

Town of Waitsfield, VT
Local Hazard Mitigation Plan
Created April, 2015 – Adopted _____
Prepared by the Town of Waitsfield and CVRPC

DRAFT

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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 Local Hazard Mitigation Plan is to provide a local mitigation plan that makes the Town of Waitsfield 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 Waitsfield in recognizing hazards facing the region and their community and identify strategies to begin reducing risks from acknowledged hazards.

3. Community Profile

The Town of Waitsfield is a small, rural, residential, and tourism-based community located in the southwestern portion of Washington County. It is bordered by Moretown and Duxbury to the north, by Fayston to the west, by Warren to the south and Northfield to the east.

According to the 2010 Census, Waitsfield has a total population of 1,719 people living in 1,011 housing units. The Town's estimated 2013 population is 1,804, a slight increase. According to the municipal plan "Waitsfield is a rural community with a working landscape, a regional commercial center, a bedroom community, a tourist destination, and is home to a variety of species, habitats and natural resources." The town is characterized as a bedroom community as it provides only about 3.8 percent of the jobs in the Region (VT Dept. of Labor, 2012).

Waitsfield is located in the heart of the 143 sq. mile Mad River watershed, which drains in a northerly direction into the Winooski River Basin, and is bounded to the east by the Northfield mountain range with elevations nearing 3,000 feet. Vermont Route 100 follows the Mad River in a North-South direction and provides connection to Waterbury and Warren. The Village of Irasville is located at the intersection of Vermont Route 100 and Vermont Route 17, which provides passage west beyond the Green Mountains via Appalachian Gap.

According to information contained in the Waitsfield 2012 Town Plan, a dominant characteristic of Waitsfield is the extensive forest cover, especially in mountainous areas and on steep slopes rising from the valley floor. The town's physical character, however, is defined by the contrasting patchwork of that forest with large areas of farmland, especially in the vicinity of Waitsfield Common and the valley floor, and an attractive built environment. Commercial development is concentrated in existing centers, Waitsfield Village and Irasville, and in the Limited Business and Industrial Districts. Residential development is widely distributed throughout town, although concentrations exist in the village centers and in rural areas served by major roads near the villages.

The Town of Waitsfield strives to encourage compact village centers surrounded by rural landscapes. Recent development primarily consists of low-density, scattered residential development in the Forest Reserve district as "a growing market for lots which offer a big view" have increased development pressure. The town has designated Irasville and Waitsfield Village as future growth centers for development. All new development is required to adhere to the Flood and Fluvial Erosion Hazard zoning regulations adopted in 2010 where applicable.

The Town recently completed construction of a municipal water system serving approximately 150 parcels in Irasville and Waitsfield Village. The purpose of the water system is to address

public health concerns, protect water quality of the Mad River, provide for economic development, and reduce the potential for sprawl outside these areas. The town is currently investigating municipal decentralized wastewater options for its population centers, though existing wastewater treatment is provided by on-site systems.

In Waitsfield, electricity is provided by Green Mountain Power to the majority of residents with the exception of a small area along the North Fayston and Airport Roads, which is supplied by the Washington Electric Cooperative. The Town's fire coverage is provided by the Waitsfield-Fayston Volunteer Fire Department, which provides support to the inter-municipal Capital Fire Mutual Aid System. According to the 2014 Waitsfield Town Report the Fire Department responded to a total of 137 calls during 2014 (including 47 motor vehicle accidents, 10 structure fires and 4 wildland fires). The Mad River Valley Ambulance Service provides emergency medical care to all Valley residents via its home in Waitsfield Village. Law enforcement is provided by the Vermont State Police and by the Washington County Sheriff's Office which is under contract for 16 hours per week. The Town Constable is also a Deputy Sheriff.

The Town of Waitsfield has an approved Local Emergency Operations Plan that was adopted in 2014. The Waitsfield Elementary School serves as the Town's primary emergency shelter and the town office is the Emergency Operations Center. The Town also adopted Road and Bridge Standards in 2014 with the purpose of increasing the likelihood that town roads and bridges will hold up during flooding and heavy rain events.

The Town Plan was adopted in 2012 and includes a discussion and goals in regards to flood history, public safety, natural resources, land use, floodplain management, vulnerable transportation infrastructure, water quality protection, and climate change. The 2010 Waitsfield Zoning Bylaws include Flood Hazard Area and Fluvial Erosion Hazard Area Overlay Districts, a Forest Reserve District, provisions for Planned Unit Development and standards in regards to surface water protection, steep slopes and lot coverage maximums.

4. Planning Process and Maintenance

4.1 Planning Process

The Central Vermont Regional Planning Commission (CVRPC) coordinated the Waitsfield Local Hazard Mitigation Plan process. CVRPC was contacted by the Town Administrator (TA) and sent Town-Specific hazard mitigation material for review. After assessing the material, the TA and CVRPC staff held a meeting along with members of the community on May 7th, 2015 at the Municipal Offices. Preparation for the meeting included a review of the 2012 Waitsfield Town Plan, Local Emergency Operations Plan, 2010 Pre-Disaster Mitigation Plan, 2014 Town Report, 2007 Mad River Geomorphic Assessment Report, 2008 Upper Mad River Corridor Plan and 2013 Stormwater Management in the Mad River Valley report. Information from these documents is incorporated into various sections of this plan.

The Waitsfield 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 the following:

- Valerie Capels, Town Administrator
- Susan Senning, Zoning Administrator and Floodplain Manager
- Fred Messer, Emergency Management Director
- Joshua Schwartz, Director, Mad River Valley Planning District
- Sacha Peeler, Floodplain Manager, Vermont Agency of Natural Resources

The meeting indicated that the Town is most vulnerable to dam failures, flood/flash flood/fluvial erosion, hurricanes & severe storms, ice jams, winter storm/ice storm/extreme cold with power failure. The town will focus most of its mitigation on flooding as it is the most common and damaging hazard.

Once the draft was updated, a press release was issued announcing the opportunity to provide feedback at the June 15, 2015 Waitsfield Selectboard Meeting. The draft was posted to solicit comments on the Waitsfield website and on the CVRPC blog. The draft was also available for review and comment at Waitsfield Municipal offices from 06/10/2015 to 06/19/2015. A copy of the draft was emailed to emergency management directors in adjacent towns for comment. _____ comments were received by CVRPC or Waitsfield Staff.

In subsequent plan update processes, public comments will be reviewed by the Town Administrator (and CVRPC Staff dependant on funding) and attached as an appendix. The draft plan will also be made available during Town Meeting Day and local meetings with State and local officials to allow for more public comment and review. After Approval Pending Adoption, the plan will go before the Select Board for adoption.

4.2 Plan Update Process

The previous Waitsfield Local Hazard Mitigation Plan was adopted by the Town in 2010 and received FEMA final approval in December 2010. The 2015 update is intended to be submitted as a single-jurisdiction Local Hazard Mitigation Plan.

The current plan is an overhaul of the 2010 plan. Below is a list of the revisions that have been made from the past plan and the appropriate sections for reference. Hurricanes and Severe Storms have been added to the hazards posing the worst threats to Waitsfield.

General Updates

- General reorganization/restructuring of the plan according to future FEMA/VEM checklist
 - New sections added – 4.1 Planning Process, 4.3 Plan Maintenance, 5.2 Worst Threat Hazards

- Update of all data and statistics using 2012 Town Plan, 2014 Town Report and US Census Data (Section 3)
- Revaluation, identification and analysis of all significant hazards (Section 5)
- Acknowledgment of implemented mitigation strategies since 2010 – see matrix below (section 4.2)
- Update 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 – Hurricanes & Severe Storms
- Review of Vermont Hazard Mitigation Plan (Section 5 – hazard analysis table)

Maps

- Review of 2010 Areas of Concern map and Local Hazards Analysis map – added Fluvial Erosion Hazard Zones, Emergency Shelter, Emergency Operations Center, additional ice & debris jam locations

The following chart provides an overview of Waitsfield's proposed 2010 hazard mitigation actions along with their current status.

2010 Mitigation Action	2015 Status
Stabilize approx. 300ft of eroding river bank, upstream of covered bridge	<ul style="list-style-type: none"> • Completed 2014.
Reduce amount of impervious surface at Bridge Street Market Place parking area	<ul style="list-style-type: none"> • It was determined that is area is not in the Town's jurisdiction. Rain gardens were installed by Friends of the Mad River.
Retrofit trenches and expand bioretention areas at Bridge Street Market Place parking area	<ul style="list-style-type: none"> • It was determined that is area is not in the Town's jurisdiction. Rain gardens were installed by Friends of the Mad River.
Install tree box filters for street trees on Bridge Street	<ul style="list-style-type: none"> • Issues of stormwater runoff damage at this area of Bridge Street have been addressed by adding a pocket park as well as adding rip rap along the river bank
Flood proof municipal offices and library building	<ul style="list-style-type: none"> • Substantially completed 2015.
Purchase river channel management rights through river	<ul style="list-style-type: none"> • Waitsfield Elementary School purchased the field between the school and the Mad River, which is in the

conservation easements	<p>100 year floodplain and Vermont River Corridor, with a conservation easement.</p> <ul style="list-style-type: none"> This action continues to be relevant and is also included in mitigation actions for the 2015 plan.
Upgrade high priority culverts as identified in the municipal Culvert Inventory and Geomorphic Assessment including culvert # 6 on Tremblay Road, culvert # 15 & 22 on North Road, and culvert on Ronk Road.	<ul style="list-style-type: none"> Complete
Develop a dam failure notification system, including increased communication regarding the Warren timber crib dam	<ul style="list-style-type: none"> This action is still relevant and has been included in mitigation actions for the 2015 plan
Increase Community Rating thru the NFIP's Community Rating System (CRS)	<ul style="list-style-type: none"> This action is still relevant and has been included in mitigation actions for the 2015 plan
Install ice motion detectors	<ul style="list-style-type: none"> This action is still relevant and has been incorporated into mitigation actions for the 2015 plan
Purchase ice cutting and ice breaking equipment	<ul style="list-style-type: none"> This action is still relevant and has been incorporated into mitigation actions for the 2015 plan
Implement recommendations of Fire Station structural analysis	<ul style="list-style-type: none"> Completed 2010.
Develop a program to retrofit/reconstruct roofs of town structures to withstand heavier snow/ice loads	<ul style="list-style-type: none"> Fire Station roof was enhanced 2010 to handle heavier snow loads.
Conduct a tree removal/trimming program to reduce risk of tree fall on structures and above ground utilities	<ul style="list-style-type: none"> On-going via the Tree Board.
Develop public alerts about the potential for and impacts of roof collapses	<ul style="list-style-type: none"> Working currently to set up training to implement VT-Alert in Waitsfield.

