CERTIFICATE OF ADOPTION

13 AUGUST, 2018

TOWN OF DUXBURY, VERMONT SELECTBOARD

A RESOLUTION ADOPTING THE TOWN OF DUXBURY, VERMONT 2018 LOCAL HAZARD MITIGATION PLAN

WHEREAS, THE TOWN OF DUXBURY HAS HISTORICALLY EXPERIENCED SEVERE DAMAGE FROM NATURAL HAZARDS AND IT CONTINUES TO BE VULNERABLE TO THE EFFECTS OF THE HAZARDS PROFILED IN THE TOWN OF DUXBURY, VERMONT 2018 LOCAL HAZARD MITIGATION PLAN, WHICH RESULT IN LOSS OF PROPERTY AND LIFE, ECONOMIC HARDSHIP, AND THREATS TO PUBLIC HEALTH AND SAFETY; AND

WHEREAS, THE TOWN OF DUXBURY HAS DEVELOPED AND RECEIVED CONDITIONAL APPROVAL FROM THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FOR ITS 2018 LOCAL HAZARD MITIGATION PLAN (PLAN) UNDER THE REQUIREMENTS OF 44 CFR 201.6; AND

WHEREAS, THE PLAN SPECIFICALLY ADDRESSES HAZARD MITIGATION STRATEGIES, AND PLAN MAINTENANCE PROCEDURES FOR THE TOWN OF DUXBURY; AND

WHEREAS, THE PLAN RECOMMENDS SEVERAL HAZARD MITIGATION ACTIONS (PROJECTS) THAT WILL PROVIDE MITIGATION FOR SPECIFIC NATURAL HAZARDS THAT IMPACT THE TOWN OF DUXBURY WITH THE EFFECT OF PROTECTING PEOPLE AND PROPERTY FROM LOSS ASSOCIATED WITH THOSE HAZARDS; AND

WHEREAS, ADOPTION OF THIS PLAN WILL MAKE THE TOWN OF DUXBURY ELIGIBLE FOR FUNDING TO ALLEVIATE THE IMPACTS OF FUTURE HAZARDS;

WHEREAS, A DULY-NOTICED PUBLIC MEETING WAS HELD BY THE TOWN OF DUXBURY SELECT BOARD ON AUGUST 13, 2018 TO FORMALLY ADOPT THE DUXBURY LOCAL HAZARD MITIGATION PLAN; NOW THEREFORE BE IT

RESOLVED BY TOWN OF DUXBURY SELECTBOARD:

1. THE TOWN OF DUXBURY, VERMONT 2018 LOCAL HAZARD MITIGATION PLAN IS HEREBY ADOPTED AS AN OFFICIAL PLAN OF THE TOWN OF DUXBURY;

2. THE RESPECTIVE OFFICIALS IDENTIFIED IN THE MITIGATION ACTION PLAN OF THE PLAN ARE HEREBY DIRECTED TO PURSUE IMPLEMENTATION OF THE RECOMMENDED ACTIONS ASSIGNED TO THEM AS TOWN CAPACITY AND FUNDING ALLOWS;

3. FUTURE REVISIONS AND PLAN MAINTENANCE REQUIRED BY 44 CFR 201.6 AND FEMA ARE HEREBY ADOPTED AS PART OF THIS RESOLUTION FOR A PERIOD OF FIVE (5) YEARS FROM THE DATE OF FORMAL FEMA APPROVAL OF THE PLAN; AND

4. AN ANNUAL REPORT ON THE PROCESS OF THE IMPLEMENTATION ELEMENTS OF THE PLAN WILL BE PRESENTED TO THE SELECTBOARD BY THE LOCAL MITIGATION PLANNING COMMITTEE.

IN WITNESS WHEREOF, THE UNDERSIGNED HAVE AFFIXED THEIR SIGNATURE AND THE CORPORATE SEAL OF THE TOWN OF DUXBURY THIS 13TH DAY OF AUGUST 2018.

Tamatha Thomas-Haase, Selectboard Chair

Erin Lander, Selectboard Vice-Chair

Jerry McMahan, MEMBER OF SELECTBOARD

MARI PRATT. MEMBER OF SELECTBOARD

Bob Magee, MEMBER OF SELECTBOARD

ATTEST

Maureen Harvey, Town Clerk

Town of Duxbury, VT
Local Hazard Mitigation Plan Update
February 26, 2018
Adopted _____ 2018
Prepared by the Town of Duxbury

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In accordance with the Stafford Act, municipalities may perform mitigation planning and be eligible to receive increased federal funding for hazard mitigation measures. (42 U.S.C. 5165).

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 community of Duxbury 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, improving public education, or ensuring development is disaster resistant.

2. Purpose

The 2018 Duxbury Local Hazard Mitigation Plan is an update of the town's adopted 2012 Local Hazard Mitigation Plan approved by FEMA on March 11, 2013. The purpose of this Plan is to assist the Town of Duxbury in recognizing hazards facing the community ranking them according to local vulnerabilities, and identify strategies to reduce risks from acknowledged hazards of highest concern based on current information. The town reviewed, evaluated, and revised the 2012 plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities. New information has been incorporated in the Plan making it up to date, stronger, and more useful to the Town of Duxbury officials and residents who will implement the actions and measures going forward. Implementation of this plan will make Duxbury more resistant to harm and damages in the future, and will help to reduce public costs.

Duxbury strives to be in accordance with 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 2018 Duxbury Local Hazard Mitigation Plan is an update of the 2012 adopted plan. Updates to the plan include:

- Current information since the last plan update done in 2012
- The town has updated the hazards reflecting the communities' priorities.
- Plan Update Process
- Plan Maintenance
- Update of Flood and Severe Storm Hazards
- Updates of Local Areas of Concern Map reflects current information
- Status of 2012 mitigation strategies
- Identification of new mitigation strategies section that reflects the current priorities and intended actions of the community over the next five years

3. Community Profile

The Town of Duxbury is located on the western edge of Washington County and is bounded by the towns of Moretown to the east, Fayston to the south, Huntington to the west, and Waterbury and Bolton to the north. Duxbury's northern border is set by the Winooski River, while its western edge is marked by the principal ridge of the Green Mountains. These elements give Duxbury one of the most rugged physical reliefs in Vermont; with an elevation change from about 360 feet above sea level along the Winooski River to 4,083 feet at the summit of Camels Hump only four and a half miles away. These elevations are the lowest and highest, respectively, in Central Vermont (Town Plan 2014).

Duxbury is in the Winooski River Basin and is within three major Sub-basins; the Mad River, Upper Winooski and Lower Winooski. Principal rivers and streams include Ridley Brook, which drains the northwestern portion of the Town into the Winooski, Crossett and Dowsville Brooks draining the eastern section of Town, and Shepard Brook, which provides drainage to a small area in the southwestern portion of Town.

The Town of Duxbury is one of five communities served by the nonprofit organization, Friends of the Mad River which promotes "informed and active stewardship of the Mad River and its 144 square mile watershed." (Town Report 2016). Duxbury lies within the northwest portion of this watershed. The Friends of the Mad River provide support and leadership to the Ridge to River task force formed in 2015 of which Duxbury is a member. Duxbury is represented on the task force with a member from the Planning Commission and the Selectboard. The 5-town coalition is working on innovative ways to address stormwater runoff to help reduce the impact from flash flooding which has caused road and culvert washouts, degradation in water quality and increased maintenance costs and frequency of repairs to communities in the Mad River Valley (MRV). The Ridge to River initiative is "to develop a long-term approach for building flood resilience and water quality in the valley by improved and coordinated stormwater management. The goal is to identify regulations, programs and projects needed to meet changing state regulations related

to water quality and to help communities prepare for and reduce the impacts of future floods." (Town Report 2016).

Over the past five years, stormwater management has become a focus of the flood resiliency efforts in the community. Together with the school and community, in 2016, Friends of the Mad River completed a stormwater master planning process at the Harwood Union Middle and High School. Recommended measures were developed to reduce the amount of pollutants and sediment from the school buildings and parking lots from going into the Dowsville Brook.

In 2013, on behalf of the Friends of the Mad River and their Watershed Restoration and Resiliency efforts, Watershed Consulting Associates, LLC conducted a review of the stormwater management regulations in the five Mad River Watershed towns of Duxbury, Fayston, Moretown, Waitsfield, and Warren. The study did a comprehensive review of the municipal town plans and the local zoning and subdivision regulations with respect to stormwater and erosion control. A final report was issued in April 2013 (*Stormwater Management Regulation in the Mad River Valley; Review and Recommendations).* This study was considered in the 2014 update of the Duxbury Town Plan adopted in October of 2014 and the 2017/2018 proposed zoning amendments of the Duxbury Land Development Regulations currently under review.

According to the 2010 US Census, Duxbury has a total population of 1,337 people living in 639 housing units. Duxbury has seen its population increase by 3% from the 2000 Census, while its number of housing units has increased by 28%. The American Community Survey (ACS) 5 year estimates for 2012 – 2016 show a decrease in population for both the County and Duxbury. The 2016 ACS 5-year population estimate for Duxbury is 1,247. Approximately 90% of Duxbury's workforce is employed outside of the community, while the remaining 10% are employed within the Town.

Much of the development within the Town is concentrated along Route 100, the single paved highway that transects the town in a north-south direction along its eastern boundary. There is concentrated residential development in the "village" of Duxbury Corner, but for several years much of the new residential development has been taking plan in the more remote, higher elevation areas of town, which are reached by Ward Hill Road, Dowsville Road, Crossett Hill Road, and Camels Hump Road. Despite this trend, the Town Plan limits land uses and densities in outlying areas and high elevations and instead encourages appropriate clustered or concentrated patterns of development. Overall, new development since the 2012 Plan has not increased the communities' vulnerabilities.

The Washington Electric Cooperative provides electricity to approximately 411 members in the southern portion of the Town. Green Mountain Power serves the remaining north sections of Duxbury.

Natural springs and drilled wells provide water to most sections of Town; however, residences in Duxbury Corner, students at Crossett Brook Middle School, and the Town Offices are served by the Waterbury municipal system. Wastewater treatment within the town is treated by individual

subsurface disposal facilities. These facilities are regulated by the State's wastewater regulations.

The Waterbury Fire Department provides fire coverage in the northern section of Duxbury, while the Moretown Fire Department provides protection for residents in the southern section. Both Waterbury and Moretown Fire Departments are members of the Capital Fire Mutual Aid System, which is composed of approximately 45 departments in Washington, Orange and Caledonia Counties. The Departments responded to a combined 32 calls in 2004, which includes grass fires, propane leaks, automobile accidents and structural fires. There were 21 responses to fire calls in 2016. The nearest HazMat response truck is located approximately 47 miles away at the IBM Facility in Essex Junction. The nearest HazMat decontamination, rescue and mass care trailer is located at Barre City and Berlin Fire Departments. Waterbury Ambulance Service responds to emergencies throughout the Town, with back up support provided by The Mad River Valley Ambulance Service. The Ambulance departments report they responded to a total of 67 calls for Duxbury in 2016.

Police services are provided by the Vermont State Police stationed at the Middlesex Barracks. Thatcher Brook Primary School serves as the Town's Primary Emergency Shelter. The Town has a warming shelter in the Town Garage and other buildings that could provide shelter are Crossett Brook Middle School, Harwood Union High School and Green Mountain Community Alliance Church. The shelter and shelter contact information is incorporated into the Local Emergency Operation Plan (LEOP). Towns can open a shelter at their discretion. Backup generators are located at Thatcher Brook Primary School and the Town Garage.

The Town Plan was adopted in October of 2014 and regionally approved by CVRPC in January of 2015. The existing plan is still current and active. The Town Plan includes goals, policies, and tasks in regards to housing, natural resources, future land use, flood resiliency, economic development, food and agriculture, wastewater treatment, transportation, education public services, and energy. The 2011 Zoning Ordinance greatly limits development within the Ecological Reserve Lands District, any land above 2,500 feet. Only low-impact uses are permitted within this District and special consideration must be made in regards to erosion control. In addition, the Ordinance prescribes a Flood Hazard Overlay District that limits the construction of structures within the National Flood Insurance Program's 100-year floodplain. The Town is in the process of updating its zoning regulations, including those that relate to flood hazards. Updates incorporate and consider the goals and priority Strategies of the Town Plan. As stated in the Town Plan under Goal 3 Flood Resiliency, a priority strategy is to "Update flood hazard area and river corridor regulations to meet standards in the current Vermont flood hazard area regulation model. Duxburians may be aware of other issues related to frequent flooding, dam safety, ice jams or other issues that should be identified and addressed either in the hazard area regulations, the Hazard Mitigation Plan, the Emergency Operations Plan or all three." When Duxbury updates their 2014 Town Plan, the goals and objectives of this local hazard mitigation plan will be incorporated into the updated town plan and vis versa when this plan is again updated.

