



2018 Vermont State Hazard Mitigation Plan

Making Vermont safer and more resilient in the face of climate change and natural disasters

DRAFT COVER

I: INTRODUCTION & EXECUTIVE SUMMARY

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects.

The impact of anticipated yet unpredictable natural events can be reduced through community planning and implementation of cost effective, preventive mitigation efforts.

The State of Vermont understands that it is not only less costly to reduce vulnerability to disasters than to repeatedly repair damage, but that we can also take proactive steps to protect our economy, environment and most vulnerable citizens from inevitable natural hazard events. This Plan recognizes that communities have the opportunity to identify mitigation strategies during all phases of emergency management (preparedness, mitigation, response, and recovery) to more comprehensively address their vulnerability. Though hazards themselves cannot be eliminated, Vermonters can reduce our vulnerability to hazards by improving our understanding of both the natural hazards we face and their potential impacts.

Mission: to protect life, property, natural resources and quality of life in Vermont by reducing our vulnerability to climate change and natural disasters.

The 2018 Vermont State Hazard Mitigation Plan (SHMP) presents the hazard impacts most likely to affect Vermont and a mitigation strategy to reduce or eliminate our most significant vulnerabilities. This SHMP is a complete rewrite of the 2013 plan, both in the content of the plan document and in the mitigation actions presented. Vermont Emergency Management, along with key stakeholders, completed a thorough review of the 2013 SHMP at the beginning of the update process to ensure that nothing developed in previous versions would be lost in this rewrite process.

Audience and Use:

The 2018 Vermont SHMP was developed to help the State of Vermont and local governments identify all natural hazards facing our communities and establish actions that reduce risk. The planning process for this update was much broader than previous mitigation planning efforts in order to better integrate the work of State agencies with those of regional and local governments and non-profit and private partners. The SHMP will also serve as a resource for State agencies and other resilience stakeholders to better understand Vermont's exposure to natural hazards and collectively implement actions that reduce our vulnerability.

While the Vermont Department of Public Safety's Division of Emergency Management (VEM) produced this plan, a large network of stakeholders across Vermont have worked together to develop the capabilities and actions. Accordingly, few of the actions in the 2018 SHMP fall solely on VEM to implement; most will require ongoing, concerted engagement by multiple stakeholders over the next five years.

This Plan is also intended to be a valuable resource for Local Hazard Mitigation Plan (LHMP) development. The capabilities list and disaster history spreadsheet are examples of resources that can be pulled directly from the SHMP for use in LHMPs. Further, several of the mitigation actions in this Plan aim to simplify the LHMP development process.

ACKNOWLEDGEMENTS

Though there was a great deal of stakeholder engagement during the planning process, we would like to extend a special thanks to the following individuals for their technical assistance during plan development:

- **Mike Kline** | Rivers Program Manager | ANR Department of Environmental Conservation
- **Rob Evans** | State Floodplain Manager | ANR Department of Environmental Conservation
- **Jared Ulmer** | Climate and Health Program Coordination | Vermont Department of Health
- **Rose Paul** | Director of Critical Lands and Conservation Science | The Nature Conservancy
- **Marjorie Gale** | State Geologist | ANR Department of Environmental Conservation
- **Joe Segale** | Policy, Planning & Research Bureau Director | Vermont Agency of Transportation
- **Ben Green** | Dam Safety Engineer | ANR Department of Environmental Conservation

Thank you also to our committee members and the individuals who participated in the Working Groups and Focus Groups.

Photo Credit: Stephanie Smith, VEM



THE PROCESS

In previous iterations of Vermont SHMPs, plan development was the responsibility of VEM and sister State agencies. Recognizing that resilience efforts in Vermont are far more expansive than the work carried out solely by State government, this SHMP represents a robust, inclusive planning process that better addresses and incorporates statewide mitigation initiatives.

