

# **Orange, NH**

## **Hazard Mitigation Plan**

### **Update 2024**



**This plan integrates the following:**

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

**February 12, 2024**  
**Final Plan**

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**Prepared for the Town of Orange and NH Homeland Security &  
Emergency Management**

**By**  
**The Orange Planning Team**

**With assistance from Mapping and Planning Solutions**

**O**  
**R**  
**A**  
**N**  
**G**  
**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**

June E. Garneau, Owner/Planner  
Mapping and Planning Solutions  
PO Box 283  
91 Cherry Mountain Place  
Twin Mountain, NH 03595  
jgarneau@mappingandplanning.com  
(603) 991-9664 (cell)

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## Acknowledgments

This plan integrates elements to qualify it as a Community Wildfire Protection Plan (CWPP), according to the US Forest Service and the NH Department of Natural & Cultural Resources (DNCR). The plan was created through a grant from NH 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 Strategic Initiatives (OSI)
- Mapping and Planning Solutions (MAPS)
- NH Forests & Lands (DNCR)

**This plan is an update to the most recent Orange Hazard Mitigation Plan, approved on February 22, 2017.  
This plan was funded under the Pre-disaster Mitigation Grant Program (PDM19)**

**Approval Notification Dates for 2024 Update**

Approved Pending Adoption (APA) .....	December 19, 2023
Jurisdiction Adoption: .....	January 3, 2024
CWPP Approval: .....	March 14, 2024
<b>*Plan Approval Date (HSEM): .....</b>	<b>February 12, 2024</b>
Receipt of FEMA Letter.....	February 12, 2024
Plan Distribution (MAPS):.....	March 20, 2024

*\*The start of the next five-year clock*

### TOWN OF ORANGE HAZARD MITIGATION PLANNING TEAM (HMPT)

The Town of Orange would like to thank the following people for the time and effort spent to complete this plan. This plan would not exist without your knowledge and experience — many thanks for all the hard work and effort given by everyone. The following people have attended meetings or been instrumental in completing this plan:

- Aaron Allen ..... Orange Select Board
- Donald McFarlane ... Orange Planning Board
- Scott Sanborn ..... Orange Road Agent
- Judith Lindahl..... Orange Landowner
- Dorothy Heinrichs .... Orange Select Board
- Doug Weekes ..... Orange EMD, HO & BI
- Kip Riley..... Orange Citizen
- Trish Weekes..... Orange Treasurer
- Hilary Rogers ..... Orange Citizen
- Karen McFarlane ..... Orange Citizen
- Jennifer Gilbert ..... NH OSI
- Paul Hatch ..... NH HSEM
- June Garneau ..... MAPS
- Olin Garneau ..... MAPS

The Town of Orange would like to thank the Federal Emergency Management Agency and NH Homeland Security & Emergency Management as the primary funding sources for this plan.

Acronyms or abbreviations associated with the above list:

- EMD ..... Emergency Management Director
- HO..... Health Officer
- BI..... Building Inspector

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## Executive Summary

The Orange, NH Hazard Mitigation Plan Update 2024 was compiled to assist the town in reducing and mitigating future losses from natural, technological, or human-caused hazardous events. The plan was developed by the Orange Hazard Mitigation Planning Team (HMPT), 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 Orange Hazard Mitigation Plan 2017. To produce an accurate and current planning document, the planning team used the 2017 plan as a foundation, building upon that plan to provide more timely information.

This project was held virtually due to the Covid-19 pandemic; the plan's final writing was completed as the pandemic continued. References to Covid-19 and its impact on Orange are discussed in Chapter 5, Section C, Infectious Diseases.

**Mitigation action items for natural hazards are the main focus of this plan.** However, this plan addresses technological and human-caused hazards in addition to natural hazards, as shown below

### NATURAL HAZARDS

- |                                      |                         |
|--------------------------------------|-------------------------|
| 1) Severe Winter Weather             | 7) Extreme Temperatures |
| 2) Wildfires                         | 8) High Wind Events     |
| 3) Inland Flooding                   | 9) Infectious Diseases  |
| 4) Drought                           | 10) Earthquakes         |
| 5) Tropical & Post-Tropical Cyclones | 11) Landslide & Erosion |
| 6) Lightning & Hail                  |                         |

### TECHNOLOGICAL HAZARDS

- |                             |                                  |
|-----------------------------|----------------------------------|
| 1) Long Term Utility Outage | 3) Known & Emerging Contaminants |
| 2) Aging Infrastructure     | 4) Hazardous Materials           |

### HUMAN-CAUSED HAZARDS

- |                            |                         |
|----------------------------|-------------------------|
| 1) Cyber Events            | 3) Transport Accidents  |
| 2) Mass Casualty Incidents | 4) Terrorism & Violence |



*Cover Photo: Orange Town House*

*Photo Credit:*

*[https://en.wikipedia.org/wiki/Orange,\\_New\\_Hampshire](https://en.wikipedia.org/wiki/Orange,_New_Hampshire)*

Some hazards listed in the 2018 New Hampshire Hazard Mitigation Plan were not included in this plan as the team felt they were unlikely to occur in Orange or were not applicable. An explanation of why these hazards are excluded from this plan can be seen in Chapter 3, Section A.

This plan also provides a list of Critical Infrastructure & Key Resources (CIKR) categorized as follows: Emergency Response Facilities (ERF), Non-Emergency Response Facilities (NERF), Facilities & Populations to Protect (FPP), and Potential Resources (PR). Also, this plan addresses the town's involvement in the National Flood Insurance Program (NFIP).

Communities can sometimes cope with the impact of particular natural hazards. For example, although severe winter weather is often a common hazard in the state, most New Hampshire communities handle two to three-foot snowstorms with little or no disruption of services. On the other hand, an unexpected ice storm can have disastrous effects on a community. Mitigation for sudden storms such as ice storms is difficult to achieve. Establishing warming and cooling centers, creating notification systems, providing public outreach, tree trimming, opening shelters, and perhaps burying overhead power lines are just a few actions that may be implemented.

In summary, finding mitigation action items for every hazard that affects a community can be difficult. With economic constraints, cities and towns are less likely to have the financial ability to complete certain mitigation action items, such as burying power lines. In preparing this plan, the Hanover HMPT (the team) has considered a comprehensive list of mitigation action items that could diminish the impact of hazards. The team 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:

Orange, NH Hazard Mitigation Plan Update 2024.....	the plan or this plan
Orange .....	the town or the community
Hazard Mitigation Planning Team.....	the team or HMPT
Hazard Mitigation Plan.....	HMP
Emergency Operations Plan .....	EOP
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 E: Acronyms*

**Mission Statement:**  
To make Orange 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 Town of Orange 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 Orange, NH Hazard Mitigation Plan Update 2024 was prepared following 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 Orange Hazard Mitigation Planning Team (HMPT) 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 (MAPS). HSEM funded this plan through Federal Emergency Management Agency (FEMA) grants. 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 the 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 aims to have all New Hampshire communities complete a local hazard mitigation plan to reduce future losses from natural hazards before they occur. HSEM outlined a process whereby communities throughout the state may be eligible for grants and other assistance upon completing this hazard mitigation plan.

The Orange, NH Hazard Mitigation Plan Update 2024 is a planning tool to reduce future losses from natural, technological, 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 emphasizes local mitigation planning. It requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans as a condition for receiving grants under the Hazard Mitigation Grant Program (HMGP). Local governments must review this plan yearly and update this plan every five years to continue program eligibility.

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<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 Orange, Grafton County, New Hampshire.

### **D. SCOPE OF THE PLAN & FEDERAL & STATE PARTICIPATION**

A community's hazard mitigation plan often identifies many 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 wildfire on Critical Infrastructure & 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 (HMP) and a Community Wildfire Protection Plan (CWPP), the planning effort included the participation of NH Homeland Security & Emergency Management (HSEM), the United States Department of Agriculture-Forest Service (USDA-FS), the NH Department of Natural & Cultural Resources (DNCR), and the NH Bureau of Economic Affairs (BEA) as well as routine notification of upcoming meetings to other state and federal entities. Designation as a CWPP may allow a community to gain federal funding for hazardous fuel reduction and other mitigation projects supported by the USDA-FS and NH-DNCR. 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 consider local communities as they develop and implement forest management and hazardous fuel reduction projects. However, a community must first prepare a CWPP to take advantage of this opportunity. 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:** *Local and state government representatives must collaboratively develop a CWPP 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 the 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) and its continued compliance with the program. As part of a vulnerability assessment, the plan must address the NFIP-insured structures that have been repetitively damaged due to floods.