The Town of Duxbury has an approved Local Emergency Operations Plan (LEOP), (formerly known as the Rapid Response Plan), that is updated and adopted annually, after Town Meeting Day and

before May 1st. The current LEOP was adopted on March 30, 2017 and is due for renewal by May 1, 2018. The town coordinates with the Central Vermont Regional Planning Commission who provides technical support and guidance with the LEOP plan update. The town requires the certifying officer to be trained in ICS 402 or ICS 100 at a minimum. All Selectboard members as of 2016 were trained in ICS 100. In conjunction with the LEOP, on April 10, 2012, the town adopted the use of the National Incident Management System (NIMS) as the standard for management and systematic approach involving all threats and hazards, regardless of cause, size, location, or complexity, in order to reduce loss of life, property, and harm to the environment.

Since 1982, Duxbury has participated in the National Flood Insurance Program. In 2013, official Digital Flood Insurance Rate Maps became available. The Duxbury FIRMS were last updated effective 3/19/2013, Community panel #50023C0209E, and can be found online at tinyurl.com/floodreadyatlas and www.msc.fema.gov. Many of the panels are not printed due to large areas being in Zone X, areas of minimal flood hazard. Using 2017 data, there are 18 structures in the 100 year flood plain; 15 residential, 1 commercial, and two public gathering places. There are 85 parcels that touch the flood plain. There are no repetitive loss properties in Duxbury. There are 3 policies. Lacking a history of no repetitive loss properties in the community, it is likely that Duxbury cannot meet the eligibility criteria to enroll in the NFIP Community Rating System (CRS). The administrative resources necessary for enrollment and ongoing program maintenance are likely to be a significant challenge for Duxbury and a deterrent for participation.

Duxbury is eligible under the Vermont Emergency Relief and Assistance Fund (ERAF) to receive state funding to match Federal Public Assistance funds after a federally declared disaster. Communities that take specific steps to reduce flood damage can increase the percentage of state funding they receive from 7.5% up to a maximum of 17.5%. At the time of this Plan development, Duxbury has an ERAF rating of 12.5%. Duxbury has taken the specific steps to reduce flood damage by 1) participating in the National Flood Insurance Program, 2) adopting standards that meet or exceed the current Vermont Roads and Bridge Standards 2016, 3) adopting a Local Emergency Operations Plan which is renewed and adopted annually, 4) adopting a Local Hazard Mitigation Plan approved by FEMA. The town has not adopted Interim River Corridor protection standards (River Corridor Plan criteria) which, if it did, would bring the rate to 17.5%.

Duxbury can qualify for the maximum 17.5% rate if it adopts river corridor standards that meet the Agency of Natural Resources (ANR) criteria within two years of ANR publishing a statewide river corridor map updated to include existing Phase 2 Stream Geomorphic Assessment (SGA) data. The data release, expected to occur at the end of 2016, has been delayed and the agency has not announced a new release date. The other option to qualify for the maximum ERAF rate is for Duxbury to enroll in the NFIP Community Rating System (CRS) and adopt a bylaw that prohibits new structures in the Flood Hazard Area. The CVRPC is posed to assist the community in drafting a river corridor plan with the release of the Phase II data.

4. Planning Process and Maintenance

4.1 Planning Process

The Duxbury Emergency Management Team assisted by the Planning Commission coordinated the Duxbury Local Hazard Mitigation Plan process. Emergency Management and Planning Commission members updated the 2012 LHMP beginning in early 2017 during regularly scheduled monthly warned meetings and through email correspondence. The LHMP was also on the agenda at multiple Selectboard meetings. A draft of the LHMP was reviewed at the December 2017 Selectboard meetings. The December review identified future hazard mitigation programs, projects and activities based off of an assessment of past projects and a predictive analysis of future weather events. Town residents were present at the select board meetings but made no comment on the LHP.

He following town residents participated in the planning process:

Selectboard:

Erin Lander: 802 241-1007
erin.duxburyvt@gmail.com

Jerry McMahan:
jerryMcMahanvt@gmail.com

Tamatha Thomas-Haase: 802 241-1415
tamathaduxburyvt@gmail.com

Stacy Gibson-Grandfield: 802 244-4169
stacyggvt@yahoo.com

Road Foreman

Adam Magee : 477-2553
adam.duxburytown@myfairpoint.net

Town Clerk:

Maureen Harvey 244-0956
DuxTC@myfairpoint.net

Town Treasurer:

Anne Wilson 272-6951
duxburyvttreasurer@gmail.com

Health Officer*:*

Ty MacWalters 238-3546
Ty.macwalters@gmail.com

1st Constable*:*
Nate Isham 802-793-9191
Nate.isham@gmail.com

EM Director (through May 2018)*:*
Erik Zetterstrom 595-3215/498-3653
zettx3@gmail.com

EOC Operations Chief and EM Director (6/2018 to present) :
Karl Lander 241-1007/971-322-6076
Karl.duxburyvt@gmail.com

Shelter Coordinator*:*
Shawnee Perry 917-4711; 802-244-4991
echovalleyfarm@comcast.net

Zone Captains
Zone 1 (Camels Hump) *Lars Dickson:* 244-7556
lhdickson@pshift.com

Zone 2 (Main St./River Rd): Peter Merriman 585-4843/244-7527
pmerrimanvt@gmail.com

Zone 3a (North Crossett Hill): Mame McKee 793-7182
mamemckee@gmail.com

Zone 3b (South Crossett Hill):*Tommy Young: 224-6693*
tyoung1974@gmail.com

Zone 4 (Vt 100 from Lookout to Tobin): Nils Shenholm 244-6460
nils@saunavermont.com

Zone 5 (Dowsille and Ward Hill): John Haase:272-0933/c:241-1415
Jhaase33@hotmail.com

Duxbury Planning Commission
Alan Quackenbush
802.244.7512 **aqbogs@myfairpoint.net**

Brian Fitzgerald
fitzgerald@madriver.com

The Town remains most vulnerable to flash flood/flood/fluvial erosion, hurricanes/severe storms/tropical storms, and wildfire/forest fire. The methodology used to perform the assessment and prioritization is described further on in this Plan. The Town will focus on flooding hazards as these events are the most common and severe. Continued investments by GMP and Washington Electric Coop, Inc. (WEC) for ongoing line clearing maintenance, upgrades to the grid, and a varied mix of power sources reduce the impact from power outages. The town is still predominantly rural and heavily forested and the potential for forest fires remain a significant threat hazard.

Changes identified at the December Selectboard meeting were made to the draft plan. In January 2018 a copy of the draft plan was sent electronically to the following persons for review and comment with instructions to send comments to Erik Zetterstrom by email at zettx3@gmail.com. Comments were asked to be received by February 19, 2018.

Laura Ranker, Planner with the Central Vermont Regional Planning Commission, ranker@cvregion.com;

Barbara Farr, Waterbury Community Transportation Liaison and member of the Waterbury Floodplain Management Working Group, bfarr@waterburyvt.com;

Steve Smith, Moretown Fire Chief and Emergency Coordinator, stephen.smith11c@yahoo.com;

Dan Weston, Washington Electric Coop, Inc., dan.weston@wec.coop

Brenda Spafford, Green Mountain Power, Brenda.Spafford@greenmountainpower.com;

Ned Swanberg, VT Regional Floodplain Manager, ned.swanberg@vermont.gov;

Gretchen Alexander, VT Regional Rivers Scientist, gretchen.alexander@vermont.gov;

Dan Singleton, Washington County Forester, dan.singleton@vermont.gov;

Benjamin Green, VT ANR Dam Program, Benjamin.Green@vermont.gov;

Karl Lander, Duxbury EOC Chief, karl.duxburyvt@gmail.com;

Stacy Gibson-Grandfield, Duxbury Selectboard Chair, stacy.duxburyvt@gmail.com

Matthew Nally, Commander Middlesex State Police Barracks & LEPC 5, Matthew.Nally@vermont.gov;

Todd Keller, Washington West Supervisory Union, tkeller@wwsu.org;

Shawnee Perry, Duxbury Service Officer, echovalleyfarm@comcast.net;

Erika Dolan, School Nutrition Specialist and meal planner, edolan@wwsu.org;

Tom Drake, Principal Crossett Brook Middle School, tdrake@wwsu.org.

Gary Dillon, Waterbury Fire Chief, waterburyfd@waterburyvt.com

Laura Ranker, Dan Weston, Ned Swanberg and Benjamin Green provided comment which was considered and added as appropriate.

Additionally, a notice for public review and comments on the draft was posted in the Waterbury Record, Valley Reporter and on the Duxbury website under the Emergency Management Page. Hard copies of the draft plan were available in the Town Office and digitally on the Emergency Management Page. The deadline for public comment was March 6, 2018 with comments to be sent to Erik Zetterstrom, Duxbury's Emergency Management Director at zettx3@gmail.com.

Additional opportunities for the public to weigh in on the planning process have been made available at Emergency Management meetings, Selectboard meetings and via opportunities through the zone reporting system. The planning meetings focused on 1) assessing past mitigation projects and compiling information on its current and future hazard mitigation programs, projects and activities, 2) identifying and ranking the hazards significant to Duxbury, 3) discussion of vulnerabilities, 4) plan maintenance, and 5) public engagement. All meetings were open to the public. No public attended the working meetings between the Emergency Management Team and the Planning Commission and no public comments were received at any of these meetings. After public comments were considered, the draft plan was updated and made available during Town Meeting Day, March 6, 2018. It will also be made available during local meetings with State and local officials to allow for more public comment and review.

On 28 February 2018, the draft Plan and a completed Plan Review Tool was sent to Stephanie Smith, Hazard Mitigation Planner at Vermont Emergency Management (VEM) for review and comment. This started the review and approval process with VEM and FEMA.

Based on comments received on March 8, 2018 from S. Smith, minor revisions were made to the draft Plan prior to submittal to FEMA and outreach to adjoining towns was broadened. On March 14, 2018 the revised draft Plan was sent electronically to the additional towns of Fayston, Bolton, Huntington, and Waitsfield for review and comment with instructions to send comments to Erik Zetterstrom by email at zettx3@gmail.com. Comments were asked to be received by March 21, 2018. Any public comments received were considered by the Planning Team. The following persons were sent the revised draft Plan:

Town of Fayston
Bob Lockett, Emergency Management Director - blockett@bridgesresort.com
Pattie Lewis, Town Clerk - patti@madriver.com

Bolton
Amy Grover, Town Clerk - clerkbolton@gmavt.net

Huntington
Heidi Racht, Town Clerk - huntingtonclerk@gmavt.net

Waitsfield
Fred Messer, EMD - fmesser@madriver.com
Carla Straight-Messer, Co EMD - smilingdogfarm@madriver.com
Trevor Lashua, Town Administrator - townadmin@gmavt.net

The revised Plan was sent to S. Smith for further review. After VEM review, the final plan will be submitted to FEMA for review and approval. Once FEMA approves the plan they will notify VEM of "Approval Pending Adoption" status. After Approval Pending Adoption, the plan will go before the Selectboard for adoption. The Selectboard will hold a warned public hearing and after the hearing and at a regular Selectboard meeting will approve and adopt the Duxbury 2018 Local Hazard Mitigation Plan and execute the Certificate of Adoption. A copy of the executed Certificate of Adoption will be attached to this Plan. The adopted Plan and signed certification was sent to VEM for submittal to FEMA on August 15, 2018. The Plan will expire 5 years from the FEMA approval effective date. During the review and adoption process CVRPC provided support and technical assistance.

Public comments submitted in the future will be reviewed by the Select Board (and CVRPC Staff dependent on funding) and attached as an appendix.

Also during the Town Meeting a LHMP Committee will be identified and a Chairperson appointed. The LHMP Committee will update the plan annually and provide updates at all future Town Meetings.

During, and after, the update process, the town used the town website to post notices and informational pieces about the updated local hazard mitigation plan. The Waterbury Record was also utilized to provide public participation.

4.2 Plan Update Process

The 2018 LHMP update will be submitted as a single jurisdiction local mitigation plan. This Plan will guide the town into the next five years and maintain the town's eligibility as an applicant for mitigation grants.

The current plan is not a significant departure from the 2012 plan; however, new analysis was done to best determine where the Town should put resources in the future. Town planners updated the significant weather events history, considered changes to risk based off of past events and the likelihood of future events and their impact to infrastructure and lives, and reviewed the historical and expected locations of future events to make determinations on how best to apply resources.

Analysis showed that the worst threats and areas of concern remain the same from the 2012 plan and that continued effort needs to be applied to these threats and areas to mitigate risk. Priorities have not changed from the 2012 plan. Available resources will be applied to mitigate top priority threats.

The implementation of several mitigation actions over the past five years, some not listed because the town considers them to be regular maintenance and program implementation measures, have reduced the town's vulnerability to specific hazards. Despite the fact that solid strides have reduced the risk of identified worst threats and areas, additional work needs to be done. Duxbury has benefitted from the collaborative approach to achieving mitigation on the local level, by partnering with Agency of Natural Resources (ANR), Vermont Agency of Transportation VTrans, Agency of Commerce and Community Development (ACCD), Vermont Emergency Management, Central Vermont Regional Planning Commission (CVRPC), Federal Emergency Management Administration (FEMA) Region 1 and other agencies, all working together to provide assistance and resources to pursuing mitigation projects and planning initiatives in Duxbury.