Existing Hazard Mitigation Programs, Projects & Activities

The ongoing or recently completed programs, projects and activities are listed below by mitigation strategy and were reviewed for the development of the plan. The 2012 Town Plan, 2014 Town Report, 2010 Land Use regulations, CVRPC's past Regional Mitigation Plan (2005), and Local Emergency Operations Plan (2014), and past newspaper articles were reviewed for pertinent information. The VT State Hazard Mitigation Plan (2013) was reviewed as well for information and future mitigation projects. Information from these sources is incorporated into appropriate sections of the plan.

Community Preparedness Activities

- Local Emergency Operations Plan, 2014
- Mad River Valley All-Hazards Mitigation Plan, 2005
- School Emergency Evacuation Plan, 2009

Hazard Control & Protective Works

- Maintenance Programs (Bridge & Culvert Inventory) – performed through CVRPC
- Capital Mutual Aid System
- Capital Equipment Plan
- Waitsfield Streambank Stabilization Project

Insurance Programs

- Participation in the National Flood Insurance Program (NFIP) since 1978. Floodplain permitting is administered, monitored and enforced by the Planning and Zoning Administrator and Conditional Use review is conducted by the seven-member Development Review Board. Development review applications also require submittal of a FEMA Elevation Certificate and a Vermont Agency of Natural Resources Project Review Sheet. Flood Insurance Rate Maps and related assistance are made available both upon request at the municipal offices and via an online link through the municipal web site to digital Flood Insurance Rate Map panels.

Land Use Planning/Management

- Waitsfield Town Plan 2012
- Mad River Geomorphic Assessment Report, 2007
- Upper Mad River Corridor Plan, 2008
- Mad River Valley Road Erosion Study, 2012
- U.S. EPA Smart Growth Implementation Assistance Flood Resilience Checklist
- Stormwater Management Regulation in the Mad River Valley, 2013
- Vermont Downtown Action Team Flood & Economic Resilience Design Charette
- Irasville Master Planning
- Waitsfield Zoning Bylaws 2010: Districts and General use Standards

- Flood Hazard Area Overlay District (Table 2.10) - Limits construction of structures in floodplain areas designated within the Flood Insurance Rate Map for Waitsfield.
- Fluvial Erosion Hazard Area Overlay District (Table 2.11) – Prohibits new structures, storage and fill in fluvial erosion hazard areas designated on the Fluvial Erosion Hazard Area Map for Waitsfield.
- Forest Reserve District (Table 2.08) – Maximum density of 1 unit per 25 acres, permitted uses limited to agriculture and forestry, additional standards for resource protection and limits on clearing.
- Surface Water Protection Standards (Section 3.12) - Requires a 50- to 100-foot undisturbed, naturally vegetated buffer strips from streams depending on average grade of adjacent riparian land and a 50 foot buffer from wetlands.

Investing in Growth in Safer Areas

- Waitsfield Water System Investments
- Waitsfield Decentralized Loan Program
-

Restoration of Flood Storage Capacity

- The municipality has purchased 0.05 acres on the riverbank in Waitsfield Village to turn it into a floodable pocket park. The building formerly on the site was severely damaged from flooding and erosion during Tropical Storm Irene in 2011.

Protection/Retrofit of Infrastructure and Critical Facilities

- Dry Hydrant Program
- Municipal Emergency Generator

Public Awareness, Training & Education

- Fire safety educational programs
- First responder CPR & HazMat trainings
- CERT Program
- Disaster Animal Response Team (DART)
- Municipal web site: Flood information web page & E911 web page
- 211 Emergency Information phone resource

4.3 Plan Maintenance

The Waitsfield Local Hazard Mitigation Plan will be evaluated and, if necessary, updated annually at an April meeting of the Planning Commission (PC). Evaluation and updates by the PC will also occur within six 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, Town Administrator and public at the abovementioned April Planning Commission

meeting. CVRPC will help with updates or if no funding is available, the Planning Commission 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, Front Porch Forum, the Valley Reporter and CVRPC newsletter and blog inviting the public to a Select Board meeting to provide comment on the updates. Additional stakeholders invited to the meeting will be the large business owners located throughout town. 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 River Corridor areas, and other applicable initiatives. These efforts will be coordinated by the Town Administrator and Planning Commission.

Monitoring of plan progress, implementation, and the 5 year update process will be undertaken by the Town Administrator and Planning Commission. 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. The plan is to be a “living document” to allow for new actions to be identified in the five year interim period and amended without formal re-adoption during regularly scheduled Select Board meetings. Prior to the end of the five year period, the plan will undergo a formal update and be submitted to FEMA for re-adoption following the process outlined the schematic found in the Attachments section.

Waitsfield shall incorporate mitigation planning into their long term land use and development planning documents. It is recommended the Town reviews and incorporates elements of the Local Mitigation Plan when updating the Municipal Plan and Flood Hazard bylaws. The incorporation of the Local Mitigation Plan into the municipal plan, possible future zoning regulations and additional flood hazard bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing future Upper Mad River Corridor planning documents for ideas on future mitigation projects and hazard areas.

5. Risk Assessment

5.1 Hazard Identification and Analysis

In the table on the next page, 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.

Risk Assessment Table			
Hazard	Probability ¹	Community Vulnerability ²	Worst Threat ³
Avalanche/Landslide	Low	No	
Dam Failures	Med	Yes	X
Drought	Med	No	
Earthquake	Low	No	
Flood/Flash Flood/Fluvial Erosion	High	Yes	X
High Wind	Med	No	
Ice Jam	Med	Yes	X
Hurricane/Severe Storms	Med	Yes	X
Structure Fire	Low	No	
Tornado	Low	No	
Wildfire/Forest Fire	Low	Yes	
Winter Storm / Ice Storm/Extreme Cold with Power Failure	High	Yes	X

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

- Dam Failures
- Flood/Flash Flood/Fluvial Erosion
- Ice Jam
- Hurricane/Severe Storms
- Winter Storm/Ice Storm/Extreme Cold with Power Failure

Due to the frequent and severe nature of flooding events, Waitsfield feels flooding is the worst natural hazard within the Town and will focus on mitigation efforts to reduce the impacts from flooding events.

A discussion of each worst 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 description matrix containing the following overview information:

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

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

Low Probability 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)?

³ Worst threat – Identified hazard presents threat of loss of life and property – hazard mitigation activities are identified;
Mode

Hazard	Location	Vulnerability	Extent	Impact	Probability
Type of hazard	General areas within municipality which are vulnerable to the Identified hazard.	Types of structures impacted	Magnitude of hazard – scale dependant on hazard	Dollar value or percentage of damages	Probability of hazard occurring based upon past events: HIGH = Near 100% probability in the next year. or at least once in the next 10 years. MED = 10% to 100% probability in the next year or at least once in the next 10 years. Low = 1% to 10% probability in the next year or at least once in the next 100 years.

5.2 Worst Threat Hazards

Dam Failure

Dam failure can occur with little warning and may be the result of rainstorm, debris jam, accumulation of melting snow or due to human or technological misoperation. The Vermont Department of Environmental Conservation's Dam Safety and Hydrology Section compiles and tracks dam safety data in Vermont as part of the Vermont Dam Inventory (VDI). The VDI identifies 162 dams in Central Vermont, ranging from hydroelectric dams (in-service and historic) to flood control dams to historic milldams.

According to the VDI, there are dam sites in Waitsfield; one located on the Mad River near the Great Eddy Bridge on Bridge Street and the other located at the Sugarbush snow-making pond, adjacent to the Mad River near Route 100 on the southern town boundary.

The Sugarbush snow-making pond dam is classified according to the VDI as "low hazard potential". A low hazard potential dam is defined as "failure or mis-operation may result in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property." This dam, as well as the walls of the snowmaking pond, are vulnerable to migration of the Mad River channel, which runs parallel to the pond. On three occasions, the river has avulsed into the snowmaking pond, damaging both the walls of the pond and the dam. Release of the impounded water in the pond threatens to exacerbate flood damage downstream during flood events.



Figure 1 Sugarbush Snowmaking Pond. Damage after river avulsion after Tropical Storm Irene.

In addition, the following dams were identified during the PDM plan update process: a dam at the Waitsfield Town Pond (located at the intersection of Route 100 and Carroll Road) and the Warren Village Dam (a timber crib dam located south of Waitsfield, upstream on the Mad River in Warren Village). The Waitsfield Town Pond impoundment nearly failed in spring 2008 during a rain on snow event. The dam was repaired by the town in 2009 and is no longer recognized as a hazard. The VDI identifies the Warren Village Dam as a low hazard potential dam. A dam study was proposed to examine the timber crib dam and referenced in the 2005 Waitsfield Pre-Disaster Mitigation Plan, yet the study was suspended as a result of a Warren town-wide vote.