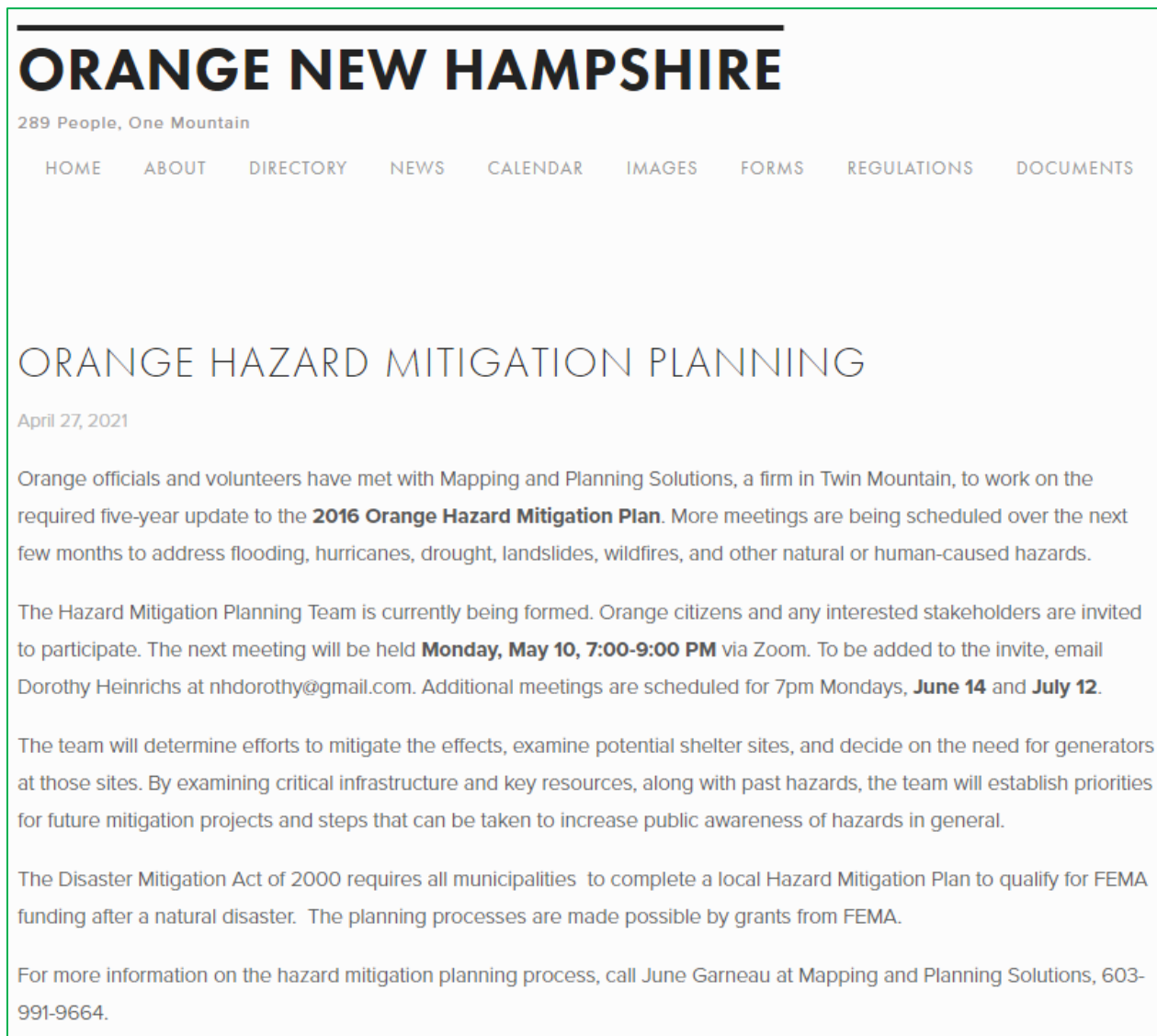
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<sup>3</sup> Healthy Forest Restoration Act; HR 1904, 2003; Section 101-3-a.b.c; [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108\\_cong\\_bills&docid=f:h1904enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108_cong_bills&docid=f:h1904enr.txt.pdf)

**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 (see next page). Community officials were urged to contact as many residents as possible to participate in the planning process and to reach out to officials and residents from surrounding communities. The Town of Orange understands that natural hazards do not recognize political boundaries.

Many interested citizens and stakeholders had the opportunity to become aware of the hazard mitigation planning in Orange. The team provided excellent public and stakeholder notification for a very small community. A press release (see below) was posted at the Town House and on the privately run website. The press release was used to notify businesses and private and non-profit organizations that work with underserved communities and socially vulnerable populations that meetings were taking place, and they were invited to attend. Orange has no colleges or universities and no official town website.



The screenshot shows the website for Orange, New Hampshire. At the top, it says "ORANGE NEW HAMPSHIRE" in large, bold, black letters. Below that is the tagline "289 People, One Mountain". A navigation menu includes links for HOME, ABOUT, DIRECTORY, NEWS, CALENDAR, IMAGES, FORMS, REGULATIONS, and DOCUMENTS. The main content area features a large heading "ORANGE HAZARD MITIGATION PLANNING" and a date "April 27, 2021". The text of the press release follows, detailing the town's efforts to update its hazard mitigation plan and inviting citizens to participate in meetings.

**ORANGE NEW HAMPSHIRE**  
289 People, One Mountain

HOME ABOUT DIRECTORY NEWS CALENDAR IMAGES FORMS REGULATIONS DOCUMENTS

## ORANGE HAZARD MITIGATION PLANNING

April 27, 2021

Orange officials and volunteers have met with Mapping and Planning Solutions, a firm in Twin Mountain, to work on the required five-year update to the **2016 Orange Hazard Mitigation Plan**. More meetings are being scheduled over the next few months to address flooding, hurricanes, drought, landslides, wildfires, and other natural or human-caused hazards.

The Hazard Mitigation Planning Team is currently being formed. Orange citizens and any interested stakeholders are invited to participate. The next meeting will be held **Monday, May 10, 7:00-9:00 PM** via Zoom. To be added to the invite, email Dorothy Heinrichs at [nhdorothy@gmail.com](mailto:nhdorothy@gmail.com). Additional meetings are scheduled for 7pm Mondays, **June 14** and **July 12**.

The team will determine efforts to mitigate the effects, examine potential shelter sites, and decide on the need for generators at those sites. By examining critical infrastructure and key resources, along with past hazards, the team will establish priorities for future mitigation projects and steps that can be taken to increase public awareness of hazards in general.

The Disaster Mitigation Act of 2000 requires all municipalities to complete a local Hazard Mitigation Plan to qualify for FEMA funding after a natural disaster. The planning processes are made possible by grants from FEMA.

For more information on the hazard mitigation planning process, call June Garneau at Mapping and Planning Solutions, 603-991-9664.

Lastly, the planner sent a monthly calendar (see below) and email inviting stakeholders to participate in planning meetings being held by MAPS. EMDs, Police Chiefs, Fire Chiefs, Rangers, and other state, federal, and private officials were included in this email blast. Orange’s neighbors, Groton, Alexandria, Grafton, and Canaan, are part of MAPS’ monthly email.



