

# **Lyme**

## **Hazard Mitigation**

### **Plan**

#### **Update 2017**



**This Plan integrates the following:**

- **Hazard Mitigation Plan Update (FEMA)**
- **Community Wildfire Protection Plan (DRED)**

**April 3, 2017**  
**Final**  
**(for Town Adoption)**

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**Prepared for the Town of Lyme and NH Homeland Security &  
Emergency Management**  
**By**  
**The Lyme Planning Team**

**With assistance from Mapping and Planning Solutions**

**L**

**Y**

**M**

**E**

*“Plans are worthless, but planning is everything. There is a very great distinction because when you are planning for an emergency you must start with this one thing: The very definition of “emergency” is that it is unexpected, therefore it is not going to happen the way you are planning.”*

*-Dwight D. Eisenhower*

### HAZARD MITIGATION PLAN DEFINITIONS

“A natural hazard is a source of harm or difficulty created by a meteorological, environmental, or geological event.”

“Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards (44CFR 201.2). Hazard mitigation activities may be implemented prior to, during, or after an event. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.”

(Source: Local Mitigation Plan Review Guide, FEMA, October 1, 2011)



**Plan Prepared and Authored By**

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**Cover: Downtown-Lyme, NH**

**Photo Credit: <http://www.upstatenh.com/LymeNH.html>**

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## Acknowledgements

This Plan integrates elements to qualify it as a Community Wildfire Protection Plan (CWPP) according to the US Forest Service and the Department of Resources and Economic Development. This Plan was created through a grant from New Hampshire Homeland Security & Emergency Management (HSEM). The following organizations have contributed invaluable assistance and support for this project:

- NH Homeland Security & Emergency Management (HSEM)
- Federal Emergency Management Agency (FEMA)
- NH Office of Energy & Planning (NHOEP)
- Mapping and Planning Solutions (MAPS)
- NH Forests & Lands (DRED)

**This Plan is an update to the prior Lyme Hazard Mitigation Plan, adopted September 15, 2011**

**Approval Notification Dates for 2017 Update**

Approved Pending Adoption (APA):..... April 3, 2017

Jurisdiction Adoption: ..... \_\_\_\_\_, 2017

CWPP Approval: ..... \_\_\_\_\_, 2017

Plan Approval Date (FEMA):..... \_\_\_\_\_, 2017

Plan Distribution (MAPS): ..... \_\_\_\_\_, 2017

### Town of Lyme Hazard Mitigation Planning Team

The Town of Lyme would like to thank the following people for the time and effort spent to complete this Plan; the following people have attended meetings and/or been instrumental in completing this Plan:

- Margaret Caudill-Slosberg.....Lyme EMD
- Aaron Rich.....Lyme Fire Captain
- Michael Hinsley .....Lyme Fire Chief/DEMD
- Shaun O’Keefe .....Lyme Police Chief
- C Jay Smith .....Lyme Selectboard
- Patty Jenks.....Lyme Selectboard
- Susan MacKenzie.....Lyme Selectboard-Chair
- Dina Cutting.....Lyme Admin. Assistant
- Blake Allison.....Lyme Conservation Com.
- Karen Keane .....Lyme FAST Squad
- Jeff Valence.....Lyme School Principal
- Dave Robbins.....Lyme Planning Board
- Steve Williams.....Lyme Highway Department
- Susanne Simon.....Lyme Citizen
- Michael Mundy .....Lyme Fire Chief
- Paul Hatch.....NH HSEM
- June Garneau.....MAPS
- Olin Garneau.....MAPS

Many thanks for all the hard work and effort given by each and every one of you. This Plan would not exist without your knowledge and experience. The Town of Lyme also thanks the Federal Emergency Management Agency and NH Homeland Security and Emergency Management as the primary funding sources for this Plan.

Acronyms associated with the Planning Team list above:

- EMD ..... Emergency Management Director
- DEMD..... Deputy EMD
- NH HSEM..... New Hampshire Homeland Security & Emergency Management
- NH OEP ..... New Hampshire Office of Energy & Planning
- MAPS ..... Mapping and Planning Solutions

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## Executive Summary

The Lyme Hazard Mitigation Plan Update 2017 was compiled to assist the Town of Lyme in reducing and mitigating future losses from natural or human-caused hazardous events. The Plan was developed by participants of the Town of Lyme Hazard Mitigation Planning Team, interested stakeholders, the general public and Mapping and Planning Solutions (MAPS). The Plan contains the tools necessary to identify specific hazards and aspects of existing and future mitigation efforts.



This Plan is an **update** to the 2011 Lyme Hazard Mitigation Plan. In an effort to produce an accurate and current planning document, the Planning Team used the 2011 Plan as a foundation, building upon that Plan to provide more timely information.

**This Plan addresses the following natural hazards and human-caused hazards.**

### Natural Hazards

- |  |                                      |
|--|--------------------------------------|
| 1) Severe Winter Weather & Ice Storms                      | 7) High Winds (windstorms)           |
| 2) Flooding (ice jams, heavy rain, riverine & local roads) | 8) Extreme Temperatures (hot & cold) |
| 3) Erosion, Landslide & Mudslide (riverbank)               | 9) Hailstorms                        |
| 4) Hurricanes & Tropical Storms                            | 10) Wildfires                        |
| 5) Tornadoes & Downbursts                                  | 11) Earthquakes                      |
| 6) Severe Thunder & Lightning Storms                       | 12) Subsidence (sinkholes)           |
|  | 13) Drought                          |

### Human-Caused Hazards

- |                           |   |
|---------------------------|---|
| 1) Extended Power Failure | 4) Hazardous Materials - Transport      |
| 2) Epidemic/Pandemic      | 5) Terrorism                            |
| 3) Dam Failure            | 6) Hazardous Materials - Fixed Location |

Some hazards that are listed in the 2013 NH Hazard Mitigation Plan were not included in this Plan as the Team felt they were extremely unlikely to occur in Lyme or not applicable. These include: *Coastal Flooding, Radon, Radiological, Fire & Hazardous Materials and Snow Avalanche*. The Team does acknowledge that radon exists but felt that mitigation for radon was the responsibility of the individual homeowner. Fire & Hazardous Materials are covered under the hazard categories of Wildfire, Hazardous Material-Transport and Hazardous Material-Fixed Location (see page 37).

This Plan also provides a list of Critical Infrastructure and Key Resources (CIKR) categorized as follows: Necessary for Emergency Response Facilities (ERF), Not Necessary for Emergency Response Facilities (NERF), Facilities and Populations to Protect (FPP) and Potential Resources (PR). In addition, this Plan addresses the Town's involvement in the National Flood Insurance Program (NFIP).

This hazard mitigation plan was designed to include a detailed study and analysis of wildfires. The original goal was to produce separate plans but that concept produced excessive overlap and cost. To streamline the process, the Community Wildfire Protection Plan (CWPP) was fully integrated into this hazard mitigation plan as were risks from human-caused hazards.

Mitigation action items are the main focus of this Plan; however, it is at times difficult to arrive at true mitigation projects. Some communities, though faced with an array of natural hazards, are able to adequately cope with the impact of these hazards. For example, although *Severe Winter Weather* is often a common hazard in New Hampshire and more often than not considered to be the most likely to occur, most New Hampshire communities handle two-three foot snow storms with little or no disruption of services. On the other hand, an unexpected ice storm can have disastrous effects on a community. Mitigation for this type of sudden storm is difficult to achieve; establishing warming and cooling centers, establishing notification systems, providing public outreach, tree trimming, opening shelters and perhaps burying overhead power lines are just a few of the action items that may be put in place.

In summary, finding mitigation action items for every hazard that effects a community is at times difficult. In addition, with today’s economic constraints, cities and towns are less likely to have the financial ability to create some mitigation action items, such as burying power lines. In preparing this Plan, the Lyme Planning Team has considered a comprehensive list of mitigation action items that could diminish the impact of hazards but has also decided to maintain a list of preparedness action items for future reference and action.

To simplify the language in the Plan, the following abbreviations and acronyms will be used:

Lyme Hazard Mitigation Plan Update 2017 .....	the Plan or this Plan
Lyme .....	the Town or the Community
Hazard Mitigation Planning Team.....	the Team
Hazard Mitigation Plan.....	HMP
Emergency Operations Plan.....	EOP
Community Wildfire Protection Plan .....	CWPP
Mapping and Planning Solutions .....	MAPS
Mapping and Planning Solutions Planner.....	the Planner
NH Homeland Security & Emergency Management .....	HSEM
Federal Emergency Management Agency .....	FEMA

For more acronyms, please refer to *Appendix F: Acronyms*

**Mission Statement:**  
 To make Lyme less vulnerable to the effects of hazards through the effective administration of hazard mitigation planning, wildfire hazard assessments, and a coordinated approach to mitigation policy and planning activities.

**Vision Statement:**  
 The community of Lyme will reduce the impacts of natural hazards and other potential disasters through implementing mitigation measures, public education and deliberate capital expenditures within the community. Homes and businesses will be safer and the community’s ISO rating may be improved.

## Chapter 1: Hazard Mitigation Planning Process

### A. Authority & Funding

The Lyme Hazard Mitigation Plan Update 2017 was prepared in accordance with the Disaster Mitigation Act of 2000 (DMA), Section 322 Mitigation Planning, signed into law by President Clinton on October 30, 2000. This hazard mitigation plan was prepared by the Lyme Hazard Mitigation Planning Team under contract with New Hampshire Homeland Security & Emergency Management (HSEM) operating under the guidance of Section 206.405 of 44 CFR Chapter 1 (10-1-97 Edition) and with the assistance and professional services of Mapping and Planning Solutions. This Plan was funded by HSEM through grants from FEMA (Federal Emergency Management Agency); matching funds for team members' time were also part of the funding formula.

### B. Purpose & History of the FEMA Mitigation Planning Process

The ultimate purpose of Disaster Mitigation Act of 2000 (DMA) is to:

*"...establish a national disaster hazard mitigation program -*

- *To reduce the loss of life and property, human suffering, economic disruption and disaster assistance costs resulting from natural disasters; and*
- *To provide a source of pre-disaster hazard mitigation funding that will assist States and local governments (including Indian tribes) in implementing effective hazard mitigation measures that are designed to ensure the continued functionality of critical services and facilities after a natural disaster".<sup>1</sup>*

DMA 2000 amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act by, among other things, adding a new section "322 – Mitigation Planning" which states:

*"As a condition of receipt of an increased Federal share for hazard mitigation measures under subsection (e), a State, local, or tribal government shall develop and submit for approval to the President a mitigation plan that outlines processes for identifying the natural hazards, risks, and vulnerabilities of the area under the jurisdiction of the government."<sup>2</sup>*

HSEM's goal is to have all New Hampshire communities complete a local hazard mitigation plan as a means to reduce future losses from natural or human-caused events before they occur. HSEM outlined a process whereby communities throughout the state may be eligible for grants and other assistance upon completion of this hazard mitigation plan.

The Lyme Hazard Mitigation Plan Update 2017 is a planning tool to use to reduce future losses from natural and human-caused hazards as required by the Disaster Mitigation Act of 2000; this plan does not constitute a section of the Town's Master Plan, however mitigation action items from this Plan may be incorporated into future Master Plan updates.

The DMA places new emphasis on local mitigation planning. It requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans as a condition to receiving Hazard Mitigation Grant Program (HMGP) project grants. Local governments must review this plan yearly and update this plan every five years to continue program eligibility.

<sup>1</sup> Disaster Mitigation Act (DMA) of 2000, Section 101, b1 & b2

<sup>2</sup> Disaster Mitigation Act (DMA) of 2000, Section 322a

### C. Jurisdiction

This Plan addresses one jurisdiction – the Town of Lyme, NH.

### D. Scope of the Plan & Federal & State Participation

A community's hazard mitigation plan often identifies a vast number of natural hazards and is somewhat broad in scope and outline. The scope and effects of this plan were assessed based on the impact of hazards and wildfires on: Critical Infrastructure and Key Resources (CIKR); current residential buildings; other structures within the Town; future development; administrative, technical and physical capacity of emergency response services; and response coordination between federal, state and local entities.

In seeking approval as a Hazard Mitigation Plan and a Community Wildfire Protection Plan (CWPP), the planning effort included participation of Homeland Security and Emergency Management, the US Forest Service, the Department of Resources and Economic Development (DRED), NH Office of Energy & Planning (OEP) as well as routine notification of upcoming meetings to the state and federal entities above. Designation as a CWPP will allow a community to gain access to federal funding for hazardous fuels reduction and other mitigation projects supported by the US Forest Service. By merging the two federal planning processes (hazard and wildfire), duplication is eliminated and the Town has access to a larger pool of resources for pre-disaster planning.

The Healthy Forest Restoration Act (HFRA) of 2003 includes statutory incentives for the US Forest Service to give consideration to local communities as they develop and implement forest management and hazardous fuel reduction projects. For a community to take advantage of this opportunity, it must first prepare a CWPP. This hazard mitigation planning process not only satisfies FEMA's criteria regarding wildfires and all other hazards but also addresses the minimum requirements for a CWPP:

- **Collaboration:** *A CWPP must be collaboratively developed by local and state government representatives, in consultation with federal agencies and other interested parties.*
- **Prioritized Fuel Reduction:** *A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at-risk communities and essential infrastructure.*
- **Treatment of Structural Ignitability:** *A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.<sup>3</sup>*

Finally, as required under Code of Federal Regulations (CFR), Title 44, Part 201.6(c) (2) (ii) and 201.6(c) (3) (ii), the Plan must address the Community's participation in the National Flood Insurance Program (NFIP), its continued compliance with the program and as part of vulnerability assessment, the Plan must address the NFIP insured structures that have been repetitively damaged due to floods.

<sup>3</sup> Healthy Forest Restoration Act; HR 1904, 2003; Section 101-3-a.b.c; [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108\\_cong\\_bills&docid=f:h1904enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108_cong_bills&docid=f:h1904enr.txt.pdf)

**E. Public & Stakeholder Involvement**

Public and stakeholder involvement was stressed during the initial meeting and community officials were given a matrix of potential team members (page 17). Community officials were urged to contact as many people as they could to participate in the planning process, including not only residents but also officials and residents from surrounding communities. The Town of Lyme understands that natural hazards do not recognize corporate boundaries.

It was noted that there are two schools in Lyme, the Lyme Elementary School (grades K-8) and Crossroads Academy (grades K-8/private school). Students in grades 9-12 are tuitioned to area schools. The Principal from the Lyme Elementary School attended hazard mitigation planning meetings. The Town provided excellent public and stakeholder notification as seen on this page and the next.

Many interested citizens and stakeholders had the opportunity to become aware of the hazard mitigation planning taking place in Lyme. A Press Release (see below) was posted at the Town Offices and was available through a link on the Town’s schedule of upcoming meetings and events. Other “snips” from the Town’s website are shown on this page.



**Upcoming Meetings & Events**

<p><b>Mon, Oct 5, 2015</b>  <a href="#">Conservation Commission</a>                  7:00 PM - Academy Building</p>
<p><b>Tue, Oct 6, 2015</b>  <a href="#">Class V Roads Study Committee</a>                  6:00 PM - Town Office Conference Room</p>
<p><b>Wed, Oct 7, 2015</b>  <a href="#">Hazard Mitigation Plan Meeting</a>                  4:00 PM - Town Offices Conference Room</p>

*Mapping and Planning Solutions  
 P.O. Box 283  
 Twin Mountain, NH 03595*

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**Press Release**

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FOR IMMEDIATE RELEASE November 1, 2015  
 Contact: June Gameau  
 603.846.5720

**TOWN OF LYME COMMENCES  
 HAZARD MITIGATION PLANNING**

A member of the Lyme Emergency Management Director and other town met on October 7, 2015 with June Gameau, Mapping and Planning Solutions and Paul Hatch, NH Homeland Security & Emergency Management, to discuss the required five-year update to the 2011 Lyme Hazard Mitigation Plan. As a result of this meeting, the Emergency Management Director is conducting a series of Hazard Mitigation Plan planning meetings over the next few months.

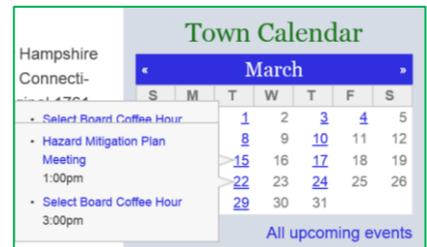
Through this series of public meetings, the Hazard Mitigation Planning Team will address issues such as flooding, hurricanes, drought, landslides and wildfires and determine efforts the Town can take to mitigate the effects of both natural and human-caused hazards. By examining past hazards, the Planning Team will establish priorities for future mitigation projects and efforts that can be taken to increase public awareness of hazards in general.

As mandated by the Disaster Mitigation Act of 2000, all communities are required to complete a local hazard mitigation plan in order to qualify for FEMA funding should a natural disaster occur. The planning processes are made possible through grants from the Federal Emergency Management Administration (FEMA).

The Hazard Mitigation Planning Team is currently being formed; the public and any interested stakeholders are invited to participate. All interested parties should contact the Margaret Caudill-Slosberg, 930-5671 if they wish to be included in the process.

The next meeting has been scheduled for Tuesday, November 10 at the Lyme Fire Station. The general public is encouraged to attend all meetings whether or not they are a part of the Planning Team.

For more information on the hazard mitigation planning process, please contact June Gameau at Mapping and Planning Solutions, 603.846.5720.



**Hazard Mitigation Plan Meeting**

Event Date: Tuesday, March 22, 2016 - 1:00pm

**Address**

Town Offices Conference Room  
 One High Street  
 Lyme, NH 03768  
 United States  
[See map: Google Maps](#)

In addition, notice of the hazard mitigation plan meetings was included in the 2015 Annual Report of the Town of Lyme as shown in the excerpt below from the Annual Report.

Updating Lyme’s Hazard Mitigation Plan got underway in the fall, and these public meetings will continue to be held into the spring of 2016. In this process, potential hazards are identified, and ways to prevent emergencies or limit damage are proposed and implemented over the next 5-year cycle.

An update of the Lyme Emergency Operations Plan was also started in December, and the majority of this work will take place from the spring through summer of 2016.

For more information on these or other activities in Emergency Management, you may contact Margaret Caudill-Slosberg, [emd@lymenh.gov](mailto:emd@lymenh.gov).

The Planner also sent a monthly calendar to NH EMD’s, Police Chiefs, Fire Chiefs, Rangers and other State, Federal and Private Officials throughout the State, including stake-holders for the Town.



## MAPS EOP & Hazard Mitigation Meetings | 2016

New or changed Emergency Operations, Hazard Mitigation or Master Plan meetings; highlighted by “Counties”.

Status update: 2/3/16

Day	Date	Time	Town/Location	Plan Type	HSEM Field Rep	County
Tuesday	Feb 23	1:00 PM	Canaan Public Safety Complex	HMP	Paul Hatch	Grafton
Wednesday	Feb 24	6:00 PM	Bethlehem Library	MP	N/A	Grafton
Tuesday	Mar 1	8:00 AM	Lancaster Ambulance Bay	HMP	Heidi Lawton	Cooe
Tuesday	Mar 1	5:00 PM	Dummer Town Hall	HMP	Heidi Lawton	Cooe
Wednesday	Mar 2	9:00 AM	Wakefield Public Safety Building	HMP	Heidi Lawton	Carroll
Wednesday	Mar 2	6:00 PM	Shelburne Town Offices	MP	N/A	Cooe
Monday	Mar 14	5:30 PM	Ellsworth Town House	HMP	Paul Hatch	Grafton
Tuesday	Mar 15	9:30 AM	Whitefield Town Offices	HMP	Heidi Lawton	Cooe
Thursday	Mar 17	6:00 PM	Albany Town Offices	HMP	Heidi Lawton	Carroll
Tuesday	Mar 22	1:00 PM	Lyme Fire Station	HMP	Paul Hatch	Grafton
Tuesday	Mar 22	6:30 PM	Jackson Town Offices	EOP	Heidi Lawton	Carroll
Wednesday	Mar 23	12:00 PM	Lyman Town Hall	HMP	Paul Hatch	Grafton
Wednesday	Mar 23	6:00 PM	Bethlehem Library	MP	N/A	Grafton
Monday	Mar 28	6:00 PM	Stark Fire Station	HMP	Heidi Lawton	Cooe
Wednesday	Apr 27	6:00 PM	Bethlehem Library	MP	N/A	Grafton
Wednesday	May 25	6:00 PM	Bethlehem Library	MP	N/A	Grafton
Wednesday	Jun 22	6:00 PM	Bethlehem Library	MP	N/A	Grafton

*One of eight hazard mitigation planning meetings in Lyme*

It was noted that Team composition is expected to be lower in smaller communities because of the small population base and the fact that many people “wear more than one hat”. It is often very difficult to attract individual citizens to participate in town government and those that do generally hold full-time jobs and work as volunteers in a variety of town positions. With small populations, the percent of interested citizens in the rural towns’ planning processes is extremely small. Due to the availability of jobs and other economic factors, the Town has a relatively high elderly population and a dwindling amount of young people with interest in politics.

While much effort was made to promote public participation at the Lyme hazard mitigation meetings, only one general community member took the opportunity to participate. Comments made by all attendees were integrated into the narrative discussion and were incorporated into the essence of the document.

**F. Incorporation of existing plans, studies, reports and technical information**

The planning process included a complete review of the Lyme Hazard Mitigation Plan of 2011 for updates, development changes and accomplishments. In addition, as noted in the Bibliography and in footnotes located throughout the Plan many other documents were used to create this mitigation plan.

Some, but not all, of those plans and documents are listed as follows:

The Lyme Hazard Mitigation Plan of 2011.....	Compare & Contrast
Master Plan for Lyme, NH, 2013.....	Community Information
Lyme Annual Report, 2015 .....	Fire Report & Structures Values
Hazard Mitigation Plans (Conway, Berlin, Columbia).....	Formats & Mitigation Ideas
Lyme Subdivision Regulations.....	New Development Regulations
Lyme Zoning Ordinance.....	Zoning Regulations
Lyme Floodplain Development Ordinance.....	Floodplain Regulations
Census 2010 Data .....	Population Data
The NH DRA Summary of Inventory of Valuation MS-1 2015 for Lyme.....	Structure Evaluation
The Economic & Labor Market Information Bureau Community Response .....	Population Trends
The American Community Survey (ACS 2010-2014).....	Population Trends
NH Forest Forests & Lands (DRED).....	DRED Fire Report
NH Office of Energy & Planning .....	Flood Losses
The NH Department of Revenue property tax valuation by property type.....	Property Information

Other technical manuals, federal and state laws as well as research data were combined with these elements to produce this integrated hazard mitigation plan. Please refer to the Bibliography in *Appendix A: Bibliography* and the Plan’s footnotes.

§201.6(b) requires that there be an open public involvement process in the formation of a plan. This process shall provide an opportunity for the public to comment on the Plan during its formation as well as an opportunity for any neighboring communities, businesses, and others to review any existing plans, studies, reports, and technical information and incorporation of those in the Plan, to assist in the development of a comprehensive approach to reducing losses from natural disasters.

## G. Hazard Mitigation Planning Process & Methodology

The planning process consisted of twelve specific steps; some steps were accomplished independently while other areas were interdependent. Many factors affected the ultimate sequence of the planning process such as the number of meetings, community preparation, attendance and other community needs. The planning process resulted in significant cross-talk regarding all types of natural and human-caused hazards by team members.



All steps were included but not necessarily in the numerical sequence listed. The list of steps is as follows:

### PLANNING STEPS

Step 01: Team Formation and Orientation, Goal Identification

Step 02: Formulate Hazards List, Hazards Description and Threat Matrix

*Table 3.1 – Hazard Risk Analysis*

Step 03: Profile, List and Map Historic and Potential Hazards, Wildfire, Natural and Human-Caused

*Table 3.2 – Historic and Potential Hazards*

Step 04: Profile, List and Map Critical Infrastructure and Key Resources

*Tables 4.1 to 4.4 – Critical Infrastructure & Key Resources*

Step 05: Assess Community's participation in National Flood Insurance Program

*Chapter 3, Section C*

Step 06: Prepare an Introduction to the Community, discuss Emergency Service capabilities, discuss Development Trends and review the Town Statistics

*Chapter 2, Sections A, B and C and Table 2.1, Town Statistics*

Step 07: List Existing Mitigation Strategies & Brainstorm to Identify Potential Mitigation Strategies

*Table 6.1 – Current Plans, Policies and Mutual Aid*

Step 08: Examine the mitigation strategies from the prior plan

*Table 7.1 – Accomplishments since the Prior Plan Approval*

Step 09: Evaluate and Categorize Potential Mitigation Action Items

*Tables 8.1 - Potential Mitigation Strategies & the STAPLEE*

Step 10: Prioritize Mitigation Action Items to Determine Action Plan

*Table 9.1 – The Mitigation Action Plan*

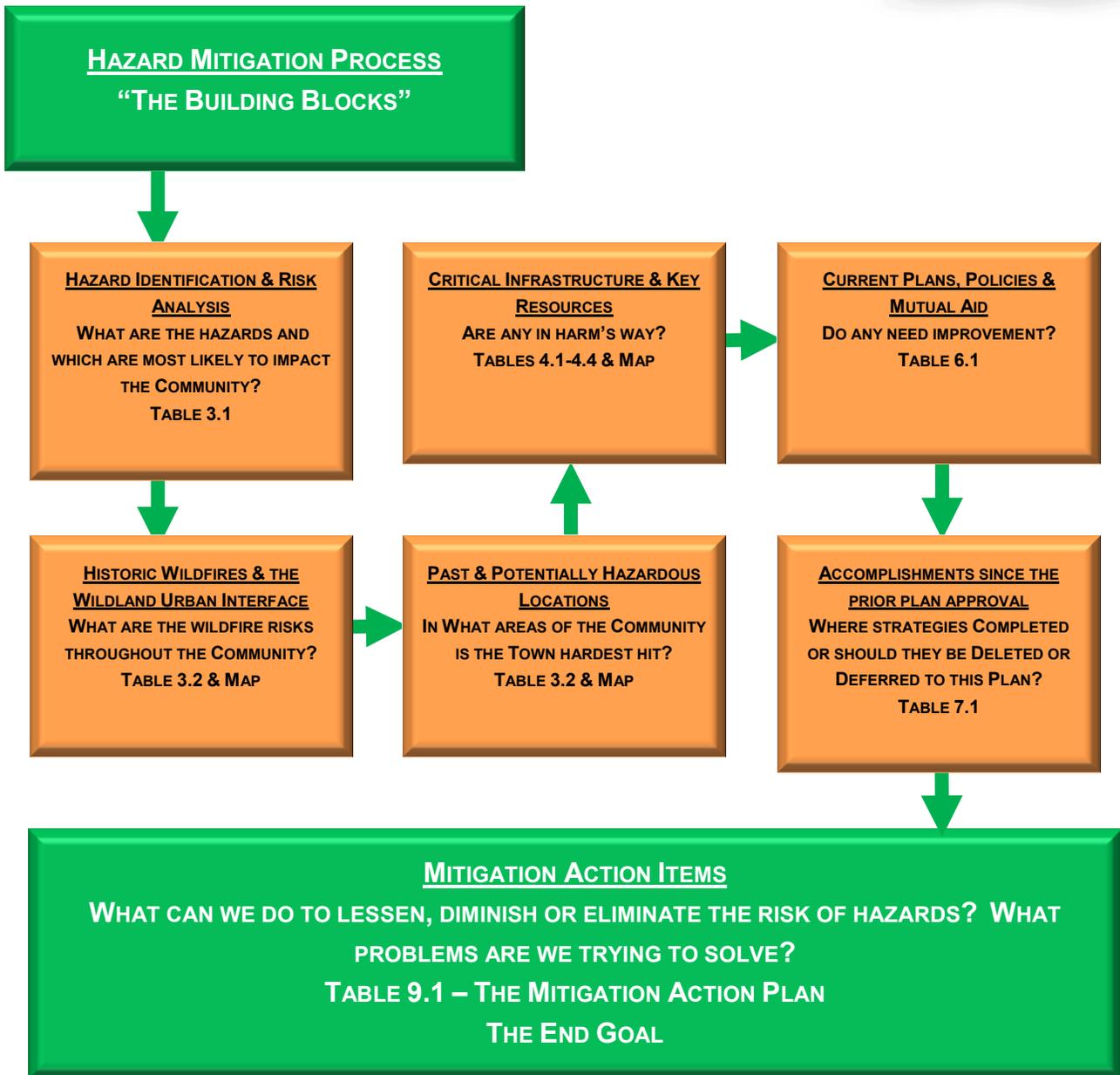
Step 11: Team Review of Plan Contents for Submission to HSEM/FEMA

Step 12: Adopt and Monitor the Plan

**H. Hazard Mitigation Building Blocks & Tables**

Using a “building block” approach, the base, or foundation, for the mitigation plan update was the prior plan. Each table that was completed had its starting point with the last hazard mitigation plan completed by the Community.

Ultimately, the “building blocks” lead to the final goal, the development of prioritized mitigation “action items” that when put into an action plan, would lessen or diminish the impact of natural hazards on the Town.



## ***I. Hazard Mitigation Goals***

Before identifying new mitigation actions, the Team established and adopted the following broad hazard mitigation goals. The goals that are in the 2013 State of New Hampshire Multi-Hazard Mitigation Plan were reviewed as were the goals that were in the 2011 Lyme Hazard Mitigation Plan. After discussing these goals, the Team agreed to the following goals for this Plan.

### **Community & Resource Protection**

- To improve upon the protection of the general population, the citizens of Lyme and visitors, from all natural and human-caused hazards.
- To reduce Lyme's potential exposure to risk with respect to natural and human-caused hazards.
- To minimize the damage and public expense which might be caused to public and private buildings and infrastructure due to natural and human-caused hazards.

### **Coordination & Communication**

- To improve the Town of Lyme's:
  - *Emergency preparedness and communication network.*
  - *Disaster response and recovery capability.*
- To identify, introduce and implement improvements to establish and maintain a reliable communication system.
- To improve communication capabilities so that the citizens of Lyme can be notified in the most efficient manner as possible.
- To ensure that regular communication occurs between various departments and with local, regional and state officials and to have up-to-date plans in place to address various emergency situations and ensure that those involved are aware of their responsibilities.

### **Outreach & Education**

- To build an awareness of public responsibility for hazard mitigation.
- To raise the awareness and acceptance of hazard mitigation opportunities through public education and outreach programs.
- To increase public awareness of the fire risk and the Town's potential liability with respect to wildfires.

### **Damage Prevention & Reduction**

- To reduce the potential impact of natural and human-caused disasters on the Town of Lyme's:
  - *Emergency Response Capability*
  - *Critical Infrastructure & Key Resources*
  - *Private property*
  - *Economy*
  - *Natural environment*
  - *Historic treasures and interests, as well as other tangible and intangible characteristics that add to the quality of life of the citizens and visitors to Lyme.*
- To identify, introduce and implement cost effective hazard mitigation measures so as to accomplish the Town's Goals and Objectives.
- To reduce the occurrence of road closures and road erosion due to localized flooding within the Town of Lyme.

**J. Narrative Description of the Process**

The Plan was developed with substantial local, state and federal coordination; completion of this new hazard mitigation plan required significant planning preparation. All meetings were geared to accommodate brainstorming, open discussion and an increased awareness of potential hazardous conditions in the Town.

The planning process included a complete review of the 2011 Lyme Hazard Mitigation Plan. Using the 2011 Plan as a base, each element of the old plan was examined and revised to reflect changes that had taken place in development and in the priorities of the Community. In addition, referring to the 2011 Plan, the Team was able to reassess strategies from the past and to improve upon mitigation these strategies for the future.

The following narrative explains how the 2011 Lyme Hazard Mitigation Plan was used during each step of the planning process to make revisions that resulted in the Plan.

**Meeting 1, October 7, 2015**

The first full meeting of the Lyme Hazard Mitigation Team was held on October 7, 2015. Meeting attendance included C Jay Smith (Selectboard), Dina Cutting (Administrative Assistant), Patty Jenks (Selectboard), Shaun O’Keefe (Police Chief), Aaron Rich (Fire Captain), Susan MacKenzie (Selectboard-Chair), Blake Allison (Conservation Commission), Karen Keane (FAST Squad Captain), Susanne Simon (Citizen), Jeff Valence (School Principal), Paul Hatch (NH HSEM), Olin Garneau (Mapping & Planning Solutions) and June Garneau (Mapping & Planning Solutions).

To introduce the Team to the planning process, June reviewed the evolution of Hazard Mitigation Plans, the funding, the 12 Step Process (handout), the collaboration with other agencies and the goals (handout). June also explained the need to sign-in, track time (handout) and to provide public notice to encourage community involvement. In addition, June and the Team discussed “stakeholders” and additional Team members (see list to right).

Work then began on *Table 2.1, Town Statistics*. Most of the work on this table was completed at this meeting with the exception of a few items that June would either determine through GIS or get at a later date. There was some discussion about the seasonal population change in Lyme with summer population increases expected to be between 10-15% but with the winter population nearly doubling with the transient population at the Dartmouth Skiway.

**HAZARDS MITIGATION  
POTENTIAL TEAM MEMBERS**

FEDERAL  
US Forest Service

STATE  
Department of  
Transportation  
DRED  
RC&D (Non-Profit)

LOCAL  
Selectmen (Past/Present)  
Town Manager/Administrator  
Town Planner  
Police Chief  
Fire Chief  
EMD  
Emergency Services  
Fire Warden  
Health Services  
Education/School  
Recreation Directors  
Public Works Director  
Road Agent  
Water Management  
Public Utilities  
Waste Management  
Dam Operators  
Major Employers

LOCAL - SPECIAL INTEREST  
Land Owners  
Home Owners  
Forest Management  
Timber Management  
Tourism & Sportsman's  
Groups  
Developers & Builders

EXPERTS  
GIS Specialists  
Environmentalists

Next on the Agenda were hazard identification and the completion of *Table 3.1, Hazard Threat Analysis*. After the hazards had been identified, the Team then assessed the risk severity and probability by ranking each hazard on a scale of 1-5 (5 being very high or catastrophic) based on the following:

- The Human Impact .....Probability of Death or Injury
- The Property Impact .....Physical Losses and Damages
- The Business Impact .....Interruption of Service
- The Probability .....Likelihood of this occurring within 25 years

The rankings were then calculated to reveal the hazards which pose the greatest risks to the Community; 13 natural hazards and six human-caused hazards were identified. After analyzing these hazards using *Table 3.1, Severe Winter Weather & Ice Storms, Flooding (ice jams, heavy rain, riverine & local roads) and Erosion, Landslide, Mudslide (riverbank erosion)* were designated as the primary concerns.

Time ran out before starting the hazard descriptions, but before adjourning the meeting, June thanked the Team for their work and assigned “homework” to Team members. June also asked the Team to think about the other hazardous events that have taken place since the last Plan and to begin thinking about Critical Infrastructure and Key Resources (CIKR).

The next meeting was scheduled for Tuesday, November 10, 2015.

**Meeting 2, November 10, 2015**

Meeting attendance included Margaret Caudill-Slosberg (Emergency Management Director), C Jay Smith, Patty Jenks, Aaron Rich, Susan MacKenzie, Blake Allison, Susanne Simon, Dave Robbins (Planning Board), Paul Hatch, Olin Garneau and June Garneau.

The meeting began with a review of Tables 2.1 & 3.1 that were done at the previous meeting. June wanted to ensure that the information gathered at the first meeting still accurately depicted the Team’s views. No changes were made.

Next on the agenda, the Team worked on descriptions for each hazard and how the hazard could, or does, impact the Town of Lyme. This important part of the planning process enabled team members to describe the hazards in detail with respect to their impact in Lyme. June explained that the information gained through this process would be used to bring the plan to a more “local” level and would be the basis for *Chapter 5, Hazard Effects in Lyme*. This exercise also afforded an opportunity to discuss possible mitigation action items for each of the hazards identified in *Table 3.1*.

**Meeting 1 – October 7, 2015**

**1) Introduction**

- a) Evolution of Hazard Mitigation Plans & Community Wildfire Protection Plans
- b) Reasons for Hazard Mitigation and Update
- c) Community involvement to solicit input on how to mitigate the effects of hazards
- d) Devise a plan that lessens, diminishes or completely eliminates the threat of Hazards to the Town

**2) The Process**

- a) Funding
- b) Review of 12 Step Process & The Team (handout)
- c) Collaboration with other Agencies (HSEM, WMNF)

**3) Meetings**

- a) Community Involvement - Public Notice, Press Release
- b) Stakeholders
- c) Signing In, Tracking Time, Agendas, Narrative (handout)

**4) Today’s Topics**

- a) Table 2.1, Town Information
- b) Table 3.1, Hazard Identification & Analysis
- c) Hazard Descriptions
- d) Table 4.1-4.4, Critical Infrastructure & Key Resources (time allowing)

**5) Homework**

- a) Homework – Critical Infrastructure & Key Resources
- b) Digital Photos – contributions welcome

**6) Future Meetings**

- a) \_\_\_\_\_

In order to gain more knowledge of the impact of these hazards, June asked the Team to describe each hazard as it relates to Lyme. For example, some of the questions asked were:

- How often do these hazards occur?
- Do the hazards damage either the roads or structures?
- Have the hazards resulted in loss of life?
- Are the elderly and special needs populations particularly at risk?
- What has been done in the past to cope with the hazards?
- Was outside help requested?
- Are the hazards further affected by an extended power failure?
- What can be done to mitigate these hazards?

In addition to bringing more awareness to the hazards, these questions provided information to further analyze the impact of the hazards on the Community.

After working on the hazard descriptions, the Team moved on to work on mapping the hazardous areas in the Town. The main focus of the mapping was on the erosion of roads due to river bank erosion. The Team spoke in depth about the Connecticut River washing parts of River Road due to undermining.

With time running out June thanked the Team for their participation and reviewed the plan for the next meeting on November 24, 2015.

