongoing**

Insurance Programs

- Participation in NFIP

Land use Planning/Management

- Town Plan: Land Resources: Goals, Policies & Strategies
 - Goal #5: To minimize damage to property and buildings due to flooding
 - Strategy #5A (1): The Planning Commission will draft a new zoning regulation addressing this issue – **will occur after update of Town Plan**
 - Strategy #5-B (1): The Conservation Commission will continue to work closely with the Town road crew, the ANR and the State Agency of Transportation, to monitor and regulate water levels at pond and wetland outlets where beaver dams may be causing water to encroach upon roads or shoreline properties – **dams monitored almost daily**
- Town Plan: Transportation Goals, Policies & Strategies
 - Goal #1: To maintain and improve Town roads to provide safe and reliable passage for automobiles, commercial vehicles, bicycles and pedestrians.
 - Strategy #1-B (1): The Planning Commission will use the CVRPC as a resource to study traffic calming techniques, such as parking configuration, sidewalks, and tree plantings along the roadsides in the villages (i.e. Route 14), that could be recommended to the AOT – **Study was performed and speed was lowered.**
 - Strategy #1-B (2): The Planning Commission recommends to the Town Constable periodic placement of the “Smart Cart” (digital read-out through the AOT) at various sites along Route 14 and other Town Highways, to raise driver awareness and change driving habits, i.e. reduce speeding – **Installed when available, only 1 cart available to use in Washington County**
 - Strategy #1-B (3): The Planning Commission will consider proposing an amendment to the zoning ordinance extending the northerly boundary for Woodbury Village District. The P.C. could then appeal to the AOT to extend the Access Management Category 6 designation and post a 35 mph speed limit at this boundary, with the intent of having an impact on traffic speeds through the village. The P.C. will solicit input from camp owners on Woodbury Lakes as to whether the speed limit on Route 14 should be reduced from 40 mph to 35 mph – **In midst of updating Town Plan, will revise zoning ordinances after.**

- Zoning Regulations – Shoreline District (4.3) – **will be updated after update of Town Plan**

Protection/Retrofit of Infrastructure and Critical Facilities

- Dry Hydrant Program – 7 – **one is currently inactive due to flooding**

Public Awareness, Training & Education

- Fire safety educational programs – **annually in schools**
- First responder CPR & hazmat trainings – **AED/CPR classes offered as needed through Fire Department**
- CERT program – **now defunct**

4.3 Plan Maintenance Process

The Woodbury Local Hazard Mitigation Plan will be updated and evaluated annually at a September Select Board meeting along with the review of the Basic Emergency Operations Plan. Updates and evaluation by the Select Board will also occur within three months after every federal disaster declaration and as updates to town plan/zoning and river corridor plans come into effect. The plan will be reviewed by the Select Board, Zoning Admin, Town Manager and public at the abovementioned September select board meeting. CVRPC will help with updates or if no funding is available, the Zoning Administrator/Town Manager will update the plan.

The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website, notice in the municipal building, Hardwick Gazette and CVRPC newsletter and blog inviting the public to the scheduled Select Board (or specially scheduled) meeting. Additional stakeholders invited to the meeting will be the Quarry Owner and Woodbury Store Owner. Also invited in the future will be the VT Agency of Natural Resources (VT ANR), as they are able to provide assistance with NFIP outreach activities, models for stricter floodplain zoning regulations, delineation of fluvial erosion hazard areas, and other applicable initiatives. These efforts will be coordinated by the Zoning Administrator and Town Manager.

Monitoring of plan progress, implementation, and the 5 year update process will be undertaken by the Town Manager and Zoning Administrator. Monitoring updates may include changes in community mitigation strategies; new town bylaws, zoning and planning strategies; progress of implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities. If new actions are identified in the five year interim period, the plan can be amended without formal re-adoption during regularly scheduled Select Board meetings. After a five year period, the plan will be submitted for re-adoption following the process outlined the schematic found in the Attachments section.