Day	Date	Time	Town/Location	Plan Type	HSEM Field Rep	County
Monday	6/7/21	6:30 PM	Wentworth Zoom Meeting	MP	N/A	Grafton
Tuesday	6/8/21	1:00 PM	Pittsburg Zoom Meeting	EOP	Courtney Jordan	Coos
Thursday	6/10/21	10:00 AM	Conway Zoom Meeting	EOP	Courtney Jordan	Carroll
Monday	6/14/21	7:00 PM	Orange Zoom Meeting	HMP	Paul Hatch	Grafton
Tuesday	6/15/21	10:00 AM	Tamworth Zoom Meeting	EOP	Courtney Jordan	Carroll
Wednesday	6/16/21	9:00 AM	Eaton Zoom Meeting	HMP	Courtney Jordan	Carroll
Friday	6/18/21	8:30 AM	Holderness Zoom Meeting	EOP	Paul Hatch	Grafton
Tuesday	6/22/21	1:00 PM	Pittsburg Zoom Meeting	EOP	Courtney Jordan	Coos
Thursday	6/24/21	9:00 AM	Lincoln Zoom Meeting	HMP	Paul Hatch	Grafton
Tuesday	6/29/21	10:00 AM	Tamworth Zoom Meeting	EOP	Courtney Jordan	Carroll
Wednesday	6/30/21	9:00 AM	Madison Zoom Meeting	HMP	Courtney Jordan	Carroll
Monday	7/5/21	6:30 PM	Wentworth Zoom Meeting	MP	N/A	Grafton
Thursday	7/8/21	10:00 AM	Berlin Zoom Meeting	HMP	Courtney Jordan	Coos
Monday	7/12/21	7:00 PM	Orange Zoom Meeting	HMP	Paul Hatch	Grafton
Wednesday	7/14/21	9:00 AM	Eaton Zoom Meeting	HMP	Courtney Jordan	Carroll

Team composition can be impacted in some communities due to lower population and because many people “wear more than one hat”. It is often challenging to attract citizens to participate in town government. In smaller communities, those working in town government generally hold full-time jobs and volunteer in various town positions. Depending on the population, the percentage of interested citizens in a town’s planning processes may be diminished. Due to the availability of jobs, a high elderly population, and other economic factors, smaller communities have a dwindling number of young people interested in politics.

Orange had excellent participation in the development of this plan despite its size. In addition to the Emergency Management Director (EMD)/Building Inspector/Health Officer, the Road Agent and the Treasurer participated in meetings. Members of the Select Board and Planning Board participated, and four members of the general public also attended meetings. Comments made by all team members, including the general public, were integrated into the narrative discussion and incorporated into the document.

**HAZARD MITIGATION POTENTIAL TEAM MEMBERS**

FEDERAL

- USDA Forest Service

STATE

- Department of Transportation (DOT)
- Department of Natural & Cultural Resources (DNCR)
- Bureau of Economic Affairs (BEA)

LOCAL

- Select Board Member(s)
- Town Manager/Administrator
- Planning Board Member(s)
- Town Planner
- Police Chief
- Fire Chief
- Emergency Management Director
- Emergency Medical Services
- Education/School
- Recreation Director
- DPW Director or Road Agent
- Water & Waste Management
- Public Utilities
- Dam Operator(s)
- Major Employer(s)
- Senior Citizen Facilities
- Vulnerable populations
- Academia

OTHER OR SPECIAL INTEREST

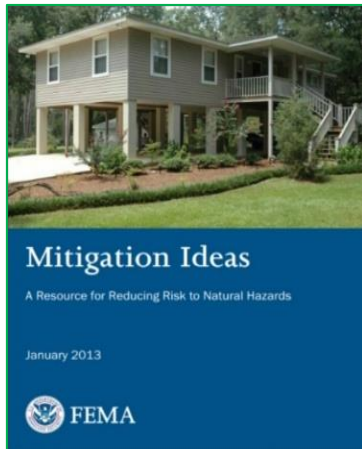
- Landowners
- Homeowners Association(s)
- Forest Management
- Developers & Builders
- Major Businesses

**F. INCORPORATION OF EXISTING PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION**

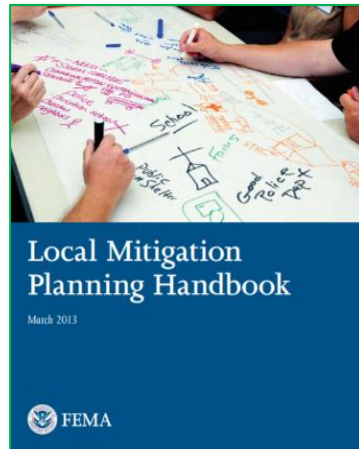
The planning process included a complete review of the Orange Hazard Mitigation Plan 2017 for updates, development changes, and accomplishments. The team worked with the planner to identify pertinent information from the reviewed documents; this information was then added to the appropriate place in the plan. Also, as noted in the bibliography and footnotes throughout the plan, many other documents were used to create this mitigation plan. Some, but not all, of those plans and documents are listed below:

The Orange Hazard Mitigation Plan 2017 .....	Compare & Contrast
Orange Master Plan (2014) .....	Community Information
Orange Annual Reports (2020) .....	Fire Report & Development
Other Hazard Mitigation Plans (Landaff, Pittsburg & Enfield) .....	Formats & Mitigation Ideas
The Orange Subdivision Regulations (2017) .....	New Development Regulations
The Orange Site Plan Review Regulations (2017) .....	Commercial Regulations
The Orange Zoning Ordinance (2018) .....	Zoning Regulations
Census 2020 Data .....	Population Data
The NH DRA Summary of Inventory of Valuation MS-1 2020 for Orange .....	Structure Evaluation
The Economic & Labor Market Information Bureau Community Profile .....	Population Trends
The American Community Survey (ACS 2016-2020) .....	Population Trends
Mitigation Ideas, FEMA, January 2013 .....	Mitigation Strategies
The Department of Cultural & Natural Resources (DNCR) .....	DNCR Fire Report
The NH Bureau of Economic Affairs (BEA) .....	Flood Losses
Property Tax Valuation (Department of Revenue Administration) .....	Property Information

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



[https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas\\_02-13-2013.pdf](https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf)



[https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook\\_03-2013.pdf](https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf)

## **G. HAZARD MITIGATION GOALS**

Before identifying new mitigation action items, the team reviewed and agreed to the goals in the State of New Hampshire Multi-Hazard Mitigation Plan Update 2018. These goals are detailed below.

### OVERARCHING GOALS

The following are the five overarching goals of this plan:

- *Minimize loss and disruption of human life, property, the environment, and the economy due to natural, technological, and human-caused hazards through a coordinated and collaborative effort between federal, state, and local authorities to implement appropriate hazard mitigation measures.*
- *Enhance the protection of the general population, citizens, and community guests before, during, and after a hazard event through public education about disaster preparedness and resilience and expanded awareness of the threats and hazards that face the community.*
- *Promote continued comprehensive hazard mitigation planning at local levels to identify, introduce, and implement cost-effective hazard mitigation measures.*
- *Address the challenges posed by climate change related to the increased risk and impacts of the hazards identified within this plan.*
- *Strengthen Continuity of Operations and Continuity of Government at the local level to ensure the continuation of essential services.*

### NATURAL HAZARD OBJECTIVES

- *Reduce long-term flood risks through assessment, identification, and strategic mitigation of at-risk or vulnerable infrastructure (dams, stream crossings, roadways, coastal levees, etc.).*
- *Minimize illnesses and deaths related to events that threaten human and animal health.*
- *Assist communities with plan development, outreach, and public education to reduce the impact of natural disasters.*
- *Ensure mitigation strategies consider the protection and resiliency of natural, historical, and cultural resources.*

### TECHNOLOGICAL HAZARD OBJECTIVES

- *Ensure technological hazards are responded to appropriately and mitigate the effect on citizens.*
- *Build upon state and local capabilities to identify and respond to emerging contaminants.*
- *Effectively collaborate between federal, state, and local agencies and private partners, Non-Governmental Organizations (NGOs), and Volunteer Organizations Active in Disaster (VOADs).*




- Enhance public education about technological hazards to prevent and mitigate hazard impacts on the population.
- Ensure hazardous material (HazMat) teams are adequately equipped and trained to respond, contain, and mitigate incidents involving technological hazards.
- Reduce the possibility of long-term utility outages by planning, training, and exercising on utility failure events.
- Lessen the effects of technological hazards on communications infrastructure by building more resilient voice and data systems.

**HUMAN-CAUSED HAZARD OBJECTIVES**

- Ensure grant-related funding processes allow for reasonable and practical actions at the community and state levels.
- Identify Critical Infrastructure & Key Resources (CIKR) risks or vulnerabilities and protect or harden infrastructure against hazards.
- Improve the ability to respond to and mitigate Cyber Events through increased training, exercising, improved equipment, and utilizing the latest technologies.
- Foster collaboration between federal, state, and local agencies on training, exercising, and preparing for mass casualty incidents and terrorism.
- Ensure that state and community assets (i.e., hospitals, state agencies, non-profits, universities, nursing homes, prisons, etc.) are prepared for all phases of emergency management, including training, reunification, and exercising.