**Meeting 3, November 24, 2015**

Meeting attendance included Margaret Caudill-Slosberg, C Jay Smith, Dina Cutting, Patty Jenks, Aaron Rich, Susan MacKenzie, Blake Allison, Susanne Simon, Steve Williams (Highway Department), Paul Hatch, Olin Garneau and June Garneau.

The meeting began with a discussion about development trends in the Town. It was determined that development is very much up and down in Lyme. There are some new structures being built, some upgrades to solar power and a possible plan for an updated fire station.

The Team then began work on *Table 3.2, Historic Hazard Identification*, a list of past and potentially hazardous locations and/or events. First, they looked at the hazards that were listed in the last Plan and determined which they would like to see kept in this Plan.

Next, the Team examined the record of Presidential Disaster Declarations that have taken place in recent years, a record that shows substantial increase over past decades. At this point, the Team assisted June in mapping some of the hazards that were identified in Table 3.2 for inclusion in *Map 3, Past & Potential Areas of Concern*.

**Meeting 2 – November 10, 2015**

**1) Last Meeting**

- a) Discussed the process, community and stakeholder involvement, our overall goal to establish mitigation action items and the collaboration of other agencies.
- b) Completed Table 2.1
- c) Completed Table 3.1

**2) Today's Topics**

- a) Review loose ends in Table 2.1
- b) Review Table 3.1 to see if order of hazards should remain as it is
- c) Hazard Descriptions
- d) Table 3.2, Historic Hazard Identification & Mitigation Ideas
- e) Tables 4.1-4.4, Critical Infrastructure & Key Resources (time allowing)

**3) Next Meeting**

- a) Table 7.1, Accomplishments since the last Plan
- b) Table 6.1, Current Plans, Policies & Mutual Aid

**4) Future Meetings**

- a) \_\_\_\_\_

**Meeting 3 – November 24, 2015**

**1) Last Meeting**

- a) Reviewed....
  - i) Table 2.1, Town Statistics
  - ii) Table 3.1, Hazard Threat Analysis
- b) Worked on....
  - i) Hazard Descriptions
  - ii) Hazard Mapping

**2) Today's Topics**

- a) Discuss Development Trends
- b) Table 3.2, Historic Hazard Identification & Mitigation Ideas
- c) Tables 4.1-4.4, Critical Infrastructure & Key Resources
- d) Table 6.1, Current Plans, Policies & Mutual Aid (time allowing)

**3) Next Meeting**

- a) Table 7.1, Accomplishments since the last Plan
- b) Begin discussing Mitigation Strategies
- c) STAPLEE

**4) Future Meetings**

- a) \_\_\_\_\_

While discussing past and potentially hazardous areas, June discussed the Wildland Urban Interface (WUI) and projected a map of the Wildland Urban Interface over the Lyme base layer and topography. The WUI was determined using GIS analysis to create a 300 foot buffer from the center line of all Class I-V roads and then an additional 1320 foot buffer from the first buffer (see Map 2). This area is determined to be the area in which the urban environment interfaces with the wildland environment and the area that is most prone to the risk of wildfires. Using GIS analysis and a 1-foot aerial imagery (2011), June explained how she would determine the number of Critical Infrastructure & Key Facilities (CIKR) in the defined WUI. It should be noted that although the “WUI” was defined for the purpose of this Plan, many rangers and firefighters believe that towns with substantial wooded land, such as Lyme, are entirely within the Wildland Urban Interface.

Documentation for the Planning process, including public involvement, is required to meet DMA 2000 (44CFR§201. (c) (1) and §201.6 (c) (1)). The Plan must include a description of the Planning process used to develop the Plan, including how it was prepared, who was involved in the process, and how other agencies participated. A description of the Planning process should include how the Planning team or committee was formed, how input was sought from individuals or other agencies who did not participate on a regular basis, what the goals and objectives of the Planning process were, and how the Plan was prepared. The description can be in the Plan itself or contained in the cover memo or an appendix.

Mitigation strategies were discussed to protect structures and to educate the Town’s citizens about the risk in the high risk and WUI areas. It was determined that the Town would acquire Firewise materials to have available at the Town Offices.

Next on the agenda were *Tables 4.1–4.4, Critical Infrastructure and Key Resources (CIKR)*. The Emergency Response Facilities, the Non-Emergency Response Facilities, the Facilities & Populations to Protect and the Potential Resources from the 2011 Plan were examined and a few minor adjustments were made for this Plan. In addition, the evacuation routes, helicopter landing zones and bridges on the evacuation routes were defined. With time running out, the “hazard risk” for each CIKR was tabled for the next meeting on January 19, 2016.

**Meeting 4, January 19, 2016**

Meeting attendance included Dina Cutting, Patty Jenks, Shaun O’Keefe, Aaron Rich, Susan MacKenzie, Blake Allison, Margaret Caudill-Slosberg, Dave Robbins, Steve Williams and June Garneau.

First on the agenda was to work on the “hazard risk” in Table 4.1-4.4, a process by which each CIKR was analyzed for its risk potential. It was determined that flooding due to dam failure will affect bridges on the evacuation route and that high winds were a particular concern at Dartmouth Skiway.

*Table 6.1, Current Plans, Policies & Mutual Aid*, was next on agenda. Looking closely at the existing policies from the last plan and current mechanisms that are in place, the Team was able to determine whether the existing policies were effective or in “need of improvement”. It was explained to the Team that those items that needed improvement would become new “action items” for this Plan and be discussed again when we got to our final table, *Table 9.1, The Mitigation Action Plan*.

- Meeting 4 – January 19, 2016**
- 1) Last Meeting**
    - a) Worked on....
      - i) Development Trends
      - ii) Table 3.2, Historic Hazard Identification & Mitigation Ideas
      - iii) Table 4.1-4.4, Critical Infrastructure & Key Resources
  - 2) Today’s Topics**
    - a) Table 4.1-4.4 – Hazard Risk
    - b) Table 6.1, Current Plans, Policies & Mutual Aid
    - c) Table 7.1, Accomplishments since the last Plan
    - d) Begin discussing Mitigation Strategies
  - 3) Next Meeting**
    - a) STAPLEE
    - b) Ranking & Priority
  - 4) Future Meetings**
    - a) \_\_\_\_\_

Each existing plan or policy was rated on its effectiveness according to the following “Key to Effectiveness”:

KEY TO EFFECTIVENESS:

- Excellent**..... The existing program works as intended and is exceeding its goals.
- Good** ..... The existing program works as intended and meets its goals.
- Average** ..... The existing program does not work as intended and/or does not meet its goals.
- Poor** ..... The existing program does not work as intended, often falls short of its goals and/or may present unintended consequences.

Next the Team next worked on *Table 7.1, Accomplishments since the Last Plan*. Having pre-populated the table with the implementation strategies from the 2011 Plan, June lead the Team through each strategy to determine which of these were “Completed”, should be “Deleted” or should be “Deferred” to this Plan as a new mitigation strategy. Many of the strategies from the 2011 Plan had been completed by the Town; several were deferred to this plan.

After completing these Tables, June began discussing mitigation strategies with the Team and provided them with a handout detailing a comprehensive list of potential mitigation strategies (see Chapter 8, Sections A & B and Appendix E). The meeting was adjourned and the next meeting was scheduled for March 22, 2016.

Meeting 5, March 22, 2016

Meeting attendance included C Jay Smith, Dina Cutting, Patty Jenks, Aaron Rich, Susan MacKenzie, Blake Allison, Susanne Simon, Margaret Caudill-Slosberg, Dave Robbins, Michael Mundy and June Garneau.

Before beginning new work, June brought the Team through a complete review of Tables 6.1 and 7.1 to ensure that none of the Team’s objectives were lost in the translation from June’s notes to the table. Some minor changes were made to these tables during this review.

Next, the Team looked back at the *Critical Infrastructure & Key Resources, Tables, 4.1-4.4* and helped June with the mapping of these CIKR. The rest of the meeting was spent discussing mitigation strategies and taking a closer look at the comprehensive list of potential strategies that June had handed out at the last meeting.

Prior to the meeting, June had populated Table 9.1 with many of the potential action items that had resulted from prior work. Looking closely at these “action items”, June explained to the Team how these action items would be analyzed during the next meeting to include a responsible department, time frame and cost estimate. Although this table was started, it was not finished and would be completed at the next meeting. The next meeting was scheduled for April 19, 2016.

Meeting 5 – March 22, 2016

- 1) Last Meeting**
  - a) Completed – Hazard Risk for Table 4.1-4.4
  - b) Completed Table 7.1
- 2) Today’s Topics**
  - a) Review Table 7.1
  - b) Work on Table 6.1, Current Plans, Policies & Mutual Aid
  - c) Explain Table 9.1, Mitigation Action Plan
  - d) Review Comprehensive list of Mitigation Action Items (handout)
  - e) Begin discussing Mitigation Action Items
- 3) Next Meeting**
  - a) Continued work on Mitigation Action Items
  - b) The STAPLEE
  - c) Ranking & Priority
- 4) Future Meetings**
  - a) \_\_\_\_\_

**Meeting 6, April 19, 2016**

Meeting attendance included C Jay Smith, Patty Jenks, Anthony Swett, Aaron Rich, Blake Allison, Susanne Simon, Margaret Caudill-Slosberg, Dave Robbins, Michael Mundy, Paul Hatch, Olin Garneau and June Garneau.

The meeting began with an overall recap of the work that had already been done. The recap included a brief look at each of the following completed tables:

- *Table 2.1 – Town Statistics*
- *Table 3.1 – Hazard Threat Analysis*
- *Table 3.2 – Historic Hazard Identification*
- *Tables 4.1-4.4 – Critical Infrastructure & Key Resources*
- *Table 6.1 – Current Plans, Policies & Mutual Aid*
- *Table 7.1 – Accomplishments since the Last Plan*

**Meeting 6 – April 19, 2016**

**1) Last Meeting**

- a) Reviewed....
  - i) Table 7.1, Accomplishments since the last Plan
- b) Worked on....
  - i) WUI and Base Risk
  - ii) Table 6.1, Current Plans, Policies & Mutual Aid
  - iii) Table 9.1, Mitigation Action Plan (not finished)

**2) Today's Topics**

- a) Review....
  - i) Table 6.1, Current Plans, Policies & Mutual Aid
- b) Continue work on....
  - i) Table 9.1, Mitigation Action Plan
- c) STAPLEE
- d) Ranking & Priority (time allowing)

**3) Next Meeting**

- a) Ranking & Priority (if not finished)

**4) Future Meetings**

- a) \_\_\_\_\_

This review helped the Team understand how each of these tables served as a building block for the final two tables, *Table 8.1, Potential Mitigation Strategies & the STAPLEE* and *Table 9.1, The Mitigation Action Plan*.

June projected the final pre-populated table for the Town's review. This table, a combination of Table 8.1 and Table 9.1, enabled the Team to examine each strategy from Tables 6.1 and 7.1 that they had previously determined to be either in "need of improvement" or "deferred" for further action. June had also added a few additional mitigation strategies that had come up during discussions with the Team, and with the Team's help, several more action items were added. Before completing the list of action items, the Team also reviewed the hazard descriptions that were provided at the first meeting to be certain that any potential strategies that had been discussed in the past were included in this new table.

The Team was now able to see and understand the "Action Items" for this hazard mitigation plan. Looking carefully at each "Action Item", the Team was able to assign responsibility, the time frame for completion, the type of funding that would be required and the estimated cost of the action. After much discussion and a careful review, ultimately, the Team settled on 25 "Mitigation Action Items" they felt were achievable and that would help to diminish the impact of natural hazards in the future.

The next meeting was scheduled for May 24, 2016 and the meeting was adjourned.



**River Road Erosion**  
 Photo Credit: Town of Lyme

**Meeting 7, May 24, 2016**

Meeting attendance included Patty Jenks, Aaron Rich, Susan MacKenzie, Blake Allison, Margaret Caudill-Slosberg, Dave Robbins, Steve Williams, Michael Mundy, Paul Hatch and June Garneau.

First on the Agenda was the STAPLEE process, a systematic method used to gauge the quality of each of the Action Items; each Team member was given a handout describing the process (Chapter 8, Section C). The Social (S), Technical (T), Administrative (A), Political (P), Legal (L), Economic (E) and Environmental (E) impact for each action item was discussed; this analysis then became Table 8.1. After reviewing each action item using the STAPLEE process, the final scores ranged from 11 to 21, with 21 being the highest score; the average of all scores was 19.36.

With time running out, June quickly reviewed the last handout, a description of the Priority & Ranking Methodology (see Chapter 9, Section A). The next meeting was set for May 31, 2016.

**Meeting 8, May 31, 2016**

Meeting attendance included Patty Jenks, Shaun O’Keefe Aaron Rich, Susan MacKenzie, Blake Allison, Margaret Caudill-Slosberg, Dave Robbins, Paul Hatch and June Garneau.

First, June asked the Team if there were any additional mitigation strategies to add.

Next, June reviewed the explanation of the ranking and priority methods (see Chapter 9) prior to beginning work on ranking and prioritizing. June organized the “Action Items” by ranking them from 0-3, roughly in order of time frame, the Town’s authority to get the strategy accomplished and the STAPLEE score. The Team reviewed the ranking and made a couple of changes based on the expected time frame.

Then within each rank, the Team assigned a priority; for example, if seven action items were ranked “1” then the priority rank was 1-7 (see explanation in Chapter 9). In this fashion, the Team was able to determine which action items were the most important within their rankings and in which order the action items would be accomplished.

With Tables 8.1 and 9.1 finalized, the Team’s work was complete with the exception of the final review. June agreed to put the final plan together and email a copy for the Town’s review. June explained the process from this point forward and thanked the Team for their hard work. No additional meeting was scheduled.

**Meeting 7 – May 24, 2016**

- 1) Last Meeting**
  - a) Reviewed....
    - i) Table 6.1, Current Plans, Policies & Mutual Aid
  - b) Worked on....
    - i) Table 9.1, Mitigation Action Plan (did not finish)
- 2) Today’s Topics**
  - a) Continue work on....
    - i) Table 9.1, Mitigation Action Plan
  - b) STAPLEE
  - c) Ranking & Priority
- 3) Next Meeting**
  - a) Ranking & Priority (if not finished)
- 4) Future Meetings**
  - a) \_\_\_\_\_

**Meeting 8 – May 31, 2016**

- 1) Last Meeting**
  - a) Worked on....
    - i) Table 9.1, Mitigation Action Plan
    - ii) STAPLEE
- 2) Today’s Topics**
  - a) Ranking & Priority

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## Chapter 2: Community Profile

### A. Introduction

Lyme is located in Grafton County in the Dartmouth-Lake Sunapee Tourist Region in the mid-western part of New Hampshire. The Town is bordered by Orford to the north, Dorchester to the east, Hanover to the south and the Connecticut River and Vermont to the west. The Town is probably most well-known for the scenic Connecticut River Valley and its historic downtown village.

Lyme  
New Hampshire



### TOWN GOVERNMENT

A three-member Selectboard governs the Town of Lyme. The Town's departments include, but are not limited to Fire, Police, Highway, Planning, Zoning, Library, Recreation, Heritage, Energy and Conservation.

#### Incorporated: 1761

**Origin:** This was another of the many towns granted along the Connecticut River in 1761. Lyme takes its name from Old Lyme, which lies at the mouth of the Connecticut River. For many years, the town's name was spelled as Lime in official state documents, however this eventually was decreed a misspelling. Most of the original grantees were from Palmer and Brimfield in Massachusetts, or from Londonderry, New Hampshire. Lyme was on protracted border dispute with the independent state of Vermont, before it was admitted to the Union in 1791.

**Villages and Place Names:** Lyme Center

**Population, Year of the First Census Taken:** 816 residents in 1790

**Population Trends:** Population change for Lyme totaled 707 over 54 years, from 1,026 in 1960 to 1,733 in 2014. The largest decennial percent change was a 19 percent increase between 1980 and 1990; the smallest change was two percent between 2000 and 2010. The 2014 Census estimate for Lyme was 1,733 residents, which ranked 149th among New Hampshire's incorporated cities and towns.

**Population Density and Land Area, 2013 (US Census Bureau):** 32.2 persons per square mile of land area. Lyme contains 53.8 square miles of land area and 1.2 square miles of inland water area.

*Source: NH Community Profiles; 2016; <http://www.nhes.nh.gov/elmi/products/cp/profiles-htm/Lyme.htm>*

### DEMOGRAPHICS & HOUSING

Over the last 30 years, the population of Lyme has increased steadily; the population change from 1980 to 2010 showed an increase of 427 according to US Census 2010. Lyme's population in 2010 was estimated to be 1,716. The American Community Survey (ACS) 2010-2014 estimates a total of 782 housing units, most of which are single family (704). Multiple-family structures total 45 and mobile homes and other housing units number 33. The median household income is estimated to be \$110,781 (ACS 2010-2014) and the median age is 48.3 years.

### EDUCATION & CHILD CARE

Lyme student's grades K-8 attend Lyme Elementary School in Lyme. Lyme students in grades 9-12 are tuitioned to Dresden Cooperative in Hanover. There are 3 licensed child care facilities in Lyme with a capacity of 98 according to the Economic & Labor Market Information Bureau, Community Response, 2014. One private elementary school, Crossroads Academy, is also located in Lyme.

### NATURAL FEATURES

The Town of Lyme covers approximately 53.8 square miles of land. Vegetation is typical of northern New England including both deciduous and conifer forests, open fields, swamp and riverine areas. Lyme's terrain lends itself to an abundance of lakes, ponds, streams and rivers, most notably, the Connecticut River, Post Pond and Pout Pond. Smarts Mountain at 3,238' above sea level stands in the northeastern corner of the Town. Hewes, Grant, and Trout Brooks flow from higher elevations to the flood plain of the Connecticut River at the Town's western border, where "some of the richest agricultural soils in New England"<sup>4</sup> are found.

<sup>4</sup> Town of Lyme website, Natural Features, <http://www.lymenh.gov/about-lyme/pages/natural-features>

**TRANSPORTATION**

There is one major roadway that runs through Lyme; NH Route 10 runs north-south from Orford in the north to Hanover in the south. VT Route 5 and Interstate 91 run along the western border of Lyme, however both are in Vermont on the other side of the Connecticut River. Other important roads for evacuation are East Thetford Road, Dorchester Road and Grafton Turnpike.

**B. Emergency Services**

**EMERGENCY OPERATION CENTER**

The Town of Lyme maintains an Emergency Operations Center (EOC) as part of the Town's emergency preparedness program. The EOC is where department heads, government officials and volunteer agencies gather to coordinate their response to a major emergency or disaster event. The EOC is where the officials responsible for responding to major emergencies and disasters assemble to direct and control the jurisdiction's response. The EOC goes into operation when town officials decide that the situation is serious enough to require a coordinated and other-than-routine response.

In Lyme the designated EOC is the Fire Station. Security and maintenance of the EOC facilities will be carried out in accordance with EOC Standard Operating Procedures (SOPs) to be developed by the EMD. If need be, the Town Office will be used as a secondary EOC.

**EMERGENCY MANAGEMENT DIRECTOR**

The Emergency Management Director (EMD) works closely with all emergency response managers as the Town collectively prepares for and responds to emergencies. During an emergency situation, the EMD is located at the EOC and coordinates the community-wide response to emergency events.

**LYME POLICE DEPARTMENT**

The Police Department staffs a full-time Chief and a full-time officer. Lyme Police Officers are well-trained in the delivery of police services in an atmosphere of regional cooperation and have found value in working with other town and regional agencies, sharing resources, training and experience to provide a superior quality of life for the residents and visitors of Lyme. The Lyme Police Department has mutual aid agreements with all Hanover, Orford, Canaan and Thetford, VT.

**LYME FIRE DEPARTMENT & EMS**

The Lyme Fire Department is a volunteer fire department providing quality fire services to the residents and visitors of Lyme 24 hours a day, 365 days a year. The Department staffs a volunteer Chief, 24 volunteer firefighters and operates one station within the Community. The Lyme Fire Department participates in the Upper Valley Regional Emergency Services Association (UVRESA) along with area departments.

Emergency Medical Services is provided by Lyme FAST Squad. The squad staffs nine volunteers offering emergency medical services to the Town of Lyme. Emergency Medical Transportation is provided by Hanover Fire or backup from Upper Valley Ambulance, Lebanon or Hartford Fire, VT.

**LYME HIGHWAY DEPARTMENT**

The Lyme Highway Department is a year-round, 24-hour as needed operation. The department staffs two full-time and one part-time employee, including a full-time Road Agent. The department's mission is to support the citizens of Lyme through the safe operation, proper maintenance and future development of highway, supporting infrastructure and utilities in a manner that is cost conscience without sacrificing quality. The Highway Department belongs to New Hampshire Public Works Mutual Aid.

**CODERED**

The entire town is serviced by the CodeRED emergency alert system. Emergency response is dispatched through Grafton County Dispatch.

**MEDICAL FACILITIES**

Dartmouth-Hitchcock Medical Center, Lebanon (12 miles, 388 beds) is the primary medical facility for Lyme. An alternative medical facility that may be used is Alice Peck Day Memorial Hospital, Lebanon (16 miles, 25 beds). A small clinic, Dartmouth-Hitchcock Clinic, is also located in Lyme.

**EMERGENCY SHELTER(S)**

The primary shelter is the location to which evacuees are directed at the time of an emergency. In Lyme, the designated primary shelter is the Lyme Elementary School. If the need arises and Lyme Elementary School is not available, the Dartmouth Ski Way would be utilized as a secondary shelter depending on accessibility and the situation.

**C. Lyme's Current & Future Development Trends**

Over the last five years, single family home construction in Lyme has been slow but requests for building permits have increased. The Team reported that there were 67 requests for "building improvements" and four or five requests for single family residences on the books for 2016. Many projects that have been proposed have been for solar improvements; some involved the demolition of an existing structure and rebuilding on the same footprint. No development since 2011 has occurred in hazard prone areas and no development since 2011 has impacted the Town's hazard vulnerability.

The mechanisms that are in place protect new construction or substantial improvements from occurring in hazard-prone areas. For example, one structure on Dorchester Road was required to be built out of the flood zone. Another project of 26 units that involves multi-generational living has been turned down. The Town is considering replacing the current fire station, but this would be built in the current location which is not in a hazard-prone area.

As the economic recovery continues and as the overall economy of the region grows, the Town anticipates slow growth and the possible construction of single family homes and request for subdivisions. The Planning Board will closely monitor any future building requests, especially those requested in flood zones and the wildfire urban interface. The Planning Board will follow town building, zoning and subdivision regulations to ensure that any building in hazardous areas will be built to minimize vulnerability to the hazards identified in this Plan. The Planning Board and the Selectboard will monitor growth in Lyme using existing regulatory documents. Building permits are required in Lyme.

The Town recognizes the importance of growth, but also understands the impact that hazards can have on new facilities and homes if built within hazardous areas of the Community. The likelihood of substantial development in Lyme in the near future is good; Town officials will continue to monitor any new growth and development, including new critical facilities, with regards to potentially hazardous events.

**TABLE 2.1: TOWN STATISTICS**

<b>Table 2.1 - Town Statistics</b>				
<b>Census Population Data</b>	<b>2010</b>	<b>2000</b>	<b>1990</b>	<b>1980</b>
<b>Lyme, NH - Census Population Data</b>	<b>1,716</b>	<b>1,681</b>	<b>1,533</b>	<b>1,289</b>
<b>Grafton County</b>	<b>89,118</b>	<b>81,826</b>	<b>74,998</b>	<b>65,806</b>
<i>Elderly Population-% over 65 (ACS 2010-2014)</i>	19.6%			
<i>Median Age (ACS 2010-2014)</i>	48.3			
<i>Median Household Income (ACS 2010-2014)</i>	\$110,781			
<i>Families below the poverty level (ACS 2010-2014)</i>	3.1%			
<i>Change in Population-Summer (%)</i>	10-15%			
<i>Change in Population-Winter (%)</i>	100% (Dartmouth Skiway)			
<b>Housing Statistics (2010 Census)</b>				
<i>Total Housing Units</i>	810			
<i>Occupied Housing Units</i>	705			
<i>Owner Occupied Units</i>	567			
<i>Renter Occupied</i>	138			
<i>Vacant Housing Units</i>	105			
<i>Units for Seasonal, Recreational, Occasional Use</i>	70			
<i>Assessed structure value (2015-MS1)</i>	\$225,471,800			
<b>Regional Coordination</b>				
<i>County</i>	Grafton			
<i>Tourism Region</i>	Dartmouth-Lake Sunapee			
<b>Municipal Services &amp; Government</b>				
<i>Town Manager</i>	No			
<i>Selectboard</i>	Yes; Elected			
<i>Planning Board</i>	Yes; Elected			
<i>School Board</i>	Yes; Elected			
<i>Zoning Board of Adjustment</i>	Yes; Appointed			
<i>Conservation Committee</i>	Yes; Appointed			
<i>Master Plan</i>	Yes; 2013			
<i>Emergency Operation Plan (EOP)</i>	2011			
<i>Hazard Mitigation Plan (HMP)</i>	Yes; 9/15/11			
<i>Zoning Ordinances</i>	1989; updated annually			
<i>Subdivisions Regulations</i>	Yes; 2005 (reviewed annually)			
<i>Capital Improvement Plan</i>	Yes; 2008; 2012 approved by Selectboard			
<i>Capital Reserve Funds</i>	Yes			
<i>Building Permits Required</i>	Yes			
<i>Town Web Site</i>	Yes; <a href="http://www.lymenh.gov/public_documents/index">http://www.lymenh.gov/public_documents/index</a>			
<i>Floodplain Ordinance</i>	Yes; January 31, 2008			
<i>Member of NFIP</i>	April 16, 1993			

<b>Table 2.1 - Town Statistics</b>	
<i>Flood Insurance Rate Maps (DFIRMS)</i>	February 20, 2008
<i>Flood Insurance Rate Study (FIS)</i>	February 20, 2008
<b>Percent of Local Assessed Valuation by Property Type-2015 (NH Department of Revenue)</b>	
<i>Residential Buildings</i>	92.2%
<i>Commercial Land &amp; Buildings</i>	5.5%
<i>Other (including Utilities)</i>	2.3%
<b>Emergency Services</b>	
<i>Town Emergency Warning System(s)</i>	CodeRED
<i>School Emergency Warning System(s)</i>	Connect 5 (Blackboard)
<i>Emergency Page</i>	No
<i>Facebook Page</i>	No
<i>ListServ</i>	Yes
<i>Local Newspapers</i>	Valley News
<i>Local TV Stations</i>	WMUR-TV, Manchester
<i>Local Radio</i>	WTSL, Lebanon
<i>Police Department</i>	Yes; Full-time Chief, one full-time officer - not 24/7; alternative is NH State Police
<i>Police Dispatch</i>	Hanover
<i>Police Mutual Aid</i>	Hanover, Orford, Thetford & Canaan
<i>Animal Control Officer</i>	Yes; the Police Department
<i>Fire Department</i>	Yes; Volunteer - 24 volunteer firefighters
<i>Fire Dispatch</i>	Hanover; rolls over to Hartford or Lebanon if needed
<i>Fire Mutual Aid</i>	Upper Valley Regional Emergency Services Association (UVRESA)
<i>Fire Stations</i>	One
<i>Fire Warden</i>	Yes
<i>Emergency Medical Services</i>	Yes; Volunteer FAST Squad; 9 volunteers
<i>EMS Dispatch</i>	Hanover; rolls over to Hartford or Lebanon if needed
<i>Emergency Medical Transportation</i>	Hanover Fire; backup from Upper Valley Ambulance, Lebanon or Hartford Fire
<i>HazMat Team</i>	Lebanon Fire
<i>Established EMD</i>	Yes
<i>Established Deputy EMD</i>	Yes
<i>Public Health Network</i>	Upper Valley Regional Public Health Network
<i>Health Officer</i>	Yes
<i>Building Inspector</i>	No
<i>Established Public Information Officer (PIO)</i>	No
<i>Nearest Hospital(s)</i>	Dartmouth-Hitchcock Medical Center, Lebanon (12 miles, 388 beds)
	Alice Peck Day Memorial, Lebanon (16 miles, 25 beds)
<i>Medical Clinic</i>	DHMC-Lyme Clinic
<i>Local Humane Society or Veterinarians</i>	Lyme Veterinarian Clinic
<i>Primary EOC</i>	Fire Station
<i>Secondary EOC</i>	Town Office
<i>Primary Shelter</i>	Lyme Elementary School
<i>Secondary Shelter</i>	Dartmouth Ski Way

**Table 2.1 - Town Statistics**

<b>Table 2.1 - Town Statistics</b>		
<b>Utilities</b>		
<i>Town Sewer</i>	Private septic	
<i>Road Agent</i>	Yes	
<i>Public Works Mutual Aid</i>	Yes	
<i>Water Supply</i>	Private wells	
<i>Waste Water Treatment Plant</i>	No	
<i>Electric Supplier</i>	Eversource & NH Electric Coop	
<i>Natural Gas Supplier</i>	None	
<i>Cellular Telephone Access</i>	Limited	
<i>High Speed Internet</i>	Limited	
<i>Telephone Company</i>	Fairpoint	
<b>Transportation</b>		
<i>Primary Evacuation Routes</i>	NH Route 10; East Thetford Road	
<i>Secondary Evacuation Routes</i>	Dorchester Road to Grafton Turnpike	
<i>Nearest Interstate</i>	I-91 (VT); Exit 14 (3 miles)	
<i>Nearest Airstrip</i>	Post Mills, VT	
<i>Nearest Commercial Airport(s)</i>	Lebanon Municipal (16 miles, 1 airline)	
	Manchester-Boston Regional Airport (86 miles, 13 airlines)	
	Burlington International (VT) (105 miles, 13 airlines)	
<i>Public Transportation</i>	No	
<i>Railroad</i>	No	
<b>Education &amp; Childcare</b>		
<i>Elementary School</i>	Lyme Elementary School (grades K-8) & Crossroads Academy (Private Elementary School)	
<i>Middle School</i>	Students in grades 9-12 are tuitioned to area schools	
<i>High School</i>		
<i>School Administrative Unit</i>	SAU 76	
<i>Licensed Childcare Facilities</i>	3 facilities; 98 capacity	
<b>Conserved Land as a Percent of Land in the Community (GIS Analysis)</b>		
	<b>Square Miles</b>	<b>Percent of Town Land</b>
<i>Approximate Square Miles in Community</i>	55.00	100.0%
<i>Approximate Total Un-Conserved Land</i>	35.43	64.4%
<i>Approximate Total Conserved Land</i>	19.57	35.6%
<i>Federal Owned Land</i>	8.71	15.8%
<i>State Owned Land</i>	0.67	1.2%
<i>Municipal/County Land</i>	4.12	7.5%
<i>Private Land</i>	6.07	11.0%
<b>Fire Statistics (NH Division of Forests &amp; Lands &amp; the Town of Lyme)</b>		
<i>Wildfire Fire Calls (14 &amp; 15)</i>	2 (2015); 4 (2014) - all were less than an acre	
<i>Grafton County Fire Statistics (15)</i>	17 fires, 22.6 acres	
<i>State Forest Fires FY (15)</i>	134 fires, 661 acres	
<i>Information found in Table 2.1, unless otherwise noted, was derived from the Economic &amp; Labor Market Information Bureau, NH Employment Security, August 2016 Community Response Received 7/26/16; <a href="http://www.nh.gov/nhes/elmi/htmlprofiles/pdfs/lyme.pdf">http://www.nh.gov/nhes/elmi/htmlprofiles/pdfs/lyme.pdf</a> and from the Town of Lyme</i>		

## Chapter 3: Hazard Identification

### A. Description of the Hazards

The first step in hazard mitigation is to identify hazards; the Team determined that thirteen natural hazards have potential to affect the Community. The hazards listed to the right and in Table 3.1 were classified based upon their relative threat score (as calculated in Column F in Table 3.1) and separated into three categories using Jenks' Optimization, which is also known as natural breaks classification. "*The natural breaks classification process is a method of manual data classification that seeks to partition data into classes based upon natural groups within the data distribution.*"<sup>5</sup> By using this grouping process, the Plan demonstrates each hazard's likelihood of occurrence in combination with its potential effect on the Town of Lyme. This process illustrates a comprehensive hazard statement and assists the Town with understanding which hazards should receive the most attention. Determination of the probability of occurrence is contained within Column D in Table 3.1; hazards are assessed based upon their likelihood of the hazard's manifestation within a 25 year period.

Table 3.1 provides estimates of the level of impact each listed hazard could have on humans, property and business and averages them to establish an index of "severity". The estimate of "probability" for each hazard is multiplied by its severity to establish an overall "relative threat" factor.

Based on this analysis, the most likely natural disaster threat to Lyme is Severe Winter Weather & Ice Storms. The second most likely threat is Flooding (ice jams, heavy rain, riverine & local roads) and the third is Erosion, Landslide & Mudslide (riverbank erosion). Six human-caused hazards were also discussed by the Team and are included in Chapter 5. Human-caused hazards include Extended Power Failure, Epidemic/Pandemic, Dam Failure, and Hazardous Materials – Transport, Terrorism and Hazardous Materials – Fixed Location.

In light of recent events (Tropical Storms Irene and Sandy), it should be noted that hurricanes and/or tropical storms have the potential to cause significant damage in Lyme as a result of both wind strength and flash flooding creating road closures and damage. Although Tropical Storm Sandy did not significantly impact Lyme, there was damage from Tropical Storm Irene to roads because of flooding from the heavy rain (see Chapter 5). There is a good probability that tropical storms will affect Lyme in the future. The Team noted that Category 1 or greater hurricanes would not likely affect Lyme; however the tropical rains that may result could be significant.

#### The Natural Hazards

The natural hazards which are **MOST LIKELY** to affect Lyme include:

- Severe Winter Weather & Ice Storms
- Flooding
- Erosion, Landslide & Mudslide
- Hurricanes & Tropical Storms
- Tornadoes & Downbursts

The natural hazards which **MAY AFFECT** Lyme include:

- Severe Thunder & Lightning Storms
- High Winds (windstorms)
- Extreme Temperatures (hot & cold)

The natural hazards which are **LESS LIKELY TO AFFECT** Lyme include:

- Hailstorms
- Wildfires
- Earthquakes
- Subsidence (sinkholes)
- Drought

<sup>5</sup> ESRI, <http://support.esri.com/en/knowledgebase/GISDictionary/term/natural%20breaks%20classification>

**TABLE 3.1: HAZARD THREAT ANALYSIS**

<b>Table 3.1 - Hazard Threat Analysis</b>							
<i>Hazards which are most likely to affect the Community</i>				<b>A natural hazard is a source of harm or difficulty created by a meteorological, environmental or geological event.</b>			
<i>Hazards which may affect the Community</i>							
<i>Hazards which are less likely to affect the Community</i>							
<b>Scoring for Probability (Columns A, B &amp; C)</b>	<b>Scoring for Likelihood of Occurrence (Column D)</b>	<b>Column A</b>	<b>Column B</b>	<b>Column C</b>	<b>Column D</b>	<b>Columns (A+B+C)/3</b>	<b>Columns D x E</b>
1=Very Low (0-20%)		What is the probability of death or injury?	What is the probability of physical losses & damage?	What is the probability of interruption of service?	What is the probability of this occurring within 25 years?	Average of Human, Property & Business Impact	Relative Threat
2=Low (21-40%)							
3=Moderate (41-60%)							
4=High (61-80%)		Human Impact	Property Impact	Business Impact	Probability of Occurrence	Severity	Risk Severity x Occurrence
5=Very High (81-100%)							
<b>Natural Hazards</b>							
1) Severe Winter Weather & Ice Storms		4.0	5.0	5.0	5.0	4.7	23.3
2) Flooding (ice jams, heavy rain, riverine & local roads)		2.0	4.0	3.0	5.0	3.0	15.0
3) Erosion, Landslide & Mudslide (riverbank)		2.0	3.0	2.0	5.0	2.3	11.7
4) Hurricanes & Tropical Storms		3.0	4.0	4.0	3.0	3.7	11.0
5) Tornadoes & Downbursts		3.0	4.0	4.0	3.0	3.7	11.0
6) Severe Thunder & Lightning Storms		2.0	2.0	2.0	5.0	2.0	10.0
7) High Winds (windstorms)		1.0	3.0	2.0	5.0	2.0	10.0
8) Extreme Temperatures (hot & cold)		2.0	2.0	2.0	5.0	2.0	10.0
9) Hailstorms		2.0	3.0	2.0	3.0	2.3	7.0
10) Wildfires		2.0	2.0	2.0	3.0	2.0	6.0
11) Earthquakes		4	4.0	4.0	1.0	2.7	2.7
12) Subsidence (sinkholes)		2.0	1.0	1.0	1.0	1.3	1.3
13) Drought		1.0	1.0	1.0	1.0	1.0	1.0
<b>Human-Caused Hazards</b>							
1) Extended Power Failure		3.0	3.0	3.0	4.0	3.0	12.0
2) Epidemic/Pandemic		4.0	2.0	4.0	3.0	3.3	10.0
3) Dam Failure		5.0	5.0	5.0	1.0	5.0	5.0
4) Hazardous Materials-Transport		4.0	4.0	4.0	1.0	4.0	4.0
5) Terrorism		4.0	4.0	4.0	1.0	4.0	4.0
6) Hazardous Materials-Fixed Location		3.0	3.0	3.0	1.0	3.0	3.0

## B. Risk Assessment

The next step in hazard mitigation planning was to identify the location of past hazard events and if possible, what facilities or areas were impacted. The Team used *Table 3.1, Hazard Threat Analysis*, to identify potential threats and prioritize their threat potential. The Team then used a base map that included the 100-year floodplain, political boundaries, water bodies, the road network and aerial photos to locate all of the past hazard events on the base map. This step in the planning process serves as a stepping stone for predicting where future hazards could potentially occur. The Team identified past events in Lyme, Coos County and the State and listed them in *Table 3.2, Historic Hazard Identification*.

To assess the fire base risk, a formula based on the following criteria was used:

- **Ignitability** – Using the 2001 NH Land Cover Assessment GIS Layer - A value between 0 and 9 was assigned based on ignitability to 23 land cover categories from open water to pitch pine forest.
- **Slope** - A value of 1-10 was assigned to various gradients of slope.
- **Aspect** - A value of 0-8 was assigned to various aspects from flat to southwest facing slopes.