TABLE 1: State Hazard Mitigation Planning & Policy Committee

Secretary Susanne Young	Agency of Administration
Secretary Julie Moore	Agency of Natural Resources
Secretary Michael Schirling	Agency of Commerce and Community Development
Secretary Joe Flynn	Agency of Transportation
Commissioner Chris Cole	Buildings and General Services
Secretary Anson Tebbetts	Agency of Agriculture, Food and Markets
Director Erica Bornemann	Vermont Emergency Management

In early 2017, the State Hazard Mitigation Planning & Policy Committee (SHMPPC) addressed the need for a more diverse group of stakeholder involvement by authorizing the creation of the State Hazard Mitigation Plan Steering Committee to steer the plan update process and engage a larger audience. The Steering Committee is comprised of members from Federal and State government, as well as the nonprofit and private sectors. Other partners were also involved in SHMP development through Working Group and Focus Group meetings.

VEM mitigation staff (Lauren Oates, State Hazard Mitigation Officer, and Stephanie Smith, Hazard Mitigation Planner) coordinated the overall planning process and plan development. Community Workshop facilitated and designed the stakeholder engagement process.

TABLE 2: State Hazard Mitigation Plan Steering Committee

Ben Rose	Vermont Emergency Management
Bob Costantino	Vermont Agency of Health and Human Services
Catherine Dimitruk	Northwest Regional Planning Commission <i>Appointed by VAPDA to represent Regional Planning Commissions</i>
Chris Cochran	Vermont Agency of Commerce and Community Development
Gaye Symington	High Meadows Fund
Greg Hanson	National Weather Service
Jen Hollar	Vermont Housing and Conservation Board
Jenna Koloski	Vermont Council on Rural Development
Joe Segale	Vermont Agency of Transportation
Karen Horn	Vermont League of Cities and Towns
Mike Kline	Vermont Agency of Natural Resources
Richard Kehne	Vermont Buildings and General Services
Rose Paul	The Nature Conservancy
Steve Libby	Vermont River Conservancy
Tara Kulkarni	Norwich University
Tim Schmalz	Vermont Agency of Agriculture, Food and Markets

FIGURE 1: 2018 Vermont SHMP - Stakeholder Engagement Process



KEY CAPABILITY IMPROVEMENTS

This Plan conveys an array of mitigation capabilities that exist within Vermont. The capabilities section and the extensive capabilities address both the improvements of existing capabilities as well as new capabilities that have been developed since the 2013 SHMP. The most significant improvements or additions to Vermont's mitigation efforts are identified below.

2018 SHMP Planning Projects:

VEM was awarded funding through FEMA's Hazard Mitigation Grant Program (HMGP) to develop the 2018 Vermont SHMP. As part of this planning grant, VEM received funding for three planning efforts to be carried out by the Agency of Natural Resources (ANR), the Agency of Transportation (VTrans) and Buildings & General Services (BGS), each of which significantly enhances the State's mitigation capabilities. These planning tasks represent a new level of proactive coordination and program integration among State agencies, which are part of an effort to institutionalize hazard mitigation and resilience efforts within State government functions and expand ownership of the 2018 State Hazard Mitigation Plan.

ANR Project: Statewide River Corridors Risk Analysis and Hazard Mitigation Prioritization

Tool: ANR modified Vermont's Statewide River Corridor Base Map to develop the map as a risk analysis, mitigation and conservation prioritization tool for use by State, regional and local governments. ANR aimed to increase understanding of the risks of fluvial erosion and to identify specific mitigation actions for reducing vulnerability. Using the template project table developed as part of this project, ANR, Regional Planning Commissions and VEM will endeavor to increase the use of project tables in municipal planning and capital improvement efforts Statewide.

VTrans Project: Methods and Tools for Transportation Resilience Planning: VTrans developed a Methods and Tools for Transportation Resilience Planning (TRPT) application that identifies the specific road infrastructure sites most vulnerable to damage from flooding in three pilot watersheds. The tool also estimates risk based on both the vulnerability and criticality of road segments and identifies a list of potential mitigation measures that can be taken to reduce infrastructural vulnerability. Though currently only available for three watersheds, this Plan's mitigation actions include expanding the tool to all watersheds across Vermont and including other critical infrastructure such as utilities.