**Did You Know?**



On average,  
**\$1** spent on **HAZARD MITIGATION**  
provides the **NATION** approximately **\$4** IN FUTURE BENEFITS

Money spent on reducing the risk of natural hazards is a wise investment. FEMA administers three grant programs that provide funding for eligible mitigation planning and projects: the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) Program, and the Pre-Disaster Mitigation (PDM) Program.

FEMA E-Brief, April 12, 2017

**H. HAZARD MITIGATION PLANNING PROCESS & METHODOLOGY**

The planning process consisted of twelve steps; some were accomplished independently, while others were interdependent. Many factors affected the planning process's sequence, such as the number of meetings, community preparation, attendance, and other community needs. The planning process resulted in significant crosstalk regarding natural, technological, and human-caused hazards.



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

**PLANNING STEPS**

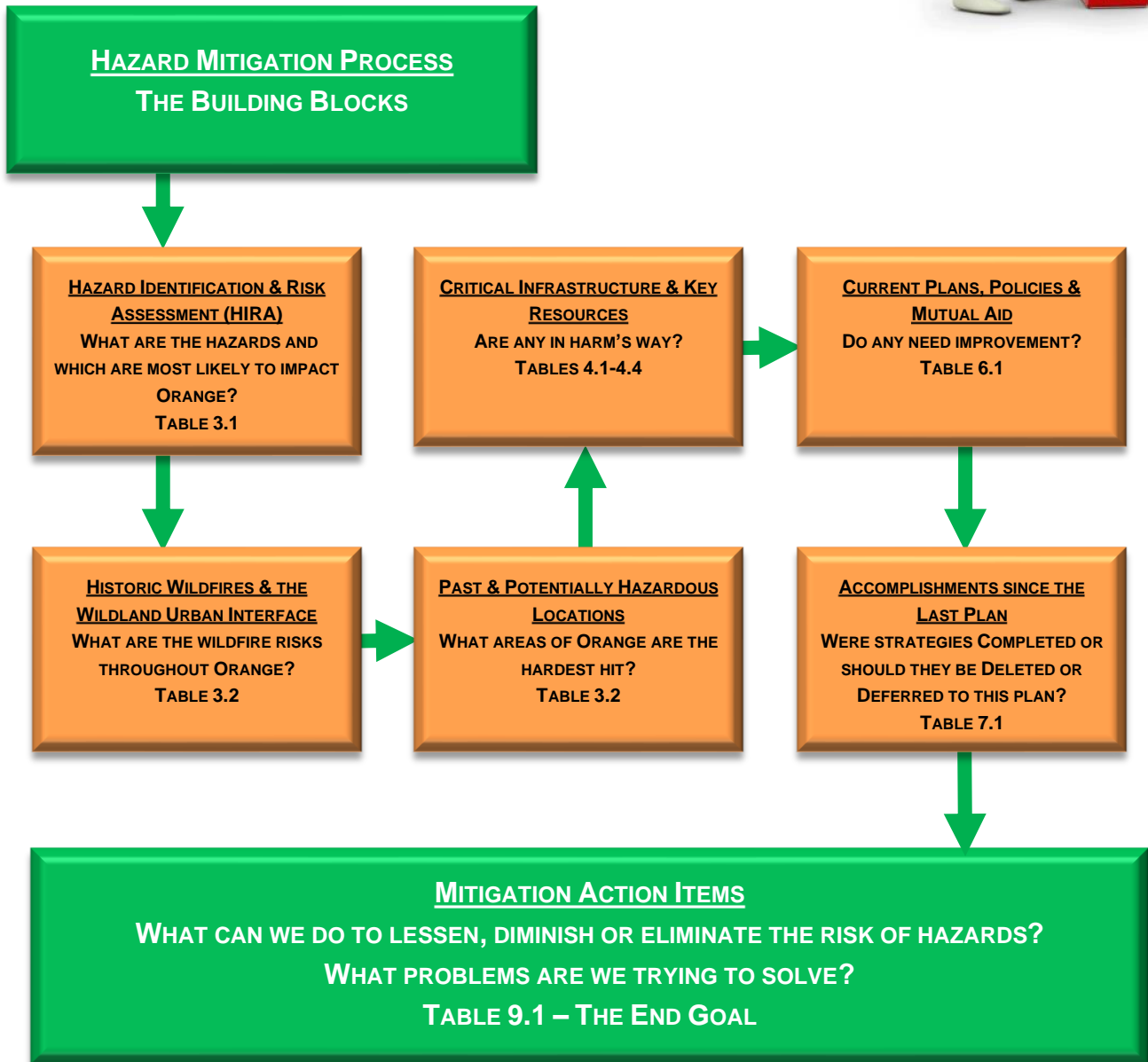
- Step 01: Team formation, orientation, and goals
- Step 02: Identify hazards and their risk and probability  
*Table 3.1 – Hazard Identification & Risk Assessment (HIRA)*
- Step 03: Profile and list historic and potential hazards  
*Table 3.2 – Historic Hazard Identification*
- Step 04: Profile, list, and establish risk for Critical Infrastructure & Key Resources (CIKR)  
*Tables 4.1 to 4.4 – Critical Infrastructure & Key Resources*
- Step 05: Assess the community's participation in the National Flood Insurance Program (NFIP)  
*Chapter 3, Section D*
- Step 06: Prepare an introduction to the community, discuss emergency service capabilities and development trends, and review statistical information about the town  
*Chapter 2, Sections A, B, and C & Table 2.1, Town Statistics*
- Step 07: Review current plans, policies, and mutual aid and brainstorm to identify improvements  
*Table 6.1 – Current Plans, Policies & Mutual Aid*
- Step 08: Examine the status of the mitigation action items from the last plan  
*Table 7.1 – Accomplishments since the last Plan*
- 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 an action plan  
*Table 9.1 – The Mitigation Action Plan*
- Step 11: Review the plan before submission to HSEM for APA (Approved Pending Adoption)
- Step 12: Adopt and monitor the plan



**I. HAZARD MITIGATION BUILDING BLOCKS & TABLES**

The foundation for this mitigation plan was the previous plan; each completed table had its starting point with the last hazard mitigation plan completed by the community.

Using a building block approach, each table led to the next table. The final goal was to develop prioritized action items that would lessen or diminish the impact of natural hazards on the town when put into an action plan.



**J. NARRATIVE DESCRIPTION OF THE PROCESS**

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

The planning process included a complete Orange Hazard Mitigation Plan 2017 review. Using the 2017 plan as a base, each element of the old plan was examined and revised to reflect changes that had taken place in development and the priorities of the community. Also, referring to the 2017 plan, strategies from the past were reassessed and improved upon for the future.

The following narrative explains how the Orange Hazard Mitigation Plan 2017 was used during each step of the planning process to make revisions that resulted in this plan.

**MEETING 1, APRIL 12, 2021**

The first virtual meeting of the Orange Hazard Mitigation Planning Team (HMPT) was held on April 14, 2021. Meeting attendance included Aaron Allen (Select Board), Donald McFarlane (Planning Board), Scott Sanborn (Road Agent), Judith Lindahl (Landowner), Dorothy Heinrichs (Select Board Chair), Doug Weekes (Health Officer & Building Inspector), Trish Weekes (Citizen), Olin Garneau (Mapping and Planning Solutions), and June Garneau (Mapping & Planning Solutions).

To introduce the team to the planning process, the planner reviewed the evolution of hazard mitigation plans, the funding, the 12-step process, the collaboration with other agencies, and the goals. The planner also explained the need to sign in, track time, and provide public notice to encourage community involvement. Prior to the meeting, the planner sent these documents to the team.

Work then began on *Table 2.1, Town Statistics*. The planner explained that this table would provide a snapshot of the community and includes data needed to write the plan.

Most of the work on Table 2.1 was completed at the meeting; a few items would be determined later. There was a discussion about the seasonal population change in Orange with summer and winter visitors. It was determined that Orange does see a significant influx of seasonal tourists, primarily due to visitors to Cardigan Mountain.