While no dam inundation study has been undertaken for either the Sugarbush snowmaking pond or the Warren timber crib dam, a dam failure would most likely cause localized flooding and river channel adjustments downstream. The Vermont Center for Geographic Information has not calculated and mapped the dam inundation areas of any dams within the Mad River Watershed therefore the impact and vulnerability of this hazard is unknown. Still, there are 203 properties within Waitsfield's NFIP's designated 100-year floodplain, and these properties could be vulnerable to flooding following a dam failure event. Additionally the main transportation

route, Route 100 would most likely sustain moderate damage. At this time, there are no major construction plans proposed within the designated floodplain and all development is subject to adhere to Waitsfield's Flood and Fluvial Erosion Hazard zoning regulations.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Dam Failure	Area downstream from the Sugarbush snow-making dam and the Warren Village dam.	Rte 100, potentially all properties within NFIP 100-yr floodplain	Moderate	Estimated loss for all properties within 100-yr floodplain = ~ \$56,505,050	Medium

Flood/Flash Flood/Fluvial Erosion

History of Occurrence: (Mad River Valley encompasses the towns of Waitsfield, Warren, Moretown and Fayston. The Mad River flood gauge is located in Moretown, approximately 6.5 miles downstream. Information from NCDC web site and FEMA DR list)

Date	Event	Location	Extent
4/15/2014-4/18/2014	Flash Flood	Waitsfield, Washington County	Mad River flood gauge at 10.02 ft; Several roads were damaged.
7/4/2013	Flood	Waitsfield, Washington County	Mad River crested at 9.33 ft; minor field flooding.
8/28/2011	Flash Flood (TS Irene)	Waitsfield, Washington County	Mad River crested at 19.06 feet – flood stage is at 9'; 5-7" of rain - DR 4022
5/20/2011	Flash Flood	Waitsfield, Washington County	4+” of rain; driveways, culverts and roads washed out;
4/23-5/9/2011	Flash Flood	Washington County	DR 1995 –
10/1/2010	Flood	Waitsfield, Washington County	4-5” of rain; Mad River flood gauge at 10.39 ft
8/2/2008	Flood	County-wide	Mad River flood gauge at 7.89 ft; DR 1790
3/15/2007	Flood; ice jams	Mad River Valley	Mad River flood gauge at 13.5 ft
12/24/2003	Flood	Mad River Valley	Mad River flood gauge at 14.17 feet, DR 1448
12/17/2000	Flood	Mad River Valley	3” of rain; no data for Mad River Gauge
5/11/2000	Flood	Mad River Valley	Mad River flood gauge at 9.96 ft
9/17/1999	Flood	County Wide	Mad River flood gauge at 8.23 ft;

			DR 1307 (TS Floyd)
6/27/1998	Flash Flood	County Wide	3-6" of rain over 2 day period – Mad River flood gauge at 14.13 ft, DR1228
1/27/1996	Flood	County Wide	Mad River flood gauge at 9.03 ft; DR 1101
8/6/1995	Flood	Mad River Valley	Mad River flood gauge at 8.12 ft
3/31/1987	Flood	Mad River Valley	Mad River flood gauge at 11.97 ft
3/13/1977	Flood; ice jams	Mad River Valley	Mad River flood gauge at 13.72 ft
8/5/1976	Flood	County Wide	Mad River flood gauge at 13.47 ft – DR 518
9/22/1938	Flood	Waitsfield, County Wide	Mad River flood gauge at 16.34 ft
11/03/1927	Flood	Waitsfield, County Wide	Mad River flood gauge at 19.40 ft

Flooding/flash flooding/fluviat erosion is Waitsfield'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. Fluviat erosion is the process of natural stream channel adjustments. Fluviat erosion causes erosion of sediment in some areas, while causing aggradation of sediment in other. Fluviat erosion processes occur more quickly and severely during flood events.

The most prominent body of water within Waitsfield is the Mad River, which originates in Granville Gulf and flows in a northerly direction along Vermont Route 100 and 100B, converging with the Winooski River in Moretown. Several stream tributaries originating in Waitsfield's upland areas converge with the Mad River in the Mad River Valley.

Waitsfield experienced a significant flood in 1998 and, most recently, a flood in the spring of 2011, and a devastating flood from Tropical Storm Irene in August of that same year. Waitsfield is committed to improving its resiliency to flood impacts. The town has adopted flood hazard area regulations to limit development within flood hazard areas, as required for municipal participation in the federal flood insurance program. These regulations are intended to protect life and property, and to allow property owners to obtain National Flood Insurance Program (NFIP) flood insurance and mortgages at relatively affordable rates. In 2010, the town adopted new floodplain regulations and maps as mandated by the Federal Emergency Management Agency (FEMA) and the NFIP. The town also added a fluviat erosion hazard bylaw to reduce the impacts associated with flooding.

According to the Moretown River gauge, at the following water levels, the impact to the surrounding areas will be:

- **Water level – 13.5 ft** – About 4 feet of water will cover Rte 100 south of Moretown...nearly reaching a trailer park.
- **Water level – 12 ft** – At 12 feet, Rte 100 will be covered with water in Moretown... Rte 100B will be partially covered. Water will inundate Telephone Flats near Waitsfield.
- **Water level – 9 ft** – At 9 feet...the Mad River begins to leave its banks. Field flooding occurs between Waitsfield and Moretown...and some local roads will flood.

According to the Upper Mad River Corridor Plan (2008), “Recent floods on the Mad River have brought to light the legacy of previous land uses and channel management activities. Historical deforestation of hillslopes in the watershed delivered large amounts of sediment to the river channel in the 18th and 19th centuries. Channel management (e.g., straightening, dredging, and bank armoring) during the middle part of the 20th century increased the channel’s flood flow capacity and decreased its access to floodplain areas, leading to the present-day river conditions with degraded biotic habitat and increased erosion hazards.” The Mad River may have indeed been named *Mad* due to its flashy nature. Steep slopes, heavy rain events, undersized culverts and areas of impervious surfaces all contribute to the resulting damages of flash flooding.

Waitsfield participates in the NFIP and has adopted flood hazard regulations, as well as adopted stream buffer zones. The Flood Rate Insurance Maps (FIRM) of the 100 year floodplain along the Mad River and the lower reaches of its major tributaries designate flood plain areas through Waitsfield (759 acres, 4.58% of land area). Based on results of overlaying Waitsfield’s current FIRMs with the location of E911 points, 20 structures and 203 properties are located within the NFIP’s designated 100-year floodplain. These include 6 commercial structures, one farm structure, one public structure and 8 residential structures.

There are no repetitive loss properties in Waitsfield. The effective FIRM date is 3/19/2014. The estimated loss for a severe flooding event for all properties within the Town’s 100 year floodplain is approximately \$56,505,050. Waitsfield has 34 active NFIP policies in force (19 in Zone A), for a total coverage of \$6,552,400.

The Forest Reserve district limits development in certain areas to protect natural resources and in some places may extend beyond NFIP floodplain boundaries. **Stream buffers of 50- to 100-feet** from surface waters within the Town also limit some infringement on floodplain areas. Development is limited within the vegetated buffer and its purpose is to prevent soil erosion, protect wildlife habitat and maintain water quality. Within the area mapped by the State of Vermont as a fluvial erosion hazard zone, there are 105 properties totaling 550 acres. The total value of these properties is \$29,226,750.

The Zoning Administrator is responsible for enforcement of flood hazard regulations. The Town has not reported any flood hazard regulation compliance issues. There have been no new structures built in the flood plain. Properties in the floodplain that are undergoing a change of use have permits reviewed and issued by the Development Review Board.

Waitsfield Village has historically been affected by flooding events. A June 1998 flood event brought the Mad River out of its banks and inundated numerous buildings including Joslin Memorial Library, which houses the Town Offices on the first floor. Water levels nearly reached Vermont Route 100, damaged the Great Eddy Bridge, and eroded the banks of the Mad River upstream of the Village.

During a flash flood event on June 28, 2010, more than 2 ½ inches of rain fell. The Valley Reporter newspaper characterized the event in its July 1, 2010 edition as follows: “area streams and brooks rose so fast that culverts were overwhelmed, roads washed away and rivers breached their banks.” Flooding was also reported behind the Bridge Street Marketplace in Waitsfield when the smaller streams emptied into the Mad River.

Waitsfield experienced substantial flash flooding during the May 2011 event and several roads and associated infrastructure were impacted. These include:

- Brook Road
- Bushnell Road
- Common Road
- Cross Road
- East Road
- Floodwoods Road
- Hastings Road
- Joslin Hill Road
- Long Road
- North Road
- Old Center Fayston Road
- Palmer Hill Road
- Palmer Lane
- Rolston Road
- Ski Valley Acres
- Tremblay Road

During Tropical Storm Irene in August 2011, the Mad River flood gauge was 19.06 feet above flood stage, the second highest crest on record. A “Tropical Storm Irene Limit of Inundation” map for the village area of Waitsfield is included as an Appendix. This is an estimate of the worst extent. The worst flooding event in Waitsfield’s history was the 1927 event with the Mad River flood gauge at 19.40 feet above flood stage; however, exact data from that event is not available. Tropical Storm Irene severe damage to residences, businesses and infrastructure in the Mad River Valley. In Waitsfield, many roads were closed and several areas heavily damaged. A heavily hit area was the Bridge Street Marketplace in Waitsfield Village where several businesses were impacted, the covered bridge sustained structural damage and a historic building was destroyed. The Fiddlers Green area, home to several businesses, also sustained heavy damage. In more rural parts of the town, several farms were flooded with crops destroyed.

Several homes were flooded when Shephard’s Brook jumped its bank and also destroyed five driveways. The storm left Waitsfield isolated for a few days until the Agency of Transportation reopened Rte 100 south of Rte 17, which was washed out by Mill Brook.

It is estimated that Waitsfield incurred \$175,567 in public infrastructure damages and over \$1.18 million in total with NFIP claims and individuals and household Program.

Conservation of undeveloped areas at flood risk are also important tools to enhance long-term flood protection and Waitsfield has several tracts under easement by the Vermont Land Trust or municipally-owned that contain portions of the Special Flood Hazard Area. These conserved areas (~190 acres) represent approximately 25% of the mapped Special Flood Hazard Area in the Town of Waitsfield.

The Upper Mad River Corridor Plan is a valuable tool to help restore the River's health and prevent future flooding impacts. Mitigation and restoration strategies for Waitsfield's section of the Mad River are attached as an appendix for the Town to refer to if future project ideas are needed.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Flood/flash flood/fluvial erosion	Floodplain, area in extent of TS Irene inundation map, see above road locations	Culverts, bridges, roads, infrastructure private property	TS Irene - ~6" of rain, Mad River flood gauge at 19.06 ft; 9 ft is flood stage (see extent of inundation map in Appendix)	Over \$1.18 million from TS Irene; \$56 million in floodplain properties	High

Ice Jams

History of Occurrence (from VT State Hazard Mitigation Plan):

Date	Event	Location	Extent
3/22/2003	Ice Jam	Mad River, Washington County	Data gap, unknown

According to the US Army Cold Region Research and Engineering Lab an ice jam is a stationary accumulation of fragmented ice or frazil that restricts flow. Ice jams can form on rivers where the flow capacity is exceeded, around sharp bends, or at the confluence of two rivers.