Woodbury shall also consider incorporation of mitigation planning into their long term land use and development planning documents. It is recommended the Town review and incorporate elements of the Local Hazard Mitigation Plan when updating the municipal plan, zoning

regulations, and flood hazard/FEH bylaws. The incorporation of the Local Hazard Mitigation Plan into the municipal plan, zoning regulations and flood hazard/FEH bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing future Kingsbury Branch Corridor planning documents for ideas on future mitigation projects and hazard areas.

5. Risk Assessment

5.1 Hazard Identification and Analysis

The following natural disasters were discussed and the worst threat hazards were identified based upon the likelihood of the event and the community's vulnerability to the event. Hazards not identified as a "worst threat" may still occur. Greater explanations and mitigation strategies of non "worst threat" hazards can be found in the State of Vermont's Hazard Mitigation Plan.

Hazard	Likelihood ¹	Community Vulnerability ²	Worst Threat
Avalanche/ Landslide	Low	No	
Dam Failures	Med/High	Yes	✓
Drought	Low	No	
Earthquake	Low	No	
Extreme Cold/Winter Storm/Ice Storm/Power Failure	Med/High	Yes	✓
Flash Flood/Flood/Fluvial Erosion	High	Yes	✓
High Wind	High	No	
Ice Jam	Low	No	
Hurricane/Tropical Storm/Severe Storms	Med	Yes	✓
Structure Fire	Med	No	
Tornado	Low	No	
Water Supply Contamination	Low	No	
Wildfire/Forest Fire	Low	No	

The following hazards were found to be most significant in the Town of Woodbury:

- Dam Failures (beaver)
- Extreme Cold/Winter Storm/Ice Storm/Power Failure

¹ High likelihood of happening: Near 100% probability in the next year.

Medium likelihood of happening: 10% to 100% probability in the next year or at least once in the next 10 years.

Low likelihood of happening: 1% to 10% probability in the next year or at least once in the next 100 years.

² Does the hazard present the threat of disaster (Yes)? Or is it just a routine emergency (No)?

- Flash Flood/Flood/Fluvial Erosion
- Hurricane/Tropical Storms/Severe Storms

A discussion of each significant hazard is included in the proceeding subsections and a map identifying the location of each hazard is attached (See map titled *Areas of Local Concern*.) Each subsection includes a list of past occurrences based upon County-wide FEMA Disaster Declarations (DR-#) plus information from local records, a narrative description of the hazard and a hazard matrix containing the following overview information:

Hazard	Location	Vulnerability	Extent	Impact
Type of hazard	General areas within municipality which are vulnerable to the identified hazard.	Types of structures impacted	<p><u>Minimal:</u> Limited and scattered property damage; no damage to public infrastructure contained geographic area (i.e., 1 or 2 communities); essential services (utilities, hospitals, schools, etc.) not interrupted; no injuries or fatalities.</p> <p><u>Moderate:</u> Scattered major property damage (more than 50% destroyed); some minor infrastructure damage; wider geographic area (several communities) essential services are briefly interrupted; some injuries and/or fatalities.</p> <p><u>Severe:</u> Consistent major property damage; major damage to public infrastructure (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and fatalities.</p>	Dollar value or percentage of damages.

5.2 Worst Threat Hazards

Flooding/Flash Flooding/Fluvial Erosion

History of Occurrences (within Central Vermont, town specific data not available):

Date	Event	Location	Extent
8/28/2011	Flash Flood (TS Irene)	Woodbury Washington County	Winooski River crested at 19.05 feet in Montpelier– flood stage is at 15'; 5-7" of rain
5/26/2011	Flash Flood	Washington County	4" of rain; Montpelier gauge at 17.59'
7/11/2007	Flash Flood	Northeast Washington County	3-6" of rain in 2 hrs
6/26/2006	Flood	Washington County	3-4" of rain