Due to much discussion about the planning process and town statistics, no further work was completed at this meeting. The planner explained what would occur at the following meeting, and a date was set for May 10, 2021.

**Meeting 1 – April 12, 2021**

- 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 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
- 5) Homework**
  - a) Homework – Critical Infrastructure & Key Resources
  - b) Digital Photos – contributions welcome
- 6) Future Meetings**
  - a) Monday, May 10, 2021 @ 7:00 PM
  - b) Monday, June 14, 2021 @ 7:00 PM
  - c) Monday, July 12, 2021 @ 7:00 PM

**MEETING 2, MAY 10, 2021**

Meeting attendance included Aaron Allen, Donald McFarlane, Judith Lindahl, Dorothy Heinrichs, Doug Weekes, Trish Weekes, Kip Riley (Citizen), Hilary Rogers (Citizen), Karen McFarlane (Citizen), Olin Garneau, and June Garneau.

The meeting began with a review of *Table 2.1, Town Statistics*, to ensure that the town data was accurate; a few changes were made to the information the town determined.

Next on the agenda were hazard identification and the completion of *Table 3.1, Hazard Identification & Risk Assessment (HIRA)*. The team assessed which hazards could affect the community using the town’s last HMP and the State of New Hampshire Multi-Hazard Mitigation Plan Update 2018. 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 ..... What is the probability of death or injury?
- The Property Impact ..... What is the probability of physical losses and damages?
- The Business Impact ..... What is the probability of the interruption of service?
- The Probability ..... What is the likelihood of this occurring within 25 years?

The rankings were then calculated to reveal the hazards which pose the most significant risks to the community. Eleven natural hazards, four technological hazards, and four human-caused hazards were identified. After analyzing these hazards in *Table 3.1, Severe Winter Weather, Wildfires, Inland Flooding, and Drought* were designated high-risk hazards.

Having completed *Table 3.1*, the team started working on descriptions of each hazard and how they could impact the community. To gain more knowledge of these hazards' impact, the planner asked the team to describe each hazard as it relates explicitly to Orange. 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 the loss of life?*
- *Are the elderly and functional needs populations 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 mitigation actions can we take to eliminate the hazards or diminish their impact?*

**Meeting 2 – May 10, 2021**

**1) Last Meeting**

- a) Reviewed planning process, purpose, funding & collaboration.
- b) Reviewed of community involvement and stakeholders
- c) Worked on Town Statistics
- d) Worked Hazard Identification & Risk Assessment (HIRA)

**2) Today’s Topics**

- a) Review....
  - i) Table 2.1, Town Statistics
- b) Work on....
  - i) Table 3.1, Hazard Identification & Risk Assessment (HIRA)
  - ii) Hazard Descriptions
  - iii) Tables 4.1-4.4, Critical Infrastructure & Key Resources
  - iv) Table 3.2, Historic Hazard Identification (time allowing)

**3) Homework**

- a) Review materials sent by MAPS
- b) Digital Photos – contributions welcome

**4) Future Meetings**

- a) Monday, June 14, 2021 @ 7:00 PM
- b) Monday, July 12, 2021 @ 7:00 PM

In addition to bringing more awareness to the hazards, these questions helped further analyze the identified hazards' impact. The planner noted that these descriptions would be used in Chapter 5.

With time running out before the hazard descriptions were completed, the planner advised the team that the remaining hazard descriptions would be completed at the next meeting. The planner thanked the team for their work and requested that the Road Agent prepare a list of road, culvert, and other drainage projects that would need to be

completed within the next five years. The planner also asked the team to think about Critical Infrastructure & Key Resources (CIKR) and past events that have affected the town. The next meeting was scheduled for Monday, June 14, 2021.

**MEETING 3, JUNE 14, 2021**

Meeting attendance included Aaron Allen, Donald McFarlane, Scott Sanborn, Judith Lindahl, Dorothy Heinrichs, Doug Weekes, Kip Riley, Trish Weekes, Hilary Rogers, Kayla Henderson (NH Homeland Security & Emergency Management), Olin Garneau, and June Garneau.

First, the team reviewed Table 3.1 again for accuracy. Some considerable time was taken, and a few changes were made. Next on the agenda was the continued work of the hazard descriptions started at the previous meeting.

With time running out, the planner reviewed the next meeting’s agenda and thanked the team. The next meeting was set for July 12, 2021.

**MEETING 4 – JULY 12, 2021**

Meeting attendance included Dorothy Heinrichs, Kip Riley, Olin Garneau, and June Garneau.

First, on the agenda, the planner reviewed *Table 3.1, Hazard Identification & Risk Assessment (HIRA)*, to ensure the team felt the hazards were in the correct order for the town; no changes were made. Work then continued on the hazard descriptions until they were completed.

The team reviewed table 3.2, Historic Hazard Identification, and Tables 4.1–4.4, Critical Infrastructure & Key Resources (CIKR). Due to light attendance at this meeting, the planner decided it was a good idea to review what would be coming up in future meetings and to adjourn the meeting. The next meeting was set for September 13, 2021.

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.

**Meeting 3 – June 14, 2021**

- 1) Last Meeting**
  - a) Reviewed....
    - i) Table 2.1, Town Statistics
  - b) Worked on....
    - i) Table 3.1, Hazard Identification & Risk Assessment (HIRA)
    - ii) Hazard Descriptions (did not finish)
- 2) Today’s Topics**
  - a) Review....
    - i) Table 3.1, Hazard Identification & Risk Assessment (HIRA)
  - b) Work on....
    - i) Hazard Descriptions
    - ii) Tables 4.1-4.4, Critical Infrastructure & Key Resources
    - iii) Table 3.2, Historic Hazard Identification (time allowing)
- 3) Homework**
  - a) Review materials sent by MAPS
  - b) Digital Photos – contributions welcome
- 4) Future Meetings**
  - a) Monday, July 12, 2021 @ 7:00 PM

**Meeting 4 – July 12, 2021**

- 1) Last Meeting**
  - a) Reviewed....
    - i) Table 3.1, Hazard Identification & Risk Assessment (HIRA)
  - b) Worked on....
    - i) Hazard Descriptions (did not finish)
- 2) Today’s Topics**
  - a) Review....
    - i) Table 3.1, Hazard Identification & Risk Assessment (HIRA)
  - b) Work on....
    - i) Hazard Descriptions
    - ii) Tables 4.1-4.4, Critical Infrastructure & Key Resources
    - iii) Table 3.2, Historic Hazard Identification (time allowing)
- 3) Homework**
  - a) Review materials sent by MAPS
  - b) Digital Photos – contributions welcome
- 4) Future Meetings**
  - a) \_\_\_\_\_

**MEETING 5 – SEPTEMBER 13, 2021**

Meeting attendance included Aaron Allen, Scott Sanborn, Dorothy Heinrichs, Doug Weeks, Kip Riley, Trish Weeks, Olin Garneau, and June Garneau.

First, the planner took the opportunity to explain the Wildland Urban Interface (WUI); this area is determined to be where the urban environment interfaces with the wildland environment and is the most wildfire-prone. The team also discussed town development and stated that an average of one new single-family home is built annually.

Being back in full force, the team returned to work on hazard descriptions as the next agenda item. The Road Agent was instrumental in creating detailed descriptions for writing Chapter 5. Much time was spent on the descriptions; Table 3.2 and Tables 4.1-4.4 were again tabled to the next meeting. The next meeting was set for October 25, 2021.

**MEETING 6 – OCTOBER 25, 2021**

Meeting attendance included Aaron Allen, Donald McFarlane, Dorothy Heinrichs, Doug Weeks, Kip Riley, Trish Weeks, Karen McFarlane, Olin Garneau, and June Garneau.

First on the agenda were *Tables 4.1–4.4, Critical Infrastructure & Key Resources (CIKR)*. The Emergency Response Facilities (ERFs), the Non-Emergency Response Facilities (NERFs), the Facilities & Populations to Protect (FPPs), and the Potential Resources (PRs) from the 2017 plan were examined. A few minor adjustments were made for this plan. The evacuation routes, helicopter landing zones, dams, and bridges on the evacuation routes were also identified. Lastly, each Critical Infrastructure & Key Resource was analyzed for its “Hazard Risk”.