General Updates

- Update of all data and statistics using available information (Section 3 and Section 5)
- Revaluation, identification and analysis of all significant hazards (Section 5)
- Acknowledgment of implemented mitigation strategies since 2011 – 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)
- Identification of new mitigation strategies (Section 6)
- Hazards referred to as "non-worst threat" are now referred to as "moderate hazards"

Hazard Analysis Updates (Sections 5 and 6)

- 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, November 2013 (Section 5 – hazard analysis table)
- Review of Federally declared disasters, weather data, ANR resources, VT Flood Ready site, and NOAA/NCDC site.
- Flood/Flash Flood/Fluvial Erosion, Hurricane/Tropical storms/Severe Storms, Wildfire/Forest Fire remain on the list of worst threat, reflecting the community's belief that these hazards are the most significant and the town is still vulnerable to these hazards. Although the town cannot predict with certainty that these events will be the norm in the future, the town continues to keep these in their analysis of hazards that they may be vulnerable to in the next five years.
- Extreme Cold/Winter Storms/Ice Storm/Power Failure remains as a moderate threat hazard. Dam Failure also remains as a moderate threat hazard.

Maps

- Review of 2017 Areas of Concern map – updated flood prone areas, added forest layer
- Review of 2016 Culvert and Bridge Survey

Updates to the 2018 LHMP included a review of all of Duxbury's planning documents:

- 2014 Duxbury Town Plan
- 2018 Proposed Land Use Development regulations
- Flood Hazard District Overlay
- 2016 Road and Culvert Inventory survey
- Capital Improvement Budget
- 2017 Local Emergency Operations Plan
- 2012 Local Hazard Mitigation Plan
- Final Report, April 2013, Watershed Restoration and Resiliency Project, Mad River Valley Vermont, Stormwater Management Regulation in the Mad River Valley; Review and Recommendations by Watershed Consulting Associates, LLC
- Town Zone System
- Flood Resiliency Checklist
- Duxbury Annual Town Reports
- 2012 Duxbury Plan Review Tool FEMA approved- reference to Section 2 recommendations for next plan update and plan strengths
- Municipal General Roads Permit (Act 64) – (in process of development)

The following chart provides an overview of Duxbury's proposed 2012 local hazard mitigation actions along with their current status. Additionally since the 2012 plan, the Town is in the process of updating their flood regulations post TS Irene to maintain NFIP compliance.

2012 Mitigation Action	2018 Status
Update homebound persons phone tree	Work in progress. Use the CARE form from Vermont 211 to gather information and update. Perform a sensitive population's survey. Continue as a preparedness action under this updated Plan.
Provide backup power to town shelters	Completed. The town garage has backup power and can be used as a warming shelter as required. The Thatcher Brook Primary School has a backup generator and serves as the Town Primary Shelter.
Upgrade bridge on Pitts/Camels Hump Rd	3-5 Years. Must prioritize and budget. To be carried over into this Plan as a mitigation action
Upgrade bridge on Camels Hump Rd	3-5 Years. Must prioritize and budget. To be carried over into this Plan as a mitigation action

Upgrade box culvert on Camels Hump Rd	3-5 Years. Must prioritize and budget. To be carried over into this Plan as a mitigation action
Work with State to develop wildfire suppression methods for the State Forest	3-5 Years. To be carried over into this Plan as a mitigation action
Work with appropriate officials to ensure continues NFIP compliance	Adoption of revised Land Use Development Regulations with Flood Hazard Overlay District is pending. 2-3 Years. To be carried over into this Plan as a mitigation action.
Participate in a Stream Geomorphic assessment	Still interested in – no funding. Will not be carried over into this Plan due to lack of town capacity and secured funding source.

Town Capabilities for Implementing Mitigation Strategy

Services provided by the Duxbury municipality are overseen by a five member volunteer Selectboard.

The Town employs a handful of staff members to carry out services to its residents on a daily basis. The following are the paid positions which are involved in hazard mitigation:

•Town Clerk (Part Time) and Assistant Clerk (Part Time): Maureen Harvey and Myra Perry
• Treasurer (Part Time): Anne Wilson
•Road Foreman & 2-Person full time and 1 part time crew Adam Magee, Brian Gibbs, Randy Fisk Sr. and Ken Sargent.

Volunteer municipal officials also play a crucial role in carrying out hazard mitigation. The Emergency Management Team consisting of Director, EOC Chief, 6 Zone Captains and Zone Reporters as well as the Planning Commission, Health Officer, Service Officer, Zoning Administrator, State Police Advisory Board, Fire and Tree Warden and Constables help plan, oversee and implement municipal & mitigation activities.

The municipal budgeting process occurs on an annual basis, planning for a fiscal year from July to June. The budget is usually developed between early November and early January, and put to voter approval on the first Tuesday in March at Annual Town Meeting Day. The Selectboard is charged with developing and proposing the budget to the voters, including the budget for Highway Equipment. After the budget has been adopted by vote of town residents, the Selectboard has the authority to modify it in cases of extraordinary circumstances; i.e. natural disaster, unexpected equipment/infrastructure failure (i.e., water well, power failure, major bridge/culvert failure). The budget is monitored several times a month by the Selectboard and Town Treasurer.

Municipal revenues are generated primarily through levy of taxes on property value. Other major sources are federal & state payments to support the town school, aid (including grants) from the

Vermont Agency of Transportation for highways, and payments in lieu of taxes for land owned by the State of Vermont. The municipality also has the authority to incur debt through bonding.

Existing Mitigation, Maintenance, and Preparedness Programs, Projects & Activities

The ongoing or recently completed programs, projects and activities are listed by strategy and have occurred since the development of the previous plan and were reviewed by the planning team. They share and incorporate the overall goals of the local hazard mitigation plan. Duxbury has the capacity to maintain these programs and initiatives using town staff and community volunteers described in the Community Capacities above. Unless otherwise noted, there is no need to expand or improve on these programs, projects and activities.

It is important to note, the job of the Duxbury Highway Foreman continues to evolve. There is an increasing need to spend more time with administrative duties of the job over the equipment operator/supervisor responsibilities. This is in part due to new requirements and regulations the town is subject to from Act 64 (the Clean Water Act) and the need of the Town to secure funding from both non–emergency and emergency grants which help to increase their capacity for implementation of mitigation strategies and actions. The Town Road Foreman, Adam Magee, has the experience and ability to perform all roles however, the time spent away from performing the duties as equipment operator is a challenge the town recognizes going forward. (Annual Town Report year ending 2016). Some of the projects completed or awarded to protect roads and increase flood resiliency during the past year are listed below:

- 1800 feet of River Road was rebuilt as part of a multi-year project that will see nearly 1,800 to 2,500 feet of this road rebuilt each year for the next few years
- Ditching, graveling and/or culvert replacements were completed on Crossett Hill Road, Pleasant Street, Morse Road, Wilder Road, Ryan Road and Turner Hill Road
- Grants were awarded to ditch and stone line the big hill of Marshall Road and replace an 18” culvert crossing
- Grants were awarded to replace culverts at the beginning of Turner Hill and remove trees that will improve stream stabilization and protect the road and the new box culvert improving flood resiliency
- Grants were awarded to replace a 4’ structure on Dowsville Road which will provide better flood resiliency
- Repair of sections on Marshall Road, Turner Hill Road and Crossett Hill Road to better improve resiliency.

Community Preparedness Activities

- VTAlert was adopted by the Town in 2016 as the official Emergency Management notification system. The town will continue to conduct trainings and testing under

this system as part of its ongoing use and expansion of services that are or may become available using VTAlert system.

- Capital Equipment Plan
- Water Supply Contamination Plan
- Homebound Persons Phone Tree/E911 CARE form
- The list of equipment that residents have to assist in emergency management systems was updated.
- Development of a Red Cross Shelter in Duxbury is being explored.
- Local Emergency Operations Plan 2017 and renewed annually
- Trained and certified Selectboard members in ICS 100
- Communal awareness training with Moretown, Waterbury and Duxbury and the VT State Police on emergency operations plans. Expanded tabletop exercises are planned.
- Participation at LEPC 5 meetings -EMD participates at regular meetings of the Local Emergency Planning Commission #5. Volunteer time. Funding from VT DPS, VEM. No need to expand or improve on attendance.
- Appointment of a Town Fire Warden to serve a five year term. Kyle Guyette currently serves as Fire Warden, no further action needed.

Hazard Control & Protective Works

- Maintenance Programs (Culvert Survey & Replacement (290 culverts); Highway Survey (35 miles of Town Highway)) – CVRPC Survey 2016.
- Stone line ditch initiative to meet changes in the VT Codes and Standards for all ditches with slopes >5%
- Adoption of the 2016 VTrans bridge and culvert standards.
- Purchase of Culvert Thawing machine - allows for safe opening of frozen culverts meeting current standards replacing old method of using chainsaws and propane torches.
- Purchase of a Road Roller to compact freshly graded roadways. This keeps gravel on the roadway and reduces sediment going into streams.
- Mutual Aid, Mutual Aid response agreement with surrounding communities
- Town Road and Bridge Standards. Duxbury adopted the VT 2016 Road and Bridge Standards.
- Local Hazard Mitigation Plan 2012 and subsequent updates every 5 years. Plan is reviewed annually and after every disaster event with a full review and update by the Town at least every five years. Current 2012 Plan expires 3/11/2018. Plan Update is in process. Town will need to receive VEM and FEMA approval prior to adoption of this Plan.
- Primary Shelter and warming shelter have backup generators.

Insurance Programs

- Participation in NFIP –Town is currently updating zoning regulations and Flood District Overlay map. Regulations need to be adopted by the Selectboard.

Land use Planning/Management

- Ecological Reserve Lands District
  - Section 1 – Above 2,500 feet, all structures prohibited except Conditional Uses for structures associated with low intensity non-commercial recreation.
    Development in this area must make special consideration for impact on wildlife habitat and natural vegetative cover, along with erosion control
- Timber Management & Wildlife District
  - Section 2 – Between 1,500 feet and 2,500 feet only low impact, nonstructural development is a Permitted Use and minimum lot sizes are 25 acres. Low impact structures are a Conditional Use.
- Flood Hazard Overlay District
  - Section 7 – Limits construction of structures in floodplain areas designated within the Flood Insurance Rate Map for Duxbury.
- Zoning Ordinances are being updated (Land Use Development Regulations). Action to adopt proposed ordinance needs to take place.
- Work to close the depleted Town Gravel Pit remains unfinished. Town continues to work with the State of Vermont to resolve the matter to officially close the pit.
- Transfer of 169 acres of State land at end of Hart Road to Town for use as a Town Forest subject to conservation easement held by the Duxbury Land Trust and establish a Town Forest Committee to address issues related to management of the property. Time is needed to complete the transaction. Work of the Town Forest Committee will be ongoing and expand as needed.

Protection/Retrofit of Infrastructure and Critical Facilities

- Dry hydrants – 2
- Spare batteries for the repeaters were purchased so that repeater coverage will be available during power outages.
- Radio equipment was purchased so that each zone captain has a portable radio with an automobile antenna. In addition, reflective vests and highway cones were purchased for each zone.
- Capital Reserve Fund maintained to fund projects
- Public Awareness, Training & Education
- VTAlert exercise messages have been sent to Town Residents and all Residents are encouraged to sign up to receive alerts.
- Semi Annual radio checks and an annual table top exercise are being scheduled.
- A mailing will be sent to residents to reinforce the town zone system.

- Participation in 5-town Ridge to River task force
- Participation in Friend of the Mad River and Friends of the Winooski River nonprofit community organizations
- Use of town website for educational outreach and information dissemination

4.3 Plan Maintenance Process

The Duxbury Local Hazard Mitigation Plan will be updated and evaluated annually by a LHMP Committee to be created at the 2018 Town Meeting. At Future February Selectboard meetings the LHMP Committee will present recommend updates to the board. A review of the Local Emergency Operations Plan will also occur at this meeting. Updates and evaluation by the Selectboard 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 Selectboard, Planning Commission and public at the abovementioned February Selectboard meeting. CVRPC will help with updates or if no funding is available, the Select Board Chair will update the plan with the support of the LHMP Committee.

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, Valley Reporter, Front Porch Forum, Duxbury Store, Crossett School, bottom of Camel's Hump Rd., and CVRPC newsletter inviting the public to the scheduled Selectboard (or specially scheduled) meeting. These efforts will be coordinated by the Selectboard.

Monitoring of plan progress, implementation, and the 5 year update process will be undertaken by the Selectboard Chair and the LHMP Committee. 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 Selectboard meetings. After a five year period, the plan will be submitted for re-adoption following the process outlined in the schematic found in the Attachments section.
Duxbury 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 current and future Winooski River and Mad River planning documents and studies for ideas on future mitigation projects and hazard areas.