7/1/1998	Flood	Washington County	No data
6/27/1998	Flash Flood	County Wide	3-6" of rain over 2 day period
8/5/1976	Flood	County Wide	Montpelier flood gauge at 12.31 feet
6/30/1973	Flood	County Wide	Montpelier gauge at 17.55 ft
9/22/1938	Flood/Hurricane	County Wide	Montpelier flood gauge at 14.11 feet
11/03/1927	Flood	County Wide	Montpelier flood gauge at 27.10 feet

Flooding/flash flooding/fluvial erosion is Woodbury's most commonly recurring hazard. Flooding is the overflowing of rivers, streams, drains and lakes due to excessive rain, rapid snow melt or ice. Flash flooding is a rapidly occurring flood event usually from excessive rain. Fluvial erosion is the process of natural stream channel adjustments. Fluvial erosion causes erosion of sediment in some areas, while causing aggradation of sediment in other. Fluvial erosion processes occur more quickly and severely during flood events.

Flooding/flash flooding/fluvial erosion is Woodbury's most common recurring hazard. Woodbury is located in the Kingsbury Watershed of the Winooski River. Only Phase I stream assessment have been performed for the waters in Woodbury. Based on prioritization measures from the Phase I assessments, corridor mitigation or stream enhancement activities have not been identified for reaches within Woodbury. The majority of land cover in Woodbury is undisturbed forest, which aids in the slowing of storm water runoff and prevention of flooding.

Due to the great retentive capacity of Woodbury's numerous lakes and wetlands, the town does not contain extensive flood prone areas. In total, approximately 112 acres of land in Woodbury lie within a 100-year flood plain, these federally recognized areas are primarily low-lying shorelines, such as around Woodbury Lake (see Woodbury Hazard Analysis Map.) The majority of Woodbury's development is located within the two village districts of Woodbury and South Woodbury.

Specific extent data for flood levels in Woodbury is lacking as the closest flood gauge is located in Montpelier. During Tropical Storm Irene, the Montpelier flood gauge was 4 feet above flood stage. The worst flooding event in Woodbury's history was the 1927 event; however, exact data from that event is not available. In 1927 event, the Montpelier flood gauge was at 27.10 feet; however, since the 1927 flood a number of flood control dams have been installed in the region to prevent the same flooding extent. Lesser but more regular flooding occurs in Woodbury, with generally 1 foot of water in areas designated on the areas of concern map.

During the Spring 2011 flooding event, Cranberry Meadow Rd and County Rd were most hard hit. The Fire Station in Woodbury village flooded during the Spring TS Irene event. The flooding caused damage primarily to roads and culverts. Spring flooding damages were paid for by funds from Woodbury's general operating budget. Cabot Road and West Woodbury Road were impacted

during the TS Irene event. All roads have been temporarily repaired. The town is seeking funds to upgrade and expand the culverts that were damaged in the spring floods and Irene.

There are 6 structures and 118 properties that are located within the National Flood Insurance Program's designated 100-year floodplain. The estimated loss for a severe flooding event for all properties located within the town's 100-year floodplain is approximately \$15,635,000. Woodbury does participate in the NFIP. There are no repetitive loss properties in Woodbury. The Woodbury Fire Station is located in the floodplain and was flooded during the Spring 2011 and Tropical Storm Irene events. The Town is seeking funding to relocate the facility to a safer area.