Work began on Table 3.2, Historic Hazard Identification, which lists past and potentially hazardous locations or events. The team looked at the hazards listed in the last plan and determined which they would like to see kept in this plan. Then, the team examined the record of Major Disaster and Emergency Declarations that have taken place in recent years.

With time running out, the planner promised to forward work for team review. The next meeting was set for November 15, 2021.

**Meeting 5 – September 13, 2021**

**1) Last Meeting**

- a) Reviewed....
  - i) Table 3.1, Hazard Identification & Risk Assessment (HIRA)
- b) Finished....
  - i) Hazard Descriptions

**2) Today's Topics**

- a) Review....
  - i) Hazard Descriptions
- b) Work on....
  - i) Tables 4.1-4.4, Critical Infrastructure & Key Resources
  - ii) Table 3.2, Historic Hazard Identification

**3) Homework**

- a) Review materials sent by MAPS
- b) Digital Photos – contributions welcome

**4) Future Meetings**

- a) Monday, October 25, 2021 @ 7:00 PM
- b) Monday, November 8, 2021 @ 7:00 PM

**Meeting 6 – October 25, 2021**

**1) Last Meeting**

- a) Discussed....
  - i) Wildland Urban Interface (WUI)
  - ii) Development
- b) Finished....
  - i) Hazard Descriptions

**2) Today's Topics**

- a) Work on....
  - i) Tables 4.1-4.4, Critical Infrastructure & Key Resources
  - ii) Table 3.2, Historic Hazard Identification

**3) Homework**

- a) Review materials sent by MAPS
- b) Digital Photos – contributions welcome

**4) Future Meetings**

- a) Monday, November 8, 2021 @ 7:00 PM

**MEETING 7 – NOVEMBER 15, 2021**

Meeting attendance included Aaron Allen, Donald McFarlane, Dorothy Heinrichs, Doug Weeks, Kip Riley, Olin Garneau, and June Garneau.

First on the agenda, the planner reviewed the work done at the last meeting, including reviewing *Table 3.2, Hazard Identification*, and *Tables 4.1-4.4, Critical Infrastructure & Key Resources*; no changes were made.

The team then began working on *Table 6.1, Current Plans, Policies & Mutual Aid*; like other tables, this table was pre-populated with information from the 2017 plan. Looking closely at the existing policies from the last plan and the current mechanisms in place, the team determined if each plan, policy, or mutual aid system should be designated as “No Improvements Needed” or “Improvements Needed” based on the “Key to Effectiveness” found in Chapter 6. It was explained that those items needing improvement would be deferred or carried over to become new action items for this plan. These new action items will be discussed again and prioritized in our final table, *Table 9.1, The Mitigation Action Plan*.

*Table 7.1, Accomplishments since the Last Plan*, also pre-populated with data from the 2017 plan, was the next agenda item. The planner led the team through each strategy to determine which of these was “Completed,” should be “Deleted,” or should be “Deferred” as a new mitigation action item. Several action items from the 2017 plan had been completed or partially completed. Some were deleted as they were no longer useful or considered emergency preparedness, while others were deferred or carried over for consideration as new action items for this plan.

The planner adjourned the meeting and promised to write statements supporting the concepts and ideas in Tables 6.1 and 7.1. The next meeting was scheduled for January 10, 2021.

**MEETING 8 – JANUARY 10, 2022**

Meeting attendance included Dorothy Heinrichs, Doug Weeks, Kip Riley, Olin Garneau, and June Garneau.

To begin the meeting, the planner walked the team through a review of Tables 6.1 and 7.1. Having translated her notes from the last meeting into paragraphs, the planner reviewed each item in these tables to see if the team's concepts and ideas remained intact and to verify the information's accuracy. Table 6.1 was a quick review with very few changes. A few changes were made in the review of Table 7.1, leaving four additional items from Table 7.1 (not also in Table 6.1) deferred to become a new mitigation action item for this plan. Although several strategies from the last plan were determined to be emergency preparedness and not mitigation, they were kept in the plan as reminders to complete these essential action items.

**Meeting 7 – November 15, 2021**

**1) Last Meeting**

- a) Worked on....
  - i) Tables 4.1-4.4, Critical Infrastructure & Key Resources
  - ii) Table 3.2, Historic Hazard Identification

**2) Today's Topics**

- a) Review....
  - i) Tables 4.1-4.4, Critical Infrastructure & Key Resources
  - ii) Table 3.2, Historic Hazard Identification
- b) Work on....
  - i) Table 6.1, Current Plans, Policies & Mutual Aid
  - ii) Table 7.1, Past Hazard Mitigation Plan Assessment

**3) Homework**

- a) Review materials sent by MAPS
- b) Digital Photos – contributions welcome

**4) Future Meetings**

- a) Monday, January 10, 2021 @ 7:00 PM



The meeting also included an overall recap of the work already done. The recap included a brief look at each of the following completed tables:

- *Table 2.1 – Town Statistics*
- *Table 3.1 – Hazard Identification & Risk Assessment (HIRA)*
- *Table 3.2 – Historic Hazard Identification*
- *Tables 4.1-4.4 – Critical Infrastructure & Key Resources*
- *Table 6.1 – Current Plans, Policies & Mutual Aid*

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*.

The team then reviewed additional potential action items. Sections of one of those sources, the FEMA document [Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards](#), January 2013, can be found in Chapter 12, Appendix F. Other mitigation strategies were also shown to the team; these included mitigation strategies derived from FEMA, HSEM, and other hazard mitigation plans and can be found in Chapter 8, Sections A & B.

Next, the team began work on Tables 8.1 and Table 9.1. The planner explained that these tables were combined for the meeting but would become separate tables in the final plan. The planner also explained that these tables had been pre-populated with the action items from Tables 6.1 and 7.1. The team looked carefully at each action item to assign responsibility, the time frame for completion, the type of funding required, and the action's estimated cost (see Chapter 9, Section B).

Work on this table included the STAPLEE process, as explained in Chapter 8. Referring to this explanation, the team examined each identified action item to determine any issues or pushback that might result. Most importantly, the STAPLEE process enabled the team to consider the cost-benefit of each action item. The STAPLEE analysis would later become *Table 8.1, Potential Mitigation Action Items & the STAPLEE*.

Although Tables 8.1 and 9.1 were mainly completed, a few action items remained for the next meeting. Also, the ranking and prioritizing of each action item were yet to be completed. The planner explained what would occur at the next meeting and adjourned the meeting.

The next meeting was scheduled for January 31, 2022.

**Meeting 8 – January 10, 2022**

**1) Last Meeting**

- a) Reviewed....
  - i) Tables 4.1-4.4, Critical Infrastructure & Key Resources
  - ii) Table 3.2, Historic Hazard Identification
- b) Worked on....
  - i) Table 6.1, Current Plans, Policies & Mutual Aid
  - ii) Table 7.1, Past Hazard Mitigation Plan Assessment

**2) Today's Topics**

- a) Review....
  - i) Table 6.1, Current Plans, Policies & Mutual Aid
  - ii) Table 7.1, Past Hazard Mitigation Plan Assessment
- b) Work on....
  - i) Table 9.1, Mitigation Action Plan
  - ii) STAPLEE

**3) Homework**

- a) Review materials sent by MAPS
- b) Digital Photos – contributions welcome

**4) Future Meetings**

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

**Link to explore:**

**FEMA Mitigation Ideas**

[https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas\\_02-13-2013.pdf](https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf)

**MEETING 8 – JANUARY 31, 2022**

Meeting attendance included Aaron Allen, Donald McFarlane, Dorothy Heinrichs, Doug Weeks, Kip Riley, Trish Weeks, Karen McFarlane, Olin Garneau, and June Garneau.

The meeting began where we had left off in Tables 9.1 and 8.1. After each strategy from Tables 6.1 & 7.1 was considered, the team considered additional mitigation items, some the planner had suggested from other plans and others discussed earlier. After discussion and careful review, the team ultimately settled on twenty-two “Mitigation Action Items” that they felt were achievable and could diminish the impact of natural hazards in the future.