These criteria were combined using GIS analysis and weighted equally to determine risk levels throughout the Town. Once the analysis and mapping were complete in GIS, a matrix was created showing varying risk levels: low, medium and high. Each risk level was assigned a color and was mapped over a base-map of the Town, see *Appendix G: Map Documents, Map 1: Base Risk Analysis*.

## C. Lyme National Flood Insurance Program (NFIP) Status

Lyme has been a member of the National Flood Insurance Program since April 16, 1993. Lyme has a relatively small flood plain with approximately 2.54 square miles of land in the 100-year floodplain<sup>6</sup>, 1.2 square miles of which is inland water. The floodplain areas of Lyme are primarily along the Connecticut River, Clay, Grant and Hewes Brooks and around the lakes and ponds in the Community; there are other small streams and brooks throughout the Town that may also experience flooding.

According to the NH Office of Energy and Planning, ten NFIP policies are in effect in Lyme for a total of \$2,243,600 of insurance in force; this includes nine residential homes and one 2-4 family unit. One loss has been paid for a total of \$302 but there have been no reported repetitive losses.<sup>7</sup> The floodplain, as well as the Critical Infrastructure and Key Resources (CIKR) that are in the floodplain can be seen on *Map 3, Past & Potential Areas of Concern*, located in *Appendix G: Map Documents*, of this Plan.

In 1968, although well-intentioned government flood initiatives were already in place, Congress established the National Flood Insurance Program (NFIP) to address both the need for flood insurance and the need to lessen the devastating consequences of flooding. The goals of the program are twofold: to protect communities from potential flood damage through floodplain management, and to provide people with flood insurance.

For decades, the NFIP has been offering flood insurance to homeowners, renters and business owners, with the one condition that their communities adopt and enforce measures to help reduce the consequences of flooding. *Source:* [http://www.floodsmart.gov/floodsmart/pages/about/nfip\\_overview.jsp](http://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp)

Elements from the Floodplain Development Ordinance for the Town of Lyme are detailed below; italicized items throughout this section are quoted directly from the Ordinance.

<sup>6</sup> GIS Analysis of Grafton County DFIRM (Digital Flood Insurance Rate Map)

<sup>7</sup> NH Office of Energy & Planning; Jennifer Gilbert, February 6, 2015

**Purposes & Authority**

“This ordinance, adopted pursuant to authority of RSA 674:16, shall be known as the Town of Lyme Floodplain Development Ordinance. The regulations in this ordinance shall overlay and supplement the regulations in the Town of Lyme Zoning Ordinance, and shall be considered part of the Zoning Ordinance for the purposes of administration and appeal under state law. If any provisions of this ordinance differs or appears to conflict with any provision of the Zoning Ordinance or other ordinance or regulation, the provision imposing the greater restriction or more stringent standard shall be controlling.

**Severe Repetitive Loss (SRL) Properties**--NFIP-insured buildings that, on the basis of paid flood losses since 1978, meet either of the loss criteria described on page SRL 1. SRL properties with policy effective dates of January 1, 2007, and later will be afforded coverage (new business or renewal) only through the NFIP Servicing Agent’s Special Direct Facility so that they can be considered for possible mitigation activities. Source: <http://www.fema.gov/national-flood-insurance-program/definitions#R>

The following regulations in this ordinance shall apply to all lands designated as special flood hazard areas by the Federal Management Agency (FEMA) in its “Flood Insurance Study for the Town of Lyme, NH” together with the associated Flood Insurance Rate Maps dated April 16, 1993 and any subsequent revisions, which are declared to be a part of this ordinance and are hereby incorporated by reference.” It is noted that the latest Flood Insurance Rate Study and the latest Flood Insurance Rate Maps are dated February 20, 2008.

Other elements of the Lyme Floodplain Management Ordinance include:

- Item I – Definitions** ..... Provides definitions for terms used in this Ordinance.
- Item II - Permits** ..... “All proposed development shall require a permit as required under the Lyme Zoning Ordinance. This includes grading as required by the State Floodplain Management program.
- Item III – Construction Requirement** ..... Specifications for construction and substantial improvement requirements in a special flood hazard zone “...to determine whether proposed building sites will be reasonably safe from flooding...”
- Item IV – Water and Sewer Systems** ..... Specifications for water and sewer systems
- Item V – Certification** ..... Specifications for substantially improved structures in special flood hazard areas such as as-built elevation and certification of floodproofing.
- Item VI - Other Permits** ..... Requirements for the applicant to obtain all necessary permits (i.e., from governmental agencies).
- Item VII - Watercourses** ..... Specification for riverine situations and watercourses and coordination with the Wetlands Bureau of New Hampshire (DES).
- Item VIII – Special Flood Hazard Areas**..... Further specifications for Zones AE and A, the 100-year flood elevation data, new construction and substantial improvements, manufactured homes, recreational vehicles and lowest floor regulations.
- Item IX – Variances and Appeals**..... Details the necessary requirements for processing requests for appeals from the Zoning Board of Adjustment.

**Effective Date**

*“The first “Flood Prone Area Building Code” was adopted at Special Town Meeting on May 6, 1975. This code was amended by the “Flood Hazard Area Building Code for the Town of Lyme” adopted at a Special Town Meeting on August 16, 1987, superseding the Flood Prone Area Building Code dated May 6, 1975. This Ordinance entitled, “Floodplain Development Ordinance for the Town of Lyme” amends what was formerly known as The Flood Hazard Area Building Code for the Town of Lyme”.<sup>8</sup> The effect date of this amended ordinance is March 9, 1993. The Floodplain Development Ordinance has since been amended several times, most recently in 2008.*

**Amendments**

- A. March 8, 1994
- B. March 12, 2002
- C. March 11, 2003
- D. March 8, 2005
- E. March 13, 2006
- F. March 13, 2007
- G. January 31, 2008

**Addendum**

*The Lyme Selectboard, at their meeting of January 31, 2008, unanimously adopted the following addendum to this ordinance:*

*“The regulations in this ordinance shall apply to all lands designated as special flood hazard areas by the Federal Emergency Management Agency (FEMA) in its “flood Insurance Study for the Country of Grafton, N.H.” dated February 20, 2008 or as amended, which are declared to be a part of this ordinance and hereby incorporated by reference.”*

As a very efficient and close-knit community, the Selectboard, Planning Board and other town officials are most always aware of new construction and/or substantial improvements that take place in town. Although Lyme has a relatively small designated Special Flood Hazard Area, the Team felt that it is worthwhile to provide flood information on the Town’s website and a link to the NFIP to provide public education for current homeowners and potential developers (see Action Items #8 & #9, Tables 8.1 & 9.1).

The Town of Lyme, through its Floodplain Development Ordinance and other best practices, complies with the National Flood Insurance Program requirements. The Team understands that the benefits of the NFIP also extend to structures that are not in the 100-year floodplain. The Town will continue to work with the Office of Energy and Planning and will carefully monitor its continued compliance with the NFIP.

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<sup>8</sup> Floodplain Development Ordinance for the Town of Lyme

### **D. Profile of Past, Present & Potential Wildfire Events in Lyme**

Historic fires can serve to help residents determine where future fires may occur, understand how the landscape and land use may have changed over time and assist with determining priorities for future mitigation strategies. The Lyme Planning Team noted that there were four wildfire calls in 2014 and two wildfire calls in 2015; all of these fires were less than an acre. It was noted that if the right conditions were in place, a large wildfire could occur. Lyme's forested lands include many of the factors associated with potential wildfire.

### **E. Probability of Future Potential Disasters**

Overall, the Town of Lyme is fairly safe from the effects of natural hazards. However, due to Lyme's geographic location, forested lands, steep hills, heavy snow pack and topography, there is always a possibility of future disasters in Lyme. The Town of Lyme has been impacted in the past by natural disasters, including flooding, lightning, severe winter storms and severe wind. In addition, the potential exists for tornado and earthquake damage although there is no record of these events striking the Town. Fortunately, many residents have generators and/or heat with wood stoves.

The hazards that are have the highest probability to occur in Lyme, based on analysis done in *Table 3.1, Hazard Threat Analysis*, are described below.

#### **SEVERE WINTER WEATHER & ICE STORMS**

Severe winter weather events, particularly ice storms, are felt to pose a great risk to the people of Lyme. Fortunately with a severe winter weather occurrence, so comes a vast knowledge of how to deal with the situation. In fact, even large single-storm accumulations of snow can generally be handled by the Town's Highway Department.

Ice storms on the other hand pose a serious threat as they are unpredictable and can create a mass amount of damage and long-lasting power outages. Areas above 1,000 feet are more susceptible to severe ice storms. Elevations in Lyme range from 548 feet to 3,238 at the summit of Smarts Mountain, therefore ice storms have a high probability of occurring in Lyme. See Chapter 5 for more information on severe winter weather and ice storms in Lyme.

#### **FLOODING (RIVERINE, ICE JAMS, HEAVY RAIN, LOCAL ROADS)**

Flooding is a common hazard event in Lyme with a high probability of occurring in the future. Many roads have been impacted including River Road, Preston Hill Road, Dorchester Road and Pinnacle Road; underperforming culverts and drainage systems contribute to Lyme's local road flooding. Other contributors include heavy rain, rapid snowmelt and beaver dams. Ice jams and flooding along the Connecticut River and Hewes, Grant and Clay Brooks have occurred in the past and are expected to occur again. See Chapter 5 for more information on flooding in Lyme.

#### **EROSION, LANDSLIDE & MUDSLIDE (RIVERBANK)**

A reservoir has been created in a section of the Connecticut River above the Wilder Dam. In this section of the Connecticut, the riverbank consists of silt and fine sands. As the Wilder Dam releases water to make electricity and lowers the level of the reservoir, this silty material turns to slurry and as the water level falls, the pulling back of the slurry causes the riverbank to be weakened. The repetitive actions being taken by the Dam (sometimes twice a

day), have caused River Road to be significantly undermined, causing road closures, isolation of residents and homes and a concern for structures which are close to the river bank. Part of River Road is currently closed because its proximity to the river has made it unsafe. The probability for addition significant riverbank erosion and instability is high. See Chapter 5 for more information on Erosion, Landslide & Mudslide.

**CLIMATE CHANGE**

Although not identified as a natural hazard in this Plan, no plan can be considered complete today without some discussion of the impact that climate change has had on weather patterns. As FEMA stated in its new State Mitigation Plan Review Guide, *"The challenges posed by climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and higher sea levels, could significantly alter the types and magnitudes of hazards impacting states in the future."*<sup>9</sup>. By including climate change in the new hazard mitigation guide for state planners, FEMA is recognizing the reality of climate change. Communities in New Hampshire, such as Lyme, should become increasingly aware of the effects of climate change on the natural hazards that are already being experienced.

**STATE HAZARD MITIGATION PLAN**

The NH State Hazard Mitigation Plan includes many of the same potential hazards that have been identified in Lyme. Several of the State’s hazards however were excluded from this Plan. These include the following:

<b><u>State Hazard</u></b>	<b><u>Reason for exclusion from Lyme’s Plan</u></b>
Coastal Flooding .....	Distance away from the sea
Radon .....	Felt to be an individual homeowner’s responsibility
Radiological .....	Distance away from a nuclear power plant
Fire & Hazardous Materials .....	Addressed with “Wildfire” and “Hazardous Materials Transport & Fixed”
Snow Avalanche .....	No known areas of avalanche that would impact people or structures

**HAZARD PROBABILITY COMBINED WITH POWER FAILURE**

Any potential disaster in Lyme is particularly impactful if combined with power failure, as would most likely be the case with severe winter storms, blizzards and ice storms, hurricanes, tropical storms and windstorms. The food supply of individual citizens could become quickly depleted should a power failure last for a week or more, particularly as there are no major pharmacies or grocery stores located in the Community. An outage during the winter months could result in frozen pipes and the lack of water and heat, a particular concern for the Town’s elderly citizens who comprise nearly 20% of the population. In addition, winter in New England commonly brings very low temperatures, while high temperatures can be experienced in the summer.

**HAZARD PROBABILITY COMBINED TRANSPORTATION**

NH Route 10 serves as a major north-south roadway through Lyme for those travelling from Haverhill and other places to the north to Hanover and Lebanon in the south. NH Route 10 is also a major roadway for traveling to Dartmouth-Hitchcock Medical Center. Route 10 carries a considerable amount of traffic including trucks and busses carrying goods and people. NH Route 10 is often impacted by weather events that create poor driving conditions. Winter season brings skiers the Dartmouth Skiway.

<sup>9</sup> State Mitigation Pan Review Guide, FEMA, Released March 2015, Effective March 2016, Section 3.2, page 13

Other roads also serve the Community, many of which are narrow and winding and subject to severe winter weather. The road system which serves Lyme consists of slow country roads and/or dirt roads, with the exception of NH Route 10. Dark, narrow, winding and bumpy roads are beautiful in the spring, fall and summer months, but when affected by flooding or winter snow conditions and ice they become treacherous. In these conditions, vehicular accidents, wildlife collisions and truck accidents involving hazardous materials are always a possibility. A major ice storm or other significant event can make egress and access difficult for individuals and first responders.

**Table 3.1, Table 3.2 and Chapter 5, Section B provide more information on past and potential hazards.**



**TABLE 3.2: HISTORIC HAZARD IDENTIFICATION**

2011 HMPT = 2011 Hazard Mitigation Planning Team  
 2017 HMPT = 2017 Hazard Mitigation Planning Team

DR Presidential Disaster Declarations (DR) since 1953  
 EM Emergency Declarations (EM) since 1953

Type of Event	Date	Location	Impact	Source
<b>Past Flooding Hazards including Riverine, Heavy Rainfall, Rapid Snowmelt, Ice Jam Flooding &amp; Local Road Flooding:</b> Riverine flooding is the most common disaster event in the State of NH. Significant riverine flooding in some areas of the State occurs in less than ten year intervals and seems to be increasing with climate change. The entire State of NH has a high flood risk. Some areas prone to flooding and road erosion were mapped and can be seen on <i>Map 3, Past &amp; Potential Areas of Concern</i> ; flood events have the potential to impact the Community on a town wide basis.				
Flooding	1936	East Thetford Bridge	Connecticut River Bridge lost due to flooding.	2011 HMPT & 2017 HMPT
Flooding	1959	Whipple Hill Road Bridge	A beaver dam on Trout Brook failed due to heavy rains and washed away a person and Whipple Hill Road Bridge.	2011 HMPT & 2017 HMPT
Severe Storms & Flooding	11-Jul-73	Dorchester Road & Baker Hill	<b>Presidential Disaster Declaration DR-399:</b> Grant Brook took out a bridge; several other bridges and culverts damaged; flooding events every 30 years or so.	FEMA & 2011 HMPT & 2017 HMPT

Type of Event	Date	Location	Impact	Source
Severe Storms & Flooding	October 7-18, 2005	Belknap, Cheshire, Grafton, Hillsborough, Merrimack & Sullivan	<b>Presidential Disaster Declaration DR-1610:</b> State and federal disaster assistance had reached more than \$3 million to help residents and business owners in New Hampshire recover from losses resulting from the severe storms and flooding in October; there was no significant impact in Lyme.	FEMA & 2017 HMPT
Severe Storms & Flooding	May 12-23, 2006	Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham & Strafford	<b>Presidential Disaster Declaration DR-1643:</b> Flooding in most of southern NH, May 12-23, 2006. (aka: Mother's Day Storm); heavy rains wash outs and a slide occurred on Shoestrap Road, part of road temporarily closed; voted at Town Meeting to make it a Class VI road after this happened (March 2007).	FEMA & 2017 HMPT
Nor'easter, Severe Storms & Flooding	April 15-23, 2007	All Ten NH Counties	<b>Presidential Disaster Declaration DR-1695:</b> Flood damages; FEMA & SBA obligated more than \$27.9 million in disaster aid following the April nor'easter. (aka: Tax Day Storm); tree damage, lost power for 4-10 days, significant tree damage; minor structure damage to roofs; barn collapsed.	FEMA & 2017 HMPT
Severe Storms, Thunder & Lightning & Flooding	July 24-August 14, 2008	Belknap, Carroll & Grafton & Coos	<b>Presidential Declaration DR-1787:</b> Severe storms, tornado and flooding on July 24, 2008 (Carroll); although there was a period of rain throughout this period, there was no significant impact in Lyme.	FEMA & 2017 HMPT
Severe Storms & Flooding	May 26-30, 2011	Coos & Grafton County	<b>Presidential Disaster Declaration DR-4006:</b> May Flooding Event, May 26th-30th 2011 Coos & Grafton County. (aka: Memorial Day Weekend Storm); north end of River Road bank washed away and road had to be closed for safety reasons (repaired with funds from NRCS & FEMA, completed repairs in August 2012).	FEMA & 2017 HMPT
Severe Storms, Flooding	July 9-10, 2013	Cheshire, Sullivan & Grafton	<b>Presidential Emergency Declaration DR-4139:</b> Severe storms, flooding and landslides during the period of June 26 to July 3, 2013 in Cheshire, Sullivan and southern Grafton Counties; although nearby towns had some damage there was no significant impact in Lyme.	FEMA & 2017 HMPT
Flooding	May 27, 2016	Grafton Turnpike	Heavy rain caused a beaver dam to fail causing 3-4 feet of roadway to be washed out on Grafton Turnpike; flood waters ran down both sides of the road, causing three driveways to be inaccessible.	2017 HMPT

**Past Wildfire Hazards:** New Hampshire is heavily forested and is therefore vulnerable to wildfire, particularly during periods of drought. The proximity of many populated areas to the State's forested land exposes these areas to the potential impact of wildfire. One wildfire was mapped as well as the Wildland Urban Interface; these are shown in **Map 2, Historic Wildfires & the Wildland Urban Interface**; wildfires have the potential to impact the Community on a town wide basis.

Wildfire	1939	Reservoir Pond	1,000 acres wildfire around Reservoir Pond; downed trees, limited road access.	2011 HMPT
Wildfire	1963	Sugar Hill	Sugar Hill fire, Lyme Center.	2011 HMPT
Wildfire	1975	Tinkhamtown	Fire burned 50 acres.	2011 HMPT
Wildfire	1994	Bliss Lane (end)	Fire; caused by hikers; less than 10 acres. (See Map 2)	2017 HMPT

The Team noted that several small (<2-3 acres) have taken place but no significant wildfires.

Type of Event	Date	Location	Impact	Source
<p><b>Past High Wind Hazards including Hurricanes, Tropical Storms, Tornadoes, Downbursts &amp; Windstorms:</b> Tornadoes are spawned by thunderstorms and occasionally by hurricanes; tornadoes may occur singularly or in multiples. A downburst is a severe localized wind blasting down from a thunderstorm. Downburst activity is prevalent throughout NH and is becoming more common with climate change; most downbursts go unrecognized unless significant damage occurs. Hurricanes develop from tropical depressions which form off the coast of Africa. New Hampshire's exposure to direct and indirect impacts from hurricanes is real, but modest, as compared to other states in New England. A hurricane that is downgraded to a Tropical Storm is more likely to have an impact in New Hampshire. These hazards were not mapped; tornadoes and other wind events have the potential to impact the Community on a town wide basis.</p>				
Hurricane	1938	Town Wide	The Great Hurricane of 1938 caused extensive flooding, power outages and wind damage in Lyme.	2011 HMPT
Hurricane Bob, Severe Storm	August 18-20, 1991	Town Wide	<b>Presidential Disaster Declaration DR-917:</b> no significant impact in Lyme.	FEMA & 2017 HMPT
Tropical Storm Floyd	September 16-18, 1999	Belknap, Cheshire & Grafton	<b>Presidential Disaster Declaration DR-1305:</b> The declaration covers damage to public property from the storm that spawned heavy rains, high winds and flooding over the period of September 16-18; heavy rains were experience in Lyme but there was no significant impact.	FEMA & 2017 HMPT
High Wind Event	Spring 2004	Town Wide	As indicated in the 2011 HMP, high winds took down a power line and sparked several fires in Lyme.	2011 HMPT
Hurricane Katrina Evacuation	August 29-October 1, 2005	All Ten NH Counties	<b>Presidential Emergency Declaration EM-3258:</b> Assistance to evacuees from the area struck by Hurricane Katrina and to provide emergency assistance to those areas beginning on August 29, 2005 and continuing; The President's action makes Federal funding available to the State and all 10 counties of the State of New Hampshire; Lyme received dogs but no people came to Lyme as a result of Katrina.	FEMA & 2017 HMPT
High Wind Event & Microburst	April 2007	Town Wide	As indicated in the 2011 HMP and confirmed by the 2017 HMPT, a microburst that affected Lyme in 2007 damaged structures, power lines and trees; roads blocked off; power outages; 1/2 mile wide wind swath across town; significant tree damage, no injuries; some isolation; power out up to 10 days in some locations; Lyme opened the EOC for this event; \$10,000 bill to local logging company to help with tree damage; FEMA funding was used.	2011 HMPT & 2017 HMPT
Tropical Storm (Hurricane) Irene	August 26-September 6, 2011	All Ten NH Counties	<b>Presidential Emergency Declaration DR-4026 &amp; EM-3333:</b> Emergency Declaration for Tropical Storm Irene for in all ten counties; some roads in Lyme were affected with flooding due to heavy rain; Dorchester Road, Flint Hill Road and Goose Pond Road.	FEMA & 2017 HMPT
Hurricane Sandy	October 26-31, 2012	All Ten NH Counties	<b>Presidential Emergency Declaration DR-4095 &amp; EM-3360:</b> Hurricane Sandy came ashore in NJ and brought high winds, power outages and heavy rain to NH; all ten counties in the State of New Hampshire although there was no significant impact in Lyme.	FEMA & 2017 HMPT

Type of Event	Date	Location	Impact	Source
<p><b>Past Severe Winter Weather Hazards including Nor'easters, Blizzards &amp; Ice Storms:</b> Severe winter weather in NH may include heavy snow storms, blizzards, Nor'easters and ice storms, particularly at elevations over 1,000 feet above sea level. Generally speaking, NH will experience at least one of these hazards during any winter season; however, most NH communities are well prepared for such hazards. These hazards were not mapped; severe winter weather and ice storms have the potential to impact the Community on a town wide basis.</p>				
Snowstorm	1968-69	Region Wide	The winter of 1968-69 brought record amounts of snow to all of NH and to Lyme; Pinkham Notch at the base of Mount Washington recorded more than 75" of snowfall in a four day period at the end of February 1969 in addition to snow that had already fallen; all of NH, including Lyme, had difficulty with snow removal because of the great depths that had fallen from December 1968 to April 1969.	2017 HMPT
Nor 'Easter	December 1969	Town Wide	This snow event from the 2011 HMP indicated heavy snow in the Connecticut River Valley; there was however, no recollection by the 2017 HMPT significant damages.	2011 HMPT & 2017 HMPT
High Winds, Tidal Surge, Coastal Flooding & Snow	16-Feb-78	Town Wide	<b>Presidential Disaster Declaration DR-549:</b> Blizzard of 1978; Lyme received heavy snow but it was handled well by the Highway Department	FEMA & 2017 HMPT
Ice Storm	January 7-25, 1998	Town Wide	<b>Presidential Disaster Declaration DR-1199:</b> The Ice Storm of 1998 caused significant forest damage to a large part of northern New Hampshire; in Lyme, only elevations over 1,000 were affected; extensive tree damage; snowmobile trails destroyed.	FEMA & 2011 HMPT & 2017 HMPT
Snowstorm	March 5-7, 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, & Strafford	<b>Presidential Emergency Declaration EM-3166:</b> Declaration covers jurisdictions with record and near-record snowfall from the late winter storm that occurred March 2001; Lyme experienced heavy snow, school was closed but snow accumulations were handled well by the Highway Department.	FEMA & 2011 HMPT & 2017 HMPT
Snowstorm	December 6-7, 2003	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan	<b>Presidential Emergency Declaration EM-3193:</b> This snow emergency declaration covered jurisdictions with record and near-record snowfall that occurred over the period of December 6-7, 2003; snow accumulations from this storm were handled well by the Highway Department.	FEMA & HMPT 2017

Type of Event	Date	Location	Impact	Source
Snowstorm	January, 22-23, 2005 February 10-11, 2005	<b>EM-3207</b> Belknap, Carroll, Cheshire, Grafton, Hillsborough, Rockingham, Merrimack, Strafford & Sullivan <b>EM-3208</b> Carroll, Cheshire, Coos, Grafton & Sullivan	<b>Presidential Emergency Declaration EM-3207:</b> January storm damage: More than \$3.5 million had been approved to help pay for costs of the heavy snow and high winds; Total aid for the January storm was <b>\$3,658,114.66</b> (Grafton: \$137,118.71; State of NH: \$1,107,426.59); February storm damage: aid for the February storm was \$1,121,727.20 (Grafton: \$213,539.52; State of NH: \$521,536.78) EM 3208-002:The Federal Emergency Management Agency (FEMA) had obligated more than \$6.5 million to reimburse state and local governments in New Hampshire for costs incurred in three snow storms that hit the state earlier this year, according to disaster recovery officials. Total aid for all three storms was \$6,892,023.87 (January: \$3,658,114.66; February: \$1,121,727.20; March: \$2,113,182.01); Grafton County did not receive aid for the March 2005 storm; the Town of Lyme received significant snow during the winter of 2005, but accumulations were handled well by the Highway Department.	FEMA & HMPT 2017
Severe Winter & Ice Storm	December 11-23, 2008	All Ten NH Counties	<b>Presidential Emergency Declaration DR-1812 &amp; EM-3297:</b> Severe winter storm beginning on December 11, 2008 and damaging ice storms to the entire state including all ten NH counties; some fallen trees and large scale power outages in some areas of New Hampshire; five months after December's ice storm pummeled the region, nearly \$15 million in federal aid had been obligated by May 2009; high winds and ice took down trees and power lines; estimated one-third of the community of Lyme was without power for up to a week.	FEMA & 2011 HMPT & 2017 HMPT
Severe Winter Storm, Ice Storm, Rain & Flooding	February 23 - March 3, 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	<b>Presidential Disaster Declaration: DR-1892:</b> Flood and wind damage to most of southern NH including six counties; 330,000 homes without power; more than \$2 million obligated by June 2010; although this storm significantly affected other parts of New Hampshire, there was no significant impact in Lyme.	FEMA & 2017 HMPT
Severe Snow Storm	October 29-30, 2011	All Ten NH Counties	<b>Presidential Emergency Declaration EM-3344:</b> Severe storm during the period of October 29-30, 2011; all ten counties in the State of New Hampshire. (aka: Snowtober); in Lyme, some trees came down, particularly oaks (leaves still one), but there were no power outages and no significant damage.	FEMA & 2017 HMPT
Severe Winter Storm	February 8, 2013	All Ten NH Counties	<b>Presidential Emergency Declaration DR-4105:</b> Nemo; heavy snow in February 2013; while Nemo largely affected the southeastern part of New Hampshire, Lyme had some snow accumulation but no significant damage.	FEMA & 2017 HMPT

Type of Event	Date	Location	Impact	Source
<p><b>Past Earthquake Hazards:</b> According to the NH State Hazard Mitigation Plan, New Hampshire is considered to lie in an area of "Moderate" seismic activity when compared to other areas of the United States. New Hampshire is bordered to the north and southwest by areas of "Major" activity. Generally, earthquakes in NH cause little or no damage and have not exceeded a magnitude of 5.5 since 1940. These hazards were not mapped; earthquakes have the potential to impact the Community on a town wide basis.</p>				
Earthquake	12/20/40	Ossipee, NH	Magnitude 5.5	State Hazard Mitigation Plan 2013
Earthquake	12/24/40	Ossipee, NH	Magnitude 5.5	
Earthquake	12/28/47	Dover NH-Foxcroft, ME	Magnitude 4.5	
Earthquake	06/10/51	Kingston, RI	Magnitude 4.6	
Earthquake	04/26/57	Portland, ME	Magnitude 4.7	
Earthquake	04/10/62	Middlebury, VT	Magnitude 4.2	
Earthquake	06/15/73	Quebec Border / NH	Magnitude 4.8	
Earthquake	01/19/82	West of Laconia, NH	Magnitude 4.5; an event recalled in 1980's	
Earthquake	06/23/10	Ontario-Quebec Border	Magnitude 5.0	
Earthquake	06/26/10	Boscawen, NH	Magnitude 3.1	
Earthquake	08/23/11	Virginia	Magnitude 5.8	
Earthquake	09/18/12	Concord, NH	Magnitude 1.2	
Earthquake	10/16/12	Waterboro, ME	Magnitude 4.0	
<p><b>Past Drought Hazards:</b> Droughts are generally not as damaging or disruptive as floods and other hazards and they are more difficult to define. A drought is a natural hazard that evolves over months or even years and can last as long as several years to as short as a few months. According to the NH State Hazard Mitigation Plan, New Hampshire has a low probability, severity and overall risk for drought. These hazards were not mapped; however droughts have the potential to impact the Community on a town wide basis.</p>				
Drought	1929-1936	Statewide	Regional	NH Drought Historical Event - NH DES
Drought	1939-1944	Statewide	Severe in southeast and moderate elsewhere	
Drought	1947-1950	Statewide	Moderate	
Drought	1960-1969	Statewide	Regional longest recorded continuous spell of less than normal precipitation	
Drought	2001-2002	Statewide	Third worst drought on record;	
Drought	2016	Southern NH	Southern NH experienced a severe drought during the summer of 2016; drought conditions also affected Lyme and residents with dug wells; however there were no significant issues.	2017 HMPT

Type of Event	Date	Location	Impact	Source
<p><b>Other Past or Potential Hazards:</b> Human-caused hazards and other unusual hazardous events have been noted throughout NH. Among others, one concern is the transport of hazardous material through communities by rail and tractor-trailer. Erosion areas on River Road as well as two flood areas are mapped and can be seen on Map 3, Past &amp; Potential Areas of Concern; other natural or human-caused hazards have the potential to impact the Community on a town wide basis.</p>				
Epidemic & Pandemic	2009-2010	Town Wide	During the 2009-2010 winter season, the H1N1 (Flu) Pandemic required planning and intervention on the part of local and regional officials.	2011 HMPT
Hazardous Materials	April 2011 or 2012	Thetford Farm	Propane leak; required evacuation of some residents just over the river in Lyme	2011 HMPT
Subsidence	Late 2000's	River Road	Man and horse fell into a sinkhole; no personal damage but help needed to get the horse out of hole	2017 HMPT
Erosion	Ongoing	River Road	Ongoing undermining of River Road due to rise and fall of the water height by operators at Wilder Dam. <i>(See Map 3)</i>	2017 HMPT
Erosion	Ongoing	North River Road	Silt soils and rise and fall of the river; threatens 450 feet of the road <i>(See Map 3)</i>	2017 HMPT
Extreme Temperatures (hot & cold)	<p>Although the Team did not identify specific examples or past occurrences of these hazards, it was felt worthwhile to list them as potential hazards to the Town. See Table 3.1, Hazard Threat Matrix and Chapter 5 for more details on these hazards.</p>			
Tornadoes				
Dam Failure				
Hailstorms				

\*Historic hazard events were derived from the following sources unless noted otherwise:

- Website for NH Disasters: <http://www3.gendisasters.com/mainlist/newhampshire/Tornados>
- FEMA Disaster Information: <http://www.fema.gov/disasters>
- The Tornado Project: <http://www.tornadoproject.com/alltorns/nhtorn.htm>
- The Tornado History Project: <http://www.tornadohistoryproject.com/>
- The Disaster Center (NH): <http://www.disastercenter.com/newhamp/tornado.html>
- <http://www.Earthquaketrack.com>

**For more information on state & county-wide past events, see *Appendix D: Presidential Disaster and Emergency Declarations.***

## Chapter 4: Critical Infrastructure & Key Resources (CIKR)

With Team discussion and brainstorming, Critical Infrastructure and Key Resources (CIKR) within Lyme were identified and mapped for this Plan. The “ID” number in the following lists is also represented as a CIKR in *Appendix G: Map Documents, Map 4: Critical Infrastructure and Key Resources*. Facilities located in adjacent towns were not mapped (NM). The Hazard Risk rating was based on a scale of 1-3 with 1 indicating little or no risk.

**TABLE 4.1 - EMERGENCY RESPONSE FACILITIES (ERF) & EVACUATION**

Emergency Response Facilities (ERF)				
ERFs are primary facilities and resources that may be immediately needed during an emergency response.				
Map ID	Facility	Expected use of the Facility	Hazard Risk	
1	Town Office (generator)	Town Government	All Hazard	1
2	Police Department (generator)	Law Enforcement of Secondary EOC	All Hazard	1
3	Lyme Elementary School (generator)	Primary Shelter	All Hazard	1
4	Fire Station & FAST Squad (generator)	Primary EOC; Fire Suppression & EMS	All Hazard	1
5	Highway Garage (generator)	Heavy Equipment; Sand & Gravel	All Hazard	1
6	Dartmouth Hitchcock Clinic (Lyme)	Outpatient Care	All Hazard & Wildfire	1
Out of Town	Dartmouth Hitchcock MC (Lebanon)	Hospital	All Hazard	1
Out of Town	Hanover Fire Department	EMS; Medical Transportation	All Hazard	1
Helicopter Landing Zones				
7	Dartmouth Ski Way	Helicopter Landing Zone	All Hazard	1
Out of Town	Cross Country Ski Center (Dorchester)	Helicopter Landing Zone	All Hazard	1
<i>Other locations would be available throughout the Town depending on the emergency situation.</i>				
Bridges on the Evacuation Routes				
8	East Thetford Bridge @ Connecticut River	Bridge on Evacuation Route & Access to I-91	All Hazards & Flooding	2
9	East Thetford Road @ River Road (culvert)	Bridge on Evacuation Route	All Hazards & Flooding	3
10	North Thetford Road @ Clay Brook	Bridge on Evacuation Route	All Hazards & Flooding	3
11	NH Route 10 @ Trout Brook	Bridge on Evacuation Route	All Hazards & Flooding	3
12	NH Route 10 @ Grant Brook	Bridge on Evacuation Route	All Hazards & Flooding	2
13	NH Route 10 @ Hewes Brook	Bridge on Evacuation Route	All Hazards & Flooding	1
14	Dorchester Road @ Grant Brook #1	Bridge on Evacuation Route	All Hazards & Flooding	1

Emergency Response Facilities (ERF)				
15	Dorchester Road @ Grant Brook #2	Bridge on Evacuation Route	All Hazards & Flooding	2
16	Dorchester Road @ Grant Brook #3	Bridge on Evacuation Route	All Hazards & Flooding	1
17	Dorchester Road @ Grant Brook #4	Bridge on Evacuation Route	All Hazards & Flooding	1
18	Dorchester Road @ Grant Brook #5	Bridge on Evacuation Route	All Hazards & Flooding	1
19	Bridge/Goose Pond #1	Bridge on Evacuation Route	All Hazards & Flooding	1
20	Bridge/Goose Pond #2	Bridge on Evacuation Route	All Hazards & Flooding	1
21	Grafton Turnpike @ Marshall Brook (Town line)	Bridge on Evacuation Route	All Hazards & Flooding	3
22	Grafton Turnpike @ Call Brook	Bridge on Evacuation Route	All Hazards & Flooding	1
<i>Additional bridges on the evacuation route include the Orford Bridge (Orford) and Ledyard Bridge (Hanover); these were not mapped as they are located in adjacent towns.</i>				
Evacuation Routes				
NH Route 10		Primary Evacuation Route	All Hazards & Flooding	
East Thetford Road		Primary Evacuation Route	All Hazards & Flooding	
Dorchester Road to Grafton Turnpike		Secondary Evacuation Route	All Hazards & Flooding	

**TABLE 4.2 – NON- EMERGENCY RESPONSE FACILITIES (NERF)**

Non-Emergency Response Facilities (NERF)				
<b>NERFs are facilities, that although they are critical, they are not necessary for the immediate emergency response efforts; this includes facilities to protect public health and safety, utilities, and provide backup to emergency facilities.</b>				
Map ID	Facility	Expected use of the Facility	Hazard Risk	
7	Dartmouth Skiway (generator)	Secondary Shelter	All Hazards & Windstorm	2
23	Lyme Congregational Church (no generator)	Possible Shelter	All Hazards	1
24	Lyme Center Vestry (no generator)	Possible Shelter	All Hazards & Flooding	1
25	Fairpoint Switching Station (Lyme Common)	Communications	All Hazards	1
NM	Fairpoint Switching Station (Orford)	Communications	All Hazards	1
NM	Wells (private water system; generator)	Lyme Water Association - water for 31 residences		

**TABLE 4.3 – FACILITIES & POPULATIONS TO PROTECT (FPP)**

Facilities & People to Protect (FPP)				
FPPs are facilities that need to be protected because of their importance to the Town and to residents who may need help during a hazard event.				
Map ID	Facility	Expected use of the Facility	Hazard Risk	
7	Dartmouth Skiway	Gathering of People	All Hazards & Windstorm	2
3	Lyme Elementary School	School	All Hazards	1
23	Lyme Congregational Church	Gathering of People; Historic	All Hazards	1
26	First Baptist Church	Gathering of People; Historic	All Hazards	1
27	Crossroads Academy	School	All Hazards, Wildfire & Flooding	1
28	Lyme Center Academy	Historic	All Hazards & Flooding	1
29	Lyme Inn	Gathering of People & Food/Water	All Hazards	1
30	Horse Sheds	Historic	All Hazards	1
31	Dowd's Inn	Gathering of People & Food/Water	All Hazards	1
32	Breakfast on the CT B&B	Gathering of People	All Hazards & Flooding	1
24	Lyme Center Vestry	Gathering of People	All Hazards & Flooding	1
33	Pathways (residential facility)	Gathering of People	All Hazards	1
34	Lyme Nursery School	Nursery School	All Hazards	1
35	Kid's Time	Childcare Facility	All Hazards	1
36	Converse Free Library	Gathering of People; Historic	All Hazards	1

**TABLE 4.4 – POTENTIAL RESOURCES (PR)**

Potential Resources (PRs)				
PRs are potential resources that could be helpful for emergency response in the case of a hazard event.				
Map ID	Facility	Expected use of the Facility	Hazard Risk	
37	Lyme Country Store	Gas & Food	All Hazards	1
38	Stella's Restaurant & Lyme Hardware	Food/Building Supplies/Post Office/Bank	All Hazards	1
7	Dartmouth Skiway	Food & Water (seasonal)	All Hazards & Windstorm	1
3	Lyme Elementary School	Food & Water	All Hazards	1
39	Loch Lyme Lodge	Food & Water (seasonal)	All Hazards & Flooding	1
For additional resources, please refer to the Town's Emergency Operations Plan (EOP)				

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## Chapter 5: Hazard Effects in Lyme

### A. Identifying Vulnerable Structures

Because damages from floods and wildfires are more predictable than damages from other disasters, it is important to identify the Critical Facilities and Key Resources (CIKR) and that are most likely to be damaged by these events. Using GIS analysis and aerial imagery, at-risk CIKR structures were identified throughout the Town.