In 2013, the Vermont Legislature passed a law requiring all towns to incorporate a flood resiliency element into their Town Plan as of July 2014. As part of meeting this requirement, Duxbury will identify flood hazard and fluvial erosion hazards, strategies, and recommendations to mitigate risks to public safety, critical infrastructure, historic structures, and public investments. This Plan

will help Duxbury comply with the new community flood resilience requirements for Municipal Plans adopted after July 2014 and will assist the Planning Commission in their work as they update the existing and due to expire Duxbury Town Plan.

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. Refer to section 4.2 for a description of the hazard mitigation rubric. Greater explanations and mitigation strategies of moderate 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	No	
Drought	Low	No	
Earthquake	Low	No	
Extreme Cold/Winter Storm/Ice Storm/Power Failure	High	No	
Flash Flood/Flood/Fluvial Erosion	High	Yes	X
High Wind	Low	No	
Hurricane/Tropical Storm/Severe Storms	Med	Yes	X
Structure Fire	Low	No	
Tornado	Low	No	
Water Supply Contamination	Low	No	
Wildfire/Forest Fire	Med	Yes	X
Ice Jams	Low	No	

Flood/Flash Flood/Fluvial Erosion, based on history, has a High Likelihood of happening. At least one flood event each year over the past five years has occurred in Duxbury. Therefore the likelihood of Flood/Flash Flood/Fluvial Erosion has been changed from Med to High in the above chart.

[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)?

Those hazards not found to pose the greatest threat to Duxbury such as avalanches, drought, earthquakes, tornadoes, dam failures (man-made), water supply contamination, extreme heat, landslides/mudslide/rockslides, invasive species, hazard material spills, structure fire, ice jams and nuclear power plant failure are not addressed in this Plan and were not included in the risk and vulnerability assessment due to the low occurrence, low probability of impact or negligible potential impact and scarce community resources (time and money). A review of the Vermont State Hazard Mitigation Plan of November 2013 provides a greater explanation of these hazards and possible mitigation strategies to address them. Like the State of Vermont Hazard Mitigation Plan, Duxbury did not include the following hazards in the risk and vulnerability assessment due to the low occurrence, low vulnerability, and or geographic proximity: civil disturbance, coastal erosion, expansive soils, karst topography, sinkholes, tsunami, and volcano.

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

- Flash Flood/Flood/Fluvial Erosion
- Hurricane/Severe Storms/Tropical Storms
- Wildfire/Forest Fire

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

Moderate threat hazards include
- Dam Failures (Bolton Falls No. 1, Duxbury Mill, Ice Pond, beaver dams)
    - Duxbury is in the flood inundation zone for both Waterbury and Wrightsville Dams
- Extreme Cold/Winter Storm/Ice Storm/Power Failure

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 and the National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI), formally the National Climate Data Center, a narrative description of the hazard and a hazard matrix containing the following overview information:

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 dependent on hazard	Dollar value or percentage of damages	Likelihood of hazard occurring based upon past events: HIGH = Near 100% probability in the next year. MEDIUM = 10% to

					100% probability within 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

Flash Flood/Flood/Fluvial Erosion

History of Occurrences: Local and County Wide Data – nearest flood gauges are Winooski Gauge, Waterbury and Mad River Gauge, Moretown (from NCDC website and FEMA DR List), NOAA NEEI storm events database.

Date	Event	Location	Extent **and** Impact
6/29/2017 – 7/1/2017	Flood/Flash Flood, Severe Storm	Duxbury, County wide	Heavy rains approx... 1-1.5 inches of rainfall on top of 3-4 inches of rain over a prior period of four days. Road damage on River Road, Upper Marshall Road, Hayes and South Crossett Hill Road. Culvert replaced on Marshal Road. Moved material in front of culvert on Turner Hill to remove obstruction. FEMA Grant covered costs. Crossett Hill slide estimated to cost $525,000 to repair. DR 4330-VT
8/16/2016 – 8/17/2016	Flash Flood	Duxbury, Washington County	3 – 5 inches of rain in a few hours. Total road damage cost ~$350,000, Town paid share of cost ~$125,000. Damaged roads – Welch Rd., Turner Hill, Stevens Brook Rd., Crossett Hill, and Dowsville Rd. Work involved culvert replacement and road restoration.
7/19/2015 7/20/2015	Flash Flood, severe storm	Duxbury, Parts of Washington County	Excess of 2” torrential rainfall with training thunderstorms. Road damage ~$70k – Major washouts on Mountainview Road,

			Camels Hump Road, Scrabble Hill Road.
4/15/2014 – 4/18/2014	Flood, Severe Storms	State-wide Washington County Duxbury	Heavy rains & melting snow pack; release of 4-6 inches of water from snowpack. Road Damage to River Road, Scrabble Hill Rd., Wilder Rd. Camels Hump Rd. Cross Hill, Ward Hill, Turner Hill, Dowsville Rd., and Stevens Brook Rd. Damage included 6 culverts and road washout and scouring. Federal share of obligation for 4 projects $168,264.40. DR 4178- VT
6/25/2013-7/11/2013	Flood/Flash Flood/Fluvial Erosion, Severe Storms	State-wide Washington County Duxbury	Rainfall rates of 2 inches/hour. Mad River in Moretown crested at 9.33 feet. Federal share obligated to Town of Duxbury for 4 projects $47,146.44. DR 4140-VT
8/28/2011	Flood/Tropical Storm	Statewide, Duxbury	Winooski Flood gauge knocked out – above 423.3 feet (flood stage is 419 feet). Federal share of obligation for 7 projects $629,594.93 DR 4022
5/27/2011	Flood	Duxbury	Winooski flood gauge at 423.3 feet DR 4001
4/11/2011	Flood	Duxbury	Winooski flood gauge at 421.0 feet
10/01/2010	Flood	Duxbury	Winooski flood gauge at 421.8 feet
1/19/2006	Flood, Ice jam	Duxbury	Winooski flood gauge at 421.9 feet
12/17/2000	Flood	County Wide	3” of rain, $1 M in damages
6/27/1998	Flash Flood	County Wide	3-6” of rain over 2 day period – Mad River flood gauge at 14.13 feet (flood stage is 9 feet) DR 1228
1/19/1996	Flood; ice jam	County Wide	3-5” of rain, not historical crest
8/4/1995	Flood	County wide	$1.5 M damages; Mad River gauge at 8.12 ft.

8/10/1976	Flood	County Wide	Mad River flood gauge at 13.47 feet DR 518
9/22/1938	Flood	County Wide	Mad River flood gauge at 16.34 feet
11/03/1927	Flood	County Wide	Mad River flood gauge at 19.40 feet

Flooding/flash flooding/fluvial erosion is Duxbury'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. Fluvial erosion extent data is not available for Duxbury.

The major water bodies within the Town of Duxbury are: Ridley Brook, which drains the northwestern portion of the Town into the Winooski; Crossett and Dowsville Brooks draining the eastern section of Town; and Shepard Brook, which provides drainage to a small area in the southwestern portion of Town. The Winooski River, which serves as the Town's northern border, drains into Lake Champlain. These waterways drain the Green Mountain's principle eastern ridge, resulting in a vertical drop of over 3,700 feet within the Town. As a result, there exists great variability in the streams' water levels, which makes them prone to flooding and erosion during snowmelt and after heavy rains.

The majority of the Town's National Flood Insurance Program (NFIP) designated 100-year floodplain is located along the Winooski and out of reach of most of the Town's built environment. However, based on the results of overlaying the FIRM flood maps with the location of the E911 points, there exist 37 buildings and 70 properties in the Town that are vulnerable to potential flooding the estimated loss for a severe flooding event for all properties located within the Town's 100-year floodplain is approximately $32,468,400. There are no repetitive loss structures in Duxbury.

In 2014, Duxbury received a Hazard Mitigation Planning Grant to acquire the Cubit property located on River Road which was in the floodplain. The property was cleared and remains as open space in perpetuity. This mitigation action was part of the communities flood resiliency efforts to remove the risk and vulnerability to flooding.

As previous events have made clear, even areas beyond the NFIP designated 100-year floodplain may be vulnerable to flood related hazards. Channel adjustments with devastating consequences have frequently been documented wherein such adjustments are linked to historical channel management activities, floodplain encroachments, adjacent land use practices and/or changes in watershed hydrology associated with conversion of land cover and drainage activities, within and beyond the NFIP floodplain. The attached Local Areas of Concern Map identifies the Crossett Brook Middle School and Town Offices, as well as other buildings, as outside the designated floodplain, but nearest major waterways.

In order to maintain NFIP compliance, Duxbury adopted a flood hazard overlay district to limit new development in flood prone areas. The Development Review Board is charged with reviewing development applications in the overlay areas. The Zoning Administrator is charged with enforcement of the regulations. The overlay is based on the NFIP 100 year floodplain data. Duxbury's current FIRM date is 3/19/2013. New digital flood maps for Washington County are in the preliminary approval stages as of writing this plan. The Town has three policies in force for a total coverage of $2,358,800. The Town has not reported any flood hazard regulation compliance issues.

The worst anticipated flooding varies throughout Duxbury due to the terrain. Most flooding in the highlands is experienced as flash flooding. The worst flooding event in Duxbury's recorded history occurred in 1927, followed closely by the 2011 events in April, May and August. Data from the Winooski flood gauge for the 1927 event is not available. The Mad River gauge was 10 feet above flood stage. During Irene, the Winooski flood gauge was damaged and the Mad River flood gauge was 10 feet above flood stage In the future, Duxbury can better gather data for flooding extent by having individuals call in local flood levels in areas around Duxbury.

In 2011, storms in April, May and August caused severe damage to Duxbury public and private infrastructure. Duxbury estimates that it cost close to $2 million to repair public infrastructure damages from the storms. Damage to road and culverts from the April storm occurred on:

- Camels Hump Rd – slide on lower road, bridge abutment severely damaged
- Dowsville Rd
- Scrabble Hill Rd
- Mountain View Rd
- Legal trails – Wescott Rd
- Ward Hill Rd
- Crossett Hill Rd – bridge and road damage
- River Rd
- Pollander Rd

On August 28, 2011, 4-5" of rain fell during Tropical Storm Irene. Damages from Irene cost the Town approximately $750,000. Tropical Irene storm damaged occurred in the following areas:

- Stevens Brook Rd – culvert
- Dowsville Rd – 6 ft. culvert
- Camel's Hump Rd – lower portion again, bridge 41 at Marshall Rd
- Crossett Hill Rd
- River Rd

In addition to public infrastructure, there was extensive damage to private driveways on steep hills, and riverside properties in low lying areas, especially mobile home parks. Mobile home parks that were damaged were Crossett Hill and Duxbury Corner mobile home parks.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Flood/Flash Flood/Fluvial Erosion	Camel's Hump Rd, Dowsville Rd, Scrabble Hill Rd, Mountain View Rd, Wescott Rd, Ward Rd, Crossett Hill Rd, flood plain, areas of steep slopes /terrain. Areas where roads cross waterways, including bridges and culverts.	Roads, bridges, culverts, mobile home parks, properties in floodplain and areas along steep terrain	Winooski River gauge highest recorded historical crest at 423' on 5/28/11; gauge damaged during TS Irene event, but water was higher.	Over $2 million	High

Vermont's Act 64 is our legislature's response to the effects of flooding and runoff from roads connected to its major streams, rivers, ponds and lakes. Full implementation begins in 2018. It provides guidelines and goals to communities throughout Vermont for improving the resilience of roads during severe weather thereby enabling them to be more effective in diverting pollutants and sediment from entering these water resources. It provides grant opportunities to aid municipalities in funding the remediation of erosion or flood-prone areas. Many towns are already engaged in implementing the Act's directives. 2038 is the target year for the successful completion of road improvements required for all municipalities via an incremental yearly approach. Duxbury is actively working with the Agency of Transportation, Agency of Natural Resources and the Central Vermont Regional Planning Commission to meet the new regulations and requirements, including the Municipal General Roads Permit. Duxbury participates in the region's Transportation Advisory Committee (TAC) as well.

Damage to roads and the cost of their rehabilitation is a continuing challenge for communities around the state. Although no storms approaching Tropical Storm Irene's magnitude have occurred since 2011, heavy rainfall at rapid rates of accumulation continues to effect road infrastructure. Events are often localized but cumulatively have sometimes triggered federal and state disaster status allowing grant money to be accessed by affected communities. Over the last five years, since Tropical Storm Irene, Duxbury has experienced at least one flood event a year. The following table shows the cost of some major events that have occurred in Duxbury since 2017.