The Vermont Division of Emergency Management and the Vermont Agency of Natural Resources developed a statewide list of historic ice jam locations; the list does not contain precise locations, only affected towns and streams. The Vermont State Hazard Mitigation Plan, updated 2007, identifies an ice jam on the Mad River on March 22, 2003.

According to Barry Cahoon, Stream Alteration Engineer with the Vermont River Management Section, the stretch of the Mad River in the vicinity of the Bridge Street covered bridge is susceptible to ice jams. In the event of an ice jam properties upstream of Bridge Street would be susceptible river bank erosion and flood inundation.

Similar to ice jams, and often in the same locations, jams of debris and hay bales in the warmer months also cause flooding. Locations susceptible to this include the Butternut Bridge and Trombley Bridge.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Ice Jam	Mad River in vicinity of Bridge Street covered bridge, Waitsfield Village	Properties upstream; privates residences, business, municipal infrastructure	Minimal - Moderate	Data gap - \$ amount unknown	Medium

Hurricane/Tropical/Severe Storms

History of Occurrence: (Mad River Valley encompasses the towns of Waitsfield, Warren and Fayston)

Date	Event	Location	Extent
7/04/2013	Flash Flood	Waitsfield Washington County	The Mad River at Moretown rose above its flood stage of 9.0 feet and crested at 9.33 feet. At 9.0 feet minor field flooding begins and water approaches local roads for Waitsfield to Moretown
7/23/2012	Hail	Waitsfield Washington County	Numerous reports of damaging winds and large hail.
8/28/2011	Tropical Storm, Flash Flood (TS Irene)	Waitsfield Washington County	Mad River flood gauge at 19.07 feet; 10.07 feet above flood stage (flood stage is 9 feet) – DR 4022
7/06/2011	Thunderstorm	Washington County	50 knot winds; 15,000 people in VT lost power
5/26/2011	Hail/Thunderstorms/Flash Flooding	Waitsfield Washington County	1" hail, 25,000 customers lost power in VT, 3-5" of rain, not a historical Mad river crest DR 4001
5/20/2011	Flash Flooding	Waitsfield	Twenty roads were damaged

		Washington County	or covered in water from flash flooding in Waitsfield east of Route 100. The town lost 35 culverts, and 14 roads suffered damage. In addition, a new water system under construction was damaged.
8/9/2010	Thunderstorm/Wind/Hail	Waitsfield	50 knot winds
7/21/2010	Hail	Washington County (Mad River Valley)	1" Hail
7/18/2008	Hail	Mad River Valley	1" Hail, 30 knot winds
7/9/2007	Hail, thunderstorms	Mad River Valley	Baseball sized hail DR 1715
7/1/2006	Hail, thunderstorms	Mad River Valley	1" Hail, severe t-storms
9/29/2005	Severe thunderstorms	Mad River Valley	Downed trees and power lines, 35 knot winds
9/16/1999	Tropical Storm Floyd	Statewide	Tropical storm winds and flooding
7/22/1999	Hail, Thunderstorms	Mad River Valley	1.5" hail, severe t-storms
6/27/1998	Severe Storms	County Wide	Mad River gauge 14.13 ft DR 1228
7/15/1997	Severe Storms	County Wide	3-5" of rain, Not a historical crest
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. A severe thunderstorm is a thunderstorm that contains any one or more of the following three weather conditions: hail that is 3/4 of an inch or greater in diameter, winds 58 miles per hour or greater, and/or tornadoes. 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.

The impact of severe storms in Waitsfield is usually flood related, although hail and wind have also caused significant damage. See the flood section above for a characterization of flood hazards and vulnerabilities. The hail that fell during the May 26, 2011 storm event caused significant private property damage in Waitsfield.

Wind extent from storms is not well documented as there is no monitoring station in Waitsfield. Estimates for wind are gathered from county wide data off the NCDC website. In the future, Waitsfield could consider installing a monitoring station on the Mad River and other major brooks, or training staff as spotters to better gather data for wind and flood events.

In 1999, Tropical Storm Floyd passed through Vermont. The primary impact from Floyd was downed trees and power lines due to high winds. 5-8" of rain fell over the Central Vermont Region; however, flood impacts were offset by drought conditions from earlier in the year.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Hurricane/Severe Storms	Town Wide for Wind and Hail impacts, see flooding above for locations	Culverts, bridges, private property, power lines, trees	Floyd - 5-7" of rain, winds 31 mph ~6" rain – TS Irene ; Mad River flood gauge at 19.07 feet; 9 ft is flood stage	Over \$1.18 million from TS Irene	Medium

Extreme Cold/Winter Storm/Ice Storm in conjunction with Power 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
12/9/2014-12/11/2014	Winter Storm	Waitsfield, County wide	18" of snow
11/26/2014	Winter Storm	Waitsfield, County wide	13" of snow
3/12/2014	Winter Storm	Waitsfield, County wide	12-20" of snow
3/6/2011	Winter storm	Waitsfield, County wide	12-18" of snow, 10,000 customers lost power statewide
2/23/2010	Winter Storm	Waitsfield, County wide	20" of snow and 50,000 customers lost power statewide
2/22/2009	Winter Storm	Waitsfield, County Wide	16" of snow, 30 mph wind gusts
2/1/2008	Winter storm	Waitsfield, County wide	3-7" of snow and ice ¼-1/2" thick, 50 mph wind gusts
2/14/2007	Winter storm	Waitsfield, County wide	22" of snow
2/14/2006	Winter storm	Waitsfield, County Wide	30" of snow

1/4/2003	Winter storm	Waitsfield, County wide	19" of snow
3/5/2001	Winter storm	Waitsfield, County wide	15-30" of snow
12/31/2000	Winter storm	County wide	10" of snow
1/15/1998	Winter storm	Waitsfield, County wide	10-12" snow (not a DR in Washington County)
12/29/1997	Winter storm	Waitsfield, County wide	21" of snow
12/7/1996	Winter Storm	Waitsfield, County wide	12" of snow
3/21/1994	Winter storm	Waitsfield, County Wide	5-11" of snow
11/1/1993	Winter storm	Waitsfield, County wide	15" of snow
1/3/1993	Freezing Rain	Waitsfield, Statewide	¼-1/2" freezing rain

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 physical impacts of winter storms are town wide due to the expansive nature of winter storms. For the next plan update, Waitsfield will more closely monitor winter storms to determine the worst impacts possible on the Town. Based on past occurrences, the worst anticipated winter weather Waitsfield could experience would be 2-3' in 24 hrs of snow with more at higher elevations and several days of power outages. The worst recent storms were in December 2014 and March 2011.

February 14, 2007 Vermont experienced one of the heaviest snowfalls on record. According to the State Hazard Mitigation Plan, updated 2007, some areas of Vermont received 28 to 36 inches of snow in 25 to 48 hours. The National Oceanic and Atmospheric Administration classified this storm as a Category 3 "Major" Winter Storm.

In Waitsfield, the heavy snow resulted in downed trees and power outages along North Road and at least one roof collapse. The roof collapse at the Turner Barn, a local farm, killed 5 cows and displaced 16 cows according to the March 1, 2007 Valley reporter new article. The cost to rebuild the barn was estimated at approximately \$50,000 - \$60,000.

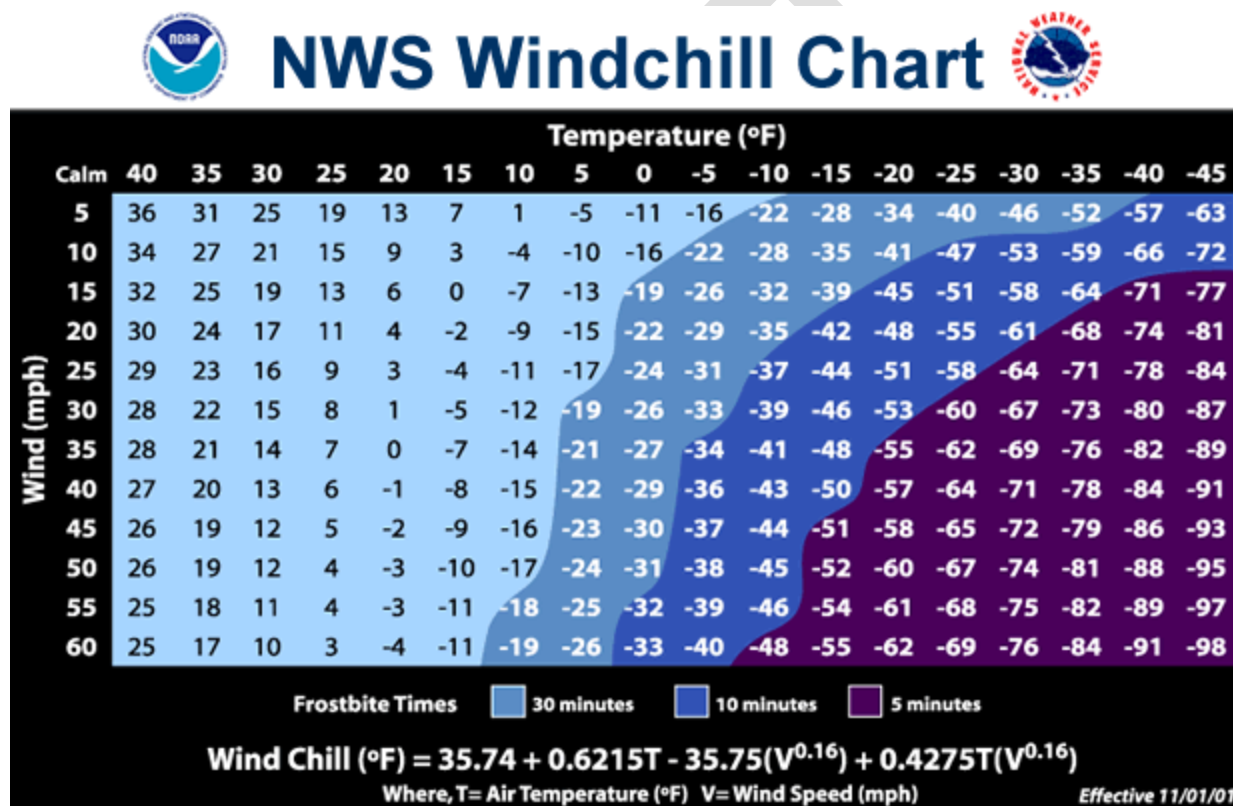
Scales to measure the extent of winter storms are:

Heavy snowfall – Waitsfield is significantly affected when they experience an accumulation of 7 inches or more of snow in a 12-hour period or 13 inches or more in a 24-hour period.