All CIKR in Lyme were identified in GIS; this list was then narrowed by those CIKRs that were located in the FEMA floodplain. A total of ten CIKRs were found in the flood zone as seen in the chart to the right; all of these CIKR are bridges on the evacuation route. No other CIKR were found to be in the designated FEMA floodplain although it is expected that numerous non-CIKR structures are within the FEMA floodplain. Town officials should keep these CIKR in mind when a flood hazard is likely.

ID	ALL H	NAME	Hazmit_Type
8	ERFB	East Thetford Bridge	Evac Bridge
10	ERFB	N. Thetford Rd over Clay Brook	Evac Bridge
11	ERFB	Route 10 @ Trout Brook	Evac Bridge
12	ERFB	Route 10 @ Grant Brook	Evac Bridge
13	ERFB	Route 10 @ Hewes Brook	Evac Bridge
14	ERFB	Dorchester Rd/Grant #1	Evac Bridge
15	ERFB	Dorchester Rd/Grant #2	Evac Bridge
16	ERFB	Dorchester Rd/Grant #3	Evac Bridge
19	ERFB	Goose Pond #1	Evac Bridge
20	ERFB	Goose Pond #2	Evac Bridge

Using the same methodology that was used for flooding, structures falling within the Wildland Urban Interface (WUI) were reviewed. Identifying these structures assists the Team in creating wildfire mitigation action items and prioritizing those action items; it is important to determine which Critical Infrastructure and Key Resources are most vulnerable to wildfires and to estimate their potential loss.

**Table 3.1, The Hazard Threat Analysis, is used to evaluate the probability and the potential impact of all hazards.**

Many structures were found to be in the traditional WUI, however, only one CIKR was found in the WUI, Crossroads Academy. The rest of the Town’s Critical Infrastructure & Key Resources were found to be within the 300 foot buffer, therefore accessible by fire apparatus and hoses. However, as stated elsewhere in this Plan, the entire town of Lyme, including many structures, is thought to be in the WUI because it is so heavily forested; therefore, all structures in Town can be assumed to be in the WUI.

### B. Calculating the Potential Loss

It is difficult to ascertain the amount of damage that could be caused by a natural or human-caused hazard because the damage will depend on the hazard’s extent and severity, making each hazard event somewhat unique. Therefore, we have used the assumption that hazards that impact structures could result in damage to either 0-1% or 1-5% of Lyme’s structures, depending on the nature of the hazard and whether or not the hazard is localized.

MS-1 Assessed Value of All Structures			
2015	Value	1% Damage	5% Damage
Residential	\$190,007,000	\$1,900,070	\$9,500,350
Manufactured Housing	\$966,400	\$9,664	\$48,320
Commercial	\$12,536,800	\$125,368	\$626,840
Discretionary Preservation Easements	\$92,800	\$928	\$4,640
Tax Exempt	\$16,354,200	\$163,542	\$817,710
Utilities	\$5,514,600	\$55,146	\$275,730
Total	\$225,471,800	\$2,254,718	\$11,273,590
<i>Provided by the Town, February 29, 2016</i>			

Based on this assumption, the potential loss from any of the identified hazards would range from \$0 to \$2,254,718 or \$2,254,718 to \$11,273,590 based on the 2015 Lyme town valuations which lists the assessed value of all structures in Lyme to be \$225,471,800 (see chart above).

Human loss of life was not included in the potential loss estimates, but could be expected to occur, depending on the severity and type of the hazard.

**C. Natural Hazards**

Descriptions below represent the “local impact” to the Community for the hazards that were identified by the Team. For the “extent” of these hazards, please refer to Appendix C, The Extent of Hazards, which includes charts such as the Saffir-Simpson Hurricane Wind Scale, the Beaufort Wind Scale, the National Weather Service Heat Index, the Sperry-Piltz Ice Accumulation Index and the Fujita Scale for tornadoes. . The numbers preceding the hazard name correspond to the numbers in Table 3.1, Hazard Threat Analysis.

**1) Severe Winter Weather & Ice Storms ..... \$2,254,718 to \$11,273,590**

**SNOW STORMS**

Heavy snowstorms typically occur from December through April. New England usually experiences at least one or two heavy snow storms with varying degrees of severity each year. Power outages, extreme cold and impacts to infrastructure are all effects of winter storms that have been felt in Lyme in the past. All of these impacts are a risk to the Community, including isolation, particularly of the elderly and increased traffic accidents. Damage caused by severe winter snowstorms varies according to wind velocity, snow accumulation, duration and moisture content. Seasonal accumulation can also be as significant as an individual snowstorm. Heavy overall winter accumulations can impact the roof-load of some buildings.

Like most of New Hampshire, Lyme received large accumulations of snow from repeated storms during the winter of 1968-69; total snow accumulation records were broken all across the State. Although the Blizzard of '78 did most of its damage in southern New England, New Hampshire also received high snow accumulations from this storm. Lyme’s Highway Department and NH DOT were able to handle the snow accumulation that resulted from the '78 storm.

Although unusual, a very severe winter snow storm or blizzard could shut all of Lyme’s roads down at least temporarily and thus prevent many of the Town’s citizens from going to work and prevent visitors from arriving. Fortunately, in New England, most road crews are able to handle 2-3’ snow storms with a little time on their side.

**ICE STORMS**

Of more concern in Lyme than 2-4’ snow storms are ice storms, though the probability of the occurrence of a major ice storm is lower than that of a major snowstorm. A significant ice storm can inflict several million dollars’ worth of damage to forests and structures. It is a common winter occurrence to have icy roads and ice on trees and power lines in Lyme, although much of the devastation from ice storms in Lyme happens at the highest elevations. The elevations range from 548’ above sea level at the lowest point to 3,238’ at the top of Smarts Mountain.

The 1998 Ice Storm impacted primarily the higher elevations, causing forest damage and damage to snowmobile trails in Lyme. Although this ice storm caused downed trees, closed roads and power and phone outages for extended periods of time in other parts of New Hampshire, no significant damage occurred in Lyme. Fortunately, Lyme escaped the worse that this storm had to offer; if the storm had impacted areas just 300' lower, the results would have been significant. Neither the 1979 or 2008 ice storms impacted Lyme.

Due to the widespread nature of ice storms and the excessive damage this type of storm is able to produce, the potential loss value is estimated to be between 1% and 5% of the total assessed value of all structures in Town.

**2) Flooding (riverine, ice jam, heavy rain, local roads) ..... \$2,254,718 to \$11,273,590**

Heavy rain, rapid snowmelt and river and stream flooding can cause culverts to be overwhelmed and roads to wash out. Today, with changes in land use, aging roads, designs that are no longer effective and undersized culverts, the risk of flooding is a serious concern. Flooding is often associated with tropical storms, heavy rains and rapid snowmelt in the spring. Based on the Grafton County Floodplain Map, Lyme has a relatively small 100-year floodplain which follows along the banks of Connecticut River and around other rivers, streams, brooks, lakes and ponds.

The Team reported that several flooding events have historically occurred in Lyme. In 2011, flooding on the Connecticut River washed out a 1,200 foot stretch of River Road. Grant Brook, Whipple Brook and many other brooks and streams have flooded in the past and caused road damage and washouts. Ice jams have also contributed to flooding, particularly on Grant Brook which affected Dorchester Road. In 2006, Shoestrap Road was affected by heavy rains which created a slide that closed the road temporarily; Shoestrap Road was later designated as a Class VI road.

Grant Brook, Trout Brook and other small tributaries of the Connecticut have flooded their banks and caused damage. In 1959, Trout Brook washed away the Whipple Hill Road Bridge and in 1973, Grant Brook washed out or damaged several bridges on Dorchester Road and Baker Hill Road. More recently, in May 2016, heavy rain caused the failure of a beaver dam creating a washout of 3-4 feet of roadway on Grafton Turnpike.

Several bridges in the Community have been damaged by floodwaters of the Connecticut, most notably the East Thetford Bridge that was lost due to riverine flooding in 1936.

Undersized, aging and overwhelmed culverts have impacted the roads of Lyme. Failure of a culvert on Preston Hill Road created flood waters that washed out parts of this gravel road, eroded driveways and filled up one septic field. With 63 miles of Class V roads, 50 miles of which are gravel, road upkeep is a daunting task for the Highway Department. The Town has established a roads committee that continues to assess the 400-500 culverts in Town to get a handle on the age, size and poor construction that exists. Mitigation Action Items #1 and #23 address stormwater maintenance and culvert replacement.

Most flooding in Lyme has affected infrastructure and caused little structural or property damage. However, flooding is still a major concern, particularly with the abundance of overwhelmed or aging culverts in the Community. In addition, flooding as a result of a major dam failure upstream on the Connecticut River is of great

concern (see Dam Failure later in this Chapter). Due to these factors, the estimated loss value was determined to be between 1% and 5% of the total assessed value of all structures.

**3) Erosion, Landslide & Mudslide (riverbank)..... \$2,254,718 to \$11,273,590**

Erosion along the Connecticut River is of chief concern for the Town of Lyme, particularly for the residents who live on River Road. The section of the Connecticut River at Lyme serves as a reservoir for the Wilder Dam as part of the dams' power generation. Sometimes twice a day, as part of the dam's operational procedures, water is held back on the Connecticut River until the reservoir is filled and then dropped to make electricity.

The banks of the Connecticut consist of fine silty sand which becomes a type of mud or "slurry" when the reservoir fills. Upon release of the water at the dam, the slurry is taken along with the water causing the riverbank to be undermined. This repetitive action has caused instability on River Road and forced the Town to close the road twice; a particularly vulnerable section is currently closed as it is "unsafe". As the road continues to be undermined, the concern is that a more significant failure of the roadway would occur, thus leaving approximately 20 homes isolated.

The Town has taken a proactive approach to this problem and is working with state and regional authorities to address the situation. Action Item #24 calls for cooperative measures to be taken to prevent future erosion and to offer solutions for 12 separate areas of concern. Possible solutions vary from the development of bank stabilization techniques such as retaining walls and riprap, moving the roadway and even eminent domain of threatened properties. Based on the anticipated cost of any program that will solve this problem, the estimated structure loss value is estimated to be between 1% and 5% of the total assessed value of all structures in Town.

**4) Hurricane & Tropical Storms ..... \$2,254,718 to \$11,273,590**

Wind damage due to hurricane is a consideration because of the forest and valley floors in Lyme. Like the 1938 hurricane and hurricane Carol in 1954, major forest damage could occur. Although hurricanes could fit into several different categories (wind and flooding), the Team considered hurricanes to be separate events. Hurricanes are rare in New Hampshire, but they should not be ruled out as potential hazards. In most cases, hurricanes have been down-graded to tropical storms by the time they reach northern New Hampshire.

Tropical Storm Irene, the remnants of Hurricane Irene, brought heavy rain to Lyme affecting several roads including Dorchester Road, Flint Hill Road and Goose Pond Road. Dorchester Road was affected in three locations. Both Grant Brook and Hewes Brook flooded into roadways. Fortunately, no significant structure damage or flooding occurred. Tropical Storm Sandy had no significant impact in Lyme.

Named Category hurricanes are rare in Northern New Hampshire, but if a Category 1 or higher hurricane made it as far north as Lyme, the damages caused by associated high wind and heavy rain would affect the entire town, most likely on a much higher scale than tropical storms. For this reason, although the probability is very low, the potential loss value due to hurricanes was determined to be between 1% and 5% of the total assessed structure value.

**5) Tornadoes & Downbursts ..... \$2,254,718 to \$11,273,590**

A tornado generally covers a large area, perhaps even several miles. It has winds that blow in a circular fashion leaving behind downed trees that lie in a swirling pattern. Straight-line winds and winds that burst downward are indicative of a microburst; the fallen trees that are left behind lay in roughly the same direction. A microburst must be 2.5 miles in width or less, whereas a macroburst is a similar wind event that is greater than 2.5 miles wide and generally lasts longer than a microburst.

A tornado touched down in Carroll County in July 2008, but it did not reach Grafton County or Lyme. In April of 2007, a microburst came across New Hampshire affecting the neighboring town of Dorchester and continuing for miles into Lyme over Pinnacle Hill Road, Baker Hill Road and Bailey Hill Lane, leaving a .5 mile wide swath of significant damage. Power was out in some areas of Lyme for up to ten days while most outages lasted 2-3 days. The swath of damage went almost as far west as NH Route 10. One resident reported sustained winds for 10 hours with gusts up to 80 miles an hour. Although FEMA funding was used to pay a local logging company to assist with the cleanup, for the most part, landowners absorbed the cost of this microburst with the Lyme Fire Department’s assistance with the cleanup. (See Table 3.2 for more information)

Although tornadoes and downbursts are relatively uncommon occurrences, there is a potential for significant damage. Therefore, the potential loss value was determined to be between 1% and 5% for both downbursts and tornadoes.

**6) Severe Thunderstorms & Lightning ..... \$0 to \$2,254,718**

Severe lightning as a result of summer and mountain storms or as a residual effect from hurricanes and tornadoes has occurred in Lyme. Some of the Town’s structures are older buildings and many structures are surrounded by forest. Dry timber on the forest floor and the age of many buildings and out-buildings combined with lightning strikes can pose a significant disaster threat. Lightning could do damage to specific structures or injure or kill an individual, but the direct damage would not be widespread.

The Team noted that summer storms producing thunder and lightning appeared to be happening more often than in the past and with greater severity, perhaps as a result of climate change. Many thunderstorms follow the path of the Connecticut River while others sweep across the river from Vermont. Lightning is a potential problem, but the affects would be localized. Based on the localized nature of lightning strikes, the potential loss value was determined to be 0-1% of the total assessed structure value in Town.

**7) High Winds (windstorm) ..... \$0 to \$2,254,718**

Due to the geography of Lyme and its location in the Connecticut River Valley, isolated high winds and down drafts are common occurrences within the Town. High winds have brought down trees and power lines and have caused power failures and road closures. Although there are no reported “wind tunnels”, gusts of over 30 mph are not uncommon in the Town of Lyme. Most windstorms are associated with incoming weather patterns and it was noted that over the last decade there has been an increase in high wind events.

High wind events are unpredictable; winds of this magnitude could fall timber, particularly trees with shallow roots, which in turn could block roadways, down power lines and impair emergency response. Old-growth softwood is affected by these unexpected windstorms, particularly in the spring when the water table is high. Major utility companies throughout New Hampshire (Eversource in Lyme) have done a good job in recent years trimming and select-cutting vulnerable timber near power lines. Action Item #14, calls for the continued monitoring and cutting of brush and trees to create defensible space for wildfires and to prevent power failure.

The effect of isolated high winds would most likely be localized in nature; therefore, the potential loss value due to hazards of this type was determined to be between 0% and 1% of the total assessed structure value.

**8) Extreme Temperatures (hot & cold)..... Structure loss value was not estimated**

For those who are familiar with Northern New England weather, it is obvious that temperature extremes are very common. Winter temperatures can fall below -30°F and summer temperatures, laden with high humidity can soar to nearly 100°F. In the past, there was more concern about extreme cold temperatures, but with improved heating systems and local communications, most New Hampshire residents are able to cope with extreme cold. One of the bigger concerns for extreme cold is the impact this can have on the depth of the frost and damage that can be caused to wells and septic systems.

Also of concern today are extreme heat conditions. Few residents, particularly the elderly and vulnerable populations, have air conditioners and are less able to cope with extreme heat; the elderly population in Lyme was estimated to be 19.6% according to the American Community Survey, 2010-2014.

Extreme temperatures when combined with power failure are of the most concern; power failure would result in no water for those with wells and a lack of heat and air conditioning for the Town's vulnerable population. Both town officials and the Community as a whole should be concerned and should look after its citizens to ensure that extreme temperatures do not create a life or property threatening disaster.

The cost of extreme temperatures is difficult to calculate as it is not based on the loss of structures. The expected loss value would be primarily on repair costs for frozen pipes, the economic impact on Community and the time and cost of emergency response; based on the assumption that damage would not occur to structures, the structure loss value due to extreme temperatures was not estimated.

**9) Hailstorm ..... \$0 to \$2,254,718**

Hailstorm events, although not common in Lyme, can occur at any time. The spring and summer of 2009 saw random hailstorm occurrences throughout parts of New Hampshire, although Lyme was fortunate to have avoided them. In addition, a major spring storm on Memorial Day Weekend of 2011 brought thunder, lightning and hailstorms to several communities along the northern Connecticut River, once again fortunately missing Lyme.

Damage from hail could result in failed crops for Lyme's farming community as well as roof, minor structural and vehicular damage, thus creating an economic impact for individual citizens. Overall, the Team concurred that a hailstorm event would be unlikely and would cause minimal damage; the potential loss value was determined to be between 0% and 1% of the assessed value of all structures in Lyme.

**10) Wildfire..... \$0 to \$2,254,718**

Due to the abundance of slash on the forest floor left by logging operations, blow downs and storms, there is potential for fast burning fuels. Burn permits are required in Lyme, as they are throughout the State, but often burning takes place without the proper permits. The steep terrain and heavily forested areas of town are difficult to monitor, therefore the occasional unauthorized burn will take place.

One 10 acre fire occurred in 1994 in Lyme but no wildfires of that magnitude have occurred since then (see Table 3.2 for other historic fires). In the past five years, several 2-3 acre fires have occurred, but there has been no significant damage reported. It should be noted that approximately 8.71 square miles of the White Mountain National Forest lies within Lyme, consisting primarily of the Appalachian Trail. Currently available documentation on fires in New Hampshire indicates that the majority of fires are human-caused including the 1994 fire in Lyme which was started by hikers. The Appalachian Trail and other forested areas of Lyme are likely to be the site for future wildfires. The Team established Mitigation Action Item #15 to develop partnerships and outreach activities to encourage best practices in the woodlands of Lyme.

In the mid-2000s, the Wildland Urban Interface (WUI) was determined in collaboration with the NH Division of Forests & Lands and the US Forest Service; the WUI represents the area in which the forest and human habitation intersect. It was defined to be a 1/4 mile buffer located 300 feet off the centerline of Class I-V roads. All structures within the WUI are generally assumed to be at some level of risk and therefore, vulnerable to wildfire. It should be noted that in communities that are heavily forested, like Lyme, many Rangers feel that the entire community is in the WUI and therefore the extent of a wildfire could potentially be the entire community. (See Map 2)

Large wildfires in New Hampshire are uncommon; however, given the right set of conditions (drought, lightning, human interface), the potential for large wildfires is good. With advance warning, human life is rarely threatened by wildfires; however, structures, particularly older wooden-frame buildings, are susceptible. Lyme is heavily forested and is host to hikers and campers; however with advanced warning and local response, the effects of wildfire could be localized. Therefore the potential loss value was determined to be between 0% and 1% of the total assessed structure value.

**11) Earthquake ..... \$2,254,718 to \$11,273,590**

Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines and are often associated with landslides and flash floods. Four earthquakes occurred in New Hampshire between 1924-1989 having a magnitude of 4.2 or more. Two of these occurred in Ossipee, one west of Laconia and one near the Quebec border. It is well documented that there are fault lines running throughout New Hampshire, but high magnitude earthquakes have not been frequent in New Hampshire history.

In October 2012, an earthquake with its epicenter in Hollis, ME and a magnitude of 4.6 on the Richter scale occurred. The tremor was felt through a large part of New Hampshire but was not felt in Lyme; no damage was reported.

Although historically earthquakes have been rare in New Hampshire, the potential does exist and depending on the location, the impact could be significant. The potential structure loss value due to earthquakes was determined to be between 1% and 5% of the total assessed structure value.

**12) Subsidence..... \$0 to \$2,254,718**

Land subsidence, or sinkholes, are relatively rare in New Hampshire and in general are not as extreme as they are in other parts of the United States. In Lyme however, due to the failing and rising water levels above the Wilder Dam there have been incidences of sinkholes along the Connecticut River. The ebb and flow of water as the Wilder Dam releases and holds back the waters of the Connecticut have created a scouring of the “slurry” beneath the banks of the river (more on this under “Erosion” in this chapter). This has caused some fields near the riverbank to experience subsidence, at times as much as 100 feet from the river itself. Also, a sinkhole has appeared in Goose Pond with a spring rising in the middle of the pond; the Town has made reparations for this.

Although historically subsidence has been rare in New Hampshire and to date no structures have been lost in Lyme due to subsidence, the potential does exist near the Connecticut River and along River Road. The impact would be localized; therefore the potential structure loss value due to subsidence was determined to be between 0% and 1% of the total assessed structure value.

**13) Drought..... \$0 to \$2,254,718**

An extended period without precipitation could elevate the risk for wildfire and blow-downs in the forest and with an extreme drought, the water supply and aquifer levels could be threatened. Fortunately, significant droughts rarely occur in New Hampshire or Lyme. According to the NH Department of Environmental Services, five significant droughts have occurred since 1929.<sup>10</sup> However, the summer of 2016 brought severe drought conditions to southern New Hampshire and to the Upper Valley<sup>11</sup>. According the NOAA, as of February 2017, the drought continues but is expected to improve.<sup>12</sup>

In addition to being heavily forested, Lyme has a fairly robust agricultural community, primarily consisting of family operated produce farms. A significant drought therefore would not only impact the forested lands of Lyme but also the agricultural land. The estimated loss value above, based on a 0-1% risk, reflects the potential for lost woodlands and crops as an economic impact to the Community.

***D. Human-caused Hazards***

The following human-caused hazards were also considered while developing this hazard mitigation plan. Though these hazards are not analyzed in more detail as part of this Plan, they are none-the-less worth mentioning as real and possible hazards that could occur in Lyme.

**1) Extended Power Failure (5+ days)**

Extended power failure is a concern, particularly when combined with any of the natural hazards detailed above. Extended power outages of several days have occurred in Lyme, both as a result of local line damage from high winds and storms and problems with the power grid.

No extended periods without power were reported to have taken place since the last hazard mitigation plan. Generally, Lyme residents lose power for only a few hours in minor storms, although longer periods can be

<sup>10</sup> NH DES; <http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf>

<sup>11</sup> <http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?NH>

<sup>12</sup> [http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/sdo\\_summary.php](http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php)

expected in severe storms. Of some concern are the large feeder lines coming into the Upper Valley from the Vermont side of the Connecticut River as the main substation is in Thetford, VT.

If a major and/or extended power outage occurs and lasts for more than a week, a significant hardship on individual residents could result, particularly those citizens who are elderly or handicapped.

## **2) Epidemic/Pandemic**

The threat of either an epidemic or a pandemic is a concern for Lyme as it is for communities throughout New Hampshire. Lyme's influx of summer (Appalachian Trail) and winter visitors (Dartmouth Skiway), its involvement with Dartmouth College students and faculty and a relatively high elderly population (19.6%) increase this concern. Illnesses may be brought to this community from other places, and in doing so would place a severe burden on Lyme's limited resources. In addition, Lyme's high school children attend school in nearby communities, thus increasing the risk of exposure. During 2009-2010 winter season, the H1N1 (Flu) Pandemic caused some concern among local and regional officials.

Lyme's geography provides hikers and summer and winter recreation enthusiasts many opportunities to visit the Town; both summer and winter visitors pass through Lyme to enjoy the beauty of this community and the Upper Connecticut Valley. Because of these factors, the team decided that an epidemic or pandemic could present a possible threat to Lyme. With the occurrence of world-wide pandemics such as SARS, Zika, H1N1 and Avian Flu, Lyme could be susceptible to an epidemic and subsequent quarantine.

## **3) Dam Failure**

Although Lyme has no large dams within its borders whose failure could cause significant damage to structures, small dams such as one on Pinnacle Road, beaver dams and small farm pond-dams could foreseeably cause minor flooding of roads and pastures. One example of this took place in 2016 when a beaver dam broke due to heavy rain and washed-out 3-4 feet of Grafton Turnpike.

Of more concern however, is Moore Dam in Littleton; a catastrophic failure at Moore Dam is expected to cause the failure of other dams downstream in a domino effect. The failure of Moore Dam and the inundation path that will follow would cause the complete loss of River Road, would severely damage or destroy any structures along River Road and would cause the loss of several bridges (including a covered bridge). Flood waters would cross NH Route 10, and cause Clay Brook to fill and back up to Post Pond.

The results of a complete Moore Dam failure could be devastating to areas along the Connecticut River and across NH Route 10 in the northern end of Lyme. It is however unlikely that there would be a catastrophic failure of Moore Dam. Inundation models provide advance warning and with good communication and alerting, residents will have time to evacuate along the Connecticut. Structure loss however could be significant.

## **4) Hazardous Material-Transport**

The main road through Lyme is NH Route 10, a major thoroughfare running from Littleton and Haverhill/Woodsville in the north to Hanover and Lebanon in the south. NH Route 10 runs parallel to the Connecticut River and is a major connector between communities along the northern Connecticut to the very busy Upper Valley Region around Hanover, Lebanon and White River Junction, VT. Large trucks carry a variety of unknown materials to industrial centers, residences and a variety of industries. Commercial carriers such as UPS and FEDEX are not

mandated to disclose their freight. If a hazardous material vehicular accident should occur in the Village Center, substantial damage could result and the very makeup of the historic district of Lyme could be damaged.

Of additional concern is the Washington County Railroad whose tracks also run parallel to the Connecticut River but on the Vermont side. The Washington County Railroad carries a variety of freight including lumber, propane and even tourists to a hub at White River Junction. The concern is based primarily in the risk that a hazardous materials rail accident could create a “plume” of toxic air that has potential to reach Lyme.

The Team also noted that many other vehicular accidents can occur such as moose hits, tour bus accidents and winter storm related accidents; a big concern would be “victim care” and “refugee housing”. A mass casualty accident could overwhelm a town of this size and the current emergency systems. Depending on the exact location of a potential accident involving hazardous material, structural damage, diminished services and loss of human and wildlife can occur. Potential damage could be significant.

### **3) Terrorism**

The Terrorism is a fear throughout our country but the quintessentially New England town of Lyme is a somewhat unlikely target. However, NH Route 10 serves as a major north-south thoroughfare, and because of New Hampshire’s proximity to Canada, this route along with other northern byways, could offer a potential route for terrorists coming into the United States. In addition, home-grown terrorists, for a myriad of reasons, could cause substantial damage to the Town’s infrastructure and important critical facilities.

Terrorism is identified as a possible hazard for the Town, but more likely as a result of home-grown or regional terrorism.

### **5) Hazardous Material – Fixed Location**

Hazardous Material in a Fixed Location in Lyme is a concern that is closely watched by the Lyme Fire Department, through Best Practices and through Tier II reporting.

Both small and large farms in the Community store fertilizer which has potential for hazmat incidents. In addition, a 2,000 gallon propane tank at the Village Hardware Store has the potential to “level the village”. Lastly, the Dartmouth Ski Way, which is safely outside of the Village of Lyme, maintains fuel storage at the facility.

Although a hazardous materials incident in a fixed location is unlikely, it should not be ruled out as a possible human-caused hazard in Lyme.

## Chapter 6: Current Policies, Plans & Mutual Aid

After researching historic hazards, identifying CIKR and determining potential hazards, the Team determined what is already being done in Town to protect its citizens and structures.



Once identified, the Team addressed each current policy or plan to determine its effectiveness and to determine whether or not improvements were needed. This analysis became one of the tools the Team used to identify mitigation action items for this Plan.

With the knowledge of what regulations Lyme currently had in place, creating new action items was less difficult. This process was helpful in identifying current plans and policies that were working well and those that should be addressed as a new “action item” as well as the responsible departments. The table that follows, *Table 6.1, Policies, Plans & Mutual Aid*, shows the analysis that resulted from discussion with the Team.

Existing policies, plans and mutual aid that were designated as “Improvements Needed” were added to **Table 9.1, The Mitigation Action Plan** as new strategies and were reprioritized to meet the current needs of the Town.

**TABLE 6.1: CURRENT POLICIES, PLANS & MUTUAL AID**

**KEY TO EFFECTIVENESS:**

- Excellent**..... The existing program works as intended and is exceeding its goals.
- Good** ..... The existing program works as intended and meets its goals.
- Average** ..... The existing program does not work as intended and/or does not meet its goals.
- Poor** ..... The existing program does not work as intended, often falls short of its goals, and/or may present unintended consequences.

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Building Code & Permits	The Town has not adopted International Building Codes (IBC) but does require builders to follow the NH State adopted codes for new construction to meet national standards for flood, wind, earthquake, fire and snow load.	Town Wide	Planning Board	Good	<b>Improvements Needed:</b> The Town of Lyme does not have a Building Inspector however, the permitting process requires builders to abide by the International Building Codes (IBC) and the International Residential Codes (IRC) which have been adopted by the State of New Hampshire; deferred to this plan to develop an official program to inspect commercial, rental and other publicly used buildings. <b>Action Item #22</b>

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Public Education & Awareness	The Town of Lyme is very well situated to provide public information and outreach to its citizens through a variety of means.	Town Wide	Emergency Management Director & Other Departments	Excellent	<p><b>Improvements Needed:</b> The Town has recently created an Emergency Webpage which is a great way to provide outreach to residents on not only emergency preparedness but also mitigation techniques property owners can use to reduce or eliminate the impact of natural hazards; deferred to this Plan to continue to provide robust information and links to the Emergency Webpage to educate the public on general and seasonal mitigation techniques; the Town also has the ability to get information out via a ListServ and Facebook pages for the Fire Department and the Lyme FAST Squad. <b>Action Item #7</b></p>
Emergency Warning System	Code Red through Graton County reverse calling; door-to-door notification; supplementing the EOP are PA systems in all Fire & Police vehicles; the NH Alert phone app also available.	Town-wide	Emergency Management Director	Excellent	<p><b>Improvements Needed:</b> CodeRED is an excellent warning system but it only stores resident phone numbers that are listed in the phone book; the Town has continuously provided information to residents on CodeRED but it should continue to provide public outreach to encourage all residents to contact CodeRED to add cell numbers, email, unlisted numbers and to verify information; use the website, a possible brochure or a sign up at Town Meeting. <b>Action Item #5</b></p>
Functional Needs List	A prepared and update list of those citizens of the Community who may require special assistance at the time of an emergency.	Town Wide	Emergency Management Director	Excellent	<p><b>Improvements Needed:</b> A list of the functional needs population has been developed in Lyme by the Parish Nurses; this list needs to be further developed and maintained in order to serve as an effective tool during an emergency. <b>Action Item #18</b></p>

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Storm Drain / Culvert Maintenance	The Lyme Road Agent and the State DOT clean the drainage basins once a year and after major flooding events. Culverts are repaired as needed.	Town Wide	Highway Department	Good	<p><b>Improvements Needed:</b> Although the Lyme Highway Department does a good job cleaning and repairing drainage basins and culverts, a written stormwater maintenance plan should be developed to ensure continuity of actions and efficient stormwater management; deferred for continued maintenance and the development of a written stormwater maintenance plan; many culverts in Town need improvement and some drainage work needs to be completed. <b>Action Item #23</b></p>
Emergency Operations Plan (2011)	This plan identifies the response procedures and capabilities of the Town of Lyme in the event of a natural or man-made disaster.	Town Wide	Emergency Management Director	Good	<p><b>Improvements Needed:</b> The Lyme Emergency Operations Plan is currently in need of an update according to the recommended five-year cycle; the EOP was last updated in 2011 and will need to be updated again according to the new State format of 15-ESFs; the new EOP will include an EOC Call Alert List as well as a detailed Resource Inventory List; deferred to this Plan for the update. <b>Action Item #18</b></p>
Master Plan (2013)	The Master Plan serves as the guiding document for future development and serves as the guiding document to assist the Planning Board as it updates the Town Zoning Ordinances, Subdivision and Site Plan Review Regulations.	Town Wide	Planning Board	Excellent	<p><b>Improvements Needed:</b> The Lyme Master Plan was updated in 2013 and will need a recommended 10-year update in 2023; the Master Plan will not be due for an update during the life of this Plan; however the Planning Board reviews the Master Plan periodically and amends it as needed on an annual basis; it is recommended that any future updates to the Master Plan include a Natural Hazards section. <b>Action Item #21</b></p>

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
911 Signage Compliance	A system that complies with recommended signage size, location and visibility to ensure identification by emergency responders; markers at driveway entrances that identify residence locations in conjunction with the E-911 alerting system.	Town Wide	Selectboard	Average	<b>Improvements Needed:</b> The Town is about 50% compliant now; deferred to this Plan to consider ways to get this signage more compliant so that emergency responders can better assist the public at the time of need; perhaps through purchase of signs by the Town and/or public outreach. <b>Action Item #6</b>
Capital Improvement Plan (CIP-2008; approved 2012)	A Capital Improvement Plan is a short-range plan (usually four to ten years,) which identifies capital projects and equipment purchases; provides a planning schedule and identifies options for financing the plan; a CIP provides a link between a town and its departments through a comprehensive and strategic plan.	Town Wide	Selectboard	Average	<b>Improvements Needed:</b> Although Lyme has a current Capital Improvements Plan (CIP), work needs to be done on the Plan; deferred to this Plan to establish a committee to produce a more comprehensive plan for the future and to consider mitigation strategies from this Hazard Mitigation Plan for inclusion in the CIP. <b>Action Item #25</b>
NIMS & ICS Training	Ensure effective command, control, and communications during emergencies.	Town Wide	Emergency Management Director	Good	<b>Improvements Needed:</b> NIMS & ICS training has been done by most first responders; although this is preparedness, this is deferred to this plan to continue to provide NIMS (IS-700) & ICS (ICS 100 & ICS 200) training to new first responders and to new Town officials as they become elected and/or appointed. <b>Action Item #4</b>
School Emergency Plan (2010)	A School Comprehensive Emergency Management Plan ensures preparedness and response for school personnel and Town emergency personnel in the instance of a major disaster in the schools	Lyme Elementary School	SAU 76	Good	<b>Improvements Needed:</b> The Lyme Elementary School Emergency Plan is currently updated; continued updates and training are needed; the school plan is a good plan but needs more exercising; deferred to complete update and to develop more exercises going forward. <b>Action Item #20</b>

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Flood Warning System for Moore Dam failure	High water notification for conditions 1-3 on the Connecticut River is provided by TransCanada to the Grafton County Sheriff who then notifies Hanover Dispatch.	Trans-Canada	Grafton County Sheriff's & Hanover Dispatch	Good	<b>No Improvements Needed:</b> TransCanada (owners of Moore Dam) provides notification first to the Grafton County Sheriff who would then notify Hanover Dispatch when high water levels are reached, at which time CodeRED may be activated.
Emergency Back-up Power	The Town has emergency back-up power at the Highway Department, the Town Hall, the Police Station, the Fire Station and Lyme Elementary School and for the Lyme Water Association's water supply (31 residences).	CIKR Town Wide	Emergency Management Director	Excellent	<b>No Improvements Needed:</b> The Town of Lyme is extremely well-covered for emergency backup power. There are no Critical Infrastructure or Key Resources in Lyme which currently need generators.
Hazardous Materials Response Team	The Town relies on the Lebanon Fire Department for HazMat response.	Town Wide	Fire Department	Excellent	<b>No Improvements Needed:</b> The established HazMat team at the Lebanon Fire Department provides good hazmat response; a Hazardous Materials trailer is located at the Lebanon Fire Department.
Burning Index	New Hampshire Forests & Lands (DRED) has a burning index, which measures the risk for wildfires; how likely they are to start on a given day. It also evaluates the potential damages wildfires can create, the number of people that will be needed to fight it and the type of equipment that might be needed as well.	Town Wide	DRED	Excellent	<b>No Improvements Needed:</b> The Fire Department receives regular notification of the burning index via fax and email from NH Forests & Lands; this notification is made daily during the fire danger season.

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Mutual Aid Agreements (Fire, Police, Highway & EMS)	Mutual Aid agreements provide communications capabilities and cooperative assistance between area cities and towns; mutual aid provides access to resources that are appropriate to the scope of the emergency.	Town Wide	Fire, Police, EMS & Highway	Excellent	<b>No Improvements Needed:</b> The Fire Department has a mutual aid agreement with the Upper Valley Regional Emergency Services Association (UVRESA); the Police Department has agreements with the NH State Police and the neighboring towns of Hanover, Orford, Canaan & Thetford (VT); the Highway Department has an agreement with NH Public Works Mutual Aid Association; Ambulance transport is provided by the Hanover Fire Department with backup from Upper Valley Ambulance, Lebanon and Hartford (VT); all mutual aid systems in Lyme work very well.
Wellhead Protection Program	Lyme has identified a wellhead protection area. The purpose is to prevent the contamination of groundwater used for drinking water. The area is the surface and subsurface area surrounding the public water supply where contaminants are likely to reach.	Water Supply Areas	Water & Sewer Department	Good	<b>No Improvements Needed:</b> The Lyme Water Association (LWA) has, and continues to address, any concerns that are raised by DES; wellhead protection at the LWA wells is excellent.
State Health Department Public Health Plan	State plan, "Influenza, Pandemic, Public Health Preparedness and Response Plan" written by state health department to be prepared for any public health emergency; the Town is part of the Upper Valley Public Health Region	Town Wide	Upper Valley Public Health Region	Good	<b>No Improvements Needed:</b> The Public Health Plan does what it is meant to do; the Town participates in regional public health meetings whenever possible.