Year	Weather Event	Location	Work needed	Cost
April 15–18 2014	Heavy rain, significant snowmelt, flooding	River Rd–four culverts, Scrabble Hill Rd– Wilder Rd, Camels Hump Rd., Cross Hill, Ward Hill, Turner Hill, Dowsville Rd., Stevens Brook Rd.	6 culverts; road washout repair	Federal/state cost $250,000
July 19 2015	Heavy rain, flooding	Mountainview Rd, Camels Hump Rd Scrabble Hill Rd–	Major washouts - ditching w/ stone-lining, culvert installation and replacement, road surface repair	~$70,000
August 17, 2016	Heavy rain, flash flooding	Welch Rd, Turner Hill, Stevens Brook Rd, Crossett Hill, Dowsville Road.	Culvert replacement, road restoration	$350,000 total damage, Town cost after grants and federal assistance funding, $125,000 (year ending 2016 Annual Town Report, Road Foreman Report Selectboard Report)
June 29, 2017 – July 1, 2017	Heavy rain, thundershowers, Flash Flood	River Road, Upper Marshall Road, Hayes and South Crossett Hill Road. Culvert replaced on Marshal Road. Moved material in front of culvert on Turner Hill to remove obstruction.	Culvert replacement, road restoration	FEMA grant covered costs. Crossett Hill slide estimated to cost $525,000 to repair (year ending 2017 Annual Town Report, Road Foreman Report)

Year	Weather Event	Location	Work needed	Cost
2017 Event	Heavy rain,	Dowsville Rd	Professional engineering Large Culvert Replacement Temporary remediation	Structure grant from VTrans for $329,705.00 to replace a 4 foot structure with a new super-structure (2017 Annual Town Report, Highway Foreman's Report 2017-2018).

Duxbury has lessened the impacts and the town's vulnerability to the hazard of flooding/flash flooding/fluvial erosion with mitigation activities and repairs done to its infrastructure over the past five years (and as previously noted in the 2012 Plan). The Town Capital Reserve Fund, Town Highway Fund budget, AOT grants, Federal and State assistance fund, and the recent completed Culvert Inventory and Highway Survey are tools and resources that help the town prioritize and implement their strategies. With the Culvert Inventory and Highway Survey completed, the Town is, "well positioned to apply for grants for assistance in fixing some of our bigger infrastructure challenges." (year ending 2016 Annual Town Report, Selectboard Report).

As noted in the Duxbury Town Plan, and further emphasized by work of the Ridge to River task force, storm water management is a priority for the community and over the past five years emphasis had been placed on various storm water mitigation projects, studies and activities.

It is important to note that Vermont has experienced a majority of their flooding in areas along upland streams and in road drainage systems that do not adequately convey the amount of water they are receiving. Flooding in these areas should be expected and planned for. The National Weather Service has seen a trend in recent years of more intense, locally severe storms with high intensity rain and flooding associated with them.

The topography and extent of several streams and tributaries make Duxbury susceptible to the danger of flash flooding. As noted in the Vermont State Hazard Mitigation Plan, these areas are not shown on the FEMA FIRMs. The Vermont Department of Environmental Conservation River Program is working to provide statewide coverage of fluvial erosion hazard (FEH) areas along the streams and river corridors. The river corridor is in the process of being delineated for the larger streams and rivers and setbacks have been established for the smaller upland streams. This data is due to be released within the next year and will be a valuable tool for Duxbury in their efforts to help mitigate the risk of flash flooding. Once the statewide river corridor digital map layer is finalized it will facilitate mitigation and river corridor protection planning and

prioritization. If funding is available and the political will exists, CVRPC can assist Duxbury in the development of river corridor regulations that incorporate the Vermont mapped Fluvial Erosion Areas once these maps are released.

Hurricanes/Tropical Storms/Severe Storms

History of Occurrence (from the National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI), formally the National Climate Data Center (NCDC) website and FEMA DR List):

Date	Event	Location	Extent and Impact
10/29/2017-10/30/2017	High Wind, Flooding	State wide; Duxbury	DR 4356, winds up to 63 mph, 51,300 customers statewide without power. No specific extent data available for Duxbury. Camels Hump Road trees down and scattered power outages across town.
7/8/2017	Thunderstorm winds	Duxbury	50 knot winds (58 mph)
5/31/2017	Thunderstorm winds	Duxbury	50 knot winds (58 mph)
7/19/2015-7/20/2015	Thunderstorm Winds, Hail	Duxbury	Hail up to 1”, 50 knot winds
6/24/2013	Thunderstorm Winds, Hail	Washington County, Duxbury	Hail up to 1”, 50 knot winds
6/18/2012	Hail	Duxbury	.88 inch hail, nickel size reported, damaging winds
8/28/2011	TS Irene	Statewide	~6” rain , Mad River flood gauge at 19.07 feet; 9 feet is flood stage (Winooski gauge damaged) DR 4022
5/27/2011	Severe Storm, flash flooding	Waterbury Center	1” hail, 3-5” of rain, 52 knot winds DR 4001
4/23/2011-5/9/2011	Severe Storm, heavy rain, snow melt, flash flooding	Duxbury	Up to 3 inches of rainfall from thunderstorms plus significant snow melt. Several town roads were destroyed, and washouts as much as 60 feet long and 9 feet deep were scoured out by flood waters. DR 1995 Federal obligation to Duxbury $811,074.94 for 11 projects.

7/21/2008-8/12/2008	Severe storms, flooding	County Wide	3-5" of rain. Federal share of obligated funds for 4 projects $73,087.53. DR 1790
8/25/2007	Severe Storms	Waterbury Center	65 mph wind gusts, 1" hail
7/9/2007	Severe Storms, hail, flooding	Duxbury, Waterbury, Middlesex	1"-2.75" hail. $20k property damages, DR 1715
6/19/2006	Severe storms	Waterbury	55 knot winds, downed trees and power lines
8/1/2005	Severe Storm	Waterbury Center	1" hail
9/16/1999	Tropical Storm Floyd	Statewide	Tropical Storm, DR 1307, Mad River gauge 8.23 feet
6/17/1998	Severe Storms	County Wide	DR 1228, Mad River gauge 14.13 feet
5/29/1998	Severe Storms	Duxbury, Waterbury, Middlesex	50 knot winds, heavy rains, downed trees and power lines
7/15/1997	Severe Storms	County Wide	Data gap - gauge data not available
8/4-6/1995	Severe storms, flooding	County Wide	DR 1063 – 3-6" of rain – Mad River gauge at 8.12 ft.
7/23/1990	Severe Storms, flash flooding	County Wide	DR 875 – not a historical crest
8/4/1989	Severe Storms, Flooding	County Wide	DR 840 – Mad River gauge at 10.23 feet
6/7/1982	Severe Storms	New England	14" of rain, $276 M damages
8/5/1976	Hurricane Belle	Statewide	Gale force winds, 2 deaths, DR 518 - gauge data not available
7/3/1964	Hail	County Wide	1.5" hail
9/22/1938	Hurricane	Statewide	Category 1 force winds - gauge data not available

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 (equivalent of 50 knots or greater), and/or tornadoes. Severe storm events can occur in 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 impacts associated with hurricanes and severe storms are mainly associated with flooding impacts. The past five years of severe storm data associated with flooding and the damage locations from April, TS Irene, and the May 28, 2011 storm events are outlined in the Flood/Flash Flood/Fluvial Erosion hazard section of this Plan. There were no high wind impacts associated with these events. Over the past five years, Thunderstorm winds associated with severe storms have become more prevalent. The statewide storm in July left 51,300 customers without power for an extended period of time (days). Specific data for Duxbury is not available but during these storms local knowledge showed the town experienced downed trees and limbs, debris, scattered power outages, and temporary travel delays while roads were cleared of trees and limbs.

Similar to flooding, the extent of severe storms is not well documented in the Town of Duxbury. The impact of storms is usually flood related. See flood extent description in flood section above. Wind and hail extent data from storms is not well documented as there is no monitoring station in Duxbury. Estimates for wind and hail are gathered from Washington county wide data off the National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI), formally the NCDC website. To date, the worst wind extent in Duxbury was hurricane force winds from Hurricane Belle. In the future, Duxbury could consider installing a monitoring station on major brooks and training staff as spotters to better gather data for wind and flood events. The scales used by spotters to measure the extent of the severe storm events are:

Saffir-Simpson Scale for Hurricane Classification				
Strength	**Wind Speed (Kts)**	**Wind Speed (MPH)**	**Pressure (Millibars)**	**Pressure**
Category 1	64- 82 kts	74- 95 mph	>980 mb	28.94 "Hg
Category 2	83- 95 kts	96-110 mph	965-979 mb	28.50-28.91 "Hg
Category 3	96-113 kts	111-130 mph	945-964 mb	27.91-28.47 "Hg
Category 4	114-135 kts	131-155 mph	920-944 mb	27.17-27.88 "Hg
Category 5	>135 kts	>155 mph	919 mb	27.16 "Hg
Tropical Cyclone Classification				
Tropical Depression	20-34kts			
Tropical Storm	35-63kts			
Hurricane	64+kts or 74+mph			

Beaufort Wind Chart – Estimating Winds Speeds

Beaufort Number	MPH Range	MPH Average	Terminology	Description
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	**Severe gale**	**Light structure damage.**
10	55-63	60	**Storm**	**Trees uprooted. Considerable structural damage.**
11	64-73	70	**Violent storm**	**Widespread structural damage.**
12	74-95	90	**Hurricane**	**Considerable and widespread damage to structures.**

Combined NOAA/TORRO Hailstorm Intensity Scales

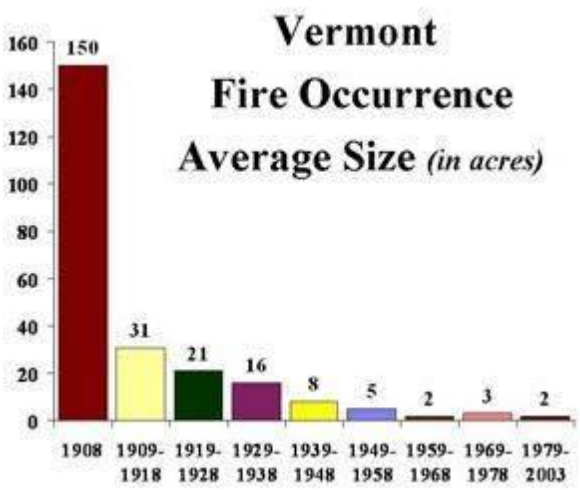
Size Code	Intensity Category	Typical Hail Diameter (inches)	Approximate Size	Typical Damage Impacts
H0	Hard Hail	up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33-0.60	Marble or Mothball	Slight damage to plants, crops
H2	Potentially Damaging	0.60-0.80	Dime or grape	Significant damage to fruit, crops, vegetation
H3	Severe	0.80-1.20	Nickel to Quarter	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Half Dollar to Ping Pong Ball	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.6-2.0	Silver dollar to Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	2.0-2.4	Lime or Egg	Aircraft bodywork dented, brick walls pitted
H7	Very destructive	2.4-3.0	Tennis ball	Severe roof damage, risk of serious injuries
H8	Very destructive	3.0-3.5	Baseball to Orange	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	4+	Softball and up	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Hazard	Location	Vulnerability	Extent	Impact	Probability
Hurricane/ Severe Storms/Tropical Storms	Camel's Hump Rd, Dowsville Rd, Scrabble Hill Rd, Mountain View Rd, Wescott Rd, Ward Rd, Crossett Hill Rd, flood plain, Town and State Forest tracts, residential and commercial properties, utilities.	Roads, bridges, culverts, mobile home parks, properties in floodplain, residences, businesses, utilities, critical facilities, crops, woodlots and forested areas	Winooski River historical crest at 423' on 5/28/11; gauge damaged during TS Irene event. Winds up to 50 knots. Hail up to 1 inch in size	Over $2 million	medium