BGS Project: State Facility Inventory and Assessment: BGS completed a vulnerability assessment of all State buildings in order to better understand their respective risks from flooding. The resulting building inventory tool will serve State planners in prioritizing the most cost-effective flood mitigation needs and opportunities to reduce future damages and increase resilience for existing State facilities.

Emergency Relief & Assistance Fund:

The criteria for Vermont’s Emergency Relief & Assistance Fund (ERAF) were revised, effective from October 2014, to incentivize communities to be more proactive prior to disasters. The default rate for State contribution towards non-federal Public Assistance match following a declared disaster dropped to 7.5%, requiring municipalities to cover the other 17.5% for Public Assistance projects. However, municipalities that take the following proactive measures are awarded 12.5% State match:

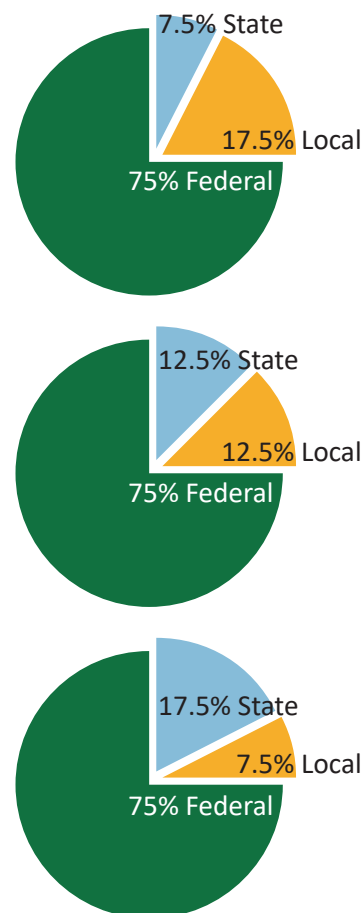
1. Participate in the National Flood Insurance Program (NFIP),
2. Adopt Town Road and Bridge Standards that meet or exceed the VTrans 2013 template,
3. Adopt a Local Emergency Operations Plan annually, and
4. Submit a Local Hazard Mitigation Plan to VEM for review

Municipalities that wish to further decrease their cost share to 7.5%, with a 17.5% State match, must also meet one of the following criteria:

5. Adoption of ANR’s River Corridor bylaws, or
6. Participation in the Community Rating System

A priority mitigation action in the 2018 SHMP will be to assess the effectiveness of the current iteration of the ERAF rule in incentivizing proactive mitigation measures, and to revise the rule (if needed) to improve it.

FIGURE 2: Emergency Relief & Assistance Fund Rates



Vermont Stream Alteration General Permit (SAGP) Revision:

A notable advancement in hazard mitigation initiatives during the past few years has been the revision of Vermont’s Stream Alteration General Permit (SAGP), and FEMA’s subsequent recognition of the new general permit as “codes and standards” for purposes of future Public Assistance repairs. For several disasters following Tropical Storm Irene in 2011, VEM, ANR and VTrans worked with FEMA Region I on a case-by-case basis to have upsized drainage structures deemed fully-eligible for Public Assistance funding under Section 406 hazard mitigation of the Stafford Act. Beginning with DR-4330, which was declared in 2017, structure replacements that fall under the jurisdiction of the SAGP, and are required to meet the standards of the SAGP, are presumed to be PA-eligible and do not require approval by FEMA prior to construction. This significant improvement allows Vermont to more quickly and appropriately address vulnerable infrastructure in a more sustainable way than has typically been implemented during the immediate response and recovery phase following a disaster.