Areas prone to flood are identified on the map and are most often a result of beaver dams. A greater explanation of beaver dams is provided below.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Flooding/ Flash Flooding/ Fluvial Erosion	Cranberry Meadows Rd, County Rd, Slayton Pond Rd, Woodbury Village, Cabot Road	Roads, culverts, bridges, fire station, village buildings	TS Irene – Montpelier gauge at 19.05'; 5" of rain	Depends on severity - ~\$15 million for properties located in flood plain, \$500,000 fire station, \$150,000/ village building	High

Dams/Beaver Dams

Dam failure is when a structure retaining water behind it is breeched and possibly causes inundation of downstream properties. In addition to flooding events, four dams exist in the Town of Woodbury. All of the dams are privately owned and, according to the town local mitigation plan meeting, are all in excess of 100-years old. In addition they have all been identified as "Dams of Concern" (see Hazard Analysis Map). A "Dam of Concern" is identified by the Agency of Natural Resources Vermont Dam Inventory (VDI) as a dam where failure or inappropriate operation will result in a high probability of a loss of human life and/or can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. There currently exists no history of major dam failure in regards to the man made dams, but the potential exists. Manmade dam locations are Nichols Pond, East Long Pond, Valley Lake and Mill Pond and are identified on the map.

Many ponds, wetlands and meadows throughout Woodbury are formed by beaver dams. These places increase bio-diversity and improve overall environmental quality. Woodbury has experienced one of the common human-beaver conflicts, flooding resulting from breached beaver dams. Culverts and Beaver Baffles are checked on a regular basis by the road crew. The Beaver

Dams are all on private land and are only checked with permission of the land owners when necessary.

In 1995 a beaver dam broke north of Woodbury Village, flooding many buildings within the village including the fire station. During Tropical Storm Irene, a beaver dam on Buck Lake Brook blew out and sent more water downstream than culvert TH2 BR 13. The dam was approximately 12' wide and 3' high. The water destroyed the culvert and a retaining wall on adjacent property. See map for culvert location. A hydraulic study was performed after Irene, which provided several recommendations for mitigation including immediate and long term actions. Recommendations from the hydraulic study are outlined in the Mitigation Activity Matrix.

Additional beaver dam locations are (highlighted on map):

- County Road – from Town Rd to TH9 – 10 to 12 dams
- Buck Lake Brook to Cabot Road
- Along Cranberry Meadow Rd to Nelson Pond
- Intersection of Wheeler Hill Rd and Dog Pond Rd

Flooding from breaching of beaver dams increases gravel movement, and can cause culverts and short structures to become overwhelmed with runoff. The extent of the water behind beaver dams is unknown as the location and size of the dams is always changing. Woodbury will take steps to better monitor the location and sizes of the beaver dams for the next plan update.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Beaver Dams	County Rd, Buck Lake Brook/Cabot Rd, Cranberry Meadow Rd, Wheeler Hill/Dog Pond Rd, Valley Lake, Nichols Pond, East Long Pond, Mill Pond	Undersized bridges and culverts and adjacent private properties along identified locations	Data gap of volume of water behind dams	\$250,000 for TH BR 13 replacement and upgrade, \$100,000/ culvert upgrade	Med/High

Extreme Cold/Winter or Ice Storm in conjunction with power shortage/Failure

History of Occurrences (county wide)

Snow and/or ice events occur on a regular basis. Recent significant events have included:

Date	Event	Location	Extent
3/6/2011	Winter storm	County wide	12-18" of snow, 10,000 customers lost power statewide
2/23/2010	Winter Storm	County wide	20" of snow and 50,000 customers lost power statewide
2/22/2009	Winter Storm	County Wide	16" of snow, 30 mph wind gusts
2/1/2008	Winter storm	County wide	3-7" of snow and ice ¼-1/2" thick, 50 mph wind gusts
2/14/2007	Winter storm	County wide	22" of snow
1/4/2003	Winter storm	County wide	19" of snow
3/5/2001	Winter storm	County wide	15-30" of snow
12/31/2000	Winter storm	County wide	10" of snow
12/29/1997	Winter storm	County wide	21" of snow
12/7/1996	Winter Storm	County wide	12" of snow
3/21/1994	Winter storm	County Wide	5-11" of snow
11/1/1993	Winter storm	County wide	15" of snow
1/3/1993	Freezing Rain	Statewide	

A winter storm is defined as a storm that generates sufficient quantities of snow, ice or sleet to result in hazardous conditions and/or property damage. Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to wires or trees, but in sufficient depth, can cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surfaces coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. Periods of extreme cold tend to occur with these events.