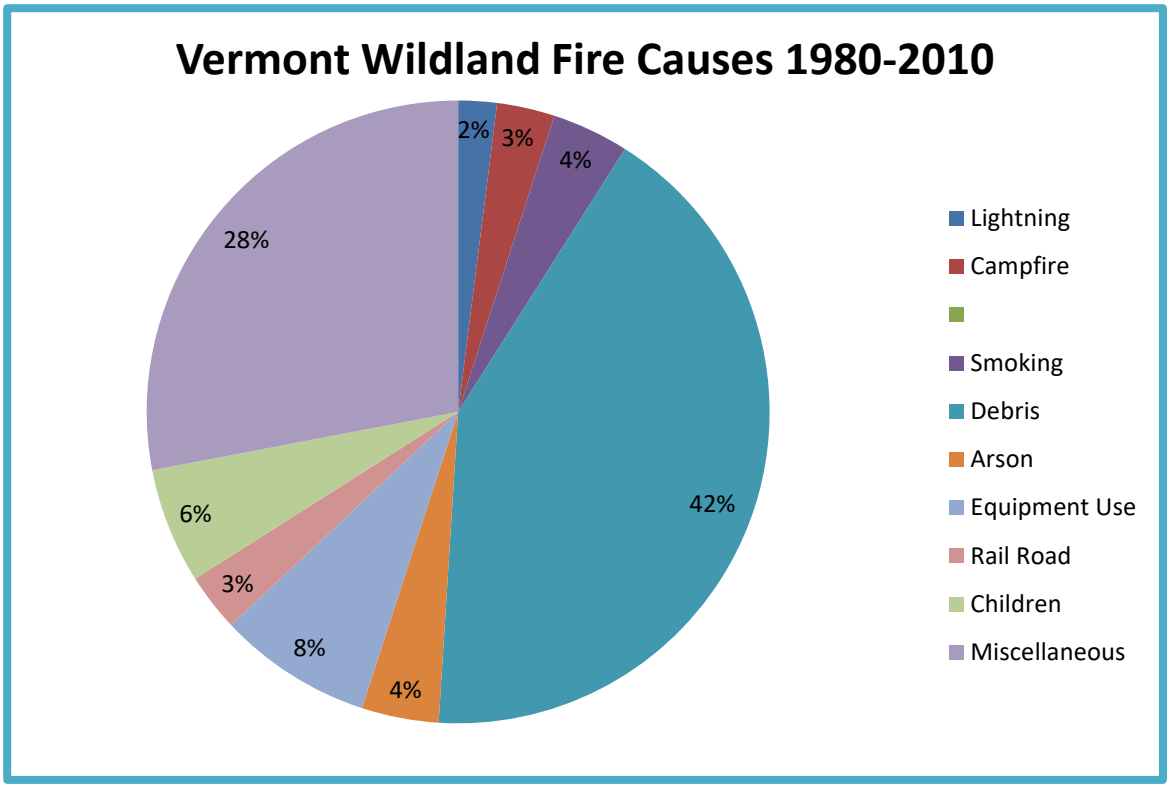
Wild Fire/Forest Fires

FEMA indicates there are three classes of wild land fires – surface fires, ground fires and crown fires, with the most common type indicated as a surface fire. Surface fires burn slowly along the forest floor, killing and damaging trees. Ground fires burn on or below the forest floor and are usually caused by lightning. Crown fires move quickly by jumping along the tops of trees. Crown fires can spread quickly during windy conditions.

In Vermont, wildfires are not a common occurrence. The Vermont State Hazard Mitigation Plan states there has not been a major wildfire in Vermont in the last 50 years. According to the Northeast Wildfire Organization, Vermont averages 200 - 400 fires a year with an average size of 1.5 to 2 acres. Back in 1908, the average fire size was 150 acres. The area of acres burned in Vermont has consistently gone down each year. The table to the right shows this decline and was taken from the Northeast Wildfire Organization website, http://www.northeastwildfire.org/vermont.



According to the Vermont Forest Parks and Recreation, burning debris is the most common cause of wildfires in Vermont. In Vermont, wildfires are most prevalent in the spring and late summer and early fall when conditions are most favorable. Drought conditions also increase the threat of wildfires. In 1903, Vermont experienced a devastating fire season, which prompted the state to pass legislation creating a town forest fire warden program. The forest fire warden program focuses on fire prevention, suppression, and fire safety at the local level. In 1939, an amendment to the law required the use of burning permits, issued by the local fire warden. In Vermont, forest fire wardens issue 20,000 burning permits annually. In 1966, 1999, 2000, and 2005 the state issued statewide bans on open burning due to the extreme vulnerability to the wildfire/forest fire hazard. In March of 2012, the threat of fire was severe due to the low humidity, warm temperatures, and strong winds prevalent in Vermont. The low occurrence of wildfires in Vermont is attributable to the local forest fire warden program, early detection measures, trained and equipped fire departments, and public education and outreach. The fires that do ignite tend to be small.



Duxbury actively participates in the Forest Fire Warden program under the VT Division of Forestry. The Commissioner of Forest, Parks, and Recreation appoints the Forest Fire Warden with the approval of the Selectboard for a five-year term, with unlimited reappointments possible. The Division of Forestry offers annual training opportunities on the latest methods, technologies and trends in wildland fire. The National Weather Service in Burlington VT posts daily fire danger levels and alerts. The fire warden program is instrumental in helping reduce and prevent the risk of forest fires in Duxbury, where 90% is forested. The Town website provides contact information for the forest fire warden with information on safe open burning and the permitting procedure residents must follow.

Stress caused by disease, insect infestation, and changes in climate affect the health of the forest and can lead to die off, adding more fuel availability which can increase the risk, extent, duration, and severity of a wildfire or forest fire. Although Duxbury has no large or small scale developments planned in the future, encroachment on forestlands presents greater threats of forest fire. As noted in the local Municipal Plan and the 2017 Vermont Forest Action Plan, a buffer between future residential development and forest land should be maintained to reduce the threat of forest fire and also protect important watershed areas. Additional impacts include loss of wildlife habitat and recreational amenities including hiking and snowmobiling trails. All impacting the local tourist economy and resident's quality of life.

Approximately 90 percent, or 27,000 acres, of Duxbury is wooded. Despite the absence of recent forest fires of significant size, the volume of the Town's forested landscape in conjunction with dry and windy weather has the potential to rapidly spread fire and create a hazardous situation. Much of Duxbury is unreachable by road and an extensive dry hydrant system does not exist, limiting firefighting ability. Properties within the Town's interior are at greatest risk to forest fires; especially in the case where access is limited to a single road, such as Devlin Road, Richardson Road, and the properties off of Camels Hump Road. Approximately 122 residences are located within these three areas. Using Duxbury's average grand list property value, the approximate total value of properties with the greatest risk to forest fire is approximately $34 million.

The Town recently acquired 169 acres of forested land for the Duxbury Town Forest and has established a Town Forest Committee. The Committee is charged with exploring use and maintenance options which will be presented to the Town for consideration.

VERMONT SPRING WILDFIRE STATISTICS		
10-year Average 2005 - 2014		
Official reports - reports have been verified by warden & VT FPR		
Month	# Fires	# Acres
March	9	29
April	62	142
May	19	30
TOTAL	90	201
Vermont Dept. Forest, Parks, & Recreation - 2015 Spring Fire Season Summary		

This table documents average wildfire occurrences over a recent 10-year period for the State of Vermont. Duxbury identified in the 2010 Vermont Forest Resources Plan as a Town at Low to Moderate Risk for wildfire (Map 32: Vermont Wildfire Risk Assessment, May 26, 2010). Data on the magnitude of forest fires affecting Duxbury is not available. A data gap exists.

The 2017 Vermont Forest Action Plan includes several goals regarding forest fire prevention. To help prevent local forest fires, the State works with local Planning Commissions to develop Community Wildfire Protection Plans (CWPP). These plans help towns to identify and mitigate wildfire risk. A limited number of towns have a CWPP in the state. The 2017 Vermont Forest Action Plan is a good resource and tool for the Duxbury Town Forest Committee.

COMMUNITY WILDFIRE PROTECTION PLANS The Healthy Forests Restoration Act (HFRA) encourages communities to develop Community Wildfire Protection Plans (CWPPs). Vermont already has a robust community-based town forest fire warden program. CWPPs can build on that foundation, although with our history of low fire danger, encouraging towns to participate in CWPPs has been challenging. However, several CWPPs have been completed in all regions of the state with input from local fire departments, planning commissions, and representatives from state and federal wildland fire agencies. These plans identify both strengths and shortcomings in effective wildland fire response in a rural landscape. With the predicted changes to our climate, wildfire risk is likely to increase. The Department will continue to encourage communities to consider CWPPs and views these plans as an excellent tool to build trust and cooperation between all partners involved in wildland fire pre-suppression efforts, identify wildland urban interface areas, values at risk from wildland fire, response time by fire departments, and access to water including dry hydrants. The Forestry Division has provided funding to third parties for the installation and maintenance of dry fire hydrants throughout the state. These hydrants provide valuable water sources in a rural state, allowing for greater access and faster resupply of water for wildland fires. Volunteer fire departments view these dry hydrants as critical assets and depend on 25 National Weather Service, Fire Weather, 2016, www.weather.gov/btv/firewx, 2016. 37 | Page 2017 Vermont Forest Action Plan them for pre-planning of fire incidents. The Forestry Division believes this is a worthwhile program that benefits local towns and intends to continue to fund and promote dry hydrants. (VFAP page 36-37)

Hazard	Location	Vulnerability	Extent	Impact	Probability
Wildfire/Forest Fire	Camel's Hump State Forest, Town Wide, Devlin Rd, Richardson Rd, Camels Hump Rd, 169 acre Duxbury Town Forest	Properties on urban/forest interface, private homes, road infrastructure, utilities, state, public and private forestlands, recreational trails, wildlife habitats	To date - 0 acres burned. Total forested area potential for burning is 27,000 acres. No data exists for Duxbury.	$34 million, plus firefighting costs	Medium

5.3 Moderate Threat Hazards

Dam Failures

The dams of concern in Duxbury are beaver dams. The exact number and location of all the beaver dams is unknown; however, the majority of them are located in Camel's Hump State Park and the heavily wooded areas of Duxbury. Known locations of beaver dams include:

- Vigilante Rd
- VAST Trail in Camel's Hump State Park
- Dowsville Rd
- Atwood Rd

There have been several occurrences of beaver dams washing out and flooding downstream property. The most recent breech occurred in April 2011. The previous winter had been especially snowy, followed by a period of heavy rain. The dam on Dowsville Rd was washed out. The additional water from the dam in conjunction with the heavy rains and snowmelt damaged a 6 foot culvert downstream of the dam. To address this hazard, the Town may consider hiring local trappers to control the beaver populations on a regular basis as part of the routine maintenance to protect town roads.

The Town is also in the flood inundation zone for Waterbury and Wrightsville dams. The Town will follow the actions in the approved Emergency Action Plans for each dam.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Dam Failure (beaver)	Camel's Hump State Park, Vigilante Rd, VAST Trails, Dowsville Rd, Atwood Rd	Roads, culverts, driveways, trails	Data gap exists – depends on severity of event. April 2011 Winooski Flood Gauge at 421.0 ft.	Depends on severity rain/ snowmelt events. April 2011 – 6 foot culvert damaged at cost of $____	Medium

Winter Storm/Ice Storm/Extreme Cold/Power Outage

History of Occurrence (from the National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information (NCEI), formally the National Climate Data Center (NCDC) website and FEMA DR List.) Due to the area-wide nature of winter storms, snowfall depths vary in and around the Town of Duxbury:

Date	Event	Location	Extent and Impact
3/14/20017-3/15/2017	Winter Storm	Statewide, Washington County	12+-36 inches of snow statewide. 14-24 inches of snow county wide. No snow fall totals for Duxbury available.
2/12/2017	Winter Storm	Statewide, Washington County	No snowfall totals for Duxbury available. Moretown 14", Waterbury 12"
2/1/2015-2/28/2015	Extreme Cold	Statewide, Washington County	In February, many sites recorded 15 to 20+ days below zero & on several days, dangerously cold wind chills of 30 below zero or colder occurred. Record Cold February 2015 for much of Vermont. Many communities witnessing the coldest month since December 1989 or January 1994. The average departure was 13 to 17 degrees below normal. No specific extent data for Duxbury is available.

1/7/2015-1/8/2015	Extreme Cold	Statewide, Washington County	15 below to 25 below zero in Washington county; with winds of 15 to 30 mph that created wind chills colder than 20 to 30 below zero through the overnight into the morning hours of January 8th. No specific extent data for Duxbury is available.
12/9/2014-12/13/2014	Winter Storm	County wide,	Heavy, wet snowfall totals across Washington County ranged from 6 to 24 inches. Snow to water ratios of 8:1 or less accounted for snow-loaded trees that resulted in more than 175,000 power outages in the region from December 9th through December 12th This was the 2nd most power outages due to weather in the state of Vermont. No specific extent data for Duxbury is available. FEMA Total PA obligated statewide $3,949,028.57. DR-4207-VT
11/26/2014-11/27/2014	Winter Storm	Statewide	Snowfall totals of 8 to 14 inches. No specific snowfall data for Duxbury. Waterbury 14", Fayston 13".
3/12/2014-3/13/2014	Winter Storm	Statewide, County wide, Washington County	Snowfall totals across Washington County generally 12 to 20+ inches. Strong winds drifting blowing snow; gusts up to 35-40mph. No specific data for Duxbury.
2/13/2014	Winter Storm Heavy Snow	Statewide, County wide, Washington County	Heavy snowfalls 10 "– 24" throughout Washington County at rates of 1-2+ inches an hour. No specific data for Duxbury.
12/26/2012-12/28/2012	Winter Storm	County wide, Washington County	Snowfall accumulations of 9" to 18"in Washington County. Warren 20". No specific data for Duxbury.
11/23/2011	Winter Storm; Ice Storm	County wide, Washington County	Washington County 5-12 inches of a heavy, wet snow mixed with rain, freezing rain, & sleet. Isolated to scattered power outages due to wet, heavy snow bending or breaking tree limbs

			onto power lines. No Duxbury specific data available.
3/6/2011	Winter storm Ice storm	Washington County, Duxbury	15-25” of snow with ice accumulation up to 1/4 inch in Central Vermont. 10,000 customers lost power statewide
2/23/2010	Winter Storm	Washington County, Duxbury	20” of snow and 50,000 customers lost power statewide
2/22/2009	Winter Storm	Washington County, Duxbury	10-18” of snow, 30 mph wind gusts
2/1/2008	Winter storm	Washington County, Duxbury	3-7” of snow and ice ¼-1/2”thick, 50 mph wind gusts
2/14/2007	Winter storm	Washington County, Duxbury	18-22” of snow
1/4/2003	Winter storm	Washington County, Duxbury	12-20” of snow
3/5/2001	Winter storm	Washington County, Duxbury	15-30” of snow
12/31/2000	Winter storm	Washington County, Duxbury	15” of snow
12/29/1997	Winter storm	Washington County, Duxbury	8-21” of snow
12/7/1996	Winter Storm	Washington County, Duxbury	12” of snow
3/21/1994	Winter storm	Washington County, Duxbury	5-11” of snow
11/1/1993	Winter storm	Washington County, Duxbury	10-20” 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, tress, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. Periods of extreme cold tend to occur with these events.