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Subdivision Regulations (2005)	The purpose of Lyme's subdivision regulations is to provide for the orderly present and future development of the Town by promoting the public health, safety, convenience and welfare of the Town's residents.	Town Wide	Planning Board	Good	<b>No Improvements Needed:</b> The Lyme Subdivision Regulations, most recently updated in 2005 but reviewed annually, are in good shape; the Subdivision Regulations address buildings on steep slope, ridgeline protection, the slope of driveways, water resources for fire suppression, clear cutting and forestry regulations to prevent erosion, regulations on maintaining adequate stormwater flow to prevent flooding and much more; the Lyme Subdivision Regulations work as they are intended and address many issues that help eliminate or diminish the impact from natural hazards.
Wetlands Protection	Wetland protection and state shore land protection act	Town Wide	Conservation Commission & Planning Board	Excellent	<b>No Improvements Needed:</b> The Town has identified wetlands and has National Wetlands Inventory maps; the Conservation Commission and Planning Board monitor permitting within the wetlands with the knowledge that preservation of wetlands helps with flooding events and with the continued survival of wildlife; the Town has gone further than DES's recommendations by adding 100 feet beyond their recommendations; any activity in the wetlands must go before the Zoning Board and then is reviewed by the Conservation Commission which provides feedback to the Zoning Board; the language in the wetlands conservation district was recently updated by vote at Town Meeting; the current program and the systems that are in place work well to protect wetlands.

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
<p>Zoning Ordinance (March 2015) &amp; Site Plan Regulations</p>	<p>Regulations dealing with land use including rural, residential, agriculture and timber management</p>	<p>Town Wide</p>	<p>Planning Board</p>	<p>Good</p>	<p><b>No Improvements Needed:</b> Lyme Zoning Ordinances are reviewed and updated annually or when there is a need; the Zoning Ordinance does what it is meant to do; Site Plan Regulations are mainly for commercial development; the Lyme Zoning Districts are regulated within this document; the Lyme Zoning Districts are: Lyme Center &amp; Lyme Common Districts; Commercial District; Rural District; East Lyme District; Skiway District; Mountain &amp; Forest Conservation District; Conservation Districts; Wetlands Conservation District; Steep Slopes Conservation District; Shoreland Conservation District; Agricultural Soils Conservation District; Flood Prone Area Conservation District and Ridgeline &amp; Hillside Conservation District.</p>
<p>Shoreland Water Quality Protection Act</p>	<p>Establishes minimum standards for the subdivision, use and development of shore land adjacent to the state's public water bodies.</p>	<p>Shoreland adjacent to NH public waters - Town of Lyme</p>	<p>Planning Board</p>	<p>Excellent</p>	<p><b>No Improvements Needed:</b> The Town of Lyme has established an ordinance which covers the Shoreland Conservation District; the New Hampshire Shoreland Water Quality Protection Act was created to protect the integrity of public waters. This act regulates development within 250 feet of the Connecticut River, Post Pond, Pout Pond, Trout Pond, and Reservoir Pond in Lyme. There are varying buffer areas depending upon the proposed activity or development. Generally, you cannot build closer than 50' to the water body, and you must leave a woodland buffer of 150' not including the building area; the Town of Lyme also has a shore land protection buffer (100 feet) from all surface water, including minor lakes and streams.</p>

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Moore Dam Emergency Action Plan	This plan identifies the response procedures and capabilities of Moore Dam in Littleton in the event of a natural or man-made disaster.	Areas Affected by Moore Dam's inundation flow	Emergency Management Director	Good	<b>No Improvements Needed:</b> The Town has the Emergency Action Plan for Moore Dam in Littleton and will receive notice of a need for evacuation should a major failure take place at Moore Dam; Stump Pond Dam has potential to fail, although it is unlikely; failure of Stump Pond Dam (earthen dam) could result in washouts on Pinnacle and Whipple Hill Roads; no known mitigation strategies exist.
Capital Reserve Fund (CRF)	A type of account on a town's balance sheet that is reserved for long-term capital investment projects or any other large and anticipated expense(s) that will be incurred in the future; reserve funds set aside to ensure adequate funding to at least partially finance future projects, equipment and other expenditures.	Town Wide	Selectboard	Excellent	<b>No Improvements Needed:</b> The Town's Capital Reserve Funds set funds are aside each year at budget time to assist the Town's departments with planned purchases of equipment and supplies or in emergency situations; the Lyme Capital Reserve Funds work well.
National Flood Insurance Program (NFIP) Lyme Floodplain Development Ordinance (Part of Zoning)	The minimum National Flood Insurance Program (NFIP) requirements (Section 60.3(c)) have been adopted; Lyme has been a member of the NFIP since April 16, 1993; the Floodplain Development Ordinance regulates all new and substantially improved structures located in the 100-year floodplain, as identified on the FEMA Flood Maps dated February 20, 2008.	Floodplain	Planning Board	Excellent	<b>No Improvements Needed:</b> The Town's Floodplain Development Ordinance works well to successfully prohibit or force compliance to the ordinance for building and substantial improvements to structures within the FEMA flood zone; the Floodplain Development Ordinance was last amended in January 2008.

Current Program or Activity	Description	Area of Town	Responsible Department	Effectiveness	Improvements Needed
Road Design Standards	Lyme Subdivision and Site Plan Regulations include road design standards that control the amount and retention of stormwater runoff.	Town Wide	Planning Board	Good	<p><b>No Improvements Needed:</b>                      Road design standards are detailed within the Town's planning mechanisms (Subdivision Regulations) and adhere to State standards; new roads will not be accepted by the Town as "town" roads unless approved at Town Meeting; limitations on new subdivisions also designate the location of new roads.</p>
State Division of Forest and Lands/Fire Permits	State regulations for open burning and permits	Town Wide	Police Department, Fire Chief, Fire Wardens	Excellent	<p><b>No Improvements Needed:</b>                      System that is in place with NHFL and the local fire warden works well; public is aware of fire permitting requirements and the ability to get permits online (fee required).</p>

## Chapter 7: Prior Mitigation Plan

### A. Date of Prior Plan

Lyme has participated in the development of a prior Hazard Mitigation Plan, based on the Disaster Mitigation Act (DMA) of 2000, which was adopted on September 15, 2011. This Plan, the “Lyme Hazard Mitigation Plan Update 2017” is an update to the 2011 plan.

Below are the action items that were identified in the 2011 plan. The Team identified the current status of each strategy based on these questions:

#### Completed

- Has the strategy been completed?
- If so, what was done?

#### Deleted

- Should the strategy be deleted?
- Is the strategy mitigation or preparedness?
- Is the strategy useful to the Town under the current circumstances?

#### Deferred

- Should the strategy be deferred for consideration in this Plan?
- If the strategy was not completed, should this strategy be reconsidered and included as a new action item for this Plan?

Strategies “deferred” from the prior plan, were added to **Table 9.1, The Mitigation Action Plan** as new strategies and were reprioritized to meet the current needs of the Town.



*Thetford Bridge flooding, 1936  
Photo Credit: The Town of Lyme*

**TABLE 7.1: ACCOMPLISHMENTS SINCE THE PRIOR PLAN APPROVAL**

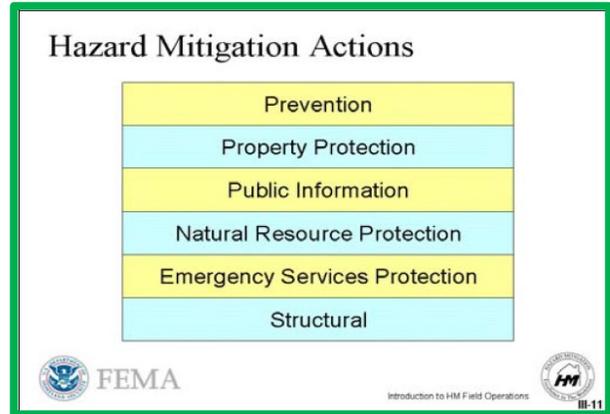
**NOTE:** Items in **red** were extracted word-for-word from the 2011 Hazard Mitigation Plan and do not represent a time frame for this plan.

Project	Responsibility Oversight	Funding Support	Time Frame	Completed, Deleted, Deferred
Seek funding to address water supply vulnerability/availability	EMD & Fire Chief	State EMPG Funding	Dec. 2012	<b>Partially Completed and Deferred:</b> Deferred because this is an ongoing project to continue to map and develop water resources for the Town. <b>Action Items #12 &amp; 13</b>
Provide educational information for the public on how to prepare for all hazard events.	Hazard Mitigation Subcommittee	Local and private funds for printing	2011-2016	<b>Completed &amp; Deferred:</b> Local phone book has information inside the covers for emergency; EMD did an Emergency Management Fair and also a display at Town Meeting; Welcome Packets for new comers; A "Go Bag" for emergencies; deferred to continue public education & awareness through a variety of methods; there is also an Emergency Management Page on the Town's website. <b>Action Item #7</b>
Create a proactive woodland vegetation maintenance plan to reduce fire hazards, power line damage and improve access and road safety	Conservation Commission	Staff and volunteer time	Dec. 2012	<b>Completed &amp; Deferred:</b> The Town works with local utility companies to keep vegetation at a minimum under power lines to reduce fire hazard; deferred to continue the work with local utilities on tree maintenance. <b>Action Item #14</b>
Engineering assessment of Dorchester Rd drainage issues	Highway Department	Federal, State, Local	Dec. 2013	<b>Completed &amp; Deleted:</b> The Town & State completed several projects on Dorchester Road to mitigate stormwater flow on Dorchester Road/Grant Brook; deleted as no projects on Dorchester Road are expected within the next five years.
Request additional training and funding from USDA Wildland/Urban Interface Program	Fire Chief	USDA Technical Assistance/Funds	2011-2016	<b>Completed &amp; Deferred:</b> The Fire Department has had wildland fire training and will continue to encourage best practices by hikers, snowmobilers and persons requesting burn permits. <b>Action #15</b>

## Chapter 8: New Mitigation Strategies & STAPLEE

### A. Mitigation Strategies by Type

The following list of mitigation categories and the comprehensive list of possible strategy ideas in Section B were compiled from a number of sources including the USFS, FEMA, other Planners and past hazard mitigation plans. This list was used during a brainstorming session to discuss what issues there may be in Town. Team involvement and the brainstorming sessions proved helpful in bringing new ideas, better relationships and a more in depth knowledge of the Community.



#### Prevention

- Forest fire fuel reduction programs
- Special management regulations
- Fire Protection Codes NFPA 1
- Firewise landscaping
- Culvert and hydrant maintenance
- Planning and zoning regulations
- Building codes
- Density controls
- Driveway standards
- Slope development regulations
- Master Plan
- Capital improvement program
- Rural Fire Water Resource Plan
- NFIP compliance

#### Public Education & Awareness

- Hazard information centers
- Public education and outreach programs
- Emergency website creation
- “Firewise” training
- NFIP awareness
- Public hazard notification
- Defensible space brochures

#### Emergency Service Protection

- Critical facilities protection
- Critical infrastructure protection
- Emergency training for town officials
- Ongoing training for first responders

#### Property Protection

- Current use or other conservation measures
- Transfer of development rights
- Firewise landscaping
- Water drafting facilities
- High risk notification for homeowners
- Structure elevation
- Real estate disclosures
- Flood proofing
- Building codes
- Development regulations

#### Natural Resource Protection

- Best management practices within the forest
- Forest and vegetation management
- Forestry and landscape management
- Wetlands development regulations
- Watershed management
- Erosion control
- Soil stabilization
- Open space preservation initiatives

#### Structural Projects

- Structure acquisition and demolition
- Structure acquisition and relocation
- Bridge replacement
- Dam removal
- Culvert up-size and/or realignment

**B. Potential Mitigation Strategies by Hazard**

In order to further promote the concept of mitigation, the Town was provided with a handout that was developed by Mapping and Planning Solutions and used to determine what additional mitigation action items might be appropriate for the Town. The mitigation action items from that handout are listed on the following two pages; each item from this comprehensive list of possible mitigation action items was considered by the Planning Team to determine if any of these action items could be put in place for Lyme with special emphasis on new and existing buildings and infrastructure.

<u>Strategies that may apply to more than one hazard</u>	<u>Type of Project</u>
• Community Outreach and Education .....	Public Awareness
• Changes to Zoning Regulations .....	Prevention
• Changes to Subdivision Regulations .....	Prevention
• Steep Slopes Ordinance .....	Prevention
• Density Controls .....	Prevention
• Driveway Standards .....	Prevention
• Emergency Website Creation.....	Public Awareness
• Critical Infrastructure & Key Resources .....	Emergency Service Protection
• Emergency Training for Town Officials .....	Emergency Service Protection
• High Risk Notification to Homeowners .....	Property Protection
• Master Plan Update or Development .....	Prevention
• Capital Improvement Plan .....	Prevention
<u>Flood Mitigation Ideas</u>	<u>Type of Project</u>
• Stormwater Management Ordinances .....	Prevention
• Floodplain Ordinances .....	Prevention
• Updated Floodplain Mapping .....	Prevention
• Watershed Management .....	Natural Resource Protection
• Drainage Easements.....	Prevention
• Purchase of Easements .....	Prevention
• Wetland Protection .....	Natural Resource Protection
• Structural Flood Control Measures .....	Prevention
• Bridge Replacement.....	Structural Project
• Dam Removal.....	Structural Project
• NFIP Compliance .....	Prevention
• Acquisition, Demolition & Relocation .....	Structural Project
• Structure Elevation .....	Structural Project
• Flood Proofing .....	Property Protection
• Erosion Control.....	Natural Resource Protection
• Floodplain/Coastal Zone Management .....	Prevention
• Building Codes Adoption or Amendments .....	Prevention
• Culvert & Hydrant Maintenance .....	Prevention
• Culvert & Drainage Improvements .....	Structural Protection
• Transfer of Development Rights .....	Property Protection

**Natural Hazard Mitigation Ideas**

**Type of Project**

**Landslide**

- Slide-Prone Area Ordinance ..... Prevention
- Drainage Control Regulations ..... Prevention
- Grading Ordinances ..... Prevention
- Hillside Development Ordinances ..... Prevention
- Open Space Initiatives ..... Prevention
- Acquisition, Demolition & Relocation ..... Structural Project
- Vegetation Placement and Management ..... Natural Resource Protection
- Soil Stabilization ..... Natural Resource Protection

**Thunderstorms & Lightning**

- Building construction ..... Property Protection

**Tornado & Severe Wind**

- Construction Standards and Techniques ..... Property Protection
- Safe Rooms ..... Prevention
- Manufactured Home Tie Downs ..... Property Protection
- Building Codes ..... Property Protection

**Wildfire**

- Building Codes ..... Property Protection
- Defensible Space ..... Prevention
- Forest fire fuel reduction ..... Prevention
- Burning Restriction ..... Property Protection
- Water Resource Plan ..... Prevention
- Firewise Training & Brochures ..... Public Awareness
- Woods Roads Mapping ..... Prevention

**Extreme Temperatures**

- Warming & Cooling Stations ..... Prevention

**Winter Weather Snowstorms**

- Snow Load Design Standards ..... Property Protection

**Subsidence**

- Open Space ..... Natural Resource Protection
- Acquisition, Demolition & Relocation ..... Structural Project

**Earthquake**

- Construction Standards and Techniques ..... Property Protection
- Building Codes ..... Property Protection
- Bridge Strengthening ..... Structural Project
- Infrastructure Hardening ..... Structural Project

**Drought**

- Water Use Ordinances ..... Prevention

**C. STAPLEE Methodology**

Table 8.1, *Potential Mitigation Items & the STAPLEE*, reflects the newly identified potential hazard and wildfire mitigation action items as well as the results of the STAPLEE evaluation as explained below. It should also be noted that although some areas are identified as “All Hazards”, many of these would apply indirectly to wildfire response and capabilities. Many of these potential mitigation action items overlap.

The goal of each proposed mitigation action item is “to reduce or eliminate the long-term risk to human life and property from hazards”. To determine the effectiveness of each mitigation action item in accomplishing this goal, a set of criteria that was developed by FEMA, the STAPLEE method, was applied to each proposed action item.

The STAPLEE method analyzes the **S**ocial, **T**echnical, **A**ministrative, **P**olitical, **L**egal, **E**conomic and **E**nvironmental aspects of a project and is commonly used by public administration officials and planners for making planning decisions. The following questions were asked about the proposed mitigation action items discussed in Table 8.1.

**Social:** ..... Is the proposed action item socially acceptable to the Community? Is there an equity issue involved that would result in one segment of the Community being treated unfairly?

**Technical:** ..... Will the proposed action item work? Will it create more problems than it solves?

**Administrative:** ..... Can the Community implement the action item? Is there someone to coordinate and lead the effort?

**Political:** ..... Is the action item politically acceptable? Is there public support both to implement and to maintain the project?

**Legal:** ..... Is the Community authorized to implement the proposed action item? Is there a clear legal basis or precedent for this activity?

**Economic:** ..... What are the costs and benefits of this action item? Does the cost seem reasonable for the size of the problem and the likely benefits?

**Environmental:** ..... How will the action item impact the environment? Will it need environmental regulatory approvals?

Each proposed mitigation action item was then evaluated and assigned a score based on the above criteria. Each of the STAPLEE categories was discussed and was awarded one of the following scores:

3 - Good ..... 2 - Average ..... 1 - Poor

An evaluation chart with total scores for each new action item is shown in Table 8.1.

The “Type” of Action Item was also considered. See Section A of this chapter for more information.

- **Prevention**
- **Public Education & Awareness**
- **Emergency Service Protection**
- **Property Protection**
- **Natural Resource Protection**
- **Structural Projects**

**D. Team’s Understanding of Hazard Mitigation Action Items**

The Team determined that any strategy designed to reduce personal injury or damage to property that could be done prior to an actual disaster would be listed as a potential mitigation strategy. This decision was made even though not all projects listed in Table 8.1 and *Table 9.1, The Mitigation Action Plan*, are fundable under FEMA pre-mitigation guidelines. The Team determined that this Plan was in large part a management document designed to assist the Selectboard and other town officials in all aspects of managing and tracking potential emergency planning action items. For instance, the Team was aware that some of these action items are more properly identified as preparedness or readiness issues. As there are no other established planning mechanisms that recognize some of these issues, the Team did not want to “lose” any of the ideas discussed during these planning sessions and thought this method was the best way to achieve that objective.

Also, it should be noted that the Town understands that the “Mitigation Action Items” for a town of 200 are not the same as the “Mitigation Action Items” for a town of 30,000. In addition, the “Mitigation Action Items” for a town in the middle of predominantly hardwood forests, are not the same as the “Mitigation Action Items” for a town on the Jersey Shore. Therefore the Town of Lyme has accepted the “Mitigation Action Items” in Tables 8.1 and 9.1 as the complete list of “Mitigation Action Items” for this Town and only this Town and hereby indicates that having carefully considered a comprehensive list of other possible mitigation action items (see sections A & B of this chapter) for this Plan, there are no additional “Mitigation Action Items” to add at this time.

**TABLE 8.1: POTENTIAL MITIGATION ACTION ITEMS & THE STAPLEE**

- **Potential mitigation action items in Table 8.1 on the following page are listed in numerical order and indicate if they were derived from prior tables in this Plan.**
- **Items in green such as (MU14) represent mitigation action items taken from Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, FEMA, January 2013; see *Appendix E: Potential Mitigation Ideas*, for more information.**

Action Items are listed in numerical order.

Proposed Mitigation Action Items	Affected Location	Type of Activity	TTL	S	T	A	P	L	E	E
<b>Action Item #1:</b> Improve the flow of stormwater by improving culverts and drainage systems throughout the Community according to a 20 project per year plan. (F13)	Culverts Town Wide	Prevention Property Protection Natural Resource Protection Structural Projects	16	3	3	3	2	2	1	2
<p><i>Political:</i> Some may not want to address the problem with culverts  <i>Legal:</i> Some culverts will need agreement by private property owners  <i>Economic:</i> Budget constraints  <i>Environmental:</i> DES permitting will be required for any culverts in wetlands</p>										
<b>Action Item #2:</b> Continue to maintain town ditches as needed to improve the flow stormwater. (F14)	Ditches Town Wide	Prevention Property Protection Natural Resource Protection Structural Projects	21	3	3	3	3	3	3	3
<p><i>No apparent difficulty with this strategy</i></p>										
<b>Action Item #3:</b> Include improvements to the Town's red-listed bridges in the Stormwater Maintenance Plan and obtain funding to repair/upgrade them.	Town's Red- Listed Bridges	Prevention Emergency Service Protection Property Protection Natural Resource Protection Structural Projects	17	3	3	3	3	3	1	1
<p><i>Economic:</i> Budget Constraints  <i>Environmental:</i> DES permitting will be required</p>										
<b>Action Item #4:</b> EMD will encourage all town officials and new hires to take NIMS 700 and ICS 100 and 200. (Table 6.1)	Town Wide	Prevention Emergency Service Protection	21	3	3	3	3	3	3	3
<p><i>No apparent difficulty with this strategy</i></p>										
<b>Action Item #5:</b> Provide public outreach to encourage all residents to contact CodeRED to add cell numbers, unlisted numbers and to verify information; use the website, a possible brochure or a sign up at Town Meeting. (MU14) (Table 6.1)	Town Wide	Prevention Public Education & Awareness	21	3	3	3	3	3	3	3
<p><i>No apparent difficulty with this strategy</i></p>										

Proposed Mitigation Action Items	Affected Location	Type of Activity	TTL	S	T	A	P	L	E	E
<b>Action Item #6:</b> Consider ways to improve 911 signage compliance so that emergency responders can better assist the public at the time of need; perhaps through purchase of signs by the Town and/or through continued public outreach. <b>(Table 6.1)</b>	Town Wide	Public Education & Awareness Emergency Service Protection	21	3	3	3	3	3	3	3
				<i>No apparent difficulty with this strategy</i>						
<b>Action Item #7:</b> Continue to provide robust information on the Town's Emergency webpage for educating the public on hazard mitigation and preparedness measures <b>(MU14)</b> by adding such information as emergency contacts, shelter locations, evacuation routes <b>(SW7, WF11 &amp; T3)</b> , methods of emergency alerting, 911 compliance, water saving techniques <b>(D9)</b> , earthquake risk and mitigation activities that can be taken in residents' homes <b>(EQ7)</b> , steps homeowners can take to protect themselves and their properties when extreme temperatures occur <b>(ET1 &amp; ET4)</b> , safety measures that can be taken during hail <b>(HA3)</b> and lightning storms <b>(L2)</b> , mitigation techniques for property protection and links to available sources; educate homeowners regarding the risks of building in hazard zones and encourage homeowners to install carbon monoxide monitors and alarms <b>(WW5)</b> ; continue to develop ways to provide notification to citizens. <b>(Tables 6.1 &amp; 7.1)</b>	Town Wide	Public Education & Awareness Property Protection Natural Resource Protection	21	3	3	3	3	3	3	3
				<i>No apparent difficulty with this strategy</i>						
<b>Action Item #8:</b> Advise the public about the local flood hazard, flood insurance and flood protection measures <b>(F10)</b> by obtaining and keeping on hand a supply of NFIP brochures to have available in the Town Offices; give NFIP materials to homeowners and builders when proposing new development or substantial improvements; encourage property owners to purchase flood insurance <b>(F22)</b> , whether or not they are in the flood zone and provide appropriate links to the NFIP and Ready.gov on the Emergency Management Services webpage.	Town Wide areas that flood	Prevention Public Education & Awareness	21	3	3	3	3	3	3	3
				<i>No apparent difficulty with this strategy</i>						

Proposed Mitigation Action Items	Affected Location	Type of Activity	TTL	S	T	A	P	L	E	E
<b>Action Item #9:</b> Through Public Outreach and the Town's website, educate homeowners regarding the risks of building in flood zone and measures that can be taken to reduce the chance of flooding, such as securing debris, propane tanks, yard items or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by floodwaters; add links and info to website; continue to actively work with residents to ensure they are in compliance with the Town's Floodplain Ordinance. (F23)	Town Wide	Prevention Public Education & Awareness	21	3	3	3	3	3	3	3
				<i>Political: Some people may resist compliance with the ordinance</i>						
<b>Action Item #10:</b> Provide public outreach to the citizens of Lyme regarding the availability of the Town Office and the Elementary School as a "cooling or warming center" during times of extended high temperatures and severe winter weather. (ET3 & WW6)	Town Wide	Prevention Public Education & Awareness	21	3	3	3	3	3	3	3
				<i>No apparent difficulty with this strategy</i>						
<b>Action Item #11:</b> Continue to post important information on the Town's Emergency website and notices of red flag burning days through mailings and obtain and have available "Firewise" brochures to educate homeowners on methods to reduce fire risk around their homes (WF10); provide "Firewise" brochures to those residents seeking burn permits; advise residents of the importance of maintaining defensible space, the safe disposal of yard and household waste and the removal of dead or dry leaves, needles, twigs, and combustible materials from roofs, decks, eaves, porches and yards. (WF12)	Town Wide	Prevention Public Education & Awareness Property Protection	21	3	3	3	3	3	3	3
				<i>No apparent difficulty with this strategy</i>						
<b>Action Item #12:</b> Routinely inspect the functionality of fire hydrants and continue the maintenance and repair of all hydrants and other water resources in Lyme; consider other areas of the Community that have limited water resources and address these issues by installing new hydrants, fire ponds and/or cisterns; consult with the Lyme FD Water Supply project. (WF8) (Table 7.1)	Town Wide	Prevention Emergency Service Protection Property Protection Natural Resource Protection Structural Projects	16	3	3	3	2	2	2	1
				<i>Political: Some people may not want money spent on these projects or the maintenance of the ponds</i> <i>Legal: Permission and easements may be required on private property</i> <i>Economic: Budget constraints</i> <i>Environmental: DES permitting may be required</i>						

Proposed Mitigation Action Items	Affected Location	Type of Activity	TTL	S	T	A	P	L	E	E
<b>Action Item #13:</b> Continue to address water availability and resource issues in an effort to maintain the public water supply and to address fire suppression capabilities; refer to the Rural Fire Water Resource Plan; consider ways to add water resources to Lyme Center, the most concerning area in the Community. (MU13) (Table 7.1)	Town Wide	Prevention Emergency Service Protection Property Protection Natural Resource Protection	19	3	3	3	2	3	2	3
				<p><b>Political:</b> Some residents and/or builders may not want to do what is recommended  <b>Environmental:</b> Some water resource projects may need to be permitted by DES</p>						
<b>Action Item #14:</b> In addition to work that is done by and with local utility companies, continue to monitor and maintain brush cutting, drainage system maintenance and tree removal as part of a tree maintenance program and continue to create defensible space around power lines, oil and gas lines and other infrastructure; continue to work to reduce wildfire risk by clearing dead vegetation, cutting high grass and other fuel loads in the Community. (SW4, WF7, WF9 & F14) (Table 7.1)	Town Wide	Prevention Emergency Service Protection Property Protection Natural Resource Protection	15	1	3	3	1	2	2	3
				<p><b>Social:</b> Some people may not want their trees cut  <b>Political:</b> Some may feel tree cutting will disturb aesthetic values  <b>Legal:</b> Must respect rules of scenic roads and property owners rights  <b>Economic:</b> Budget constraints</p>						
<b>Action Item #15:</b> Develop partnerships and outreach activities with Lyme Pinnacle Snowmobile Club, Upper Valley Land Trust, the Appalachian Trail Conservancy, Boy Scouts, hiking clubs, as well as the USDA Forest Service Wildland/Urban Interface Program, to encourage best practices will camping, hiking and riding in the forest. (WF11) (Table 7.1)	Town Wide	Prevention Public Education & Awareness Property Protection Natural Resource Protection	21	3	3	3	3	3	3	3
				<p><b>No apparent difficulty with this strategy</b></p>						
<b>Action Item #16:</b> Continue to encourage best practices and adherence to state regulations to prevent the erosion that results from timber cutting. (ER2 & MU4)	Town Wide areas of steep slope	Prevention Property Protection Natural Resource Protection	19	3	3	3	3	1	3	3
				<p><b>Political:</b> Landowner may want to do what he wants on own property without Town approval.</p>						

Proposed Mitigation Action Items	Affected Location	Type of Activity	TTL	S	T	A	P	L	E	E
<b>Action Item #17:</b> Monitor the water system in Clay Brook and Post Pond to better evaluate the flood risk in this area; proactively take measures to sustain a safe water level. (F14)	Chaffee Wildlife Sanctuary	Prevention Property Protection Natural Resource Protection	18	2	3	3	2	3	3	2
				<b>Social:</b> There may be a disagreement on the appropriate level of the pond <b>Political:</b> People may have different opinions about the appropriate water level for Post Pond <b>Environmental:</b> As water levels change, wildlife habitat may vary and cause concern among environmentalists.						
<b>Action Item #18:</b> Consider the creation of a process to track those individuals at high risk of death, such as the elderly, homeless, etc. by developing a new and updated survey of the functional needs population and a method of maintaining the data; addressed in the EOP update. (ET3 & WW6) (Table 6.1)	Town Wide	Prevention Public Education & Awareness Emergency Service Protection	20	3	3	3	2	3	3	3
				<b>Political:</b> Privacy issues; HIPAA						
<b>Action Item #19:</b> Update the Lyme Emergency Operations Plan to coincide with the new State 15-ESF format and include "Player Packets" for Lead Agencies. (Tables 6.1 & 7.1)	Town Wide	Prevention Emergency Service Protection	21	3	3	3	3	3	3	3
				<b>No apparent difficulty with this strategy</b>						
<b>Action Item #20:</b> Complete the update of the Lyme Elementary School Emergency Plan and work with the School to develop training and exercises to practice the Plan. (Table 6.1)	Elementary School	Prevention Emergency Service Protection	21	3	3	3	3	3	3	3
				<b>No apparent difficulty with this strategy</b>						
<b>Action Item #21:</b> Review the Lyme Master Plan and consider the incorporation of a Natural Hazards section and mitigation action items from this Plan. (MU6) (Table 6.1)	Town Wide	Prevention	20	3	3	2	3	3	3	3
				<b>Administrative:</b> Planning Board may not want to include hazard mitigation in the Master						
<b>Action Item #22:</b> Develop an official program to inspect commercial, rental and other publicly used buildings; provide outreach on program. (MU1) (Table 6.1)	Town Wide	Prevention Public Education & Awareness Emergency Service Protection Property Protection	19	3	3	3	2	3	2	3
				<b>Political:</b> Some may not want to comply with the program. <b>Economic:</b> Possible economic burden for builders/owners.						

Proposed Mitigation Action Items	Affected Location	Type of Activity	TTL	S	T	A	P	L	E	E
<b>Action Item #23:</b> Develop a written stormwater maintenance plan in order to ensure more efficient stormwater management; include the location, type, size, age and expected replacement date of all culverts, catch basins and drainage ditches in the Community. (F5) (Table 6.1)	Town Wide	Prevention Property Protection Natural Resource Protection	20	3	3	2	3	3	3	3
				<i>Administrative: Staff time</i>						
<b>Action Item #24:</b> Identify and describe problems areas with the help of local engineers; prevent erosion with proper bank stabilization, retaining walls, riprap, etc. to stop erosion; consider eminent domain and relocating sections of the road to ensure access to homes along River Road. (ER5)	River Road	Prevention Property Protection Natural Resource Protection	11	1	3	3	1	1	1	1
				<i>Social: Residents on River Road may have difficulty getting to their properties</i> <i>Political: May need eminent domain</i> <i>Legal: Eminent domain issues may arise</i> <i>Economic: Huge budget constraints</i> <i>Environmental: Army Corps of engineers and DES will be involved</i>						
<b>Action Item #25:</b> Establish a committee to produce a more comprehensive plan for the future and to consider mitigation strategies from this Hazard Mitigation Plan for inclusion in the CIP. (MU6) (Table 6.1)	Town Wide	Prevention	19	3	3	3	1	3	3	3
				<i>Political: Planning Board may not want to do this project</i>						

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## Chapter 9: Implementation Schedule for Prioritized Action Items

### A. Priority Methodology

After reviewing the finalized STAPLEE numerical ratings, the Team prepared to develop *Table 9.1, The Mitigation Action Plan*. To do this, team members created four categories into which they would place the potential mitigation action items.

- **Category 0** was to include those items which are being done and will continue to be done in the future.
- **Category 1** was to include those items under the direct control of town officials, within the financial capability of the Town using only town funding, those already being done or planned and those that could generally be completed within one year.
- **Category 2** was to include those items that the Town did not have sole authority to act upon, those for which funding might be beyond the Town's capability and those that would generally take between 13-36 months to complete.
- **Category 3** was to include those items that would take a major funding effort, those that the Town had little control over the final decision and those that would take in excess of 37 months to complete.

Each potential mitigation action item was placed in one of these four categories and then those action items were prioritized within each category according to cost-benefit, time frame and capability. Actual cost estimates were unavailable during the planning process, although using the STAPLEE process along with the methodology detailed above and a Low-High estimate (see following page) the Team was able to come up with a general consensus on cost-benefit for each proposed action item.

The Team also considered the following criteria while ranking and prioritizing each action item:

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures?
- Does the action keep in mind future development?
- Can the action be implemented quickly?

The prioritization exercise helped the Team seriously evaluate the new hazard mitigation action items that they had brainstormed throughout the hazard mitigation planning process. While all actions would help improve the Town's hazard and wildfire responsiveness capability, funding availability will be a driving factor in determining what and when new mitigation action items are implemented.

**B. Who, When, How?**

Once this was completed, the Team developed an action plan that outlined who is responsible for implementing each action item, as well as when and how the actions will be implemented. The following questions were asked in order to develop a schedule for the identified mitigation action items.

**WHO?** Who will lead the implementation efforts? Who will put together funding requests and applications?

**WHEN?** When will these actions be implemented and in what order?

**HOW?** How will the Community fund these projects? How will the Community implement these projects? What resources will be needed to implement these projects?

In addition to the prioritized mitigation action items, *Table 9.1, The Mitigation Action Plan*, includes the responsible party (WHO), how the project will be supported (HOW) and what the time frame is for implementation of the project (WHEN).

Once the Plan is approved, the Community will begin working on the action items listed in *Table 9.1, The Mitigation Action Plan* (see below). An estimation of completion for each action item is noted in the “Time Frame” column of Table 9.1.

Some projects, including most training and education of residents on emergency and evacuation procedures, could be tied into the emergency operation plan and implemented through that planning effort.

**TABLE 9.1: THE MITIGATION ACTION PLAN**

*Table 9.1, The Mitigation Action Plan*, located on the next page, includes Problem Statements that were expressed by the Team. These action items are listed in order of priority and indicate if they were derived from prior tables in this Plan.



The estimated cost was determined using the following criteria:

- **Low Cost**..... \$0 - \$1,000 or staff time only
- **Medium Cost** ..... \$1,000 - \$10,000
- **High Cost** ..... \$10,000 or more

The time frame was determined using the following criteria:

- **Short Term** ..... Ongoing for the life of the Plan
- **Short Term** ..... Less than 1 year (0-12 months)
- **Medium Term**..... 2-3 years (13-36 months)
- **Long Term:** ..... 4-5 years (37-60 months)

Items in green such as **(MU14)** represent mitigation action items taken from *Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards*, FEMA, January 2013; see *Appendix E: Potential Mitigation Ideas*, for more information.

Mitigation Action Items are listed in order of priority.