Once the mitigation action items were determined and the STAPLEE was completed, the team was ready to rank and prioritize. The planner had pre-ranked the action items based on the time frame, the town’s authority to accomplish the strategy, the type of strategy, and the STAPLEE score. As shown in Chapter 9, Section A, they were placed in four categories. Then, within each rank, the team assigned a priority. For example, if seven action items were ranked in category “A”, the priority rank was A-1 through A-7. In this fashion, the team determined which action items were the most important within their rankings and in what order they would be accomplished.

The team’s work was finished, except for the final review, with Tables 8.1 and 9.1 completed. No additional meetings were scheduled. The planner agreed to put the final “draft” plan together and email a copy for the team’s review. The planner explained the process from this point forward and thanked the team for their hard work.



*Damage from the July 2017 storm  
Cardigan Mountain Road  
Photo Credit: The Town of Orange*



## Chapter 2: Community Profile

### A. INTRODUCTION

Orange is a beautiful community in Grafton County in the west-central part of New Hampshire. Orange borders Groton to the north, Alexandria to the east, Grafton to the south, and Canaan to the west. Orange is located in the foothills of the White Mountains of New Hampshire and is within the Dartmouth-Lake Sunapee Tourism Region. Orange is small, rural, and heavily forested. It is a hidden gem, off the beaten track and away from major roadways. It is also the home of Mount Cardigan State Park.



### TOWN GOVERNMENT

A three-member Select Board governs the Town of Orange. The town’s departments include, but are not limited to, the Select Board, the Planning Board, the Zoning Board of Adjustments, and a Road Agent. The largest employer in Orange is FC Hammond & Sons, with 14 employees. There are no large business establishments in Orange.

### DEMOGRAPHICS & HOUSING

Orange’s population has increased from 237 in 1990 to 277 in 2020, showing an increase of 40 according to the US Census 2020.<sup>4</sup> This data represents a growth rate of approximately 16.9%.

There are an estimated 158 housing units, most of which are occupied (128), while vacant housing units total 30, thus confirming the presence of second homes.<sup>5</sup> The estimated median household income is \$95,417, and the median age is 40.6 years.<sup>6</sup>

### EDUCATION & CHILD CARE

There are no schools, daycares, colleges, or universities in Orange. Students in all grades K-4 attend Canaan Elementary School, students in grades 5-8 attend Indian River School, and students in grades 9-12 attend the Mascoma Valley Reginal High School, all in Canaan.

**Incorporated:** 1790

**Origin:** This township was chartered by Governor John Wentworth in 1769 as Cardigan, a name that had been used for some time. In 1779, residents petitioned for incorporation so taxes could be collected, and requested a name change to Bradford or Warwick. The petition failed, and in 1783 a second petition was made, with a request to name the town Middleton. That petition failed also, and a third petition was made in 1789, with a request to name the town Liscomb. The name Liscomb was subsequently crossed out and replaced with Orange in the 1790 incorporation document. Orange was probably chosen because of the large quantities of yellow-orange ochre found in Mount Cardigan.

**Villages and Place Names:** unknown

**Population, Year of the First Census Taken:** 131 residents in 1790

**Population Trends:** Population change for Orange totaled 85 over 41 years, from 197 in 1980 to 282 in 2021. The largest decennial percent change was a 26 percent increase between 1990 and 2000. The 2021 Census estimate for Orange was 282 residents, which ranked 229th among New Hampshire’s incorporated cities and towns.

**Population Density and Land Area, 2021 (US Census Bureau):** 12.2 persons per square mile of land area. Orange contains 23.1 square miles of land area and 0 square miles of inland water area.

*Source: Economic & Labor Market Information Bureau, NH Employment Security, October 2022, Received 6/6/2022*

<sup>4</sup> US Census 2020, Table P1, Decennial Census

<sup>5</sup> US Census 2020, Table H1, Decennial Census

<sup>6</sup> US Census 2020, Table S0101, American Community Survey, 5-year estimate, 2017-2021

**NATURAL FEATURES**

Orange covers approximately 23.1 square miles of land area and 0 square miles of inland water. The community is dominated by the mountains, rivers, and streams of central New Hampshire. The lowest elevation in town is 1,216' above sea level. The highest peak is Mount Cardigan, at 3,155' above sea level.

Vegetation is typical of New England, including deciduous and conifer forests, open fields, swamps, and riverine areas. The terrain lends itself to abundant small ponds, streams, and rivers, most notably Orange Brook and Number Seven Brook on the south side of Mount Cardigan and the South Branch Baker River and Atwell Brook on the north side.

**TRANSPORTATION**

A small portion of US Route 4 runs through the southwestern part of Orange. Cardigan Mountain Road, which is managed by the state, runs from Canaan in the east to the park's visitor parking lot. Approximately twelve miles of Class V (town-owned) roads are in Orange. These include:

Peaslee Road (paved)	Town House Road (gravel)	Washburn Hill Road (gravel)
Williams Road (gravel)	Tuttle Hill Road (gravel & paved)	Wheeler Road (paved)
New Colony Road (paved)	Cross Road (gravel)	Pike Road (paved)
Tug Mountain Road (gravel)	Burnt Hill Road (gravel)	Morrill Way (gravel)
Eastman Road (paved)	River Road (gravel)	
Williams Road (gravel)	Brock Hill Road (gravel)	

Orange's roadways are narrow, winding, and lightly traveled. Tuttle Hill Road, Burnt Hill Road, Cross Road, Cardigan Mountain Road, and US Route 4 are the designated evacuation routes.

***B. EMERGENCY SERVICES***

**EMERGENCY OPERATIONS CENTER & EMERGENCY MANAGEMENT DIRECTOR**

The Town of Orange has a designated Emergency Management Director (EMD). The EMD maintains an Emergency Operations Center (EOC) as part of the town's emergency preparedness program. The EOC is where the EMD, department heads, government officials, and volunteer agencies gather to coordinate their response to a significant emergency or disaster. In Orange, the designated EOC is the Town House, although the EMD's vehicle may be used.

**FIRE DEPARTMENT & EMS**

The Canaan Fire Department and Canaan Medical Services provide quality fire and emergency medical services to the residents and visitors of Orange 24 hours a day, 365 days a year. The Canaan Fire Department staffs a full-time Chief and twenty-five paid-on-call firefighters and operates one station in Canaan. Canaan Medical Services provides emergency medical treatment and transportation. The Canaan Fire Department participates with the Upper Valley Regional Emergency Services Association (URESAs) and other area departments.

**LAW ENFORCEMENT**

Orange does not have a Police Department. The NH State Police handle law enforcement out of Troop F in Twin Mountain. Troop F is self-dispatching upon notification of an emergency.

**ROAD AGENT**

The Orange Road Agent will respond to the community's needs on a year-round, 24-hour basis. The Road Agent strives to support the citizens of Orange through the safe operation, proper maintenance, and future development of roadways and supporting infrastructure cost-consciously without sacrificing quality. The department belongs to the NH Public Works Mutual Aid Association.

**MEDICAL FACILITIES**

Orange's closest medical facility is Dartmouth-Hitchcock Medical Center in Lebanon (19 miles, 396 beds). Alternative medical facilities are Alice Peck Day Memorial Hospital in Lebanon (17 miles, 25 beds) and Speare Memorial Hospital in Plymouth (27 miles, 25 beds).

**EMERGENCY SHELTER(S)**

The primary shelter is where evacuees are directed during an emergency. In Orange, the designated primary shelter is the Town House, which offers a sleeping area and bathroom facilities. The Town House has a permanent generator to keep the building operational during power outages. A secondary shelter for the town has not been designated.

***C. ORANGE'S CURRENT & FUTURE DEVELOPMENT TRENDS***

Since the pandemic's beginning in 2020, development in New England has undergone several changes. One of the most significant changes was occasionally used homes modified as permanent residents for those wishing to flee the cities. Lot line adjustments and minor subdivisions were also quite common. Then, the real estate boomed, at least during 2021 and through most of 2022, only to settle to more moderate levels by the fall.