Although winter storms and periods of cold temperatures are a frequent occurrence, the extent of winter storms within Duxbury is difficult to estimate as it is dependent on the size and path of the storm. In general, Duxbury does not consider a storm of up to 12 inches of snowfall significant

because they are equipped to handle it. The chart of historical occurrences in this Plan identifies some of the more significant events from 2017 - 1993. Specific data for Duxbury does not exist.

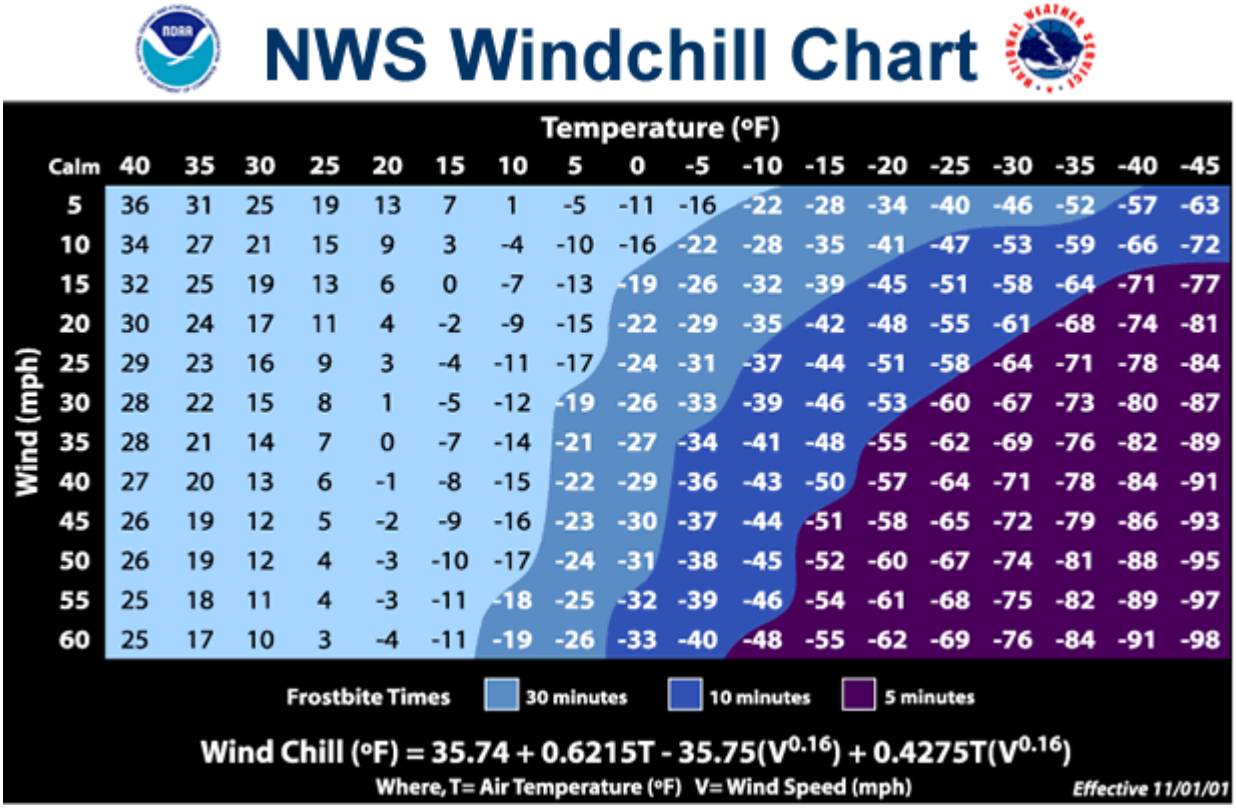
For the next plan update, Duxbury will more closely monitor winter storms and collect data to determine the worst extent possible on the Town. Extent data can be based on volumes of snow; winter weather alerts issued, or wind chill factor. See tables below for descriptions and scales.

Based on past occurrences, the worst anticipated winter weather Duxbury could experience would be 2-3' of snow with more at higher elevations and several days of power outages. Past worst storms were in March 2011 and after that the Blizzard of 1888. More recently in the past five years, the worst winter storm occurred December 9 to December 13, 2014 with Vermont receiving a federal declaration (DR4207-VT) for the storm damages. Heavy wet snow with a snow to water ratio of 8:1 caused over 175,000 power outages, the second most power outages due to weather in the state of Vermont at that time. FEMAs total Public assistance grant funds obligated to the state was $3,949,028.57. An extended period of extreme cold occurred in January and February of 2015. Dangerously cold wind chills of 30 degrees below zero and colder occurred. Overall, in the past five years the extreme cold, winter storms, ice storms, and heavy snows have spared the state of Vermont compared to the historical records of the past when heavy snowstorms and winter storms were more frequent and common. Power outages caused by broken tree limbs or downed trees from wet heavy snow loads or ice storms continue to create a challenge to the town.

Extent Scale - Winter Weather Alerts

Winter Weather advisory	This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
Winter storm watch	Severe winter weather conditions may affect your area (freezing rain, sleet or Heavy snow may occur separately or in combination).
Winter Storm Warning	Severe winter weather conditions are imminent.
Freezing rain or freezing drizzle	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice Glaze on roads and all other exposed objects.
Sleet	Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.
Blizzard Warning	Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
Frost/freeze warning	Below freezing temperatures are expected and may cause significant damage to plants, crops and fruit trees.
Wind Chill	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor.

Wind Chill Extent Scale



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.

Electric service in Duxbury is provided by Green Mountain Power (GMP) and Washington Electric Cooperative Inc. (WEC) Each utility has a specific area they are allowed to serve under the State of Vermont rules governing a utilities service territory. WEC serves 395 residential homes and commercial businesses via 28.533 miles of high voltage distribution lines located in the town of Duxbury. In general WEC serves those homes and businesses located in the more remote areas of Duxbury served by dirt roads and located in the higher elevations of the Town. WEC serves the Duxbury area from a substation several miles away located on the Moretown Common Road. Because the lines serve much of the remote and higher elevation areas in Duxbury they are more prone to damage from falling trees especially during heavy wet snows, ice storms and violent electrical storms. As a result, homes located in these areas may experience a higher frequency and duration of outages than homes located in the low lying areas and valleys such as those along the Route 100 corridor. GMP serves homes and businesses located generally along the Route 100, Route 100B and Route 2 corridors along the Winooski River and Mad River. These areas are not as prone to significant weather events and therefore experience a reduced frequency of outages. When outages do occur, access to make repairs is via a paved road and therefore can be done more quickly than in the more remote areas.

Both GMP and WEC have online real time outage tracking tools. In addition WEC and the Duxbury Emergency Team have redundant means of communication in place in the event of a sever outage in WEC territory.

Vulnerable populations, such as the elderly and handicapped are of greatest risk to this hazard. If this type of multiple hazard event takes place for an extended period of time, back-up power would be necessary for critical facilities such as the Crossett Brook Middle School, Thatcher Brook Primary School building, Harwood Union High School, Town Offices, and Town Highway Garage. The Town Garage and the Thatcher Brook Primary School building both have generators giving them back up capacity and the ability to be used as shelters if needed.

Duxbury is reviving a Homebound Persons Phone Tree that lists vulnerable residents. This list is disseminated to members of the community with All-Terrain Vehicles or Snowmobiles who volunteer to rescue their homebound neighbors in the case of a hazard. The E911 CARE form is also posted on the Town Web page which allows residents that have special requirements in the event of power outages or other emergencies to provide information on their needs that is made available to first responders during an emergency. The Emergency Team will maintain and keep the list up to date.

In 2017, Duxbury voters approved the purchase of a professional Culvert Thawing Machine using money from the Capital Reserve Fund. The new machine increases the Town capacity to handle frozen culverts and other town infrastructure. Thawing culverts to prevent water from going over the roadways will reduce the potential for damage to the town infrastructure and also allow safe travel. The Town equipment (trucks, plows, etc.) is maintained on a regular schedule and the Selectboard with the input from the Road Foreman, budget for equipment replacement.

During the many winter storms, ice storms, and extreme cold, Duxbury has experienced school closings, increased road maintenance, pressure on the town highway budget, power outages (from downed lines and extreme cold), downed trees and tree limbs, vehicular accidents, collapsed structures from heavy snow and ice loads, frozen culverts and more. In addition, the potential for increased medical needs due to over exertion with clean up and snow removal and falls, often with broken bones, due to icy surfaces exists.

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 Duxbury. 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. Shelter locations include: Crossett Brook School, Harwood Union High School and Thatcher Brook Primary School (Waterbury). The Town encourages residents who are in remote locations to be equipped with generators and backup fuel supplies, water, food, and medical supplies in the event of prolonged power outages and travel restrictions. In the event of an extended power outage, the Town is in the position to open its emergency shelter. Often, residents without power will seek family and friends to stay with during the duration of an outage.

Other major problems include closed roads and restricted transportation.

Many of the impacts from these hazards can be reduced by using common sense and practicing preparedness measures such as staying off the snow and ice covered roads until they are cleared, having vehicles equipped with proper winter gear and snow tires, using moderation and resting when removing snow and cleaning up from a storm, keeping heating pipes cleared and well ventilated, keeping roofs clean of heavy snow/ice loads, checking on and helping the elderly and disabled residents of the community, and listening to the local weather forecast for storm updates. Participating in the free VTAlert system is highly encouraged and an important resource in emergency preparedness.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Extreme Cold/Winter or Ice Storm in conjunction with power failure	Town Wide. All roads, utility poles and lines, Town Forest, Private woodlots/ timber stands, private residences and businesses, public infrastructure	Elderly & handicapped populations, remote structures, old/under insulated structures, public infrastructure and utilities, trees, telecommuni-cations, school system	Minimal to Moderate depending on severity; 18+" snowfall in March 2011 event Jan/Feb 2015 15-20 days below zero with wind chills of negative -30 degrees below zero. 12/9/2014 – 12/13/2014 6 to 24 inches wet heavy snow in county. No specific extent data for Duxbury is available.	Depends on severity – additional sheltering/ plowing/ emergency services costs for town. School closing and vehicular accidents. Downed trees and power lines. Prolonged power outages for 175,000 customers statewide. 12/2014 FEMA Total PA obligated statewide $3,949,028 A gap in the data exists for Duxbury.	High

6. Mitigation

The goal of this Plan is to update the local mitigation strategy that makes Duxbury more disaster resistant and reduces its risk from natural hazards. Further, it is the goal of this Plan to take actions to reduce or eliminate the long-term risk to human life and property from:

- The natural hazard of flash flood/flood/fluvial erosion.
- The natural hazard of hurricanes, severe storms, and tropical storms.
- The natural hazard of wildfire and forest fire.
- The natural hazard of extreme cold/winter storm/ice storm/power outage.
- The natural hazard of dam failure.

6.1 Town Plan (October 2014) Goals and Objectives that Support Local Hazard Mitigation

- The quality of the town's forest, water, air, wildlife and soil resources is protected and enhanced. (Natural Resources)
    - Make public and private new and existing infrastructure (e.g., culverts, roads, housing, etc.) more compatible with natural resources so that the impact on natural resource are minimized.
- Water resources and the built environment are not in conflict. (Flood Resiliency)
    - Avoid new development in identified flood hazard, fluvial erosion, and river corridor protection areas. If new development is to be built in such areas, it does not exacerbate flooding and fluvial erosion.
    - Encourage the protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion.
    - Engage in flood emergency preparedness and response planning.
- Land development protects natural resources and maintains Duxbury's rural character by concentrating smaller scale commercial use and residential development in areas near services, reducing strain on infrastructure and providing access to open space for recreation. (Land Use)
    - Regulate land development in a manner that protects important natural resources while encouraging a range of land uses in appropriate locations.
    - Maintain existing forest resources while promoting sustainable forest product enterprises.
    - Concentrate residential development in areas that does not increase strain on town infrastructure or impact natural resources.
- Facilities, services, and utilities are safe, practical, efficient, reliable, affordable and available. (Community Utilities, Facilities and Services)
    - Provide emergency services to Duxbury residents at a level adequate to protect public health and safety.
    - Assure public health is protected through adequate waste disposal programs and systems.