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-1	<p><b>Problem Statement:</b> <i>The Town of Lyme has many culverts (500+) that are either aging, undersized or compromised that will need improvements over the next five years; there are too many to list in this plan, however the Highway Department is compiling a list of culverts and drainage issues and prioritizing the work that will need to be done, changing priorities as needed.</i></p> <p><b>Action Item #1:</b> Improve the flow of stormwater by improving culverts and drainage systems throughout the Community according to a 20 project per year plan. <b>(F13)</b></p>	Flooding	Highway Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Medium Cost</b> \$1,000-\$10,000 (per culvert)	16
0-2	<p><b>Problem Statement:</b> <i>The Town's ditching needs continuous maintenance.</i></p> <p><b>Action Item #2:</b> Continue to maintain town ditches as needed to improve the flow stormwater. <b>(F14)</b></p>	Flooding	Highway Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>High Cost</b> >\$10,000	21
0-3	<p><b>Problem Statement:</b> <i>Five or six bridges on Town roads in Lyme are red listed and need to be repaired or replaced; two on Flint Hill Road, one on Highbridge Road, one on River Road, one Goose Pond Road and others.</i></p> <p><b>Action Item #3:</b> Include improvements to the Town's red-listed bridges in the Stormwater Maintenance Plan and obtain funding to repair/upgrade them.</p>	Flooding	Highway Department	Local & Grants	<b>Short Term-Ongoing</b> For life of the Plan	<b>High Cost</b> >\$10,000	17
0-4	<p><b>Problem Statement:</b> <i>Although most police officers and firefighters have received NIMS &amp; ICS trainings, not all of Lyme's town officials have.</i></p> <p><b>Action Item #4:</b> EMD will encourage all town officials and new hires to take NIMS 700 and ICS 100 and 200. <b>(Table 6.1)</b></p>	All Hazards	Emergency Management Director	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-5	<p><b>Problem Statement:</b> CodeRED is an excellent warning system but it only stores resident phone numbers that are listed in the phone book; residents may not be aware that they can add cell numbers and unlisted numbers.</p> <p><b>Action Item #5:</b> Provide public outreach to encourage all residents to contact CodeRED to add cell numbers, unlisted numbers and to verify information; use the website, a possible brochure or a sign up at Town Meeting. <b>(MU14) (Table 6.1)</b></p>	All Hazards	Selectboard	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21
0-6	<p><b>Problem Statement:</b> The Town has continuously used public outreach to advise residents of the need for proper 911 signage; however, the Town is currently only about 50% compliant with the proper 911 signage.</p> <p><b>Action Item #6:</b> Consider ways to improve 911 signage compliance so that emergency responders can better assist the public at the time of need; perhaps through purchase of signs by the Town and/or through continued public outreach. <b>(Table 6.1)</b></p>	All Hazards	Emergency Management Director, FAST Squad & Fire Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21
0-7	<p><b>Problem Statement:</b> Although the Town has made a great effort in providing public education; more can be done to provide not only emergency preparedness but also hazard mitigation techniques that residents can take to protect their homes and properties.</p> <p><b>Action Item #7:</b> Continue to provide robust information on the Town's Emergency webpage for educating the public on hazard mitigation and preparedness measures <b>(MU14)</b> by adding such information as emergency contacts, shelter locations, evacuation routes <b>(SW7, WF11 &amp; T3)</b>, methods of emergency alerting, 911 compliance, water saving techniques <b>(D9)</b>, earthquake risk and mitigation activities that can be taken in residents' homes <b>(EQ7)</b>, steps homeowners can take to protect themselves and their properties when extreme temperatures occur <b>(ET1 &amp; ET4)</b>, safety measures that can be taken during hail <b>(HA3)</b> and lightning storms <b>(L2)</b>, mitigation techniques for property protection and links to available sources; educate homeowners regarding the risks of building in hazard zones and encourage homeowners to install carbon monoxide monitors and alarms <b>(WW5)</b>; continue to develop ways to provide notification to citizens. <b>(Tables 6.1 &amp; 7.1)</b></p>	All Hazards including: Severe Wind, Drought, Earthquake, Extreme Temperatures, Hail, Lightning, Severe Winter Weather, Tornado & Wildfire	Emergency Management Director & Selectboard	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-8	<p><b>Problem Statement:</b> Residents and Builders may not be aware of flood regulations &amp; the availability of flood insurance through the NFIP.</p> <p><b>Action Item #8:</b> Advise the public about the local flood hazard, flood insurance and flood protection measures (F10) by obtaining and keeping on hand a supply of NFIP brochures to have available in the Town Offices; give NFIP materials to homeowners and builders when proposing new development or substantial improvements; encourage property owners to purchase flood insurance (F22), whether or not they are in the flood zone and provide appropriate links to the NFIP and Ready.gov on the Emergency Management Services webpage.</p>	Flooding	Planning & Zoning & Emergency Management Director	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21
0-9	<p><b>Problem Statement:</b> Residents may not be aware of the risk of building in the floodplain and the steps they can take to reduce flooding.</p> <p><b>Action Item #9:</b> Through Public Outreach and the Town's website, educate homeowners regarding the risks of building in flood zone and measures that can be taken to reduce the chance of flooding, such as securing debris, propane tanks, yard items or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by floodwaters; add links and info to website; continue to actively work with residents to ensure they are in compliance with the Town's Floodplain Ordinance. (F23)</p>	Flooding	Planning Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21
0-10	<p><b>Problem Statement:</b> Although public outreach has been done to advise the citizens of Lyme of the possibility of using the Town Office as a cooling shelter in times of extended high temperatures; additional public outreach needs to be done.</p> <p><b>Action Item #10:</b> Provide public outreach to the citizens of Lyme regarding the availability of the Town Office and the Elementary School as a "cooling or warming center" during times of extended high temperatures and severe winter weather. (ET3 &amp; WW6)</p>	Extreme Temperatures & Severe Winter Weather	Emergency Management Director	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-11	<p><b>Problem Statement:</b> <i>Although the Town does a great job using its Emergency webpage to keep Residents may not be aware of the steps they can take to reduce the risk of fire at their homes, this work needs to continue into the future.</i></p> <p><b>Action Item #11:</b> Continue to post important information on the Town's Emergency website and notices of red flag burning days through mailings and obtain and have available "Firewise" brochures to educate homeowners on methods to reduce fire risk around their homes (WF10); provide "Firewise" brochures to those residents seeking burn permits; advise residents of the importance of maintaining defensible space, the safe disposal of yard and household waste and the removal of dead or dry leaves, needles, twigs, and combustible materials from roofs, decks, eaves, porches and yards. (WF12)</p>	Wildfire	Emergency Management Director & Fire Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21
0-12	<p><b>Problem Statement:</b> <i>NCRC&amp;D prepared a Rural Fire Water Resource Plan with recommendations for the installation of water resources (i.e., dry hydrants, fire ponds, cisterns); maintenance needs to continue on all of the Town's water resources.</i></p> <p><b>Action Item #12:</b> Routinely inspect the functionality of fire hydrants and continue the maintenance and repair of all hydrants and other water resources in Lyme; consider other areas of the Community that have limited water resources and address these issues by installing new hydrants, fire ponds and/or cisterns; consult with the Lyme FD Water Supply project. (WF8) (Table 7.1)</p>	Wildfire	Fire Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Medium Cost</b> \$1,000-\$10,000 (depending on the project)	16
0-13	<p><b>Problem Statement:</b> <i>There continues to be availability issues regarding water resources for the Town although mechanisms are in place to work with the Planning Board and Fire Department to ensure water resources in new or expanded developments.</i></p> <p><b>Action Item #13:</b> Continue to address water availability and resource issues in an effort to maintain the public water supply and to address fire suppression capabilities; refer to the Rural Fire Water Resource Plan; consider ways to add water resources to Lyme Center, the most concerning area in the Community. (MU13) (Table 7.1)</p>	All Hazards & Wildfire	Fire Department, Highway Department & Planning Board	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	19

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-14	<p><b>Problem Statement:</b> <i>As tree limbs fall and/or encroach roadways and water systems and as vegetation grows around utilities, there is a need to continue to work to keep this hazard to a minimum.</i></p> <p><b>Action Item #14:</b> In addition to work that is done by and with local utility companies, continue to monitor and maintain brush cutting, drainage system maintenance and tree removal as part of a tree maintenance program and continue to create defensible space around power lines, oil and gas lines and other infrastructure; continue to work to reduce wildfire risk by clearing dead vegetation, cutting high grass and other fuel loads in the Community. <b>(SW4, WF7, WF9 &amp; F14) (Table 7.1)</b></p>	Severe Wind, Wildfire, Ice Storms & Flooding	Highway Department & Local Utilities	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Medium Cost</b> \$1,000-\$10,000	15
0-15	<p><b>Problem Statement:</b> <i>The Fire Department will continue to need wildland fire training and to encourage hikers, snowmobilers and others who visit the Community about best practices while in the forest.</i></p> <p><b>Action Item #15:</b> Develop partnerships and outreach activities with Lyme Pinnacle Snowmobile Club, Upper Valley Land Trust, the Appalachian Trail Conservancy, Boy Scouts, hiking clubs, as well as the USDA Forest Service Wildland/Urban Interface Program, to encourage best practices will camping, hiking and riding in the forest. <b>(WF11) (Table 7.1)</b></p>	Wildfire	Lyme Forestry Warden, Conservation Commission & Fire Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21
0-16	<p><b>Problem Statement:</b> <i>Deforestation in some parts of Lyme has the potential to cause erosion.</i></p> <p><b>Action Item #16:</b> Continue to encourage best practices and adherence to state regulations to prevent the erosion that results from timber cutting. <b>(ER2 &amp; MU4)</b></p>	Erosion	Planning Department	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	19
0-17	<p><b>Problem Statement:</b> <i>Flooding of Post Pond and neighboring areas, including Route 10, has occurred due to obstructions in Clay Brook.</i></p> <p><b>Action Item #17:</b> Monitor the water system in Clay Brook and Post Pond to better evaluate the flood risk in this area; proactively take measures to sustain a safe water level. <b>(F14)</b></p>	Flooding	Conservation Commission	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	21

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
0-18	<p><b>Problem Statement:</b> <i>A survey was done to identify the functional needs population in Lyme, and although a list of the functional needs population exists, a new and updated survey needs to be completed.</i></p> <p><b>Action Item #18:</b> Consider the creation of a process to track those individuals at high risk of death, such as the elderly, homeless, etc. by developing a new and updated survey of the functional needs population and a method of maintaining the data; addressed in the EOP update. <b>(ET3 &amp; WW6) (Table 6.1)</b></p>	All Hazards	Selectboard	Local	<b>Short Term-Ongoing</b> For life of the Plan	<b>Low Cost</b> <\$1,000 or staff time only	20
1-1	<p><b>Problem Statement:</b> <i>The Lyme Emergency Operations Plan is currently in need of an update according to the recommended five-year cycle; the EOP was last updated in 2010.</i></p> <p><b>Action Item #19:</b> Update the Lyme Emergency Operations Plan to coincide with the new State 15-ESF format and include "Player Packets" for Lead Agencies. <b>(Tables 6.1 &amp; 7.1)</b></p>	All Hazards	Emergency Management Director	Local & Grants	<b>Short Term</b> 1 Year or Less (0-12 months)	<b>Medium Cost</b> \$1,000-\$10,000	21
1-2	<p><b>Problem Statement:</b> <i>The Lyme Elementary School Emergency Plan is being updated; continued updates and training are needed; the school plan is a good plan but needs more exercising.</i></p> <p><b>Action Item #20:</b> Complete the update of the Lyme Elementary School Emergency Plan and work with the School to develop training and exercises to practice the Plan. <b>(Table 6.1)</b></p>	All Hazards	Superintendent of Schools & Emergency Management Director	Local	<b>Short Term</b> 1 Year or Less (0-12 months)	<b>Low Cost</b> <\$1,000 or staff time only	21
1-3	<p><b>Problem Statement:</b> <i>The Lyme Master Plan (2013) will be need of an update based on the recommended ten year guidelines in 2023; however it does not include a Natural Hazards section or mitigation action items from this Plan.</i></p> <p><b>Action Item #21:</b> Review the Lyme Master Plan and consider the incorporation of a Natural Hazards section and mitigation action items from this Plan. <b>(MU6) (Table 6.1)</b></p>	All Hazards	Planning Board	Local	<b>Short Term</b> 1 Year or Less (0-12 months)	<b>Low Cost</b> <\$1,000 or staff time only	20

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
1-4	<p><b>Problem Statement:</b> <i>The Town of Lyme does not have a Building Inspector however, the permitting process requires builders to abide by the International Building Codes (IBC) and the International Residential Codes (IRC) which have been adopted by the State of New Hampshire; there is not an official program to inspect commercial, rental and other publicly used buildings.</i></p> <p><b>Action Item #22:</b> Develop an official program to inspect commercial, rental and other publicly used buildings; provide outreach on program. <b>(MU1) (Table 6.1)</b></p>	All Hazards	Planning Department, Fire Department & Selectboard	Local	<b>Short Term</b> 1 Year or Less (0-12 months)	<b>Low Cost</b> <\$1,000 or staff time only	19
2-1	<p><b>Problem Statement:</b> <i>Although the Lyme Highway Department does a good job cleaning and repairing drainage basins and culverts, a written maintenance plan should be developed to ensure continuity of actions and efficient stormwater management.</i></p> <p><b>Action Item #23:</b> Develop a written stormwater maintenance plan in order to ensure more efficient stormwater management; include the location, type, size, age and expected replacement date of all culverts, catch basins and drainage ditches in the Community. <b>(F5) (Table 6.1)</b></p>	Flooding	Highway Department	Local	<b>Medium Term</b> 2-3 Years (13-36 months)	<b>Medium Cost</b> \$1,000-\$10,000	20
3-1	<p><b>Problem Statement:</b> <i>The operation of the Wilder Dam is causing along erosion and undermining of the banks of the Connecticut and particularly affecting the 2.5 miles of the 7-mile historic River Road; 12 areas of River Road need bank stabilization, rebuilding the road, moving the road or other remedial measures.</i></p> <p><b>Action Item #24:</b> Identify and describe problems areas with the help of local engineers; prevent erosion with proper bank stabilization, retaining walls, riprap, etc. to stop the erosion; consider eminent domain and relocating sections of the road to ensure access to homes along River Road. <b>(ER5)</b></p>	Erosion	Selectboard	Local & Grants	<b>Long Term</b> 4-5 Years (37-60 months)	<b>High Cost</b> >\$10,000	11

Final Priority	Problem Statement New Mitigation Action Item	Type of Hazard	Responsible Department	Funding or Support	Time Frame	Est. Cost	STAP LEE
3-2	<p><i><b>Problem Statement:</b> Although Lyme has a current Capital Improvements Plan (CIP), work needs to be done on the Plan.</i></p> <p><b>Action Item #25:</b> Establish a committee to produce a more comprehensive plan for the future and to consider mitigation strategies from this Hazard Mitigation Plan for inclusion in the CIP. <b>(MU6) (Table 6.1)</b></p>	All Hazards	Planning Board	Local	<u>Long Term</u> 4-5 Years (37-60 months)	<u>Low Cost</u> <\$1,000 or staff time only	19

## Chapter 10: Adopting, Monitoring, Evaluating and Updating the Plan

### ***A. Hazard Mitigation Plan Monitoring, Evaluation and Updates***

A good mitigation plan must allow for updates where and when necessary, particularly since communities may suffer budget cuts or experience personnel turnover during both the planning and implementation stages. A good plan will incorporate periodic monitoring and evaluation mechanisms to allow for review of successes and failures or even just simple updates. The Emergency Management Director is responsible for initiating Plan reviews and will consult with members of the hazard mitigation planning team identified in this Plan.

The Lyme Hazard Mitigation Plan Update 2017 is considered a work in progress. There are three situations which will prompt revisiting this Plan:

- First, as a minimum, it will be reviewed annually or after any emergency event to assess whether the existing and suggested mitigation action items were successful. This review will focus on the assessment of the Plan's effectiveness, accuracy and completeness in monitoring of the implementation action item. The review will also address recommended improvements to the Plan as contained in the FEMA plan review checklist and address any weaknesses the Town identified that the Plan did not adequately address.
- Second, the Plan will be thoroughly updated every five years.
- Third, if the Town adopts any major modifications to its land use planning documents, the jurisdiction will conduct a Plan review and make changes as applicable.

In keeping with the process of adopting this hazard mitigation plan, the public and stakeholders will have the opportunity for future involvement as they will be invited to participate in any and all future reviews or updates of this Plan. Public notice before any review or update will be given by such means as: press releases in local papers, posting meeting information on the Town website and at the Town Offices, sending letters to federal, state and local organizations impacted by the Plan and posting notices in public places in the Town. This will ensure that all comments and revisions from the public and stakeholders will be considered. The Emergency Management Director ensures that these actions will be done.

Concurrence forms to be used for post-hazard or annual reviews are available in Chapter 11 of this Plan. The Town is encouraged to use these forms to document any changes and accomplishments since the development of this Plan. Forms are available for years 1-4, with expectation that the five-year annual update will be in process during the fifth year.

### ***B. Integration with Other Plans***

This Plan will only enhance mitigation if balanced with all other town plans. Lyme completed its last hazard mitigation plan in 2011 and has completed some projects from that Plan, although admittedly, many strategies from the 2011 plan were more preparedness than mitigation. Examples of these can be found in Table 7.1 and include items such as the development of a robust tree maintenance program and improvement of stormwater flow on Dorchester Road/Grant Brook. The Town was able to integrate these actions into other town activities, budgets, plans and mechanisms.

The Town will incorporate elements from this Plan into the following documents:

**Lyme Master Plan:**

Traditionally, Master Plans are updated every 5 to 10 years and detail the use of capital reserves funds and capital improvements within the Town. Lyme updated their Master Plan in 2013. **Action Item #20** calls for the update of the Master Plan in 2023; however any review of the Master Plan should take into consideration elements from this Plan. The Planning Board will integrate concepts and ideas from this Hazard Mitigation Plan when working on the Master Plan.

**Lyme Emergency Operations Plan 2011 (EOP):**

The EOP is designed to allow the Town to respond more effectively to disasters as well as mitigate the risk to people and property; EOPs are generally reviewed after each hazard event and updated on a five-year basis. The last Lyme EOP was finished in 2011 and ready for its five year update. The new EOP will include elements from this hazard mitigation plan and be updated to the 15-ESF format. (**Action Item #19**)

**Town Budget, Capital Improvement Plan & Capital Reserve Funds:**

The Town maintains both a Capital Improvement Plan and Capital Reserve Funds for major expenditures. The Capital Improvement Plan (CIP) was approved in 2012 and is used to help guide the Town's financial obligations. The Capital Reserve Funds are adjusted annually in coordination with the Selectboard and the Town's department heads at budget time. The budget is then voted on at the annual Town Meeting. During the annual budget planning process and any review of the CIP or CRF, the Town will monitor specific mitigation actions identified in this Plan that require Town fiscal support.

**Refer to those Action Items that require local money or match money** such as **Action Items #1** (culvert improvements) and **Action Item #3** (bridge improvements). **Action Item #25** specifically calls for the establishment of a committee to incorporate mitigation action items from this Plan.

**Ordinances & Subdivision Regulations:**

As time goes by and the needs of the Town change, these ordinances will be reviewed and updated. In coordination with these actions, the Planning Board will review this Hazard Mitigation Plan and incorporate any changes that help mitigate the susceptibility of the Community and its citizens to the dangers of natural or human-caused disasters. Lyme's subdivision regulations and other ordinances are well-managed and are currently in good shape, although future improvements may be made based on changing climate and land use.

The local government will modify other plans and actions as necessary to incorporate hazard and/or wildfire issues; the Selectboard ensures this process will be followed in the future. In addition, the Town will review and make note of instances when this has been done and include it as part of their annual review of the Plan.

### C. Plan Approval & Adoption

This Plan was completed in a series of open meetings beginning on October 7, 2015. The Plan was presented to the Town for review, submitted to HSEM for Conditional Approval (*APA, Approved Pending Adoption*), formally adopted by the Selectboard and resubmitted to HSEM for Final Approval. Once Final Approval from HSEM was met, copies of the Plan were distributed to the Town, HSEM, FEMA, DRED and the USDA-FS; the Plan was then distributed as these entities saw fit. Copies of the Plan remain on file at Mapping and Planning Solutions (MAPS) in both digital and paper format.

Adoption by the local governing body demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in the Plan. Adoption legitimizes the Plan and authorizes responsible agencies to execute their responsibilities. The Plan shall include documentation of the resolution adopting the Plan as per requirement §201.6(c)(5).

*Note: for the purposes of clarity, the above paragraph was written in future tense, noting that these actions have not yet transpired – this box will be deleted when the final hard copy is printed and distributed.*



*Thetford Bridge and the Connecticut River; Flooding, 1936  
Photo Credit: Town of Lyme*

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## Chapter 11: Signed Community Documents and Approval Letters

### A. Planning Scope of Work & Agreement

#### PLANNING SCOPE OF WORK & AGREEMENT

#### HAZARD MITIGATION PLAN



#### PARTIES TO THE AGREEMENT

Mapping and Planning Solutions

Town of Lyme, NH

Current Plan Expiration: October 14, 2016

PDM14 Grant Expiration: September 30, 2016

This Agreement between the Town of Lyme (the Town) or its official designee and Mapping and Planning Solutions (MAPS) outlines the Town's desire to engage the services of MAPS to assist in planning and technical services in order to produce the 2016 Hazard Mitigation Plan Update (the Plan).

#### **AGREEMENT**

This Agreement outlines the responsibilities that will ensure that the Plan is developed in a manner that involves Town members and local, federal and state emergency responders and organizations. The Agreement identifies the work to be done by detailing the specific tasks, schedules and finished products that are the result of the planning process.

The goal of this Agreement is that the Plan and planning process be consistent with Town policies and that it accurately reflects the values and individuality of the Town. This is accomplished by forming a working relationship between the Town's citizens, the Planning Team and MAPS.

The Plan created as a result of this Agreement will be presented to the Town for adoption once conditional approval is received from FEMA. When adopted, the Plan provides guidance to the Town, commissions, and departments; adopted plans serve as a guide and do not include any financial commitments by the Town. Additionally, all adopted plans should address mitigation strategies for reducing the risk of natural, man-made, and wildfire disasters on life and property and written so that they may be integrated within other Town planning initiatives.

#### **SCOPE OF WORK**

#### **MAPS - Responsibilities include, but are not limited to, the following:**

- MAPS will collect data that is necessary to complete the Plan and meet the requirements of the FEMA Plan Review Tool by working with the Planning Team (the Team) and taking public input from community members.
- With the assistance of the Team, MAPS will coordinate and facilitate meetings and provide any materials, handouts and maps necessary to provide a full understanding of each step in the planning process.
- MAPS will assist the Team in the development of goals, objectives and implementation strategies and clearly define the processes needed for future plan monitoring, educating the public and integrating the Plan with other Town plans and activities.
- MAPS will coordinate and collaborate with other federal, state and local agencies throughout the process.
- MAPS will explain and delineate the Town's Wildland Urban Interface (WUI) and working with the Team, will establish a list of potential hazards and analyze the risk severity of each.

- MAPS will author, edit and prepare the Plan for review by the Team prior to submitting the Plan to FEMA for conditional approval. Upon conditional approval by FEMA, MAPS will assist the planning team as needed with presentation of the Plan to the Lyme Board of Selectmen and/or Planning Board and continue to work with the Town until final approval and distribution of the Plan is complete, unless extraordinary circumstances prevail.
- MAPS shall provide, at its office, all supplies and space necessary to complete the Lyme Hazard Mitigation Plan.
- After final approval is received from FEMA, MAPS will provide the Town with a one copy of the Plan containing all signed documents, approvals and GIS maps along with CDs containing these same documents in digital form, for distribution by the Town as it sees fit. Additional CDs may be requested at no additional cost; additional copies of the Plan will be priced according to number of pages. CD copies of the Plan will be distributed by MAPS to collaborating agencies including, but not limited to, NH Homeland Security (HSEM) and FEMA.
- MAPS will provide Plan maintenance reminders and assistance on an annual basis leading up to the next five-year plan update at no cost to the Town, if requested by the Town.

**THE TOWN - RESPONSIBILITIES INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:**

- The Town shall insure that the Planning Team includes members who are able to support the planning process by identifying available Town resources including people who will have access to and can provide pertinent data. The planning team should include, but not be limited to, such Town members as the local Emergency Management Director, the Fire, Ambulance and Police Chiefs, members of the Board of Selectmen and the Planning Board, the Public Works Director or Road Agent, representatives from relevant federal and state organizations, other local officials, property owners, and relevant businesses or organizations.
- The Town shall determine a lead contact to work with MAPS. This contact shall assist with recruiting participants for planning meetings, including the development of mailing lists when and if necessary, distribution of flyers, and placement of meeting announcements. In addition, this contact shall assist MAPS with organizing public meetings to develop the Plan and offer assistance to MAPS in developing the work program which will produce the Plan.
- The Town shall gain the support of stakeholders for the recommendations found within the Plan.
- The Town shall provide public access for all meetings and provide public notice at the start of the planning process and at the time of adoption, as required by FEMA.
- The proposed Plan shall be submitted to the Board of Selectmen and/or Planning Board for consideration and adoption.
- After adoption and final approval from FEMA is received, the Town will:
  - *Distribute copies of the Plan as it sees fit throughout the local community.*
  - *Develop a team to monitor and work toward plan implementation.*
  - *Publicize the Plan to the Community and insure citizen awareness.*
  - *Urge the Planning Board to incorporate priority projects into the Town's Capital Improvement Plan (if available).*
  - *Integrate mitigation strategies and priorities from the Plan into other Town planning documents.*

**TERMS**

- **Fees & Payment Schedule:** The contract price is limited to \$6,000; an invoice will be sent to the Town for each payment as outlined below.
  - 1. Initial payment upon signing of this contract and receipt of first invoice ..... \$3,000
  - 2. Second payment upon Plan submittal to FEMA for Conditional Approval ..... \$2,800
  - 3. Final payment upon project completion and receipt of final Plan copy ..... \$200
  - Total Fees..... \$6,000

- **Payment Procedures:** The payment procedure is as follows:
  - MAPS will invoice the Town
  - The Town will pay MAPS
  - The Town will forward the MAPS invoice along with an invoice from the Town on letterhead to HSEM
  - HSEM will reimburse the Town for the monies paid to MAPS

All payments to MAPS are fully reimbursable to the Town by Homeland Security & Emergency Management.

- **Required Matching Funds:** The Town of Lyme will be responsible to provide and document any and all resources to be used to meet the FEMA required matching funds in the amount of \$2,000. Matching funds are the responsibility of the Town of Lyme, not MAPS. Mapping and Planning Solutions will however assist the Town with attendance tracking by asking meeting attendees to “sign in” at all meetings and to “log” any time spent outside of the meetings working on this project. MAPS will provide the Town with final attendance records in spreadsheet form at project’s end for the Town to use in its match fulfillment.
- **Project Period:** This project shall begin upon signing this Agreement by both parties and continue through September 30, 2016 or whenever the planning process is complete. The project period may be extended by mutual written Agreement between the Town, MAPS and Homeland Security if required. The actual project end date is dependent upon timely adoptions and approvals which may be outside of the control of MAPS and the Town. It is anticipated that five or six two-hour meetings will be required to gather the necessary information to create the updated the Plan.
- **Ownership of Material:** All maps, reports, documents and other materials produced during the project period shall be owned by the Town; each party may keep file copies of any generated work. MAPS shall have the right to use work products collected during the planning process; however, MAPS shall not use any data in such a way as to reveal personal or public information about individuals or groups which could reasonably be considered confidential.
- **Termination:** This Agreement may be terminated if both parties agree in writing. In the event of termination, MAPS shall forward all information prepared to date to the Town. MAPS shall be entitled to recover its costs for any work that was completed.
- **Limit of Liability:** MAPS agrees to perform all work in a diligent and efficient manner according to the terms of this Agreement. MAPS' responsibilities under this Agreement depend upon the cooperation of the Town of Lyme. MAPS and its employees, if any, shall not be liable for opinions rendered, advice, or errors resulting from the quality of data that is supplied. Adoption of the Plan by the Town and final approval of the Plan by FEMA, relieve MAPS of content liability. Mapping and Planning Solutions carries annual general liability insurance.

- **Amendments:** Changes, alterations or additions to this Agreement may be made if agreed to in writing between both the Town of Lyme and Mapping and Planning Solutions.
- **About Mapping and Planning Solutions:** Mapping and Planning Solutions provides hazard mitigation and emergency operations planning throughout New Hampshire. Mapping and Planning Solutions has developed more than 50 Hazard Mitigation Plans, more than 35 Emergency Operations Plans and has completed the following FEMA courses in Emergency Planning and Operations:
  - Introduction to Incident Command System, IS-100.a
  - ICS Single Resources and Initial Action Incidents, IS-200.a
  - National Incident Management System (NIMS) An Introduction, IS-700.a
  - National Response Framework, An Introduction, IS 800.b
  - Emergency Planning, IS-235
  - Homeland Security Exercise & Evaluation Program (HSEEP)
  - IS-547.a – Introduction to Continuity Operations
  - IS-546.a – Continuity of Operations (COOP) Awareness Course
  - G-318; Preparing & Review Hazard Mitigation Plans

➤ **Contacts:**

**For Mapping & Planning Solutions**

June Garneau  
P.O. Box 283, 91 Cherry Mountain Place  
Twin Mountain, NH 03595  
jgarneau@mappingandplanning.com

**For the Town**

Margaret Caudill-Slosberg  
Emergency Management Director  
PO Box 126  
1 High Street  
Lyme, NH 03768  
emd@lymenh.gov  
603-930-5671

**SIGNATURE BELOW INDICATES ACCEPTANCE OF AND AGREEMENT TO DETAILS OUTLINED IN THIS AGREEMENT**

**FOR THE TOWN OF LYME, NH**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name/Title

\_\_\_\_\_  
Date

**FOR MAPPING AND PLANNING SOLUTIONS**

  
\_\_\_\_\_  
Signature  
June Garneau, Owner  
September 16, 2015

*Signature is a scanned facsimile; original signatures are on file.*

## B. Approved Pending Adoption (APA) Letter from FEMA

### Lyme, NH Approvable Pending Adoption

Hazard Mitigation Planning <HazardMitigationPlanning@dos.nh.gov>

Sent: Mon 4/3/2017 10:15 AM

To: 'June Garneau'

Cc: 'cjaysmith12@gmail.com'; 'Lyme Emergency Management Director'; Hatch, Paul; Dunkerley, Heather

Good morning!

The Department of Safety, Division of Homeland Security & Emergency Management (HSEM) has completed its review of the Lyme, NH Hazard Mitigation Plan and found it approvable pending adoption. Congratulations on a job well done!

With this approval, the jurisdiction meets the local mitigation planning requirements under 44 CFR 201 **pending HSEM's receipt of electronic copies of the adoption documentation and the final plan.**

Acceptable electronic formats include Word or PDF files and must be submitted to us via email at [HazardMitigationPlanning@dos.nh.gov](mailto:HazardMitigationPlanning@dos.nh.gov). Upon HSEM's receipt of these documents, notification of formal approval will be issued, along with the final Checklist and Assessment.

The approved plan will be submitted to FEMA on the same day the community receives the formal approval notification from HSEM. FEMA will then issue a Letter of Formal Approval to HSEM for dissemination that will confirm the jurisdiction's eligibility to apply for mitigation grants administered by FEMA and identify related issues affecting eligibility, if any. If the plan is not adopted within one calendar year of HSEM's Approval Pending Adoption, the jurisdiction must update the entire plan and resubmit it for HSEM review. If you have questions or wish to discuss this determination further, please contact me at [Whitney.Welch@dos.nh.gov](mailto:Whitney.Welch@dos.nh.gov) or 603-223-3667.

Thank you for submitting the Lyme, NH Hazard Mitigation Plan and again, congratulations on your successful community planning efforts.

Sincerely,

Whitney

*Signature is a scanned facsimile; original signatures are on file.*

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**C. Signed Certificate of Adoption**

**CERTIFICATE OF ADOPTION**

**LYME, NH**

**SELECTBOARD**

**A RESOLUTION ADOPTING THE TOWN OF LYME, HAZARD MITIGATION PLAN UPDATE 2017**

WHEREAS, the Town of Lyme has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of those natural hazards profiled in this plan, resulting in loss of property and life, economic hardship and threats to public health and safety; and

WHEREAS, the Town of Lyme has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update 2017 under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between October 7, 2015 to May 31, 2016 regarding the development and review of the Hazard Mitigation Plan Update 2017 and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Lyme; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Lyme 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 Lyme eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Selectboard:

1. The Plan is hereby adopted as an official plan of the Town of Lyme;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;

**Lyme, Hazard Mitigation Plan Update Certificate of Adoption, page two**

- 3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution;
- 4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Selectboard by the Emergency Management Director.

Adopted this day, the \_\_\_\_\_ of \_\_\_\_\_, 2017

**Chairman of the Selectboard**

**Member of the Selectboard**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

**Member of the Selectboard**

**Emergency Management Director**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

**IN WITNESS WHEREOF**, the undersigned has affixed his/her signature and the corporate seal of the Town of Lyme on this day, \_\_\_\_\_, 2017

\_\_\_\_\_  
Notary

\_\_\_\_\_  
Expiration

\_\_\_\_\_  
Date

**Signatures are scanned facsimile; original signatures are on file.**

***D. Final Approval Letter from FEMA***

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INSERTION OF FINAL APPROVAL LETTER FROM  
FEMA WHEN RECEIVED.

PAGE LEFT INTENTIONALLY BLANK FOR  
INSERTION OF FINAL APPROVAL LETTER  
(PAGE 2) FROM FEMA WHEN RECEIVED.

*Signatures are scanned facsimile; original signatures are on file.*

**E. CWPP Approval Letter from DRED**

**Lyme, NH  
A Resolution Approving the  
Lyme Hazard Mitigation Plan Update 2017  
As a Community Wildfire Protection Plan**

Several public meetings and committee meetings were held between October 7, 2015 to May 31, 2016 regarding the development and review of the Lyme Hazard Mitigation Plan Update 2017. The Lyme Hazard Mitigation Plan Update 2017 contains potential future projects to mitigate hazard and wildfire damage in the Town of Lyme.

The Fire Chief along with the Selectboard and the EMD desire that this Plan and be accepted by the Department of Resources and Economic Development (DRED) as a Community Wildfire Protection Plan, having adhered to the requirements of said Plan.

The Fire Chief, the Selectboard and the EMD approve the Lyme Hazard Mitigation Plan Update 2017 and understand that with approval by DRED, this Plan will also serve as a Community Wildfire Protection Plan.

For the Town of Lyme

APPROVED and SIGNED this day, \_\_\_\_\_, 2017.

_____	_____
Chairman of the Selectboard	Printed Name
_____	_____
Fire Chief	Printed Name
_____	_____
Emergency Management Director	Printed Name

**For the Department of Resources and Economic Development**

APPROVED and SIGNED this day, \_\_\_\_\_, 2017.

\_\_\_\_\_  
Forest Ranger – NH Division of Forest and Lands, DRED

APPROVED and SIGNED this day, \_\_\_\_\_, 2017.

\_\_\_\_\_  
Director – NH Division of Forest and Lands, DRED

*Signature is a scanned facsimile; original signatures are on file.*

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**F. Annual Review or Post Hazard Concurrence Forms**

**YEAR ONE**

Check all that apply

- Annual Review & Concurrence - **Year One**: \_\_\_\_\_ (Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The Town of Lyme, NH shall execute this page annually by the members of the Town’s governing body and the Town’s designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the Town website and at the Town Offices, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the Town.

Lyme, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Chairman of the Selectboard

Changes and notes regarding the 2017 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 



**YEAR TWO**

Check all that apply

- Annual Review & Concurrence - **Year Two**: \_\_\_\_\_ (Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The Town of Lyme, NH shall execute this page annually by the members of the Town’s governing body and the Town’s designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the Town website and at the Town Offices, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the Town.

Lyme, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Chairman of the Selectboard

Changes and notes regarding the 2017 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 



**YEAR THREE**

Check all that apply

- Annual Review & Concurrence - **Year Three**: \_\_\_\_\_ (Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The Town of Lyme, NH shall execute this page annually by the members of the Town’s governing body and the Town’s designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the Town website and at the Town Offices, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the Town.

Lyme, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Chairman of the Selectboard

Changes and notes regarding the 2017 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 



**YEAR FOUR**

Check all that apply

- Annual Review & Concurrence - **Year Four**: \_\_\_\_\_ (Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)
- Annual Review & Concurrence – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

The Town of Lyme, NH shall execute this page annually by the members of the Town’s governing body and the Town’s designated Emergency Management Director after inviting the public to attend any and all hearings that pertain to this annual and/or post hazard review and/or update by means such as press releases in local papers, posting meeting information on the Town website and at the Town Offices, sending letters to federal, state local organizations impacted by the Plan posting notices in public places in the Town.

Lyme, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

DATE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Emergency Management Director

CONCURRENCE OF APPROVAL

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

Chairman of the Selectboard

Changes and notes regarding the 2017 Hazard Mitigation Plan Update

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**Please use reverse side for additional notes** 



## Chapter 12: Appendices

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  - *Pre-Disaster Mitigation (PDM)*
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## Appendix A: Bibliography

### Documents

- **Local Hazard Mitigation Planning Review Guide**, FEMA, October 2011
- **Local Hazard Mitigation Planning Handbook**, FEMA, March 2013
- **Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards**, FEMA, January 2013
- **Hazard Mitigation Unified Guidance**, FEMA, July 12, 2013
- **Hazard Mitigation Assistance Guidance**, FEMA, February 27, 2015
- **Hazards Mitigation Plans**
  - Lyme Hazard Mitigation Plan, 2011
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- **Photos**: Photos taken by MAPS unless otherwise noted.

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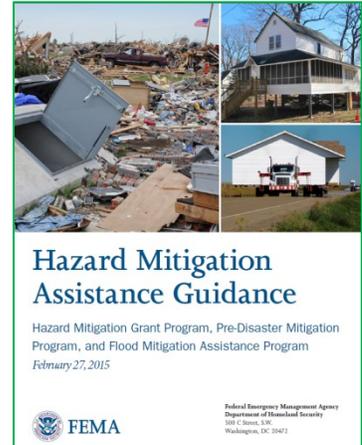
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- The Disaster Center (NH); <http://www.disastercenter.com/newhamp/tornado.html>
- Floodsmart, about the NFIP; [http://www.floodsmart.gov/floodsmart/pages/about/nfip\\_overview.jsp](http://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp)
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**Appendix B: Technical & Financial Assistance for Hazard Mitigation**

FEMA's Hazard Mitigation Assistance (HMA) grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the following HMA grant programs<sup>13</sup>:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Repetitive Flood Claims (RFC)
- Severe Repetitive Loss (SRL)



FEMA's HMA grants are provided to eligible Applicants (States/Tribes/Territories) that, in turn, provide sub-grants to local governments and communities. The Applicant selects and prioritizes subapplications developed and submitted to them by subapplicants. These subapplications are submitted to FEMA for consideration of funding.

Prospective subapplicants should consult the office designated as their Applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers is available on the FEMA website, [www.fema.gov](http://www.fema.gov).

**HMA Grant Programs**

The HMA grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to Natural Hazards. Brief descriptions of the HMA grant programs can be found below.

**A. Hazard Mitigation Grant Program (HMGP)**

HMGP assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal and local priorities.

**Table 3: Eligible Activities by Program**

Eligible Activities	HMGP	PDM	FMA
<b>1. Mitigation Projects</b>	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-residential Structures	✓	✓	✓
Generators	✓	✓	
Localized Flood Risk Reduction Projects	✓	✓	✓
Non-localized Flood Risk Reduction Projects	✓	✓	
Structural Retrofitting of Existing Buildings	✓	✓	✓
Non-structural Retrofitting of Existing Buildings and Facilities	✓	✓	✓
Safe Room Construction	✓	✓	
Wind Retrofit for One- and Two-Family Residences	✓	✓	
Infrastructure Retrofit	✓	✓	✓
Soil Stabilization	✓	✓	✓
Wildfire Mitigation	✓	✓	
Post-Disaster Code Enforcement	✓		
Advance Assistance	✓		
5 Percent Initiative Projects	✓		
Miscellaneous/Other <sup>(1)</sup>	✓	✓	✓
<b>2. Hazard Mitigation Planning</b>	✓	✓	✓
Planning Related Activities	✓		
<b>3. Technical Assistance</b>			✓
<b>4. Management Cost</b>	✓	✓	✓

<sup>(1)</sup> Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

*Eligibility Chart taken from Hazard Mitigation Assistance Guidance, February 27, 2015*

<sup>13</sup> Information in Appendix B is taken from the following website and links to specific programs unless otherwise noted [http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA\\_Guidance\\_022715\\_508.pdf](http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf)

What is the Hazard Mitigation Grant Program?