Hazard Mitigation Assistance Projects:

Since Tropical Storm Irene, Vermont has been proactive in addressing its vulnerability to natural hazards. Through various funding sources, primarily the Hazard Mitigation Assistance (HMA) grant programs, we have acquired and demolished nearly 150 flood-vulnerable properties, completed approximately 70 infrastructure improvement projects, developed LHMPs for 142 municipalities and carried out a handful of 5% Initiative projects. Since the 2013 SHMP, VEM mitigation staff have been more aggressive in applying for Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) funding as a supplement to our Hazard Mitigation Grant Program (HMGP) disaster funding. Most notably, through coordinated efforts with State, regional and local project developers, Vermont has been prioritizing larger mitigation initiatives that more comprehensively address vulnerability, like floodplain restoration efforts in Middlebury, Cambridge, Brattleboro and Waterbury.



Greenway Trail Bridge in Cambridge, VT was replaced and the floodplain restored to reduce future flooding in historic downtown Jeffersonville
Photo Credit: Seth Jensen, LCPC

HAZARD ASSESSMENT

VEM staff used several methods to identify risks in Vermont, including the evaluation of historical data, consideration of our changing climate trends, and feedback from stakeholders during the hazard assessment process. The most significant change from the 2013 SHMP to the 2018 SHMP is the way hazards are assessed. Instead of continuing to view hazards as events (e.g. hurricanes), this Plan assesses the impacts of events (e.g. inundation flooding, fluvial erosion, and wind as impacts of a hurricane event), as it is the impacts, not the events, that can be mitigated.

The result of the hazard assessment ranking by the Steering Committee are found in the table below. As with the previous SHMP, fluvial erosion and inundation flooding continue to be the first and second most significant natural hazards in Vermont, respectively.

TABLE 3: Hazard Assessment

Hazard Impacts	Probability	Potential Impact					Average:	Score:
		Infrastructure	Life	Economy	Environment			
Fluvial Erosion	4	4	3	4	4	3.75	15	
Inundation Flooding	4	4	3	4	2	3.25	13	
Ice	3	3	3	3	2	2	8.25	
Snow	4	1	3	2	1	1.75	7	
Wind	4	2	2	1	1	1.5	6	
Heat	3	1	3	2	2	2	6	
Cold	3	1	3	2	2	2	6	
Drought	3	1	2	2	3	2	6	
Landslides	3	3	2	1	2	2	6	
Wildfire	2	3	3	3	2	2.75	5.5	
Earthquake	2	3	3	3	2	2.75	5.5	
Invasive Species	2	1	1	2	3	1.75	3.5	
Infectious Disease Outbreak	2	1	3	2	1	1.75	3.5	
Hail	3	1	1	1	1	1	3	

Score = Probability x Average Potential Impact



Snowmobile bridge near Waterbury, VT flexes as debris and water rush past following Tropical Storm Irene

Photo Credit: www.mansfieldheliflight.com/flood

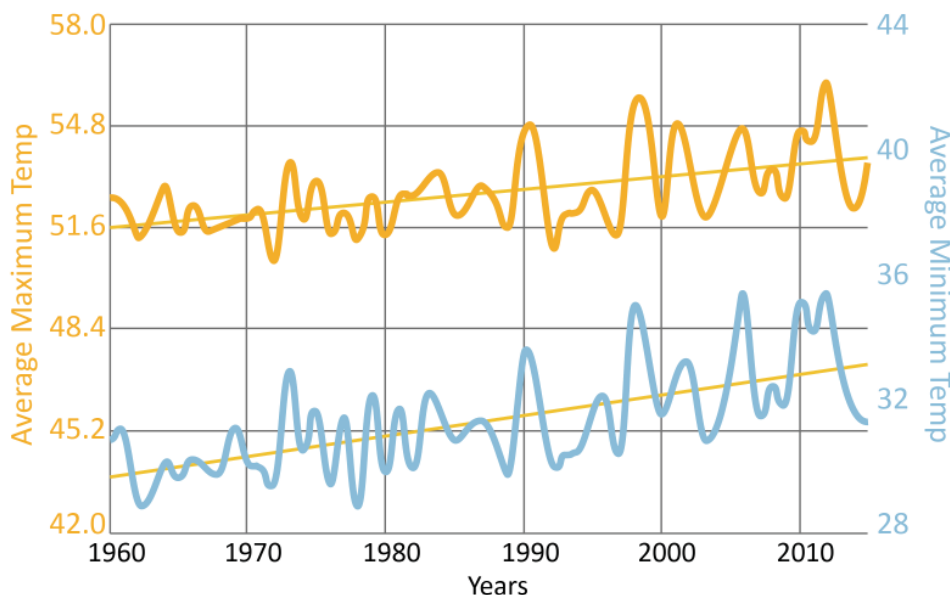
TABLE 4: Hazard Assessment Ranking Criteria