The extent of winter storms on Woodbury is difficult to estimate as it is dependent on the size and path of the storm. For the next plan update, Woodbury will more closely monitor winter storms to determine the worst impacts possible on the Town.

One of the major problems associated with ice storms is the loss of electrical power. Major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by ice, severe winds and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes and placing new distribution lines underground.

Woodbury is served by three energy utilities, Green Mountain Power and Washington Electric Cooperative and Hardwick Electric. The power generation of these entities is based upon substations that are not set by jurisdictional lines. As a result, frequency and specific dates of power shortage/failure could not be attained. This level of detail could be provided in the future by working directly with the utilities in order to research this data.

By observing winter storm watches and warnings, adequate preparations can usually be made to lessen the impact of snow, ice and sleet, and below freezing temperature conditions on the Town of Woodbury. Providing for the mass care and sheltering of residents left without heat or electricity for an extended time and mobilizing sufficient resources to clear broken tree limbs from roads, are the primary challenges facing community officials. The Woodbury Elementary School is a Red Cross certified shelter and is equipped with backup power capabilities. Additional shelter locations include: Woodbury Village Church and the South Woodbury Church. The Town encourages residents who are in remote locations to be equipped with generators and backup fuel supplies in the event of prolonged power outages and travel restrictions.

Other major problems include closed roads and restricted transportation.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Extreme Cold/Winter or Ice Storm in conjunction with power failure	Town Wide	Elderly & handicapped populations, remote structures, old/under insulated structures, utilities, trees	12+” of snow on March 2011 storm	Depends on severity – additional sheltering/ plowing/ emergency services costs for town	Med/High

Hurricane/Tropical/Severe Storms

History of Occurrence:

Date	Event	Location	Extent
8/28/2011	Tropical Storm, Flash Flood (TS Irene)	Woodbury Washington County	Montpelier flood gauge at 19.05’, flood stage at 15’; 5” of rain
7/06/2011	Thunderstorm	County Wide	50 knot winds; 15,000 people in VT lost power
5/26/2011	Hail/Thunderstorms/Flash Flooding	County Wide	1” hail, 50 knot winds, 25,000 customers lost power in VT, 3-5” of rain
8/9/2010	Thunderstorm/Wind/Hail	Worcester(adj town)	50 knot winds
7/21/2010	Hail	County Wide	1” Hail
7/18/2008	Hail	County Wide	1” Hail, 30 knot winds
7/9/2007	Hail, thunderstorms	County Wide	Baseball sized hail
6/19/2006	Hail, thunderstorms	County Wide	50 knot winds
6/9/2005	Severe thunderstorms	Calais (adj town)	Downed powerlines, 60 knot winds
9/16/1999	Tropical Storm Floyd	Statewide	Tropical storm winds and

			flooding
6/17/1998	Severe Storms	County Wide	
7/15/1997	Severe Storms	County Wide	
5/19/1982	Thunderstorm winds	County Wide	56 knot winds
7/3/1964	Hail	County Wide	1.5" hail
9/22/1938	Hurricane	Statewide	Category 1 force winds

Hurricanes and tropical storms are violent rain storms with strong winds that have large amounts of rainfall and can reach speeds up to 200 mph. Hurricane season is between the months of June and November. These types of storms originate in the warm waters of the Caribbean and move up the Eastern seaboard where they lose speed in the cooler waters of the North Atlantic. Severe storm events can occur late spring and early summer as temperatures increase in the summer season. The frequency and intensity of hurricanes, tropical storms, and severe storms is expected to increase with climate change.