6.2 Proposed Hazard Mitigation Programs, Projects & Activities

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

Hazards Mitigated	Mitigation Action	Local Leadership	Prioritization	Funding Resources	Time Frame
Flooding, Severe storms	Upgrade sections of Crossett Hill Road to meet new State requirements	SB, Road Foreman	High	HMGP, AOT funds, ERP funds, town funds	1-2 years 2019 -2020
Flooding, Severe Storms	Upgrade sections of Camels Hump Road to meet new State Requirements	SB, Road Foreman	High	HMGP, AOT funds, ERP funds, town funds	1-2 years 2018 - 2019
Flooding, Severe Storms	Upgrade and expand culvert on Atwood Rd	SB, Road Foreman	High	HMGP, town funds	2022
Flooding, Severe Storms	Repair/Upgrade and improve Head Wall on Scrabble Hill Road	ANR,SB, Road Foreman	High	HMGP, ERP funds, town funds	2-3 years 2019- 2021
Flooding, Severe Storms	Upgrade and expand 6 foot culvert on Stevens Brook Rd	SB, Road Foreman	Medium	HMGP, town funds	2-3 years 2019- 2021
ALL Hazards	Preparedness action: perform a sensitive populations survey to update homebound persons phone tree	EMD, LHMP Committee Fire Chief	Medium-Low	Local funds and Volunteers	2019-2020, annually thereafter.
Flooding, Severe Storms	Upgrade bridge on Camels Hump Road	SB, Road Foreman	Medium - Low	HMGP, Town funds, AOT	2021 - 2023
Flooding, Severe Storms	Upgrade Box culvert Camels Hump Road	SB, Road Foreman	Medium - Low	HMGP, Town funds, AOT	2021 - 2023

Wildfire/ Forest Fire	Participate in the development of wildfire suppression methods for the State Forest land in Duxbury.	SB, Fire Chief, Town Fire Warden	Low	ANR, FPR, Town	2021-2023
Flood/Flash Flood/ Fluvial Erosion; Hurricanes, Severe Storms, Tropical Storms	Adopt Duxbury Land Use Regulations and Flood Hazard Overlay District	PC, SB, ZA, CVRPC	High	Town funds	2018
All hazards	Perform Planning Study on feasibility of a Stormwater Utility	PC,SB, CVRPC, ANR, AOT, MRVPD, Ridge to River Task force	Low	ACCD, HMGP, ERP, Local funds	2023
Severe storms, hurricanes, tropical storms	Upgrade and improve Marshall Road with ditching and stone lined section on the big hill and improve culvert crossing with installation of a 18 inch culvert	SB, Road Foreman, CVRPC, AOT	High	CVRPC grant $7,500	2018
Flood/Flash Flood/ Fluvial Erosion; Severe Storm/ hurricanes/ tropical storms,	Replace undersized culvert on Turner Hill with a larger more flood resilient box culvert	SB, Road Foreman, AOT	High	VTrans structure grant $112,320	2018
Flood/Flash Flood/ Fluvial Erosion; Severe	Remove trees around new box culvert at Turner Hill to protect culvert and improve stream stabilization	AOT, ANR, SB, Road Foreman	High	AOT Better Back Roads grant $22,072	Summer 2018

Storm/ hurricanes/ tropical storms					
Flood/Flash Flood/ Fluvial Erosion; Severe Storm/ hurricanes/ tropical storms	Replace undersized 4 foot culvert on Dowsville Road with a new super structure that will provide better flood resiliency.	AOT, ANR, SB, Road Foreman	High	VTrans structure grant $329,705	Summer 2018
Wildfire/ forest fire	Develop a Community Wildfire Protection Plan for the 169 acre Duxbury Forest	PC, Town Forest Committee, SB, ANR FPR, NCCD	Low	ANR FPR, Town funds, Land Trust	2022 -2023
All Hazards	Update American Red Cross Shelter Agreements and perform facility survey	SB, EMD, School District, ARC	Med	ARC, Local funds	2019 - 2020
Dam Failure	Survey and develop a list of local trappers and follow EAPs	LHMP Committee, EMD, SB	Low	Local funds, VT fish and Game, Trappers Association	2022-2023
All hazards	Conduct exercise to test LEOP with neighboring towns	EMD, Fire Chief, SB, LHMP Committee, VT Sate Police, and towns of Moretown and Waterbury	Medium	Local funds	2019-2021
All Hazards	Conduct community forum and resilience celebration	Friends of the Mad River, Ridge to River, MRVPD,	Medium	Local funds, High Meadows, FMR	Fall 2020

		CVRPC, SB, EMD, LHMP Committee, PC, DRB, Community			
All Hazards	Develop monitor teams throughout community to gather extend data	EMD, LHMP Committees	Medium	Local funds	2019-2020
All Hazards	Update 2014 Duxbury Town Plan and adopt new Plan prior to expiration in 2019	PC, SB, CVRPC	High	ACCD, local funds, CVRPC	2018 - 2019

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. The method used for prioritization of the actions was qualitative and based upon: 1) the Community's need to address the issue, 2) the action's cost, 3) the action's benefit, and 4) the availability of potential funding. Emphasis was placed on a review of the benefits (pros) and costs (cons) when prioritizing the mitigation actions with the expectation that the benefits would outweigh the costs.

In performing the benefit cost review, the team reviewed a wide range of questions concerning the mitigation actions. How immediate and critical is the need to the community? How costly is the action? Is it a low-cost strategy? Is the action cost effective and seem reasonable for the nature of the project? Are funds already secured or readily available? Does the action use outside funding sources? Is there a time restriction on expending funds? Can the action be budgeted in the current or upcoming budget cycle or does it require long term debt? What is the level of risk to community assets (people, economy, structures, critical facilities & infrastructure, and the natural environment)? Does the action provide for the protection of life and property and reduce the risk for loss, injury, or damage? How critical are the community assets that benefit from the action? How fast will the action take to implement? How many people and or area will benefit from the action; whole community, neighborhood, individual? What benefits will the action provide? Does the action support the community goals, polices and plans?

The following categories are used to define the priority of each mitigation action/strategy.

HIGH - A High prioritization denotes that the action is either critical or potential funding is readily available or in hand, and should have a timeframe of implementation of less than two years. These projects also use grants and other outside funding sources; provide the greatest protection from loss of life and property damage; are cost effective; have a larger benefit; and provide a higher degree of risk reduction for community assets. Generally, the community assets that benefit from these actions are critical and of high priority.

MEDIUM - 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. These projects are somewhat cost effective at reducing damage to property and people, have some benefit, and provide some degree of risk reduction for community assets.

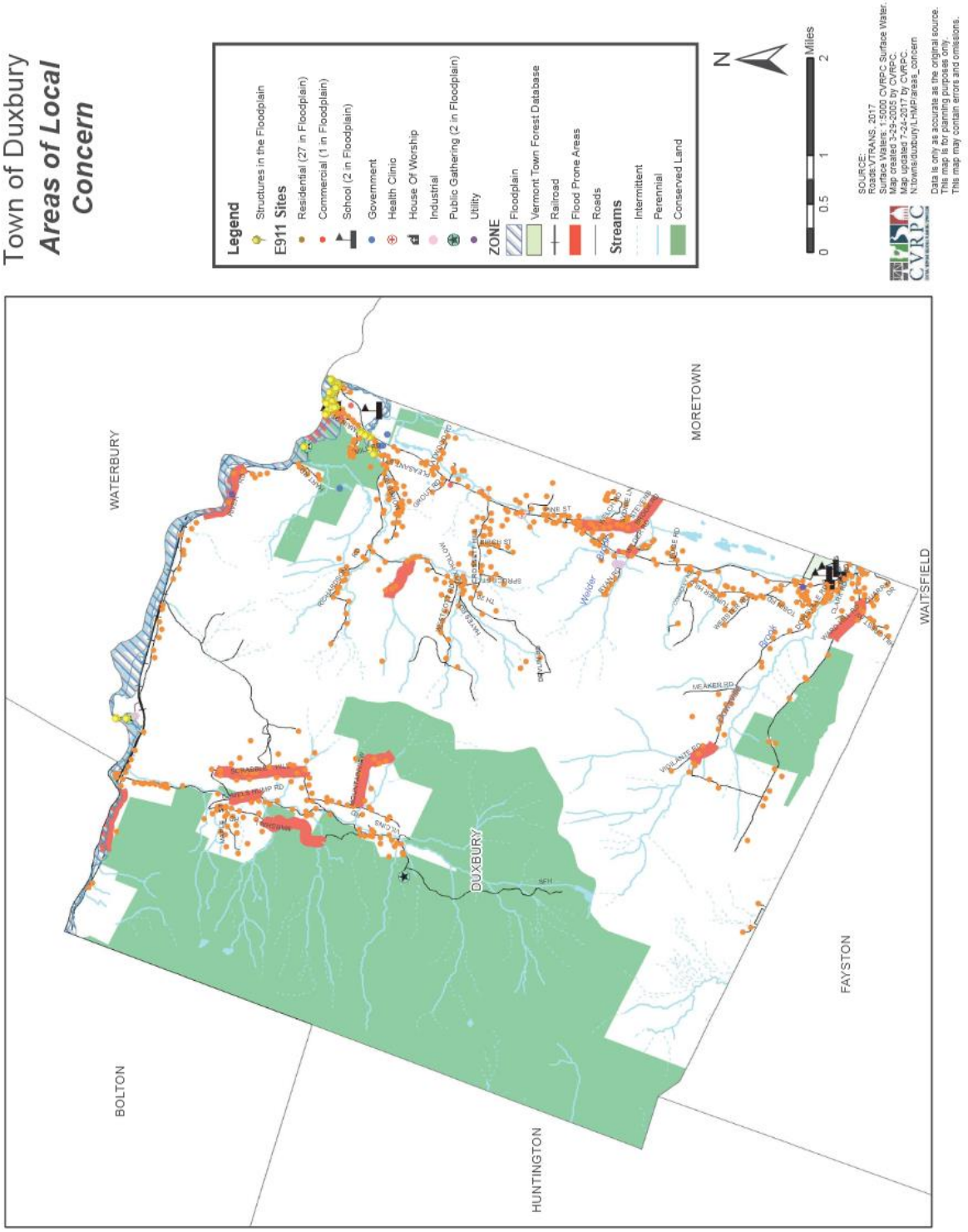
LOW - A Low prioritization indicates that the timeframe for implementation of the action, given the action's cost, availability of funding, and the community's need to address the issue, is more than four years. These actions may have limited benefit or the cost effectiveness is low. The community assets that benefit from the action are not in immediate need or are a low priority.

Duxbury 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.

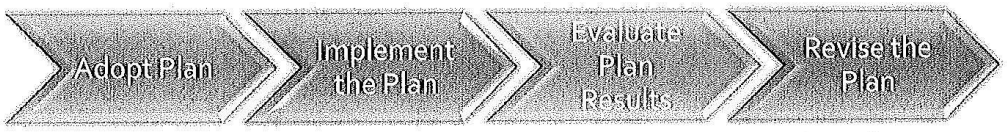
Attachments

- Areas of Local Concern Map
- 5 year plan maintenance and review process
- Town Resolution Adopting the Plan

2017 Local Area of Concerns Map



5-Year Plan Review/Maintenance



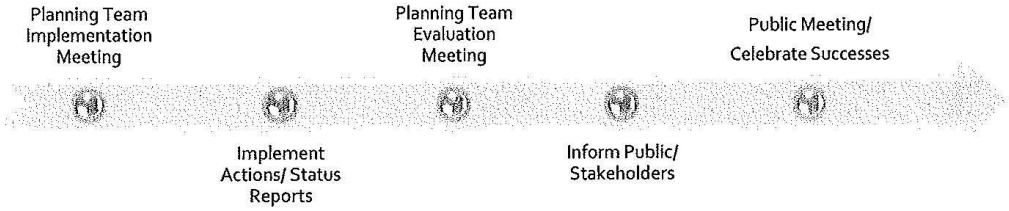
- Brief local leadership on plan approval
- Formally adopt plan
- Publicize plan approval and adoption
- Celebrate success

- Confirm/clarify responsibilities
- Integrate mitigaction actions
- Monitor and document implentation of projects and actions
- Establish indicators of effectiveness or success

- Effectiveness of planning process
- Effectiveness of actions
- Document success & challenges of actions
- Update and involve community
- Celebrate successes

- Review factors affecting community's context
- Analyze findings; determine whether to revise process or strategy
- Incorporate findings into the plan

After Plan Adoption-Annually
Implement and Evaluate



Fifth Year, and After Major Disaster
Evaluate and Revise