The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. Authorized under Section 404 of the Stafford Act and administered by FEMA, HMGP was created to reduce the loss of life and property due to natural disasters. The program enables mitigation measures to be implemented during the immediate recovery from a disaster.

Who is eligible to apply?

Hazard Mitigation Grant Program funding is only available to applicants that reside within a presidentially declared disaster area. Eligible applicants are

- State and local governments
- Indian tribes or other tribal organizations
- Certain non-profit organizations

Individual homeowners and businesses may not apply directly to the program; however a community may apply on their behalf.

How are potential projects selected and identified?

The State's administrative plan governs how projects are selected for funding. However, proposed projects must meet certain minimum criteria. These criteria are designed to ensure that the most cost-effective and appropriate projects are selected for funding. Both the law and the regulations require that the projects are part of an overall mitigation strategy for the disaster area.

The State prioritizes and selects project applications developed and submitted by local jurisdictions. The State forwards applications consistent with State mitigation planning objectives to FEMA for eligibility review. Funding for this grant program is limited and States and local communities must make difficult decisions as to the most effective use of grant funds.

***B. Pre-Disaster Mitigation (PDM)***

PDM provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. The goal of the PDM program is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from actual disaster declarations.

Program Overview

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

### **C. Flood Mitigation Assistance (FMA)**

FMA provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program.

#### Program Overview

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP).

FEMA provides FMA funds to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program.

#### Types of FMA Grants

Three types of FMA grants are available to States and communities:

**Planning Grants** to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants.

**Project Grants** to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least \$1,000 within any ten-year period since 1978.

**Technical Assistance Grants** for the State to help administer the FMA program and activities. Up to ten percent (10%) of Project grants may be awarded to States for Technical Assistance Grants

#### Repetitive Flood Claims (RFC)

RFC provides funds on an annual basis to reduce the risk of flood damage to individual properties insured under the NFIP that have had one or more claim payments for flood damages. RFC provides up to 100% federal funding for projects in communities that meet the reduced capacity requirements.

#### Program Overview

The Repetitive Flood Claims (RFC) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al).

Up to \$10 million is available annually for FEMA to provide RFC funds to assist States and communities reduce flood damages to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP).

#### Federal / Non-Federal Cost Share

FEMA may contribute up to 100 percent of the total amount approved under the RFC grant award to implement approved activities, if the Applicant has demonstrated that the proposed activities cannot be funded under the Flood Mitigation Assistance (FMA) program.

Severe Repetitive Loss (SRL)

SRL provides funds on an annual basis to reduce the risk of flood damage to residential structures insured under the NFIP that are qualified as severe repetitive loss structures. SRL provides up to 90% federal funding for eligible projects.

Program Overview

The Severe Repetitive Loss (SRL) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the National Flood Insurance Program (NFIP).

Definition

The definition of severe repetitive loss as applied to this program was established in section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

(a) That has at least four NFIP claim payments (including building and contents) over \$5,000 each and the cumulative amount of such claims payments exceeds \$20,000; or

(b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period and must be greater than 10 days apart.

Purpose

To reduce or eliminate claims under the NFIP through project activities that will result in the greatest savings to the National Flood Insurance Fund (NFIF).

Federal / Non-Federal cost share

75/25%; up to 90% Federal cost-share funding for projects approved in States, Territories and Federally-recognized Indian tribes with FEMA-approved Standard or Enhanced Mitigation Plans or Indian tribal plans that include a strategy for mitigating existing and future SRL properties.

**For further information all of these programs, please refer to the new FEMA Hazard Mitigation Assistance Guidance:**

***[http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA\\_Guidance\\_022715\\_508.pdf](http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf)***

**Appendix C: The Extent of Hazards**

Hazards indicated with an asterisk \* are included in this Plan.

**\*DAM FAILURE**

A “Dam” means any artificial barrier, including appurtenant works, which impounds or diverts water, and which has a height of 4 feet or more, or a storage capacity of 2 acre-feet or more, or is located at the outlet of a great pond<sup>[1]</sup>. A dam failure occurs when water overtops the dam, or there is structural failure of the dam which causes there to be a breach and an unintentional release of water. Dams are classified in the following manner<sup>14</sup>:

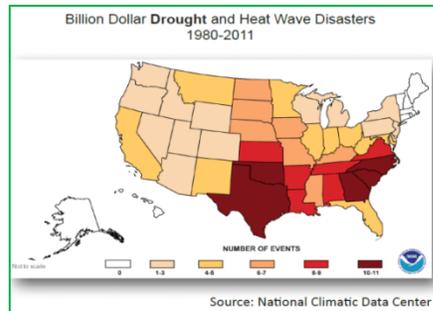
Classification	Description	Inspection Intervals
<b>Non-Menace</b>	A dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property. The dam must be less than six feet in height if the storage capacity is greater than 50 acre-feet or less than 25 feet in height if it has a storage capacity of 15-50 acre-feet.	Every 6 years
<b>Low Hazard</b>	A dam that has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in no possible loss of life, low economic loss to structures or property, structural damage to a town or city road or private road accessing property other than the dam owner’s that could render the road impassable or otherwise interrupt public safety services, the release of liquid industrial, agricultural, or commercial wastes, septage, or contained sediment if the storage capacity is less two-acre-feet and is located more than 250 feet from a water body or water course, and/or reversible environmental losses to environmentally-sensitive sites.	Every 6 years
<b>Significant Hazard</b>	A dam that has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in no probable loss of lives; however, there would be major economic loss to structures or property, Structural damage to a Class I or Class II road that could render the road impassable or otherwise interrupt public safety services, major environmental or public health losses including one or more of the following: Damages to a public water system (RSA 485:1-a, XV) which will take longer than 48 hours to repair, the release of liquid industrial, agricultural, or commercial wastes, septage, sewage, or contaminated sediments if the storage capacity is 2 acre-feet or more; or damage to an environmentally-sensitive site that does not meet the definition of reversible environmental losses.	Every 4 years
<b>High Hazard</b>	A dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probable loss of human life as well as a result of; water levels and velocities causing the structural failure of a foundation of a habitable residential structure or commercial or industrial structure which is occupied under normal conditions; water levels rising above the first floor elevation of a habitable residential structure or a commercial or industrial structure, which is occupied under normal conditions when the rise due to a dam failure is greater than one foot; structural damage to an interstate highway, which could render the roadway impassable or otherwise interrupt public safety services; the release of a quantity and concentration of material, which qualify as “hazardous waste” as defined by RSA 147-A:2 VII; or any other circumstance that would more likely than not cause one or more deaths.	Every 2 years

[1] NH DES [http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer\\_chapter11.pdf](http://des.nh.gov/organization/divisions/water/dwgb/wrpp/documents/primer_chapter11.pdf)

<sup>14</sup> <http://des.nh.gov/organization/commissioner/pip/factsheets/db/documents/db-15.pdf>

**\*DROUGHT**

A drought is defined as a long period of abnormally low precipitation, especially one that adversely affects the growing season or living conditions of plants and animals. Droughts are rare in New Hampshire. They generally are not as damaging and disruptive as floods and are more difficult to define. The effect of drought is indicated through measurements of soil moisture, groundwater levels and stream flow.



However, not all of these indicators will be minimal during a drought. For example, frequent minor rainstorms can replenish the soil moisture without raising groundwater levels or increasing stream flow. Low stream flow also correlates with low groundwater levels because groundwater discharge to streams and rivers maintains stream flow during extended dry periods. Low stream flow and low groundwater levels commonly cause diminished water supply.

Dates	Area Affected	Recurrence Interval Yrs	Remarks
1929-1936	Statewide	10 to > 25	Regional
1939-1944	Statewide	10 to > 25	Severe in southeast and moderate elsewhere
1947-1950	Statewide	10 to 25	Moderate
1960-1969	Statewide	> 25	Regional longest recorded continuous spell of less than normal precipitation
2001-2002	Statewide	Not yet determined	Third worst drought on record, exceeded only by the drought of 1956-1966 and 1941-1942

NH DES; <http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf>

**\*EARTHQUAKE**

An earthquake is a rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines and often cause landslides, flash floods, fires and avalanches. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks and end in vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is widely determined by the use of two scales, the more commonly used Richter scale (measures strength or magnitude) and the Mercalli Scale (measures intensity or severity). The chart to the right shows the two scales relative to one another. The Richter Scale measures earthquakes starting at 1 as the lowest with each successive unit being about 10 times stronger and more severe than the previous one.<sup>15</sup>

Modified Mercalli Scale		Richter Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibration like passing truck	2.5
IV	Felt indoors by many, outdoors by few, at night some may awaken; dishes, windows, doors disturbed; autos rock noticeably	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects	3.5
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos	4.5
VIII	Panel walls thrown out of frames; fall of walls, monuments, chimneys; sand and mud ejected; drivers of autos disturbed	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rails bent	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up in air	7

Four earthquakes occurred in New Hampshire between 1924-1989 having a magnitude of 4.2 or more. Two of these occurred in Ossipee, one west of Laconia and one near the Quebec border. It is well documented that there are fault lines running throughout New Hampshire, but high magnitude earthquakes have not been frequent in New Hampshire history.

<sup>15</sup> Modified Mercalli Scale/Richter Scale Chart; MO DNR, [http://www.dnr.mo.gov/geology/geosrv/geores/richt\\_mercalli\\_relation.htm](http://www.dnr.mo.gov/geology/geosrv/geores/richt_mercalli_relation.htm)

**\*EROSION, MUDSLIDE & LANDSLIDE**

Erosion is the wearing away of land, such as loss of riverbank, beach, shoreline or dune material. It is measured as the rate of change in the position or displacement of a riverbank or shoreline over a period of time. Short-term erosion typically results from periodic natural events, such as flooding, hurricanes, storm surge and windstorms but may be intensified by human activities. Long-term erosion is a result of multi-year impacts such as repetitive flooding, wave action, sea level rise, sediment loss, subsidence and climate change. Death and injury are not typically associated with erosion; however, it can destroy buildings and infrastructure.<sup>16</sup>

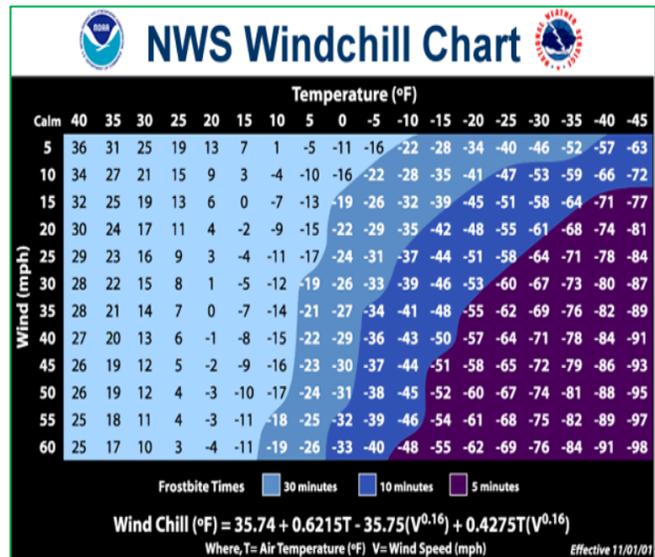
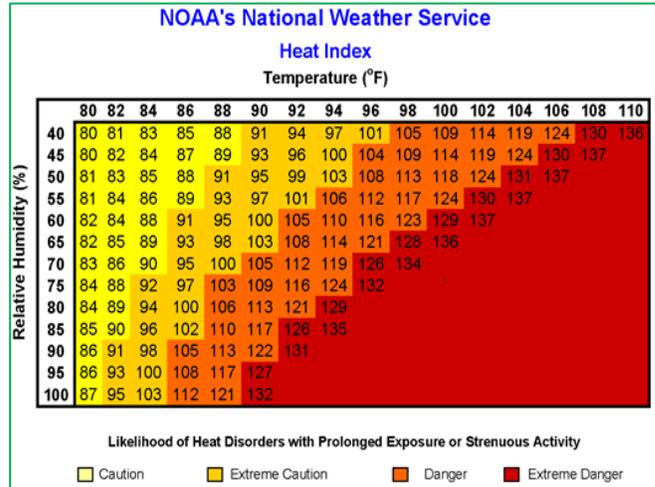
**\*EXTREME TEMPERATURES**

EXTREME HEAT

A Heat Wave is a “Prolonged period of excessive heat, often combined with excessive humidity.” Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature.

Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children and those who are sick or overweight are more likely to succumb to extreme heat.

Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the "urban heat island effect."<sup>17</sup> The chart above explains the likelihood of heat disorders that may result from high heat.<sup>18</sup>



<sup>16</sup>Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, FEMA, January 2013

<sup>17</sup> NOAA, Index/Heat Disorders; <http://www.srh.noaa.gov/ssd/html/heatwv.htm>

<sup>18</sup> NOAA; <http://www.nws.noaa.gov/os/heat/index.shtml>

EXTREME COLD

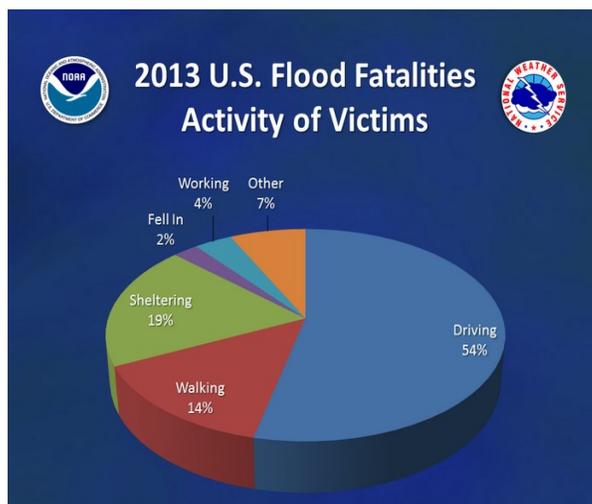
What constitutes extreme cold and its effects can vary across different areas of the country. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered “extreme cold.” Whenever temperatures drop decidedly below normal and as wind speed increases, heat can leave your body more rapidly; these weather related conditions may lead to serious health problems. Extreme cold is a dangerous situation that can bring on health emergencies in susceptible people without shelter or who are stranded, or who live in a home that is poorly insulated or without heat.<sup>19</sup> The National Weather Service Chart (previous page) shows windchill as a result of wind and temperature.<sup>20</sup>

**\*FLOODING**

GENERAL FLOODING CONDITIONS

Floods are defined as a temporary overflow of water onto lands that are not normally covered by water. Flooding results from the overflow of major rivers and tributaries, storm surges and/or inadequate local drainage. Floods can cause loss of life, property damage, crop/livestock damage and water supply contamination. Floods can also disrupt travel routes on roads and bridges.

Inland floods are most likely to occur in the spring due to the increase in rainfall and melting of snow; however, floods can occur at any time of the year. A sudden thaw in the winter or a major downpour in the summer can cause flooding because there is suddenly a lot of water in one place with nowhere to go; warm temperatures and heavy rains cause rapid snowmelt producing prime conditions for flooding. In addition, rising waters in early spring often breaks ice into chunks that float downstream and pile up, causing flooding behind them. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice in riverbeds and against structures presents a significant flooding threat to bridges, roads and the surrounding lands.



FLOODING (LOCAL, ROAD EROSION)

Heavy rain, rapid snowmelt and stream flooding often cause culverts to be overwhelmed and roads to wash out. Today, with changes in land use, aging roads, designs that are no longer effective and undersized culverts, the risk of flooding is a serious concern. Inadequate and aging stormwater drainage systems create local flooding on both asphalt and gravel roads.

FLOODING (RIVERINE)

Floodplains are usually located in lowlands near rivers and flood on a regular basis. The term 100-year flood does not mean that flood will occur once every 100 years. It is a statement of probability that scientists and engineers use to describe how one flood compares to others that are likely to occur. It is more accurate to use the phrase “1% annual chance flood”. What this means is that there is a 1% chance of a flood of that size happening in any year. Flooding is often associated with hurricanes, heavy rains, ice jams and rapid snowmelt in the spring.

<sup>19</sup> CDC; <http://www.bt.cdc.gov/disasters/winter/guide.asp> f  
<sup>20</sup> National Weather Service; <http://www.nws.noaa.gov/om/windchill/>

**\*FLOODING (DAM FAILURE)**

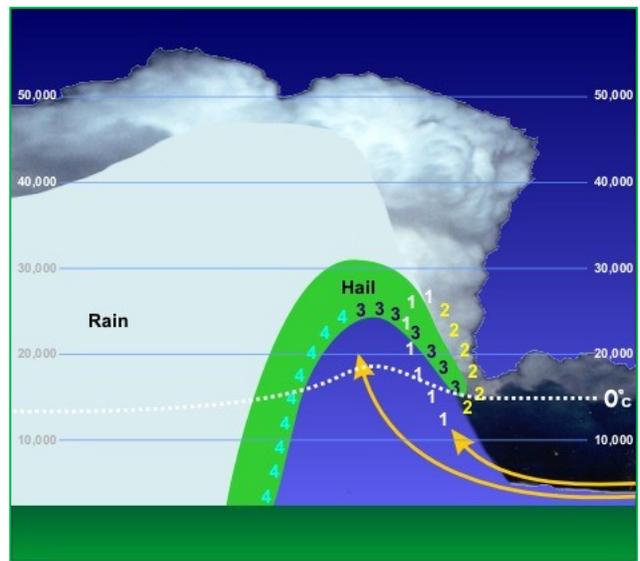
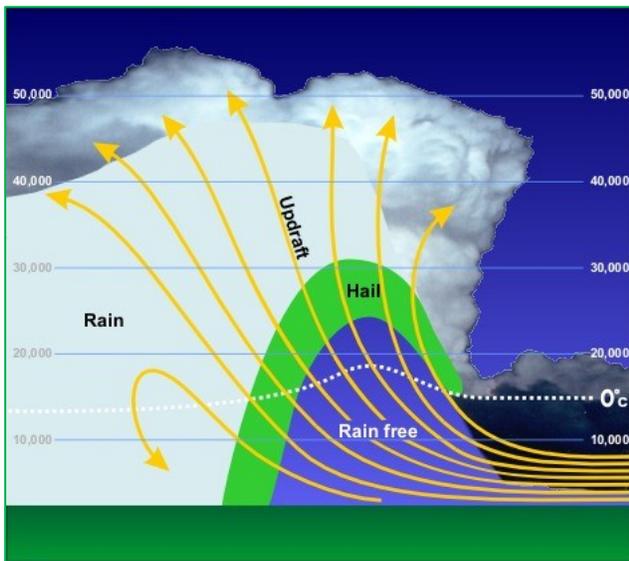
Flooding as a result of dam failure can be small enough to only affect the immediate area of the dam, or large enough to cause catastrophic results to cities, towns and human life that is below the dam. The extent of flooding depends largely on the size of the dam, the amount of water that is being held by the dam, the size of the breach, the amount of water flow from the dam and the amount of human habitation that is downstream.

**\*HAILSTORM**

Hailstones are balls of ice that grow as they're held up by winds, known as updrafts that blow upwards in thunderstorms. The updrafts carry droplets of supercooled water, water at a below-freezing temperature that is not yet ice. The supercooled water droplets freeze into balls of ice and grow to become hailstones. The faster the updraft, the bigger the stones can grow. Most hailstones are smaller in diameter than a dime, but stones weighing more than a pound have been recorded. "The largest hailstone recovered in the US fell in Vivian, SD on June 23, 2010 with a diameter of 8 inches and a circumference of 18.62 inches. It weighed 1 lb. 15 oz."<sup>21</sup>

<b>Dime/Penny</b>	<b>0.75</b>	
<b>Nickel</b>	<b>0.88</b>	
<b>Quarter</b>	<b>1.00</b>	
<b>Half Dollar</b>	<b>1.25</b>	
<b>Ping Pong</b>	<b>1.50</b>	
<b>Golf Ball</b>	<b>1.75</b>	
<b>Hen Egg</b>	<b>2.00</b>	
<b>Tennis Ball</b>	<b>2.50</b>	
<b>Baseball</b>	<b>2.75</b>	
<b>Tea Cup</b>	<b>3.00</b>	
<b>Grapefruit</b>	<b>4.00</b>	
<b>Softball</b>	<b>4.50</b>	

Details of how hailstones grow are complicated, but the results are irregular balls of ice that can be as large as baseballs. The chart above shows the relative size differences and a common way to "measure" the size of hail based on diameter.<sup>22</sup> The charts below show how hail is formed.<sup>23</sup>



<sup>21</sup> NOAA National Severe Storms Laboratory; <https://www.nssl.noaa.gov/education/svrwx101/hail/>

<sup>22</sup> <http://www.pinterest.com/pin/126171227030590678/>

<sup>23</sup> <http://oceanservice.noaa.gov/education/yos/resource/JetStream/tstorms/hail.htm#hail>

**\*HIGH WIND (WINDSTORM)**

As stated by NOAA (National Oceanic & Atmospheric Administration), wind is defined as “The horizontal motion of the air past a given point. Winds begin with differences in air pressures. Those pressures which are higher at one place than another place set up a force pushing from the high pressure toward the low pressure; the greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated. Meteorologists refer to the force that starts the wind flowing as the "pressure gradient force." High and low pressures are relative. There's no set number that divides high and low pressure. Wind is used to describe the prevailing direction from which the wind is blowing with the speed given usually in miles per hour or knots.” In addition, NOAA’s issuance of a Wind Advisory takes place when sustained winds reach 25 to 39 mph and/or gusts to 57 mph.<sup>24</sup>

Below is the Beaufort Wind Scale, showing expected damage based on wind (knots), developed in 1805 by Sir Francis Beaufort of England and posted on NOAA’s Storm Prediction Center website.<sup>25</sup>

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes bring to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 ft.) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 ft.), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 ft.) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high(30-45 ft.) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	

<sup>24</sup> NOAA; <http://www.nws.noaa.gov/glossary/index.php?letter=w>

<sup>25</sup> NOAA, Storm Prediction Center, <http://www.spc.noaa.gov/faq/tornado/beaufort.html>

**\*HURRICANE & TROPICAL STORM**

HURRICANES

A hurricane is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. The eye of the storm is usually 20-30 miles wide and the storm may extend over 400 miles. High winds are a primary cause of hurricane-inflicted loss of life and property damage.

“The Saffir-Simpson Hurricane Wind Scale” (to the right<sup>26</sup>) is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however and require preventative measures. In the western North Pacific, the term "super typhoon" is used for tropical cyclones with sustained winds exceeding 150 mph.<sup>27</sup>

Flooding is often caused from the coastal storm surge of the ocean and torrential rains, both of which may accompany a hurricane; these floods can result in loss of lives and property.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	<b>Devastating damage will occur:</b> Well-built frame homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	<b>Catastrophic damage will occur:</b> Well-built frame homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	96-110 mph 83-95 kt 154-177 km/h	<b>Catastrophic damage will occur:</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

TROPICAL STORMS

A tropical depression becomes a tropical storm when its maximum sustained winds are between 39-73 mph. Although tropical storms have winds of less than 74 miles per hour, like hurricanes, they can do significant damage. The damage most felt by tropical storms is from the torrential rains they produce which cause rivers and streams to flood and overflow their banks.

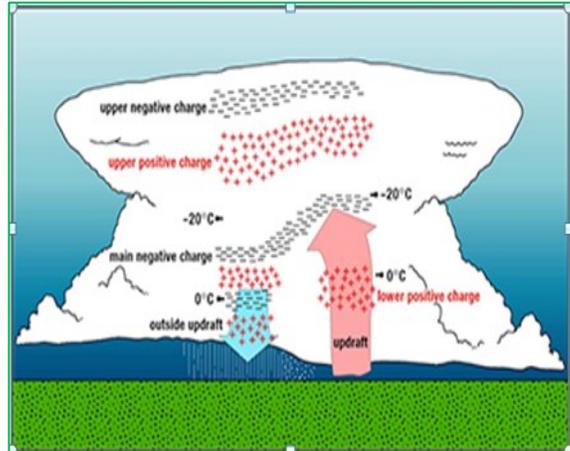
Rainfall from tropical storms has been reported at rates of up to 6 inches per hour; 43 inches of rain in a 24 hour period was reported in Alvin, TX as a result of Tropical Storm Claudette.<sup>28</sup>

<sup>26</sup> National Hurricane Center; <http://www.nhc.noaa.gov/aboutsshws.php>  
<sup>27</sup> National Hurricane Center, NOAA; <http://www.nhc.noaa.gov/aboutsshws.php>  
<sup>28</sup> [http://www.wpc.ncep.noaa.gov/research/mcs\\_web\\_test\\_test\\_files/Page1637.htm](http://www.wpc.ncep.noaa.gov/research/mcs_web_test_test_files/Page1637.htm)

### \*SEVERE THUNDER & LIGHTNING STORM

As stated by the NOAA National Severe Storms Laboratory (NSSL) "Lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. When the opposite charges build up enough, this insulating capacity of the air breaks down and there is a rapid discharge of electricity that we know as lightning. The flash of lightning temporarily equalizes the charged regions in the atmosphere until the opposite charges build up again."<sup>29</sup>

Thunder, a result of lightning, is created when the "lightning channel heats the air to around 18,000 degrees Fahrenheit..."<sup>30</sup> thus causing the rapid expansion of the air and the sounds we hear as thunder. Although thunder that is heard during a storm cannot hurt you, the lightning that is associated with the thunder can not only strike people but also strike homes, out-buildings, grass and trees sparking disaster. Wildfires and structure loss are at a high risk during severe lightning events.



*"A conceptual model shows the electrical charge distribution inside deep convection (thunderstorms), developed by NSSL and university scientists. In the main updraft (in and above the red arrow), there are four main charge regions. In the convective region but outside the out draft (in and above the blue arrow), there are more than four charge regions."- NOAA*

Although thunderstorms and their associated lightning can occur any time of year, in New England they are most likely to occur in the summer months and during the late afternoon or early evening hours and may even occur during a winter snowstorm. Trees, tall buildings and mountains are often the targets of lightning because their tops are closer to the cloud; however, lightning is unpredictable and does not always strike the tallest thing in the area.

"Lightning strikes the ground somewhere in the U.S. nearly every day of the year. Thunderstorms and lightning occur most commonly in moist warm climates. Data from the National Lightning Detection Network shows that over the continental U.S. an average of 20,000,000 cloud-to-ground flashes occur every year. Around the world, lightning strikes the ground about 100 times each second, or 8 million times a day.

In general, lightning decreases across the U.S. mainland toward the northwest. Over the entire year, the highest frequency of cloud-to-ground lightning is in Florida between Tampa and Orlando. This is due to the presence, on many days during the year, of a large moisture content in the atmosphere at low levels (below 5,000 feet), as well as high surface temperatures that produce strong sea breezes along the Florida coasts. The western mountains of the U.S. also produce strong upward motions and contribute to frequent cloud-to-ground lightning. There are also high frequencies along the Gulf of Mexico coast, the Atlantic coast and in the southeast United States. US Regions along the Pacific west coast have the least cloud-to-ground lightning."<sup>31</sup>

<sup>29</sup> NOAA National Severe Storms Laboratory, <https://www.nssl.noaa.gov/education/svrwx101/lightning>

<sup>30</sup> Ibid

<sup>31</sup> Ibid

**\*SEVERE WINTER SNOW & ICE STORM**

Ice and snow events typically occur during the winter months and can cause loss of life, property damage and tree damage.

SNOW STORMS

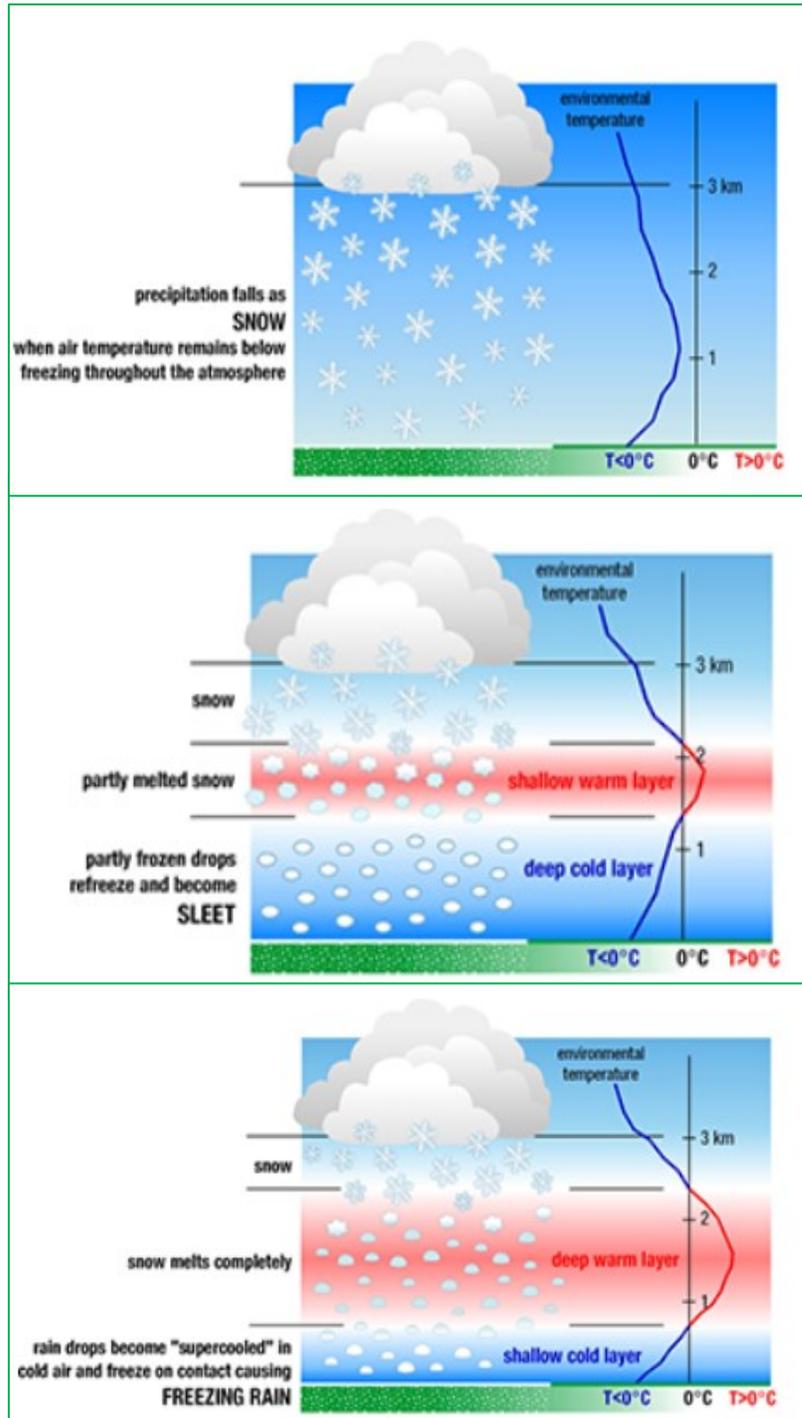
A winter storm can range from moderate snow to blizzard conditions. Blizzard conditions are considered blinding wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period.

SLEET

Snowflakes melt as they fall through a small band of warm air and later refreeze when passing through a wider band of cold air. These frozen rain drops then fall to the ground as “sleet”.

FREEZING RAIN & ICE STORMS

Snowflakes melt completely as they fall through a warm band of air then fall through a shallow band of cold air close to the ground to become “supercooled”. These supercooled raindrops instantly freeze upon contact with the ground and anything else that is below 32 degrees Fahrenheit. This freezing creates accumulations of ice on roads, trees, utility lines and other objects resulting in what we think of as an “Ice Storm”. “Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires and similar objects.”<sup>32</sup>



*Types of Severe Winter Weather  
NOAA – National Severe Storms Laboratory*

<sup>32</sup> NOAA, National Severe Storms Laboratory, <https://www.nssl.noaa.gov/education/svrwx101/winter/types/>

The Sperry-Piltz Ice Accumulation Index (SPIA) (below) is designed to help utility companies better prepare for predicated ice storms.<sup>33</sup>

**The Sperry-Piltz Ice Accumulation Index, or “SPIA Index” – Copyright, February, 2009**

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) <small>*Revised-October, 2011</small>	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
<b>0</b>	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
<b>1</b>	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
<b>2</b>	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
<b>3</b>	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
<b>4</b>	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
<b>5</b>	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

**SNOW AVALANCHE**

According to the National Snow & Ice Data Center “An avalanche is a rapid flow of snow down a hill or mountainside. Although avalanches can occur on any slope given the right conditions, certain times of the year and certain locations are naturally more dangerous than others. Wintertime, particularly from December to April, is when most avalanches tend to happen. However, avalanche fatalities have been recorded for every month of the year.”<sup>34</sup>



“All that is necessary for an avalanche is a mass of snow and a slope for it to slide down...A large avalanche in North America might release 230,000 cubic meters (300,000 cubic yards) of snow. That is the equivalent of 20 football fields filled 3 meters (10 feet) deep with snow. However, such large avalanches are often naturally released, when the snowpack becomes unstable and layers of snow begin to fail. Skiers and recreationalists usually trigger smaller, but often more deadly avalanches.”

There are three main parts to an avalanche (see image above). The first and most unstable is the “starting zone”, where the snow can “fracture” and slide. “Typical starting zones are higher up on slopes. However, given the right conditions, snow can fracture at any point on the slope.”<sup>35</sup>

<sup>33</sup> The Weather Channel, <http://www.weather.com/news/weather-winter/rating-ice-storms-damage-sperry-piltz-20131202>

<sup>34</sup> Copyright Richard Armstrong, NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>

<sup>35</sup> NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>; image credit: Betsy Armstrong

The second part is the “avalanche track”, or the downhill path that the avalanche follows. The avalanche is evident where large swaths of trees are missing or where there are large pile-ups of rock, snow, trees and debris at the bottom of an incline.

The third part of an avalanche is the “runout zone”. The runout zone is where the avalanche has come to a stop and left the largest and highest pile of snow and debris.

“Several factors may affect the likelihood of an avalanche, including weather, temperature, slope steepness, slope orientation (whether the slope is facing north or south), wind direction, terrain, vegetation and general snowpack conditions. Different combinations of these factors can create low, moderate, or extreme avalanche conditions. Some of these conditions, such as temperature and snowpack, can change on a daily or hourly basis.”<sup>36</sup>

When the possibility of an avalanche is evident, an “avalanche advisory” is issued. This preliminary notification warns hikers, skiers, snowmobilers and responders that conditions may be favorable for the development of avalanches. The chart below shows avalanche danger as determined by likelihood, size & distribution.<sup>37</sup>

North American Public Avalanche Danger Scale				
Avalanche danger is determined by the likelihood, size and distribution of avalanches.				
Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme		Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain <u>not</u> recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.

<sup>36</sup> Copyright Richard Armstrong, NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>

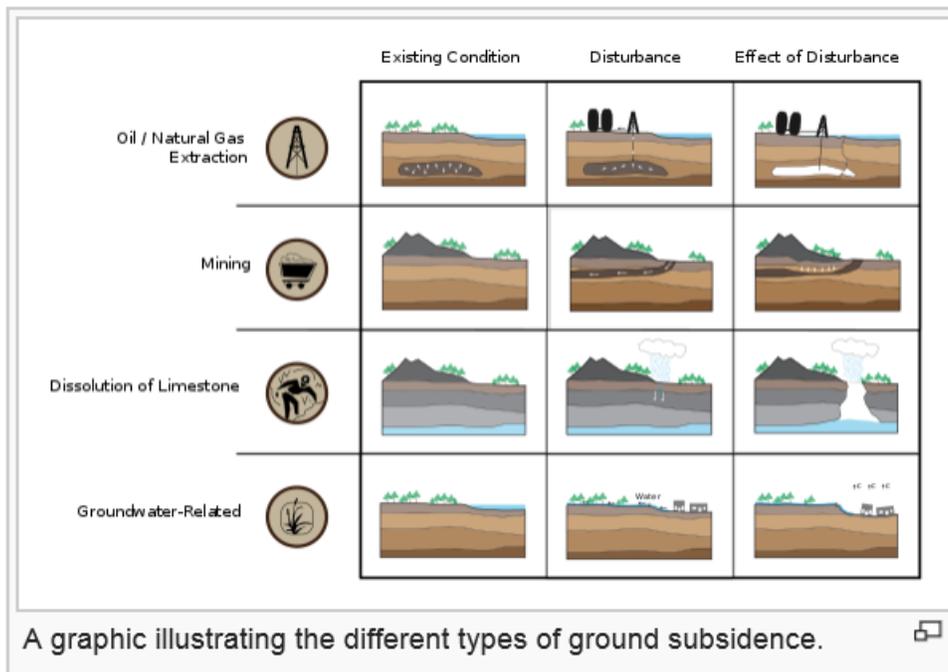
<sup>37</sup> <http://www.avalanche.ca/cac/bulletins/danger-scale>

**\*SUBSIDENCE**

According to USGS, “Land subsidence occurs when large amounts of groundwater have been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rocks falls in on itself...it can occur over large areas rather than in a small spot...”<sup>38</sup>

“Subsidence is a global problem and, in the United States, more than 17,000 square miles in 45 States, an area roughly the size of New Hampshire and Vermont combined, have been directly affected by subsidence. More than 80 percent of the identified subsidence in the Nation has occurred because of exploitation of underground water, and the increasing development of land and water resources threatens to exacerbate existing land-subsidence problems and initiate new ones. In many areas of the arid Southwest, and in more humid areas underlain by soluble rocks such as limestone, gypsum, or salt, land subsidence is an often-overlooked environmental consequence of our land- and water-use practices...Land subsidence is most often caused by human activities; mainly from the removal of subsurface water...The principal causes are aquifer-system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost.”<sup>39</sup>

Subsidence can affect homes, fields, roadways and virtually any place where the ground has been altered beneath the surface. The chart below shows how subsidence can be affected by oil and natural gas extraction, mining, the dissolution of limestone and groundwater extraction.<sup>40</sup>



<sup>38</sup> USGS, Land Subsidence, <http://water.usgs.gov/edu/earthgwlandsubside.html>

<sup>39</sup> Ibid

<sup>40</sup> Subsidence, Wikipedia; <https://en.wikipedia.org/wiki/Subsidence>

**\*TORNADO & DOWNBURST**

TORNADO

A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. Tornadoes develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. The atmospheric conditions required for the formation of a tornado include great thermal instability, high humidity and the convergence of warm, moist air at low levels with cooler, drier air aloft. Most tornadoes remain suspended in the atmosphere, but if they touch down they become a force of destruction.

Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage.

The Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes. A tornado is usually accompanied by thunder, lightning, heavy rain and a loud “freight train” noise. In comparison to a hurricane, a tornado covers a much smaller area but can be more violent and destructive.

“Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale (F-Scale) to provide estimates of tornado strength based on damage surveys. Since it’s practically impossible to make direct measurements of tornado winds, an estimate of the winds based on damage is the best way to classify a tornado. The new Enhanced Fujita Scale (EF-Scale) addresses some of the limitations identified by meteorologists and engineers since the introduction of the Fujita Scale in 1971. The new scale identifies 28 different free standing structures most affected by tornadoes taking into account construction quality and maintenance. The range of

tornado intensities remains as before, zero to five, with 'EF-0' being the weakest, associated with very little damage and 'EF-5' representing complete destruction, which was the case in Greensburg, Kansas on May 4th, 2007, the first tornado classified as 'EF-5'. The EF scale was adopted on February 1, 2007.”<sup>41</sup> The chart (above), adapted from wunderground.com, shows a comparison of the Fujita Scale to the Enhanced Fujita Scale.

Tornadoes are relatively uncommon natural hazards in New Hampshire; on average, about six tornadoes touch down each year. Damage largely depends on where the tornado strikes. If it were to strike an inhabited area, the impact could be severe.

EF SCALE	OLD F-SCALE	TYPICAL DAMAGE
<b>EF-0</b> (65-85mph)	<b>F0</b> (65-73 mph)	<b>Light damage.</b> Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
<b>EF-1</b> (86-110 mph)	<b>F1</b> (74-112 mph)	<b>Moderate damage.</b> Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
<b>EF-2</b> (111-135 mph)	<b>F2</b> (113-157 mph)	<b>Considerable damage.</b> Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off
<b>EF-3</b> (136-165 mph)	<b>F3</b> (158-206 mph)	<b>Severe damage.</b> Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
<b>EF-4</b> (166-200 mph)	<b>F4</b> (207-260 mph)	<b>Devastating damage.</b> Well-constructed houses and whole frame houses completely leveled; cars through and small missiles generated.
<b>EF-5</b> (>200 mph)	<b>F5</b> (261-318 mph)	<b>Incredible damage.</b> Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yards); high-rise buildings have significant structural deformation; incredible phenomena will occur.
EF No rating	<b>F6-F12</b> (319 mph to speed of sound)	<b>Inconceivable damage.</b> Should a tornado with the maximum wind speed in excess of EF5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

<sup>41</sup> Enhance Fujita Scale, [http://www.wunderground.com/resources/severe/fujita\\_scale.asp](http://www.wunderground.com/resources/severe/fujita_scale.asp)

DOWNBURST

A downburst is a strong downdraft which causes damaging winds on or near the ground according to NOAA. Not to be confused with downburst, the term "microburst" describes the size of the downburst. A comparison of a microburst and the larger macroburst shows that both can cause extreme winds.

A microburst is a downburst with winds extending 2 ½ miles or less, lasting 5 to 15 minutes and causing damaging winds as high as 168 MPH. A macroburst is a downburst with winds extending more than 2 ½ miles lasting 5 to 30 minutes. Damaging winds, causing widespread, tornado-like damage, could be as high as 134 MPH.<sup>42</sup>

**\*WILDFIRE**

As stated by the National Wildfire Coordinating Group (NWCG), wildfires are designated in seven categories as seen in the top chart to the right.<sup>43</sup> For the purpose of statistical analysis, the US Forest Service recognizes the cause of fires according to the bottom chart to the right.<sup>44</sup>

The definition according to the International Wildland-Urban Interface Code of wildfire is “an uncontrolled fire spreading through vegetative fuels exposing and possibly consuming structures”. In addition, the IWUIC goes on to define the wildland urban interface area as “that geographical area where structures and other human development meets or intermingles with wildland or vegetative fuels.”<sup>45</sup>

There are two main potential losses with a wildfire: the forest itself and the threat to the built-up human environment (the structures within the WUI). In many cases, the only time it is feasible for a community to control a wildfire is when it threatens the built-up human environment. Therefore, the loss to the forest itself will not be a factor in our loss calculation analysis.

Class	Acres Burned
Class A	0 to .25 acres
Class B	.26 to 9 acres
Class C	10 to 99 acres
Class D	100 to 299 acres
Class E	300 to 999 acres
Class F	1,000 to 4,999 acres
Class G	5,000 acres or more
Code	Statistical Cause
1	Lightning
2	Equipment Use
3	Smoking
4	Campfire
5	Debris Burning
6	Railroad
7	Arson
8	Children
9	Miscellaneous

<sup>42</sup> NOAA - <http://www.erh.noaa.gov/cae/svrwx/downburst.htm>

<sup>43</sup> <http://www.nwcg.gov/pms/pubs/glossary/s.htm>

<sup>44</sup> <http://www.fs.fed.us/im/directives/fsh/5109.14/5109.14.20.txt>

<sup>45</sup> International Wildland-Urban Interface Code, 2012, International Code Council, Inc.

**Appendix D: NH Presidential Disaster & Emergency Declarations**

NH Presidential Disaster Declarations (DR) since 1953				
Number	Description	Date of Event	Counties	Description
DR-4209	Severe Winter Storm and Snowstorm	January 26-28, 2015	Hillsborough, Rockingham & Stafford	<b>Presidential Emergency Declaration DR-4206:</b> Severe winter storm and snowstorm in Hillsborough, Rockingham and Strafford Counties; disaster aid to supplement state and local recovery efforts.
DR-4139	Severe Storms, Flooding	July 9-10, 2013	Cheshire, Sullivan & Grafton	<b>Presidential Emergency Declaration DR-4139:</b> Severe storms, flooding and landslides during the period of June 26 to July 3, 2013 in Cheshire, Sullivan and southern Grafton Counties.
DR-4105	Severe Winter Storm	February 8, 2013	All Ten NH Counties	<b>Presidential Emergency Declaration DR-4105:</b> Nemo; heavy snow in February 2013.
DR-4095	Hurricane Sandy	October 26- November 8, 2012	Belknap, Carroll, Coos, Grafton & Sullivan	<b>Presidential Disaster Declaration DR-4095:</b> The declaration covers damage to property from the storm that spawned heavy rains, high winds, high tides and flooding over the period of October 26-November 8, 2012.
DR-4065	Severe Storm & Flooding	May 29-31, 2012	Cheshire	<b>Presidential Disaster Declaration DR-4065:</b> Severe Storm and Flood Event May 29-31, 2012 Cheshire County.
DR-4049	Severe Storm & Snowstorm	October 29-30, 2011	Hillsborough & Rockingham	<b>Presidential Disaster Declaration DR-4049:</b> Severe Storm and Snowstorm Event October 29-30, 2011 Hillsborough and Rockingham Counties.
DR-4026	Tropical Storm Irene	August 26- September 6, 2011	Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan	<b>Presidential Disaster Declaration DR-4026:</b> Tropical Storm Irene Aug 26th- Sept 6, 2011 Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan Counties.
DR-4006	Severe Storms & Flooding	May 26-30, 2011	Coos & Grafton County	<b>Presidential Disaster Declaration DR-4006:</b> May Flooding Event, May 26th-30th 2011 Coos & Grafton County. (aka: Memorial Day Weekend Storm)
DR-1913	Severe Storms & Flooding	March 14-31, 2010	Hillsborough & Rockingham	<b>Presidential Disaster Declaration DR-1913:</b> Flooding to two NH counties including Hillsborough and Rockingham counties.
DR-1892	Severe Winter Storm, Rain & Flooding	February 23 - March 3, 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	<b>Presidential Disaster Declaration: DR-1892:</b> Flood and wind damage to most of southern NH including six counties; 330,000 homes without power; more than \$2 million obligated by June 2010.
DR-1812	Severe Winter Storm & Ice Storm	December 11-23, 2008	All Ten NH Counties	<b>Presidential Declaration DR-1812:</b> Damaging ice storms to entire state including all ten NH counties; fallen trees and large scale power outages; five months after December's ice storm pummeled the region, nearly \$15 million in federal aid had been obligated by May 2009.
DR-1799	Severe Storms & Flooding	September 6-7, 2008	Hillsborough	<b>Presidential Declaration: DR-1799:</b> Severe storms and flooding beginning on September 6-7, 2008.
DR-1787	Severe Storms & Flooding	July 24-August 14, 2008	Belknap, Carroll & Grafton & Coos	<b>Presidential Declaration DR-1787:</b> Severe storms, tornado and flooding on July 24, 2008.

NH Presidential Disaster Declarations (DR) since 1953				
DR-1782	Severe Storms, Tornado, & Flooding	July 24, 2008	Belknap, Carroll, Merrimack, Strafford & Rockingham	<b>Presidential Declaration DR-1782:</b> Tornado damage to several NH counties.
DR-1695	Nor'easter, Severe Storms & Flooding	April 15-23, 2007	All Ten NH Counties	<b>Presidential Disaster Declaration DR-1695:</b> Flood damages; FEMA & SBA obligated more than \$27.9 million in disaster aid following the April nor'easter. (aka: Tax Day Storm)
DR-1643	Severe Storms & Flooding	May 12-23, 2006	Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham & Strafford	<b>Presidential Disaster Declaration DR-1643:</b> Flooding in most of southern NH, May 12-23, 2006. (aka: Mother's Day Storm)
DR-1610	Severe Storms & Flooding	October 7-18, 2005	Belknap, Cheshire, Grafton, Hillsborough, Merrimack & Sullivan	<b>Presidential Disaster Declaration DR-1610:</b> To date, state and federal disaster assistance has reached more than \$3 million to help residents and business owners in New Hampshire recover from losses resulting from the severe storms and flooding in October.
DR-1489	Severe Storms & Flooding	July 21-August 18, 2003	Cheshire & Sullivan	<b>Presidential Disaster Declaration DR-1489:</b> Floods stemming from persistent rainfall and severe storms that caused damage to public property occurring over the period of July 21 through August 18, 2003.
DR-1305	Tropical Storm Floyd	September 16-18, 1999	Belknap, Cheshire & Grafton	<b>Presidential Disaster Declaration DR-1305:</b> The declaration covers damage to public property from the storm that spawned heavy rains, high winds and flooding over the period of September 16-18.
DR-1231	Severe Storms & Flooding	June 12-July 2, 1998	NA	<b>Presidential Disaster Declaration DR-1231:</b>
DR-1199	Ice Storms	January 7-25, 1998	NA	<b>Presidential Disaster Declaration DR-1199:</b>
DR-1144	Severe Storms/Flooding	October 20-23, 1996	NA	<b>Presidential Disaster Declaration DR-1144:</b>
DR-1077	Storms/Floods	October 20-November 15, 1995	NA	<b>Presidential Disaster Declaration DR-1077:</b>
DR-923	Severe Coastal Storm	October 30-31, 1991	NA	<b>Presidential Disaster Declaration DR-923:</b>
DR-917	Hurricane Bob, Severe Storm	August 18-20, 1991	NA	<b>Presidential Disaster Declaration DR-917:</b>
DR-876	Flooding, Severe Storm	August 7-11, 1990	NA	<b>Presidential Disaster Declaration DR-876:</b>
DR-789	Severe Storms & Flooding	March 30-April 11, 1987	NA	<b>Presidential Disaster Declaration DR-789</b>
DR-771	Severe Storms & Flooding	July 29-August 10, 1986	NA	<b>Presidential Disaster Declaration DR-771:</b>
DR-549	High Winds, Tidal Surge, Coastal Flooding & Snow	February 16, 1978	NA	<b>Presidential Disaster Declaration DR-549:</b> Blizzard of 1978
DR-411	Heavy Rains, Flooding	January 21, 1974	NA	<b>Presidential Disaster Declaration DR-411:</b>

NH Presidential Disaster Declarations (DR) since 1953				
DR-399	Severe Storms & Flooding	July 11, 1973	NA	Presidential Disaster Declaration DR-399:
DR-327	Coastal Storms	March 18, 1972	NA	Presidential Disaster Declaration DR-327:
DR-11	Wildfire	July 2, 1953	NA	Presidential Disaster Declaration DR-11:
Emergency Declarations (EM) since 1953				
Number	Description	Date of Event	Counties	Description
EM-3360	Hurricane Sandy	October 26-31, 2012	All Ten	<b>Presidential Emergency Declaration EM-3360:</b> Hurricane Sandy came ashore in NJ and brought high winds, power outages and heavy rain to NH; all ten counties in the State of New Hampshire.
EM-3344	Severe Snow Storm	October 29-30, 2011	All Ten	<b>Presidential Emergency Declaration EM-3344:</b> Severe storm during the period of October 29-30, 2011; all ten counties in the State of New Hampshire. (aka: Snowtober)
EM-3333	Hurricane Irene	August 26-September 6, 2011	All Ten	<b>Presidential Emergency Declaration EM-3333:</b> Emergency Declaration for Tropical Storm Irene for in all ten counties.
EM-3297	Severe Winter Storm	December 11, 2008	All Ten	<b>Presidential Emergency Declaration EM-3297:</b> Severe winter storm beginning on December 11, 2008.
EM-3258	Hurricane Katrina Evacuation	August 29-October 1, 2005	All Ten	<b>Presidential Emergency Declaration EM-3258:</b> Assistance to evacuees from the area struck by Hurricane Katrina and to provide emergency assistance to those areas beginning on August 29, 2005 and continuing; The President's action makes Federal funding available to the State and all 10 counties of the State of New Hampshire.
EM-3211	Snow	March 11-12, 2005	Carroll, Cheshire, Hillsborough, Rockingham & Sullivan	<b>Presidential Emergency Declaration EM-3211:</b> March snowstorm; more than \$2 million has been approved to help pay for costs of the snow removal; Total aid for the March storm is <b>\$2,112,182.01</b> (Carroll: \$73,964.57; Cheshire: \$118,902.51; Hillsborough: \$710,836; Rockingham: \$445,888.99; Sullivan: \$65,088.53; State of NH: \$697,501.41)
EM-3208	Snow	February 10-11, 2005	Carroll, Cheshire, Coos, Grafton & Sullivan	<b>Presidential Emergency Declaration EM-3208:</b> FEMA had obligated more than \$1 million by March 2005 to help pay for costs of the heavy snow and high winds; Total aid for the February storm was <b>\$1,121,727.20</b> (Carroll: \$91,832.72; Cheshire: \$11,0021.18; Coos: \$11,6508.10; Grafton: \$213,539.52; Sullivan: \$68,288.90; State of NH: \$521,536.78) <b>EM 3208-002:</b> The Federal Emergency Management Agency (FEMA) had obligated more than \$6.5 million to reimburse state and local governments in New Hampshire for costs incurred in three snow storms that hit the state earlier this year, according to disaster recovery officials. Total aid for all three storms was \$6,892,023.87 (January: \$3,658,114.66; February: \$1,121,727.20; March: \$2,113,182.01)

NH Presidential Disaster Declarations (DR) since 1953				
<b>EM-3207</b>	Snow	January, 22-23, 2005	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Rockingham, Merrimack, Strafford & Sullivan	<b>Presidential Emergency Declaration EM-3207:</b> JANUARY STORM DAMAGE: More than \$3.5 million had been approved to help pay for costs of the heavy snow and high winds; Total aid for the January storm was <b>\$3,658,114.66</b> (Belknap: \$125,668.09; Carroll: \$52,864.23; Cheshire: \$134,830.95; Grafton: \$137,118.71; Hillsborough: \$848,606.68; Merrimack: \$315,936.55; Rockingham: \$679,628.10; Strafford: \$207,198.96; Sullivan: \$48,835.80; State of NH: \$1,107,426.59)
<b>EM-3193</b>	Snow	December 6-7, 2003	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan	<b>Presidential Emergency Declaration EM-3193:</b> The declaration covers jurisdictions with record and near-record snowfall that occurred over the period of December 6-7, 2003
<b>EM-3177</b>	Snowstorm	February 17-18, 2003	Cheshire, Hillsborough, Merrimack, Rockingham & Strafford	<b>Presidential Emergency Declaration EM-3177:</b> Declaration covers jurisdictions with record and near-record snowfall from the snowstorm that occurred February 17-18, 2003
<b>EM-3166</b>	Snowstorm	March 5-7, 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, & Strafford	<b>Presidential Emergency Declaration EM-3166:</b> Declaration covers jurisdictions with record and near-record snowfall from the late winter storm that occurred March 2001
<b>EM-3101</b>	High Winds & Record Snowfall	March 13-17, 1994	NA	<b>Presidential Emergency Declaration EM-3101:</b>
<b>EM-3073</b>	Flooding	March 15, 1979	NA	<b>Presidential Emergency Declaration EM-3073:</b>

**Source:**

*Disaster Declarations for New Hampshire*

[http://www.fema.gov/disasters/grid/state-tribal-government/33?field\\_disaster\\_type\\_term\\_tid\\_1=All](http://www.fema.gov/disasters/grid/state-tribal-government/33?field_disaster_type_term_tid_1=All)

## Appendix E: Potential Mitigation Ideas<sup>46</sup>

### Drought

- D1 ..... Assess Vulnerability to Drought Risk
- D2 ..... Monitoring Drought Conditions
- D3 ..... Monitor Water Supply
- D4 ..... Plan for Drought
- D5 ..... Require Water Conservation during Drought Conditions
- D6 ..... Prevent Overgrazing
- D7 ..... Retrofit Water Supply Systems
- D8 ..... Enhance Landscaping & Design Measures
- D9 ..... Educate Residents on Water Saving Techniques
- D10 .... Educate Farmers on Soil & Water Conservation Practices
- D11 .... Purchase Crop Insurance

### Earthquake

- EQ1.... Adopt & Enforce Building Codes
- EQ2.... Incorporate Earthquake Mitigation into Local Planning
- EQ3.... Map & Assess Community Vulnerability to Seismic Hazards
- EQ4.... Conduct Inspections of Building Safety
- EQ5.... Protect Critical Facilities & Infrastructure
- EQ6.... Implement Structural Mitigation Techniques
- EQ7.... Increase Earthquake Risk Awareness
- EQ8.... Conduct Outreach to Builders, Architects, Engineers and Inspectors
- EQ9.... Provide Information on Structural & Non-Structural Retrofitting

### Erosion

- ER1.... Map & Assess Vulnerability to Erosion
- ER2.... Manage Development in Erosion Hazard Areas
- ER3.... Promote or Require Site & Building Design Standards to Minimize Erosion Risk
- ER4.... Remove Existing Buildings & Infrastructure from Erosion Hazard Areas
- ER5.... Stabilize Erosion Hazard Areas
- ER6.... Increase Awareness of Erosion Hazards

### Extreme Temperatures

- ET1 .... Reduce Urban Heat Island Effect
- ET2 .... Increase Awareness of Extreme Temperature Risk & Safety
- ET3 .... Assist Vulnerable Populations
- ET4 .... Educate Property Owners about Freezing Pipes

### Hailstorm

- HA1 .... Locate Safe Rooms to Minimize Damage
- HA2 .... Protect Buildings from Hail Damage
- HA3 .... Increase Hail Risk Awareness

### Landslide

- LS1..... Map & Assess Vulnerability to Landslides
- LS2..... Manage Development in Landslide Hazard Areas
- LS3..... Prevent Impacts to Roadways
- LS4 .... Remove Existing Buildings & Infrastructure from Landslide

### Lightning

- L1..... Protect Critical Facilities
- L2..... Conduct Lightning Awareness Programs

### Flood

- F1 ..... Incorporate Flood Mitigation in Local Planning
- F2 ..... Form Partnerships to Support Floodplain Management
- F3 ..... Limit or Restrict Development in Floodplain Areas
- F4 ..... Adopt & Enforce Building Codes and Development Standards
- F5 ..... Improve Stormwater Management Planning
- F6 ..... Adopt Policies to Reduce Stormwater Runoff
- F7 ..... Improve Flood Risk Assessment
- F8 ..... Join or Improve Compliance with NFIP
- F9 ..... Manage the Floodplain beyond Minimum Requirements
- F10 .... Participate in the CRS
- F11 .... Establish Local Funding Mechanism for Flood Mitigation
- F12 .... Remove Existing Structures from Flood Hazard Areas
- F13 .... Improve Stormwater Drainage System Capacity
- F14 .... Conduct Regular Maintenance for Drainage Systems & Flood Control Structures
- F15 .... Elevate or Retrofit Structures & Utilities
- F16 .... Floodproof Residential & Non-Residential Structures
- F17 .... Protect Infrastructure
- F18 .... Protect Critical Facilities
- F19 .... Construct Flood Control Measures
- F20 .... Protect & Restore Natural Flood Mitigation Features
- F21 .... Preserve Floodplains as Open Space
- F22 .... Increase Awareness of Flood Risk & Safety
- F23 .... Educate Property Owners about Flood Mitigation Techniques

### Severe Wind

- SW1... Adopt & Enforce Building Codes
- SW2... Promote or Require Site & Building Design Standards to Minimize Wind Damage
- SW3... Assess Vulnerability to Severe Wind
- SW4... Protect Power Lines & Infrastructure
- SW5... Retrofit Residential Buildings
- SW6... Retrofit Public Buildings & Critical Facilities
- SW7... Increase Severe Wind Awareness

### Severe Winter Weather

- WW1.. Adopt & Enforce Building Codes
- WW2.. Protect Buildings & Infrastructure
- WW3.. Protect Power Lines
- WW4.. Reduce Impacts to Roadways
- WW5.. Conduct Winter Weather Risk Awareness Activities
- WW6.. Assist Vulnerable Populations

### Tornado

- T1 ..... Encourage Construction of Safe Rooms
- T2 ..... Require Wind-Resistant Building Techniques
- T2 ..... Conduct Tornado Awareness Activities

<sup>46</sup> Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, FEMA, January 2013

**Wildfire**

- WF1 ... Map & Assess Vulnerability to Wildfire
- WF2 ... Incorporate Wildfire Mitigation in the Comprehensive Plan
- WF3 ... Reduce Risk through Land Use Planning
- WF4 ... Develop a Wildland Urban Interface Code
- WF5 ... Require or Encourage Fire-Resistant Construction Techniques
- WF6 ... Retrofit At-Risk Structure with Ignition-Resistant Materials
- WF7 ... Create Defensible Space around Structures & Infrastructure
- WF8 ... Conduct Maintenance to Reduce Risk
- WF9 ... Implement a Fuels Management Program
- WF10 . Participate in the Firewise Program
- WF11 . Increase Wildfire Awareness
- WF12 . Educate Property Owners about Wildfire Mitigation Techniques

**Multi-Hazards**

- MU1 ... Assess Community Risk
- MU2 ... Map Community Risk
- MU3 ... Prevent Development in Hazard Areas
- MU4 ... Adopt Regulations in Hazard Areas
- MU5 ... Limit Density in Hazard Areas
- MU6 ... Integrate Mitigation into Local Planning
- MU7 ... Strengthen Land Use Regulations
- MU8 ... Adopt & Enforce Building Codes
- MU9 ... Create Local Mechanisms for Hazard Mitigation
- MU10 . Incentivize Hazard Mitigation
- MU11 . Monitor Mitigation Plan Implementation
- MU12 . Protect Structures
- MU13 . Protect Infrastructure & Critical Facilities
- MU14 . Increase Hazard Education & Risk Awareness
- MU15 . Improve Household Disaster Preparedness
- MU16 . Promote Private Mitigation Efforts

**Appendix F: Acronyms**

**Hazard Mitigation Planning  
List of Acronyms**

ACS.....	American Community Survey (Census)
BFE.....	Base Flood Elevation
BOCA.....	Building Officials and Code Administrators International
CIKR.....	Critical Infrastructure & Key Resources
CIP.....	Capital Improvements Program
CWPP.....	Community Wildfire Protection Plan
DRED.....	Department of Resources & Economic Development
EMD.....	Emergency Management Director
EMS.....	Emergency Medical Services
EOC.....	Emergency Operations Center
ERF.....	Emergency Response Facility
FEMA.....	Federal Emergency Management Agency
FIRM.....	Flood Insurance Rate Map
FPP.....	Facilities & Populations to Protect
GIS.....	Geographic Information System
HFRA.....	Healthy Forest Restoration Act
HMGP.....	Hazard Mitigation Grant Program
HSEM.....	Homeland Security & Emergency Management (NH)
ICS.....	Incident Command System
LEOP.....	Local Emergency Operations Plan
MOU.....	Memorandum of Understanding
NCRC&D.....	North Country Resource Conservation & Development Council
NOAA.....	National Oceanic and Atmospheric Association
NSSL.....	National Severe Storms Laboratory (NOAA)
MAPS.....	Mapping and Planning Solutions
NERF.....	Non-Emergency Response Facility
NFIP.....	National Flood Insurance Program
NGVD.....	National Geodetic Vertical Datum of 1929
NHDOT.....	NH Department of Transportation
NIMS.....	National Incident Management System
PR.....	Potential Resources
SPNHF.....	Society for the Protection of New Hampshire Forests
USDA.....	US Department of Agriculture
USDA-FS.....	USDA-Forest Service
USGS.....	United States Geological Society
WMNF.....	White Mountain National Forest
WUI.....	Wildland Urban Interface

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## **Appendix G: Map Documents**

The following 11" x 17" maps are included in hard copy plans:

*Map 1 – Base Risk Analysis*

*Map 2 – Historic Wildfires & Wildland Urban Interface*

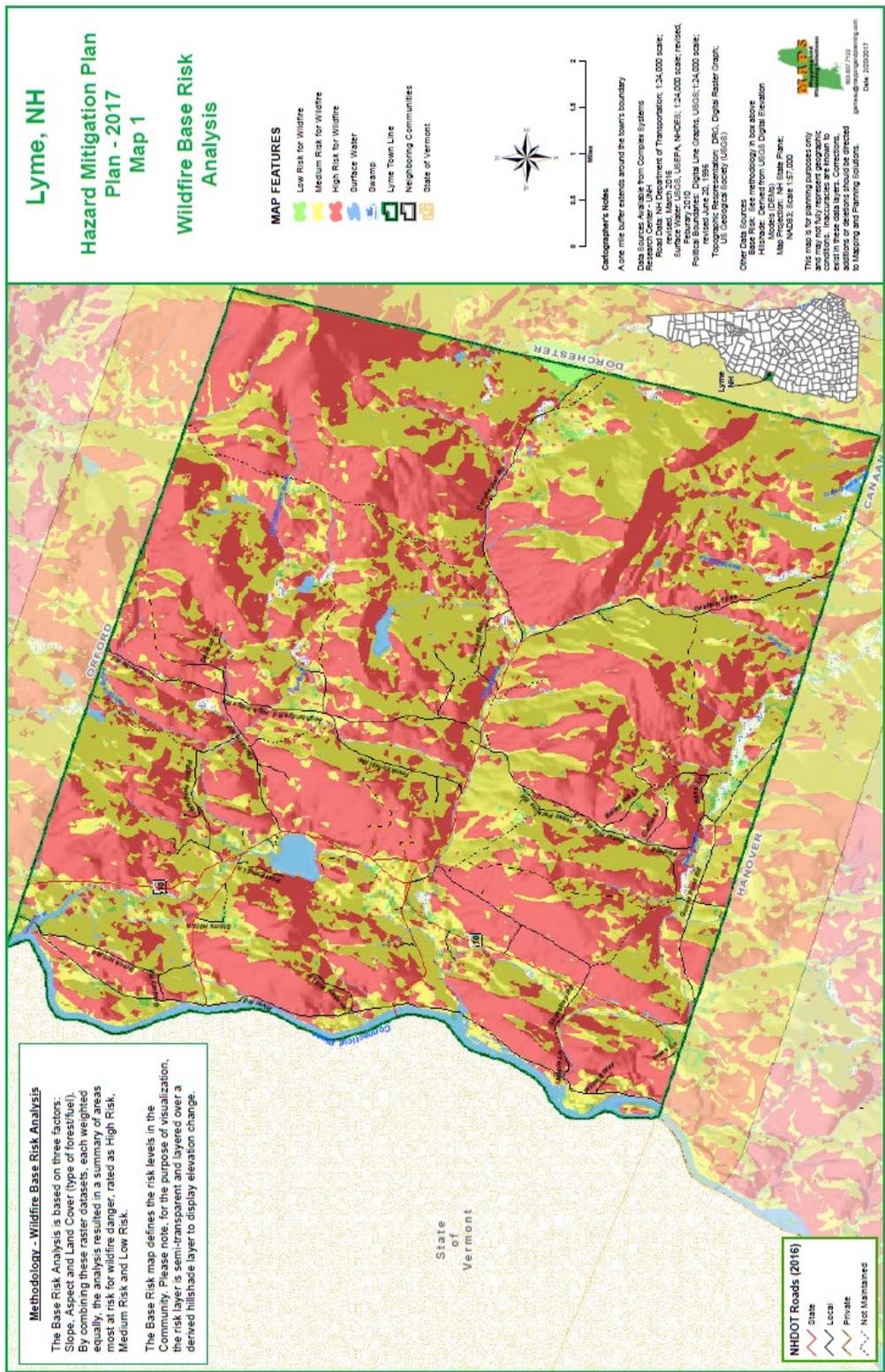
*Map 3 – Past & Potential Areas of Concern*

*Map 4 – Critical Infrastructure & Key Resources*

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MAP 1 – BASE RISK ANALYSIS

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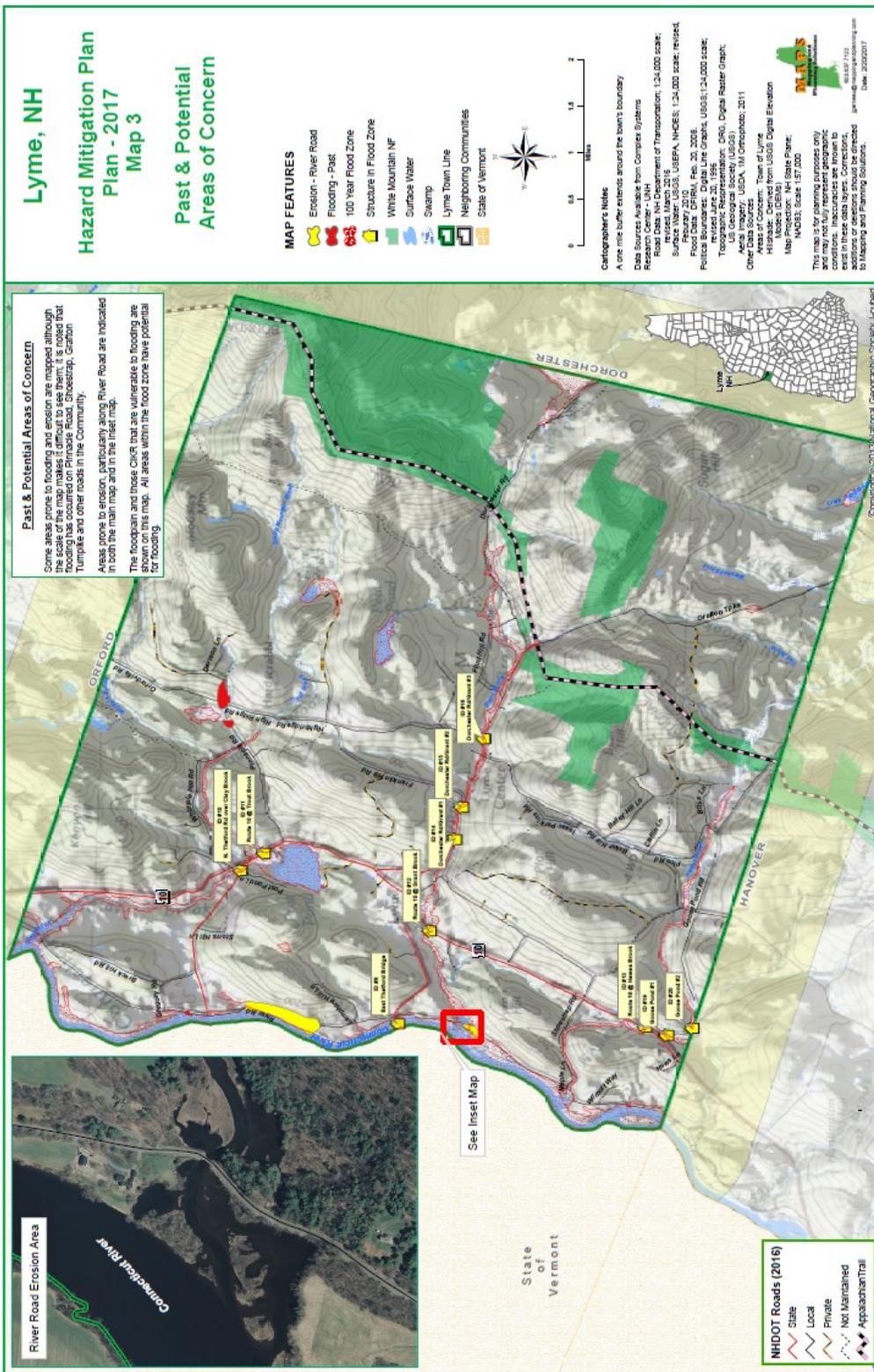
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MAP 3 – PAST & POTENTIAL AREAS OF CONCERN

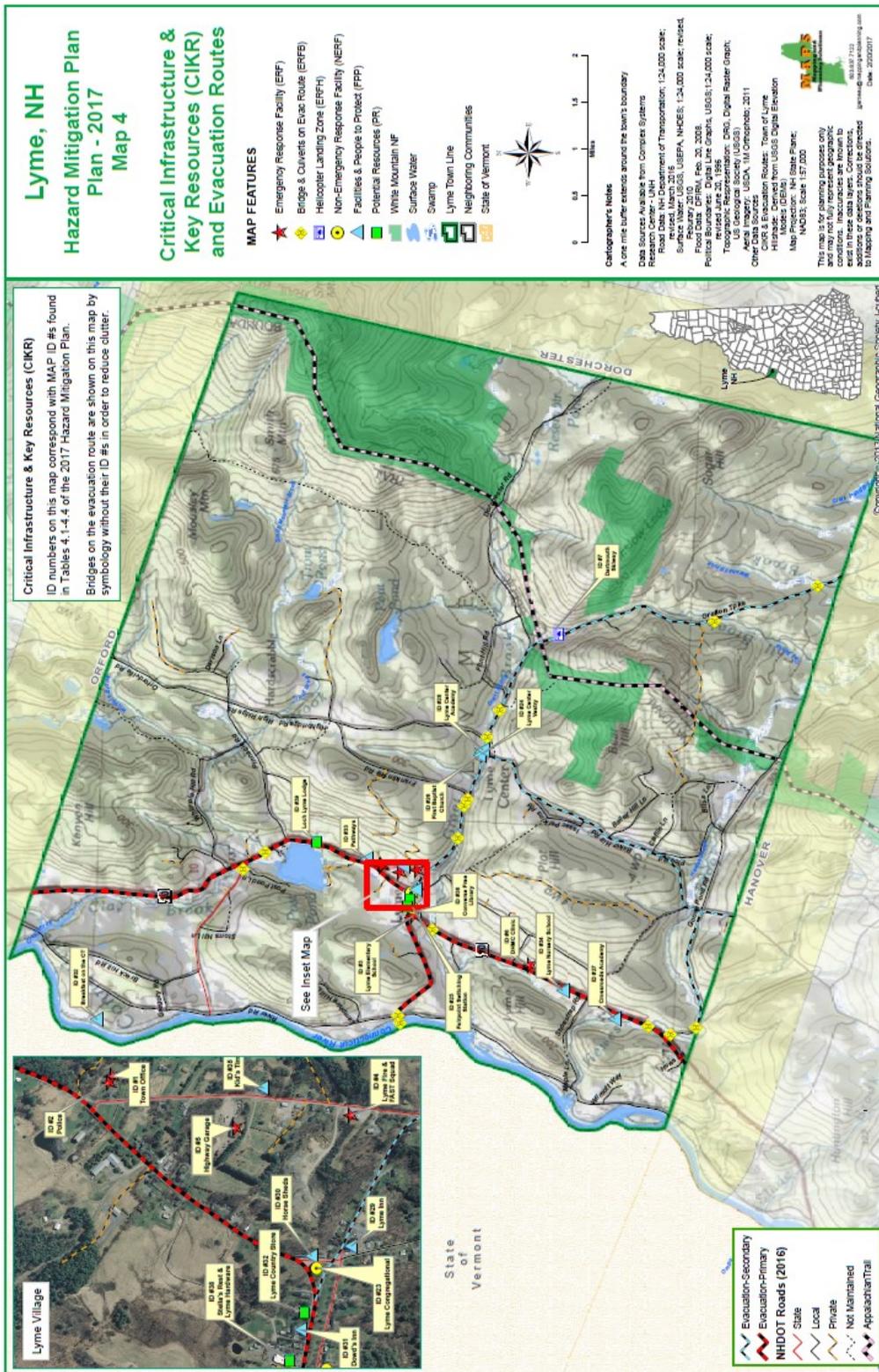
To be replaced with 11" x 17" map in final hard copy.



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MAP 4 – CRITICAL INFRASTRUCTURE & KEY RESOURCES

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*Lyme Common*

*Photo credit: <http://dustycarmuddyboots.com/ridges-boots-movie-upper-valley-vt-nh/>*

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