Similar to flooding, the extent of severe storms is not well documented in the Town of Woodbury. The impact of storms is usually flood related. See flood extent description in flood section above. Wind extent from storms is not well documented as there is no monitoring station in Woodbury. Estimates for wind are gathered from county wide data off the NCDC website. In the future, Woodbury could consider installing a monitoring station to better gather data for wind events. Woodbury could also install lake level monitors to record data for flooding events.

On Aug 28, 2011, Tropical Storm Irene hit Vermont and proceeded to deposit 4-5" of rain over Woodbury. Total damages from the storm have not yet been calculated. Roads that received the greatest damage were Cranberry Meadow Rd, County Rd, Cabot Rd, W. Woodbury Rd, and Buck Lake Rd. Localized flooding was exacerbated on Buck Lake Rd and Cabot Road, due to a beaver dam breaching upstream. These roads typically experience flooding during extreme rain events and were similarly damaged in the Spring 2011 floods, but to a lesser extent. Four culverts on West Woodbury Rd have been replaced with upsized culverts since Irene. The Town is now focusing on upsizing all culverts up to new State standards.

In addition the abovementioned roads and culverts, the Village of Woodbury became an island during Irene. The fire station was flooded with 1 inch of water. The structural integrity of the Smith residence, the Bailey building and The Old Country Store were compromised due to the flood waters rising in the Buck Lake Brook which completely washed out the Cabot Road. All buildings within the Village (Woodbury Store, Woodbury Fire Station, Smith's residence, Bailey building, Abbott's residence, The Old Country Store and LK Rossi Corp.) received water damage. The Rathburn Shop became an island. There was approximately 2 feet of extremely rapid water flowing through the Village.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Hurricane/ Tropical/	Town Wide for Wind	Large trees, power lines,	Tropical Storm/Catego	Data gap – depends on	Med

Severe Storms	impacts, Cabot Rd, West Woodbury Rd, Cranberry Meadow, Church St	culverts/bridges, fire station, village buildings	ry 1 hurricane winds; 5" of rain during TS Irene	severity \$250,000 estimate for upgrade and replacement of TH2 culvert	
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5.3 Non Worst Threat Hazards

High Winds

High wind is defined as an event with sustained wind speeds of 40 m.p.h. or greater lasting for 1 hour or longer or an event with winds of 58 m.p.h. or greater for any duration. Thunderstorms can generate high winds and down hundreds of large trees within a few minutes. The State can also experience tornadoes, which are capable of damaging or destroying structures, downing trees and power lines and creating injuries and death from collapsing buildings and flying objects. Tornadoes are less common than hail storms and high winds, but have occurred throughout Vermont. Across the State, however, 34 tornadoes have been recorded between 1950 and 1999, injuring 10 people and causing over \$8.4 million dollars in estimated property damage. Nearly all of these incidents occurred from May through August with most of occurring in the afternoon. To date, no high wind events have occurred in Woodbury.

Hazard	Location	Vulnerability	Extent	Impact	Probability
High Winds	Town Wide	Power lines, trees, structures	Depends on severity of event	Depends on severity of event	High

Structure Fire

Structure fire is when a building is partially damaged or destroyed by a fire. About one third of the calls received in 2010 by Woodbury's fire department were fire related incidents – chimney fires, smoke alarms, and carbon monoxide alarms. Although many structures in Woodbury are less than 100 years old, many residents heat their homes with wood or pellet burning stoves. The remoteness and distance from fire and emergency services of many homes also increases the likelihood of a home being completely, opposed to partially, destroyed by a fire. To date, there have been no large structure fires.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Structure Fires	Town Wide	Wood structures, especially older than 100 yrs, homes that use wood burning stoves for heat	Moderate	\$150,000 per home based on median grand list value	Med

6. Mitigation

6.1 Town Plan (2004) Goals and Mitigation Strategies that Support Local Hazard Mitigation

- To protect and preserve the integrity and function of significant natural communities, environmentally sensitive areas and special scenic features.
- To ensure that current and future land uses do not adversely affect air and water quality.
- To maintain and enhance recreational opportunities.
- To encourage the provision and maintenance of a safe road network and to provide guidance in planning and construction of future roads and improvements.