Blizzard – Waitsfield is significantly affected when they experience sustained wind speeds in excess of 40 mph accompanied by heavy snowfall or large amounts of blowing or drifting snow.

Ice storm – Waitsfield is significantly affected when they experience ice accumulations of ¼” or greater.

Wind Chill Extent Scale



One of the major impacts 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.

Additionally, sensitive populations such as the elderly or handicapped may be susceptible to extreme cold when power is lost and heating systems are run on electricity (versus gas or natural fuels). If power is lost, some populations may need to be relocated to areas with power

so that medical equipment can function. Additionally limited mobility of some persons may make it difficult to relocate in general or in times of emergencies. The Town encourages neighbors to check on those neighbors who they may believe to be at risk during times of emergency. The Fire Department also has a list of those with medical needs. In the future, the Town can map the location of sensitive populations and trouble spots on roads that reach those populations in order to identify additional routes. Also, the Town can continue to provide outreach and education of the impacts of winter storms to these populations.

Other major impacts include closed roads, restricted transportation and large buildings collapsing under the weight of heavy snows.

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 Waitsfield. 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. Waitsfield should plan and prepare for these emergencies. That planning and preparedness effort should include the identification of mass care facilities and necessary resources such as cots, blankets, food supplies and generators, as well as debris removal equipment and services. Sheltering areas in Waitsfield include the Waitsfield Elementary School. 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.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Extreme Cold/Winter or Ice Storm in conjunction with power failure	Town Wide	Power outages: along North Road. Roof Collapses: Large barns, garages and storage facilities, including the Fire Station.	18+” snow in March 2011 storm in 24 hrs, Blizzard of 1888	\$60,000 +/-	Medium

6. Mitigation

6.1 Town Plan (2012) Policies that Support Local Hazard Mitigation

- Use road maintenance practices that factor in the frequency of flash flooding, the increased frequency and magnitude of high storm flows resulting from climate change,

and the high costs associated with repairing or replacing undersized transportation infrastructure (8.F-26)

- Goal: Flood resiliency, mitigation, and restoration following flood events such as the one that occurred in May 2011 and Tropical Storm Irene which occurred in August 2011. Particular attention should be paid to protecting the flood-prone Historic District in Waitsfield. (11.K-3)
- Identify and protect important natural resources, including prime agricultural soils, forest resources (soils, products, habitat), significant wildlife habitat, floodplains, river corridors, water resources and other features described in this plan. (11.L-1)
- Support the efforts of local, regional and statewide conservation organizations to protect open space in Waitsfield through voluntary programs (e.g., purchase or donation of development rights). Priorities for open space protection include: riparian lands, river corridors and floodplain. (11.L-4.f)
- Continue to prevent development of critical facilities in flood-prone areas and in the floodplain and floodway. (11.L-32)
- Continue to protect natural and beneficial functions for mitigating flood hazards. (11.L-33)
- Promote hazard mitigation as a cost-effective measure to improve the town's resilience to flooding (11.L-34)
- Protect the Historic District using hazard mitigation strategies, including flood-proofing and/or elevating structures. (11.L-35)
- Develop and implement flood hazard mitigation plans when possible. [Planning Commission, Development Review Board, Selectboard] (11.M-14)
- Maintain the Agricultural-Residential District for the purpose of supporting the continued operation and expansion of agricultural operations, forest management, the preservation of rural resources and natural features, and to accommodate low density residential development while encouraging moderate or high density clustered residential development in appropriate locations. To this end: Ensure that land subdivision and residential development is designed in a manner to protect the rural landscape (e.g., farmland, open meadows, forested ridge lines) and land characterized by fragile features (e.g., floodplains, wetlands, steep slopes), and to avoid the fragmentation and development of land containing significant areas of primary agricultural soils. (12.M-4.c)

Waitsfield's town plan will be updated in 2017. The Town is interested in expanding on goals which relate to mitigation planning.

The goal of this hazard mitigation plan is:

- To take actions to reduce or eliminate the long-term risk to human life and property from:
 - Dam failure
 - Flooding/Flash Flooding/Fluvial Erosion

- Ice Jams
- Hurricane/Severe Storms
- Extreme Cold/Winter Storms/Ice Storms

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

- Ensure existing and future drainage systems are adequate and functioning properly.
- Preserve and prevent development in areas where natural hazard potential is high.
- Ensure that all residents and business owners are aware of the hazards that exist within Waitsfield 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.

6.2 Identified Hazard Mitigation Programs, Projects & Activities

Hazard mitigation programs, projects and activities that were identified for implementation through the Local Hazard Mitigation planning process are outlined in the table on the following page.

The Hazard Mitigation Activities Matrix lists mitigation activities in regards to local leadership, partnering roles and organizations, possible resources, timeframe and prioritization. Prioritization was based upon the economic impact of the action, the Community's risk to the hazard, the action's cost, and the availability of potential funding. Due to the frequency and damage caused by flooding, mitigation actions which address areas that are frequently flooded will be the highest priority of the Town. Other mitigation actions listed will be performed as funds become available and dependent on public interest.

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 risk to the hazard, is more than four years.

Waitsfield understands that in order to apply for FEMA funding for mitigation projects, a project must meet FEMA benefit cost criteria. In addition, the Town must also have a FEMA approved Hazard Mitigation Plan.

Hazard Mitigated	Mitigation Action	Local Leadership ¹	Partners ¹	Possible Resources ²	Time Frame	Prioritization (High, Med, Low)
Flooding/Flash Flooding/Fluvial Erosion	Coordinate with partners to seek out opportunities to purchase river channel management rights through river conservation easements	Town Administrator	Conservation Commission, Mad River Conservation Partnership (MRVPD, VLT, Friends of the Mad River)	High Meadows Fund/VCF???, ANR Ecosystem Restoration Program, CDGB, ANR Rivers Management Program	Ongoing, 4 Years	Low
Flooding/Flash Flooding/Fluvial Erosion, Ice Jams, Dam Failure	Participate with the 5 Mad River Valley towns in stormwater management planning for the Mad River Valley watershed	Zoning Administrator /Floodplain Manager	Mad River Valley Planning District	HMPG, Municipal Planning Grant, High Meadows Fund	6 Months	High
Flooding/Flash Flooding/Fluvial Erosion	Conduct floodplain analysis for flooding impacts in Waitsfield Village, including above the Bridge Street Bridge	Z.A. /Floodplain Manager	Planning Commission, Selectboard, Friends of the Mad River	HMPG, CDBG, Municipal Planning Grant, Ecosystem Restoration Grant	2 Years	High
Dam Failure, Flooding/Flash Flooding/Fluvial Erosion, Ice Jams	Investigate cost-effectiveness of enrollment in NFIP Community Rating System	Town Administrator	Selectboard, Zoning Administrator, ANR, Regional Planning Commission	Municipal Budget	2-4 Years	Low
Flooding/Flash Flooding/Fluvial Erosion	Evaluate fluvial erosion hazard regulations and maps and discuss with key stakeholders to determine maintenance of	Z.A. /Floodplain Manager	ANR, Planning Commission, Town Administrator,	Municipal Budget	2 Years	Medium

	eligibility for highest state share of post-disaster FEMA Public Assistance		Selectboard			
Hazard Mitigated	Mitigation Action	Local Leadership ¹	Partners ¹	Possible Resources ²	Time Frame	Prioritization (High, Med, Low)
Flooding/Flash Flooding/Fluvial Erosion	Upgrade one culvert and one bridge on Ronk Road	Selectboard	Road Commissioner, Town Administrator	Municipal Budget, AOT Town Highway Structures Program, Better Backroads	2-4 Years	Medium
Ice Jams	Develop a plan for ice monitoring and coordination with local contractors, ANR & AOT for removal	Emergency Management Director	Local Contractors, ANR, AOT	Municipal Budget	4 Years	Low
Dam Failure, Flooding/Flash Flooding/Fluvial Erosion	Develop a dam failure notification system, including increased communication regarding the Warren timber crib dam & Sugarbush snowmaking pond	Emergency Management Director	Fire Department	Municipal Budget, Fundraising	2-4 Years	Medium
All Hazards	Complete enrollment in VT Alert Program	Emergency Management Director	Fire Dept.	Vermont Emergency Management	6 Months	High
All Hazards	Obtain generator for town garage (manual switch)	Emergency Management Director	Selectboard, Road Commissioner	VEMHS Generator Grant Program, Municipal Budget	2-4 Years	Medium

¹ SB – Select Board, PC – Planning Commission, ANR – Agency of Natural Resources, AOT – Agency of Transportation, MRVPD – Mad River Valley Planning District, VLT – Vermont Land Trust

² HMGP – Hazard Mitigation Grant Program, EMGP – Emergency Management Grant Program, PSIC/NTIA – National Telecommunications and Information Administration, USDA – United States Dept. of Agriculture, VCF – Vermont Community Foundation, CDBG – Community Development Block Grant








Attachments

- Hazards Analysis Map
- Town of Waitsfield TS Irene Limit of Inundation Map (2011)
- Upper Mad River Corridor Plan - Mad River Corridor Planning Project and Strategy Summary Table (Reaches M11-15 are in Waitsfield)
- 5 Year Plan Maintenance and Review Process
- Town Resolution Adopting the Plan