	Frequency of Occurrence: Probability of a plausibly significant event	Potential Impact: Severity and extent of damage and disruption to population, property, environment and the economy
1	Unlikely: <1% probability of occurrence per year	Negligible: isolated occurrences of minor property and environmental damage, potential for minor injuries, no to minimal economic disruption
2	Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years	Minor: isolated occurrences of moderate to severe property and environmental damage, potential for injuries, minor economic disruption
3	Likely: >10% but <75% probability per year, at least 1 chance in next 10 years	Moderate: severe property and environmental damage on a community scale, injuries or fatalities, short-term economic impact
4	Highly Likely: >75% probability in a year	Major: severe property and environmental damage on a community or regional scale, multiple injuries or fatalities, significant economic impact

Climate Change:

Warming temperatures, shrinking winters and increasing incidence of intense storm events are beginning to have a significant impact on Vermont’s economy, people and environment require immediate attention across all planning efforts at the local, regional, state, federal and global levels. Accordingly, and as a guiding principle of this Plan, we have aimed to recognize and include the impacts of climate change throughout plan development, most notably reflected in the hazard profiles and mitigation actions. Both direct and indirect impacts of climate change are addressed within pertinent hazard profiles, as well as the potential for compounding impacts. An example of a concerning compounding impact of climate change is that warming temperatures will allow for increased survivability of forest pests, such as the Emerald Ash Borer. This invasive species can decimate Vermont’s ash population, not only shifting the composition of our forests, but also creating additional debris that may exacerbate impacts of other hazards such as flooding or wildfire.

FIGURE C: Vermont’s Annual Maximum and Minimum Temperatures (1960-2015)



Source: climatechange.vermont.gov

MITIGATION STRATEGY

At the request of the SHMPPC in early 2017, the Steering Committee worked to develop a mitigation strategy that would be implementable, leverage cross-sector resources and effectively and efficiently reduce Vermont’s vulnerability to natural hazards. To do this, the Steering Committee first developed the following four goals of the 2018 SHMP:

Protect, restore and enhance Vermont’s natural resources to promote healthy, resilient ecosystems.

Enhance the resilience of our built environment – our communities, infrastructure, buildings, and cultural assets.

Develop and implement plans and policies that create resilient natural systems, built environments, and communities.

Create a common understanding of – and coordinated approach to – mitigation planning and action.

Using these goals, Working Groups and Focus Groups developed a significant list of mitigation actions. These actions were sorted by goal and then further sorted according to similar themes, called “strategies”. The Steering Committee then prioritized the list of 96 mitigation actions based on each individual action’s Impact and Feasibility. This prioritization process yielded 24 priority actions, which were then further prioritized into the following top five priorities by the Steering Committee:

- ***Develop a cross-sector buyout program***
- ***Inventory and protect critical headwater storage areas***
- ***Collaborate across flood resilience, water quality and habitat connectivity programs and funding***
- ***Audit state programs to assess and improve their support of mitigation goals***
- ***Coordinate State programs to promote development, sharing and maintenance of hazard-related data and mapping***

The majority of the mitigation actions identified in this Plan require collaboration between multiple organizations. Though this will require significant coordination, we believe it also broadens ownership and improves the implementation potential of the 2018 SHMP.

Photo Credit: Stephanie Smith, VEM