The next time the Town of Woodbury updates its Town Plan, it may consider adding additional mitigation goals. Additional mitigation goals could include:

- To take actions to reduce or eliminate the long-term risk to human life and property from natural hazards.

Specific hazard mitigation strategies related to the goals of the plan include:

- Ensure existing and future drainage systems are adequate and functioning properly
- Ensure that all residents and business owners are aware of the hazards that exist within Woodbury and ways they can protect themselves and insure their property
- Ensure that emergency response services and critical facilities functions are not interrupted by natural hazards
- Provide adequate communication systems for emergency personnel and response units
- Provide residents with adequate warning of potential hazards

6.2 Proposed Hazard Mitigation Programs, Projects & Activities

Hazard mitigation programs, projects and activities that were identified for implementation at the Town Local Hazard Mitigation meeting:

Hazards Mitigated	Mitigation Action	Local Leadership	Prioritization	Possible Resources	Time Frame
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Flooding, Severe storms, Dam Failures	Replacement and upgrade of culverts on County Rd, W. Woodbury Rd, Cranberry Meadow Rd, Buck Lake Road/TH 2, Cabot Rd, Rt 14, Old Quarry Road and Nichols Pond Road	Road foreman, Select Board	High	HMGP, General Funds	1-3 years
Power Failure/Extreme Cold, Severe Storms	Generator education and training	Select Board, Fire Dept	Med	General Funds, EMGP	2-3 years
Flooding, Severe Storms, Dam Failures	Relocate fire station out of flood plain	Select Board, Fire Dept	High	FMA, HMGP, General Funds	2 years
Flooding, Severe Storms, Dam Failures	Develop priority culvert/bridge replacement list	Select Board, Road Foreman, CVRPC, VTrans/ANR	High	General Funds	1 year
Power Failure/Extreme Cold, Severe Storms	Installation of generator transfer switch from Fire Department annex to Town Hall	Select Board, Fire Dept	Med/Low	HMGP, EMGP	3-4 years
Power Failure/Extreme Cold, Severe Storms	Purchase generator for Town Hall	Select Board	Med	HMGP	3-4 years
Power Failure/Extreme Cold, Severe Storms	Install communications system in Town Hall	Select Board, Fire Dept.	Low	EMGP	4 years
Power Failure/Extreme Cold, Severe Storms	Connect Woodbury Store to generator to allow for store to stay open and provide supplies during events	Select Board, Business owner	Med	EMGP, Town funds	3 years

All Hazards	Issue a Town Wide survey to determine vulnerable populations and resident needs/available reserve equipment & supplies	Select Board	Med	General fund	2 years
NFIP Compliance	Work with elected officials, the State and FEMA to correct existing compliance issues and prevent any future NFIP compliance issues through continuous communications, training and education	Select Board, ANR, CVRPC	High	General fund	1-2 years

VEM also emphasizes a collaborative approach to achieving mitigation on the local level, by partnering with ANR, VTrans, ACCD, Regional Planning Commissions, FEMA Region 1 and other agencies, all working together to provide assistance and resources to towns interested in pursuing mitigation projects and planning initiatives.

The mitigation activities are listed in regards to local leadership, possible resources, implementation tools, and prioritization. Prioritization was based upon the economic impact of the action, the Community's need to address the issue, the action's cost, and the availability of potential funding. The action's cost was evaluated in relation to its benefit as outlined in the STAPLEE guidelines.

Woodbury understands that in order to apply for FEMA funding for mitigation projects that a project must meet FEMA benefit cost criteria. The Town must also have a FEMA approved Hazard Mitigation Plan as well.