Waitsfield Areas of Local Concern

Legend




Facilities

-  Government
-  Church
-  School
-  Cultural
-  Fire Station
-  Public Gathering Place
-  Ambulance House




Areas of Local Concern

-  Flash Flood
-  Ice Jam
-  Dams of Local Concern



AOTCLASS

-  Minor Roads
-  Major Roads
-  Lake/River

Streams

-  Intermittent
-  Perennial
-  NFIP 100 Year Flood Area

FLOODWAY

-  FLOODWAY
-  Winter Storm Related Power Outages

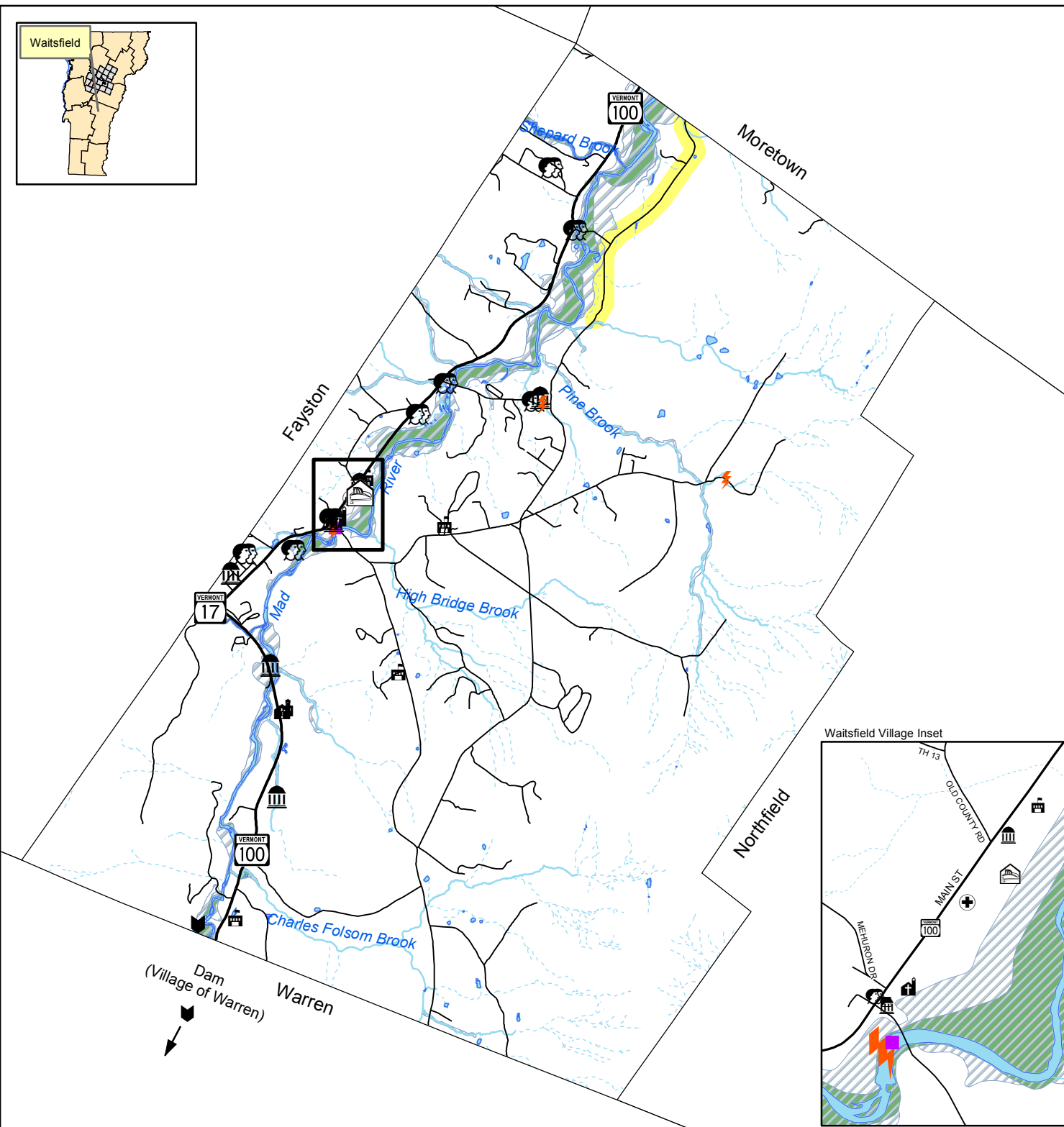


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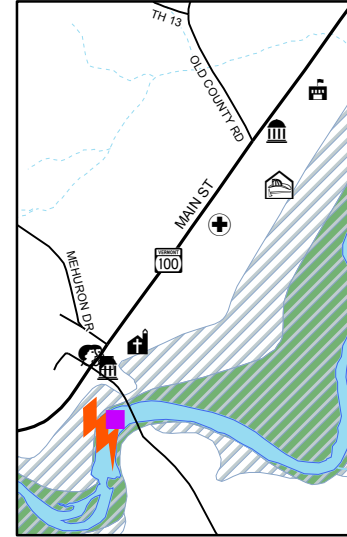
SOURCE:
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 Flood Zone: ANR, 2013
 FEH Zone: VT ANR, 2013
 Roads: VTrans, 2014
 Surface Waters: CVRPC, 1993
 Dams: VDI - VT ANR, 2009
 Ice Jam: Waitsfield, 2010
 Flash Flood: Waitsfield, 2010
 Power Outages: Waitsfield, 2010

Map created 7-18-05 by CVRPC.
 Updated 9-10-2010
 Updated 4/20/2015
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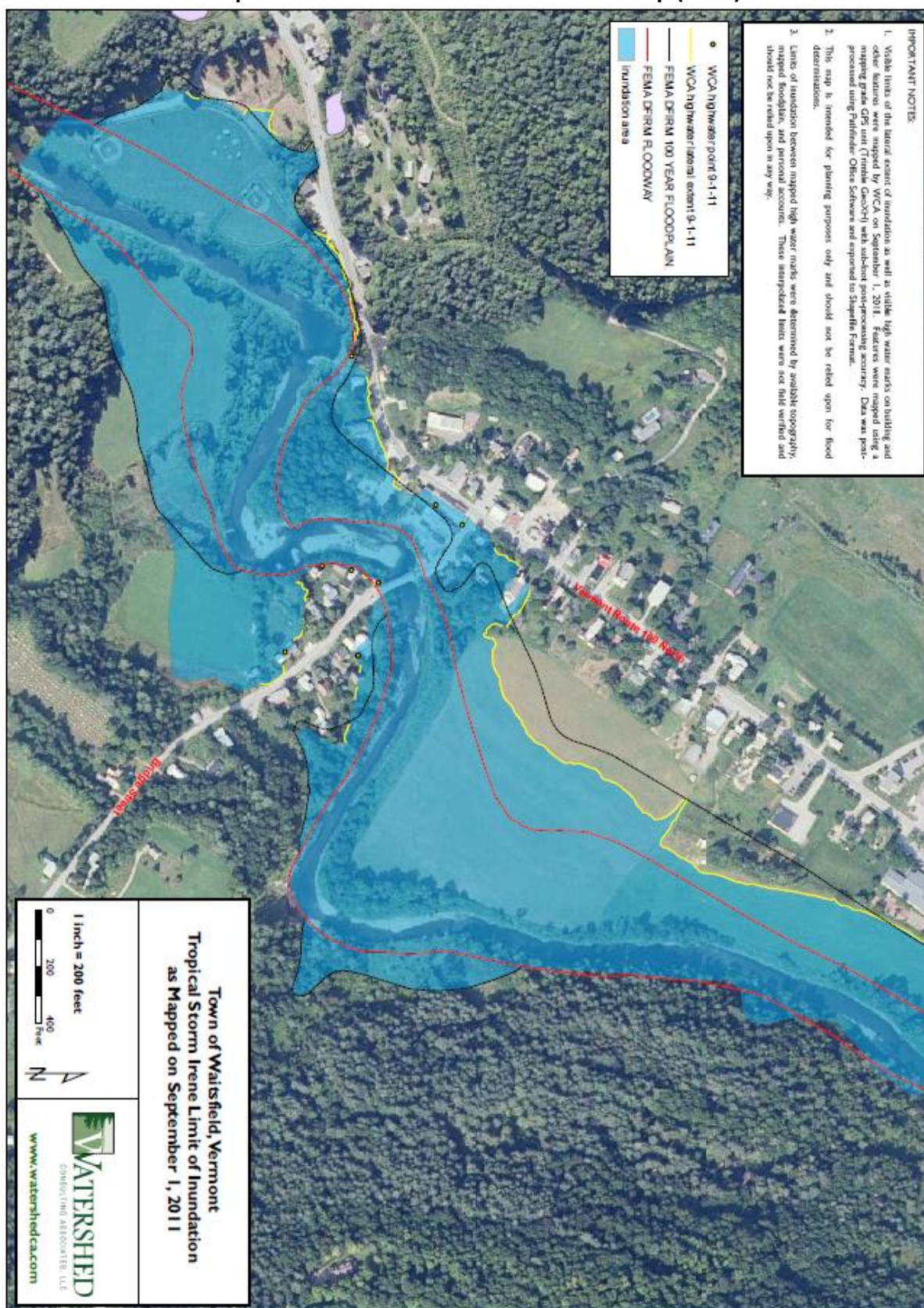
Data is only as accurate as the original sources.
 This map is for planning purposes only.
 This map may contain errors and omissions.