A High prioritization denotes that the action is either critical or potential funding is readily available and should have a timeframe of implementation of less than two years. A Medium prioritization is warranted where the action is less critical or the potential funding is not readily available and has a timeframe for implementation of more than two years but less than four. A Low prioritization indicates that the timeframe for implementation of the action, given the action's cost, availability of funding, and the community's need to address the issue, is more than four years.

Attachments

- Areas of Local Concern Map
- Appendix A

- 5 year plan maintenance and review process
- Town Resolution Adopting the Plan

Appendix A

6.2 Hazardous Materials

History of Occurrences:

- ?? May 11, 2001 – Motor oil
- ?? June 11, 2001 – Oil based paint

Woodbury is vulnerable to a hazardous materials spill, as identified at the Woodbury local mitigation plan meeting. The Route 14 corridor that travels through the central portion of the Town is used by Casella Waste Management to transport potential hazardous materials (See Area of Concern Map).

6.4 Transportation Accidents

History of Occurrences:

- ?? Approximately 19 accidents/year over a five-year period

Route 14 is the main thoroughfare in Woodbury and is classified as a “minor arterial” by the state Agency of Transportation; Route 14 connects the town to the Barre/Montpelier area and the town of Hardwick to the north. According to the Woodbury Town Plan traffic volume has grown approximately 20-25% on Route 14 in the past 20 years and approximately 2,500 vehicles travel the road each day. Speeding and the increasing number of curb cuts contribute to the number of accidents. In 2003 Woodbury emergency services responded to a two-vehicle accident at Greenwood Lake, one vehicle was forced off the road into the water resulting in one fatality. Woodbury emergency services do not own water rescue equipment.

According to the Woodbury local mitigation plan meeting, Woodbury’s most accident-prone intersections are at the intersection of Route 14 and Herricks Cove Road, Route 14 and TH #31 road, Route 14 crossroad intersection within the Village of Woodbury and on a section of Route 14 north of the intersection of East Hill Road (TH #6) (see Areas of Concern Map).

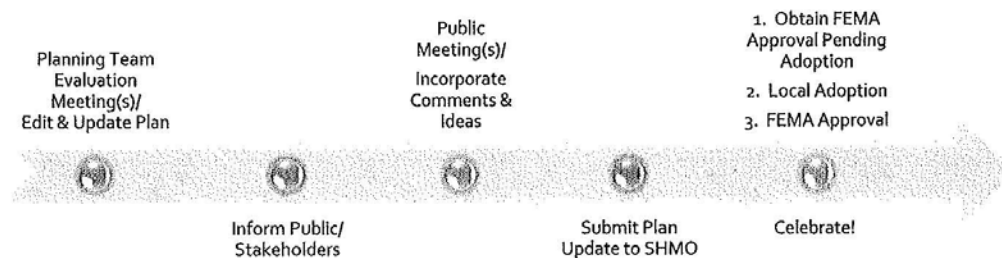
5-Year Plan Review/Maintenance



After Plan Adoption-Annually Implement and Evaluate



Fifth Year, and After Major Disaster Evaluate and Revise



CERTIFICATE OF ADOPTION

The Town of Woodbury
Select Board
A Resolution Adopting the Local Hazard Mitigation Plan
_____, 2011

WHEREAS, the Town of Woodbury has worked with the Central Vermont Regional Planning Commission to identify hazards, analyze past and potential future losses due to natural and manmade-caused disasters, and identify strategies for mitigating future losses; and

WHEREAS, the Woodbury Local Hazard Mitigation Plan contains several potential projects to mitigate damage from disasters that could occur in the Town of Woodbury; and

WHEREAS, a duly-noticed public meeting was held by the Town of Woodbury Select Board on _____, 2011 to formally adopt the Woodbury Local Hazard Mitigation Plan;

NOW, THEREFORE BE IT RESOLVED that the Woodbury Select Board adopts the Woodbury Local Hazard Mitigation Plan.

Chair of Select Board

Member of Select Board

ATTEST

Woodbury Clerk