Waitsfield Village Inset



Tropical Storm Irene Limit of Inundation Map (2011)



Upper Mad River Corridor Plan
Mad River Corridor Planning Project and Strategy Summary Table
(Reaches M11-15 are in Waitsfield)

DRAFT

Table 6.2: Mad River Corridor Planning Project and Strategy Summary Table, Reaches M11-M19

Project #, Stream Type, Evolution Stage, RGA, RHA	Site Description and Importance, Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits (All projects are aimed at achieving RMP goals)	Potential Partners and Costs	Land Use Conversion
M11-1 C III Fair Fair	Along reach 57% straightened, incised (1.8), currently widening. Some parcels already conserved/protected.	Protect stream corridor to allow for flow and sediment attenuation and to improve water and habitat quality. Also to avoid encroachment into the corridor and future expense of protecting those investments.	Feasibility depends on willingness of landowners to cooperate. High priority due to stream sensitivity, extensive straightening, and potential for further encroachment.	Habitat benefits, recreation, hunting, clean water.	RMP, VLT Relatively low cost for corridor acquisition or easement acquisition, or dev. & mgmt. rights	Corridor land use was hay and some crop area.
M11-2	2 areas identified: 1) Old oxbow area, which was connected as recently as 1962 (possibly 1972); 2) upstream of Pine Rd bridge near farm on LB.	Restore incised reach through recapture of abandoned channel areas and/or stream corridor protection. Further study necessary to investigate active channel recapture.	Feasibility depends on willingness of landowners to cooperate. High priority due to presence of abandoned channel areas and relatively little encroachment.	Reduce bank erosion pressure and velocities downstream, improved habitat diversity.	Moderate costs involve corridor easement, recapture of abandoned channel areas. RMP, VLT, Town of Waitsfield.	Wooded oxbow area, some hay and shrubs in other areas.
M11-3	Meadow Road Bridge- currently undersized and only 86% of the bankfull width.	Replace Structure as it is up for replacement.	No major problems were associated with this structure so lower priority.	Reduced flood/erosion risks.	WHIP, Better Back Roads, Town of Waitsfield	None, as bridge already exists.
M12-1 C III Fair Fair	Area upstream of Waitsfield Village near the ball field and straightened section. Also upstream encompassing the M13 reach break. Moderately incised (1.6) and currently widening with bank erosion and bar	Protect stream corridor to allow for passive restoration of the reach and to reduce encroachment. Investigate potential for recapture of meander to west of ball field or possibly to the east, with the backwater at the	High priority due to stream sensitivity, extensive straightening, and potential for further encroachment (this assumes the ball field can move if	Reduce pressure and erosion on LB near residences and Rt 100. Attenuate sediment upstream rather than allowing it	Relatively low cost for easements or corridor purchase. RMP, VLT, Town of Waitsfield, Waitsfield Couples Club.	Ball field- recreation, hay, forest & residential in upstream portion of reach. Potential for

Project #, Stream Type, Evolution Stage, RGA, RHA	Site Description and Importance, Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits (All projects are aimed at achieving RMP goals)	Potential Partners and Costs	Land Use Conversion
	aggradation (esp. at constrictions). 32% straightened.	downstream left bend. In areas with building and road constraints, restore the channel with bed forms and floodplain features in equilibrium with the higher stream power.	necessary); the upstream more wooded part may be a lower priority if development pressure is low.	to transport to the Covered Bridge area.		dev. w/in corridor at upstream end.
M12-2	A breached dam with old abutment on the left bank downstream of the ball field with levee extending onto the floodplain. This should be done in conjunction with corridor protection of M12 and M11 if sediment is allowed to move downstream. Covered Bridge in Waitsfield Village	Remove the dam and widen the levee. Assess the volume of sediment and potential consequences of removing the sediment or allowing it to move downstream. Also assess if grade controls might be necessary to protect against head cutting of the channel. Investigate options for widening the constriction at the Covered Bridge.	High priority because dam is derelict and interrupting sediment transport. Not feasible due to investments in the floodplain and previous work addressing the dam.	Sediment from this area could assist channel evolution downstream.	High if sediment must be removed and if investments must be moved. Town of Waitsfield, RMP.	Just upstream of Village area & covered Br.
M13-1 C III Fair Fair	Some straightening, bank armoring, and confinement by Rt 100. Moderately incised (1.6) and actively widening w/ bank erosion, poorly vegetated buffer. High potential for planform adjustment noted, especially at Lareau Farm area. Some planting has been done, but many trees killed by deer and dry conditions.	Protect stream corridor to allow for passive flood plain and meander redevelopment already underway. Possibly implement an inexpensive corridor planting program due to the poor vegetation.	High priority corridor protection. Protecting the corridor and planting were also the preferred options found in the Field Geology Report (Field, 2007)	Trails, wildlife habitat, improved instream habitat, reduced erosion/flood risks.	Relatively low cost for plant material and easements or corridor purchase. RMP, VLT, Town of Waitsfield, NRCS.	Some hay, parts of corridor are forested.

Project #, Stream Type, Evolution Stage, RGA, RHA	Site Description and Importance, Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits (All projects are aimed at achieving RMP goals)	Potential Partners and Costs	Land Use Conversion
	Previous owner of current Town parcel may have removed all topsoil.					
M13-2	The area downstream of the swim hole to just downstream of the M13 reach break. In the swim hole area with road constraints, past work constructed stabilization and habitat improvement features.	Protect the stream corridor to allow for sediment and flow attenuation. Possibly implement a corridor planting program due to the poor vegetation.	High priority due to location at the Mill Brook confluence and downstream of the swim hole area which is confined due to the road and upstream of M12 which is a transport reach.	Reduce bank erosion pressure and velocities downstream, improved habitat diversity.	Relatively low cost for plant material and easements or corridor purchase. RMP, VLT, Town of Waitsfield, NRCS.	Right bank terrace appeared to be hay/pasture.
M14-1 Bc to F departure IV Fair Good	Bedrock left bank, possible gorge; semi-confined, but appears to be forming “modern” floodplain area with alluvial benches along channel edges.	Protect stream corridor to allow for continued adjustment and to improve water and habitat quality.	Lower priority due to presence of woody vegetation and perceived lack of development pressure (steep slopes).	Possible area for trails.	Relatively low cost for easement or corridor purchase. RMP, VLT, Town of Waitsfield.	Corridor wooded, except for upper most part where a house sits on the RB (possible area for planting, likely stable due to BR)
M15-1 C IV Good Fair	Some channel straightening, armoring, and encroachment from Rt 100. Adjacent snowmaking pond and withdrawal. “Fair” RGA condition with bedrock providing some vertical and lateral control. Moderately incised (1.4). M15 is taking	Protect stream corridor at the Kingsbury parcel to allow for adjustment, sediment attenuation and to moderate effects from upstream (M16 and Clay Brook) A buffer planting program could help establish buffer away from eroding banks and	Higher priority due to stream sensitivity and also to help compensate for increased stream power from M16. Options mainly on the right bank due to the snowmaking pond on	Reduce bank erosion pressure and velocities downstream, improved habitat diversity.	Relatively low cost. RMP, VLT, Town of Waitsfield, Yestermorrow, MRVPD.	Hay and residential, pond on left bank.

Project #, Stream Type, Evolution Stage, RGA, RHA	Site Description and Importance, Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits (All projects are aimed at achieving RMP goals)	Potential Partners and Costs	Land Use Conversion
	the hit from Clay Bk entering the system just upstream of a confined area of M16. Clay Brook had incision and multiple MFs, sediment is passing through the confined area of M16 and is deposited in M15.	provide stability as the channel migrates.	the left bank.			
M15-2	From the snowmaking pond through the Punch Bowl area down to the confined area of M14. Area is currently aggrading and migrating, but providing valuable sediment attenuation downstream of significant sediment inputs from Clay Brook and the fairly constricted areas in M16 and adjacent to the snowmaking pond, and upstream of the confined M14 reach.	Corridor protection to allow this site to continue to function as an attenuation area. Bedrock grade control at the Punch Bowl with large bars and migration. Stabilize stream banks at Punch Bowl only if preserving the site is desired. This would increase the priority of protecting attenuation assets downstream (M13). RB adjacent to the house had riprap.	High priority to protect the corridor here to help moderate effects of upstream sediment inputs and ski area alterations. Punch Bowl would likely have pools at bedrock areas. Feasibility depends on landowner willingness.	Could preserve public access to the Punch Bowl. Reduce bank erosion pressure and velocities downstream, improved habitat diversity.	RMP, Sugarbush, VLT, Town of Waitsfield.	Hay, shrub-forest, residential
M15-3	Adjacent to the snowmaking pond, a diversion weir is in the channel with a flume and water withdrawal. Some riprap present.	Remove the snowmaking pond, or improve the withdrawal area to reduce sediment build-up and annual dredging. Study alternatives to the weir for filling and monitoring for the snowmaking pond. Remove riprap opposite the	Contingent on corridor protection and landowner willingness to participate.	Reduce sediment buildup and need for dredging at the weir, reduce pressure on opposite banks, improve habitat diversity.	Unsure of costs associated with water withdrawals and associated flow-monitoring equipment. Further investigation needed.	Appeared to be hay, some residential

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		snowmaking pond to reduce pressure and chance of avulsion into the pond. Possibly gain/recreate some floodplain on the right bank adjacent to the snowmaking pond and/or on the left bank just downstream of the Rt 100 bridge.				
M15-4	Warren Trestle Bridge has sediment deposition upstream, stepped footers and deteriorating abutments.	Replace structure with an appropriately sized bridge.	The Town of Warren and VTRANS have been working to find a larger trestle bridge and have apparently located one.	Keeping the trestle style will preserve that icon of the valley.	David Hoyne at VTRANS, Town of Warren	None, bridge already exists.
M16-1 C-F departure III Fair Fair	Channel experienced a stream type departure of C to F (incision 2.1, entrenchment 1.2) and has lost floodplain access. Altered by channel straightening and bank armoring, and constriction from Rt. 100, increasing stream power. Some riprap being undermined. Area upstream of Riverside Park is heavily armored on left bank.	Protect corridor in the vicinity of Riverside Park to allow for channel adjustment and sediment attenuation. Depositional reach currently has limited sediment attenuation areas, which exacerbates sediment deposition problems in downstream reach at Snowmaking Pond.	Feasibility depends on willingness of landowners to cooperate. High priority as this is one of the few areas until M15 where sediment attenuation is possible.	Improved biotic habitat and reduced sediment loading of Mad River watershed to Winooski and Champlain Basins. Reduced risk of future structural damage.	Town of Warren, RMP, MRCP. Cost of corridor acquisition or easement acquisition. Or dev. & mgmt. rights	Limit structural development of Riverside park.
M16-2 C-F departure	Channel experienced a departure of C to F (incision 2.1, entrenchment 1.2) and	Protect corridor in the upper reach to allow for channel adjustment and sediment	Feasibility depends on willingness of landowners to	Improved biotic habitat and reduced sediment	RMP, MRCP. Cost of corridor acquisition or	Convert low-intensity agricultural

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III Fair Fair	has lost floodplain access. Armoring in upper reach along Rodger's parcel.	attenuation. Remove bank armoring on left bank where future meanders will not impact Route 100.	cooperate. High priority because attenuation areas are limited in reach.	loading of Mad River watershed to Winooski and Champlain Basins.	easement acquisition. Or dev. & mgmt. rights	lands to forest.
M16-3 C-F departure III Fair Fair	Channel experienced a departure of C to F (incision 2.1, entrenchment 1.2) and has lost floodplain access. Altered by channel straightening and bank armoring, and constriction from Rt 100, increasing stream power. Some riprap being undermined.	In areas without building and road constraints, restore incised section of reach through "active" restoration of bed forms and/or floodplain features in equilibrium with channel bed elevation and increased stream power. Protect the stream corridor and plant buffer vegetation in conjunction with restoration projects.	Medium – high priority as there is no recently abandoned floodplain, but there are some potential areas where floodplain could be lowered. Appears to have been depositional reach in past.	Improved biotic habitat and reduced sediment loading of Mad River watershed to Winooski and Champlain Basins.	RMP Relatively high to excavate new floodplain. Additional costs in corridor easements/ acquisition & plantings	Convert low-intensity agricultural lands to forest.
M17-1 B to F departure IV Fair Good	Reach is in a bedrock gorge with some aggradation observed. Wooded buffer is greater than 100 feet. 50 Feet of riprap was on the left bank at the Bradley Brook confluence.	Protect stream corridor to prevent encroachment and buffer clearing.	Low priority for corridor protection due to the wooded corridor and unlikely encroachment pressure.	Maintained buffer for input of LWD and shading for biotic habitat.	RMP, MRCP Cost of corridor acquisition or easement acquisition.	Largely forested corridor.
M18-1 Ba I Fair Good	Reach in a rock gorge downstream of the Warren Crib Dam and confined by bedrock banks. Channel adjustment is unlikely due to bedrock. Some of the	Protect the woody vegetation in the corridor to prevent further clearing. Possibly plant buffer in area just downstream of M19 reach break.	Low-Medium priority for protection because current encroachment has not impacted channel stability (due to bedrock controls).	Preserves wooded setting of the village. Maintained buffer for input of LWD and	Town of Warren. Low cost to implement policy.	Residential, Warren Village. No "conversion" would be needed - only

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	Warren Village development encroaches into the corridor.			shading for biotic habitat.		new develop. limited.
M19A-1 C-F departure III Fair Fair	Stream corridor included residential development, roads, and low buffer width. A departure from C to F had occurred and the channel lacks floodplain access (incision 2.01). May have been a B type before the crib dam.	Adopt a no filling or cutting in the stream corridor policy to prevent further encroachments.	High feasibility. High priority due to current level of fill and development.	Maintained buffer for input of LWD and shading for biotic habitat. Reduced property damage.	Town of Warren. Low cost to implement policy.	Residential, Warren Village. No “conversion” would be needed - only new develop. limited.
M19A-2 C-F departure III Fair Fair	This segment has been straightened and partially armored and is influenced by sedimentation upstream of the Crib Dam. Channel is aggrading and attempting to widen but hindered by riprap application.	Remove Crib Dam. Investigate whether allowing some of the coarse gravel sediment to move downstream would cause negative impacts to infrastructure or channel adjustments downstream.	High priority due to the structure being non-essential. Recommended to be done in conjunction with corridor protection of sediment attenuation areas downstream (i.e., reach M16).	Improved biotic habitat and fish migration. Reduced flood/erosion risks. Improvement of incision in downstream reaches (M16)	High cost, especially if sediment needs to be removed. Town of Warren, RMP, USCOE	Possibly controversial due to age of dam/historical nature. Some residential properties and lawns may be reconfigured for new channel dimensions.
M19A-3	Covered Bridge north of Warren Village. Channel is aggrading and attempting to widen but hindered by riprap application.	Replace covered bridge or widen the bridge footings to accommodate the equilibrium channel width.	High priority if crib dam removed due to bed changes and potential increased adjustments.	Improved biotic habitat. Reduced flood/erosion risks. Improvement of incision in downstream reaches (M16)	VTAT, Town of Warren	Possibly controversial due to historic significance of bridge. No major land use conversion required.

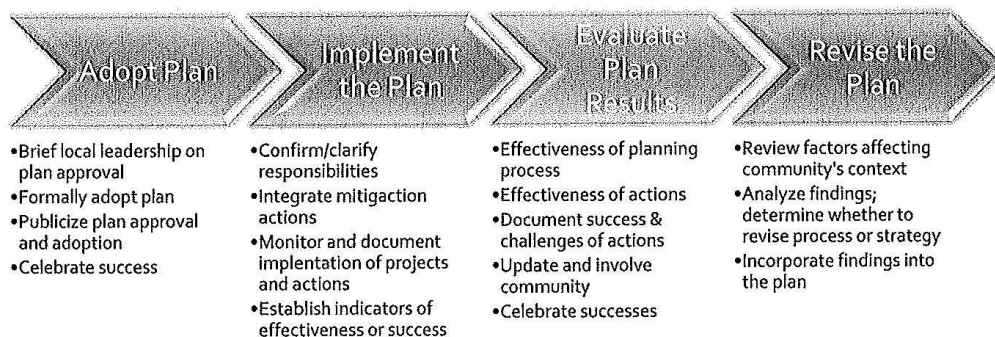
Project #, Stream Type, Evolution Stage, RGA, RHA	Site Description and Importance, Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits (All projects are aimed at achieving RMP goals)	Potential Partners and Costs	Land Use Conversion
M19A-4	Stream corridor included residential development, roads, and low buffer width. Project area is upper segment from bedrock controls down to riprap on left bank - length approx. 500 feet.	High priority corridor protection in upper segment. Prevent further structural development and plant woody buffer.	Difficult due to numerous small parcels and existing encroachments.	Improved biotic habitat. Reduced flood/erosion risks.	Low - cost of plant materials and volunteers. Town of Warren, RMP, FMR, Landowners	Some lawns and yards would be converted to woody buffer.
M19B-1 C-F departure III Fair Fair	Upstream of Rt 100 - Channel is overwidened and confined by Route 100. The channel is incised (IR=2.8) and has riprap preventing bank erosion and transferring power downstream. Two bedrock ledges control the grade at the downstream end.	Restore the incised reach through protecting the corridor on the left bank if possible and recreate some floodplain on the left bank, either through floodplain lowering or installation of sediment trapping grade control structures to attenuate flow and sediment.	Medium high priority as constraints and constrictions exist with limited options from this area downstream past the snowmaking pond. This is the last area before Warren Village to reduce velocities or attenuate some sediment.	Improved biotic habitat. Reduced flood/erosion risks.	High cost to lower floodplain. RMP	Current Bobbin mill and access road would likely require relocation, unless benefits can be gained from the small terrace areas downstream on left bank
M19B-2	The Rt 100 bridge at the downstream end has a wide span at the roadbed, however large amounts of riprap fill the channel and floodplain sides in a trapezoid shape.	Widen rip rapped banks to reduce flood flow constriction and sediment discontinuity.	Requires coordinating with VTRANS. Moderate costs associated with rock removal.	Reduced erosion pressure on banks upstream of bridge.	VTRANS, VTAOT. Cost of Equipment and stabilization materials.	Not significant.

Abbreviations:

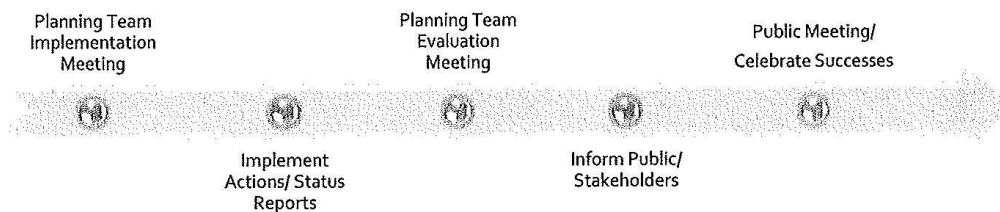
RB/LB: Right Bank/Left Bank (facing downstream)

MF: Mass Failure

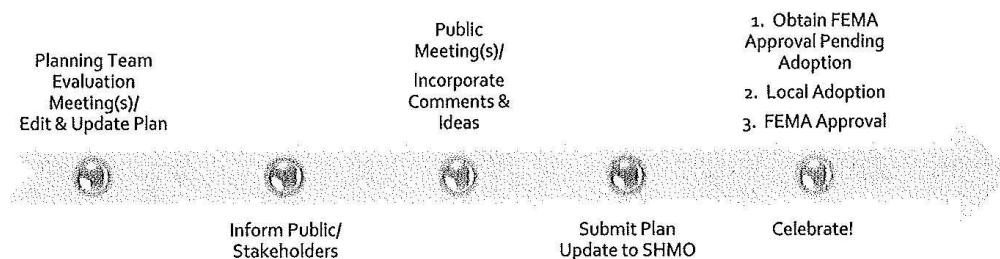
5-Year Plan Review/Maintenance



After Plan Adoption-Annually Implement and Evaluate



Fifth Year, and After Major Disaster Evaluate and Revise



Certificate of Adoption

The Town of Waitsfield
Select Board
A Resolution Adopting the Local Hazard Mitigation Plan
_____, 2015

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

WHEREAS, a duly-noticed public meeting was held by the Town of Waitsfield Select Board on _____, 2015 to formally adopt the Waitsfield Local Hazard Mitigation Plan;

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

Chair of Select Board

Member of Select Board

ATTEST

Waitsfield Clerk