In Orange, development has been slow but well-regulated. According to City-Data.com (see right)<sup>7</sup>, an average of one new single-family home has been constructed annually over the past 16 years. The Orange Planning Board's process for all subdivision and site plan applications includes the expertise of other departments and commissions as appropriate. Regulations are designed to ensure they meet state and local regulations and maintain the community's local character. Orange's regulations address wetland areas, stormwater flow, and fire protection. Regulations require all large subdivisions and commercial enterprises to address water availability, and the planning mechanisms that are in place require adequate fire protection to be installed. All development that has

**Single-family New Home Construction Permits**

- 1997: 2 buildings, average cost: \$91,700
- 1998: 2 buildings, average cost: \$120,200
- 1999: 1 building, cost: \$100,300
- 2000: 1 building, cost: \$78,000
- 2001: 3 buildings, average cost: \$121,400
- 2002: 3 buildings, average cost: \$121,400
- 2003: 1 building, cost: \$50,000
- 2004: 1 building, cost: \$50,000
- 2005: 1 building, cost: \$50,000
- 2006: 1 building, cost: \$50,000
- 2007: 1 building, cost: \$181,200
- 2008: 1 building, cost: \$200,000
- 2013: 1 building, cost: \$100,000
- 2014: 1 building, cost: \$211,200
- 2016: 1 building, cost: \$246,000
- 2017: 1 building, cost: \$248,100
- 2018: 1 building, cost: \$249,800
- 2019: 1 building, cost: \$282,200

<sup>7</sup> <https://www.city-data.com/city/Orange-New-Hampshire.html>

occurred or is proposed in hazard-prone areas has been closely monitored and mitigated to reduce the town's hazard vulnerability. No new development has increased Orange's hazard risk.

The town recognizes the importance of growth and understands the impact of hazards on new facilities and homes if built within the community's hazard-prone areas. The Planning Board, the Building Inspector, and the Select Board will monitor and guide growth and development using the Master Plan, Subdivision Regulations, the Site Plan Review process, and the Zoning Ordinance. Building permits are required.

As a community with a population of less than 300, the Building Inspector, the Planning Board, the Select Board, and other town officials are almost always aware of construction that is taking place. The Planning Board will follow town regulations to ensure that any construction in hazardous areas will be built to minimize vulnerability to the hazards identified in this plan.

**TABLE 2.1: TOWN STATISTICS**

Table 2.1 - Town Statistics				
Census Population Data	2020	2010	2000	1990
Orange, NH - Census Population Data	277	331	299	237
Grafton County	91,118	89,118	81,826	74,998
Elderly Population-% over 65 (2021 ACS 5-year)	19.9%			
Median Age (2021 ACS 5-year)	40.6			
Median Household Income (2021 ACS 5-year)	\$95,417			
Individuals below the poverty level (2021 ACS 5-year)	9.4%			
Change in Population-Summer Weekends (%)	300% or more on summer weekends, including visitors to Cardigan Mountain State Park			
Change in Population-Winter Weekends (%)	20% for hiking and skiing			
Housing Statistics (ACS 2015-2019)				
Total Housing Units	158			
Occupied Housing Units	128			
Vacant Housing Units	30			
Assessed Structure Value (2020-MS1)	Value	1% Damage	5% Damage	
Residential	\$20,780,900	\$207,809	\$1,039,045	
Manufactured Housing	\$1,010,900	\$10,109	\$50,545	
Commercial	\$409,600	\$4,096	\$20,480	
Discretionary Preservation Easement	\$0	\$0	\$0	
Tax Exempt	\$205,000	\$2,050	\$10,250	
Utilities	\$975,200	\$9,752	\$48,760	
Totals	\$23,381,600	\$233,816	\$1,169,080	
The assessed Structure Value chart shows the 2020 MS1 structure values, which were provided by the town on 4/13/21. These values estimate structure loss due to natural hazards (see Chapter 5) based on a loss of 0-1% or 1-5% of structures.				

<b>Table 2.1 - Town Statistics</b>	
<b>Regional Coordination</b>	
<i>County</i>	Grafton
<i>Tourism Region</i>	Dartmouth-Lake Sunapee
<b>Municipal Services &amp; Government</b>	
<i>Town Manager or Administrator</i>	No
<i>Select Board (3 member)</i>	Yes, elected
<i>Planning Board</i>	Yes, elected
<i>School Board</i>	Yes, an Orange representative is on Mascoma School Board
<i>Zoning Board of Adjustment</i>	Yes, appointed
<i>Conservation Committee</i>	Yes, appointed
<i>Master Plan</i>	Yes, 2014
<i>Emergency Operation Plan (EOP)</i>	Yes, 2012
<i>Hazard Mitigation Plan (HMP)</i>	Yes, February 22, 2017
<i>Zoning Ordinances</i>	Yes, 2018
<i>Subdivisions Regulations</i>	Yes, 2017
<i>Site Plan Review Regulations</i>	Yes, 2017
<i>Capital Improvement Plan (CIP)</i>	No
<i>Capital Reserve Funds (CRF)</i>	Yes
<i>Building Permits Required</i>	Yes
<i>Town Web Site</i>	www.orangenh.us
<i>Floodplain Ordinance</i>	No
<i>Member of NFIP</i>	No
<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 - 2021 (NH Department of Revenue)</b>	
<i>Residential Buildings</i>	93.9%
<i>Commercial Land &amp; Buildings</i>	1.8%
<i>Other (including Utilities)</i>	4.3%
<b>Emergency Services</b>	
<i>Town Emergency Warning System(s)</i>	CodeRED
<i>School Emergency Warning System(s)</i>	School Messenger
<i>Emergency Page</i>	No
<i>Facebook Pages &amp; Newsletter</i>	No
<i>Other social media</i>	No
<i>ListServ or Subscription Service</i>	Yes, informal list to send emails to residents
<i>Local Newspapers</i>	Valley News (internet-Lebanon)
<i>Public Access TV</i>	No
<i>Local TV Stations</i>	No

<b>Table 2.1 - Town Statistics</b>	
<i>Local Radio</i>	No
<i>Police Department</i>	No - NH State Police (Troop F)
<i>Police Dispatch</i>	Troop F Dispatch
<i>Police Mutual Aid</i>	Surrounding towns & Grafton County Sheriff's Office
<i>Animal Control Officer</i>	No
<i>Fire Department</i>	No - Served by the Canaan Fire Department
<i>Fire Dispatch</i>	Hanover Dispatch
<i>Fire Mutual Aid</i>	Upper Valley Regional Emergency Services Association (UVRESA)
<i>Fire Stations</i>	None
<i>Fire Wardens</i>	Yes
<i>Emergency Medical Services</i>	No - Served by Canaan Ambulance
<i>EMS Dispatch</i>	Hanover Dispatch
<i>Emergency Medical Transportation</i>	No - Served by Canaan Ambulance
<i>HazMat Team</i>	Midwestern Regional HazMat Team
<i>Established Emergency Management Director (EMD)</i>	Yes
<i>Established Deputy EMD</i>	Yes
<i>Line of Succession (should EMD be out of the area)</i>	1st.....Canaan Fire Chief
	2nd....Select Board Chair or designee
<i>Public Health Network</i>	Upper Valley Regional Public Health Network
<i>Health Officer</i>	Yes
<i>Deputy Health Officer</i>	No
<i>Building Inspector/Code Enforcement Officer</i>	Yes
<i>Established Public Information Officer (PIO)</i>	No
<i>Nearest Hospital(s)</i>	Alice Peck Day Memorial Hospital (17 miles, 25 beds)
	Dartmouth-Hitchcock Medical Center (19 miles, 396 beds)
	Speare Memorial Hospital (27 miles, 25 beds)
<i>Local Humane Society or Veterinarians</i>	Bristol Veterinary Hospital (Bristol), Stoney Brook Veterinary Hospital (Lebanon), Upper Valley Humane Society (Enfield), Saves (Lebanon), Cardigan Veterinary Clinic (Canaan)
<i>Primary EOC</i>	Town House (generator) or EMD's vehicle
<i>Secondary EOC</i>	Highway vehicle
<i>Primary Shelter</i>	Town House (generator)
<i>Secondary Shelter</i>	Not designated
<b>Utilities</b>	
<i>Town Sewer</i>	Private septic
<i>Road Agent</i>	Yes
<i>NH Public Works Mutual Aid</i>	Yes
<i>Water Supply</i>	Private wells

<b>Table 2.1 - Town Statistics</b>		
<i>Wastewater Treatment Plant</i>	No	
<i>Electric Supplier</i>	Granite State, NH Electric Coop (90% of the town), Eversource	
<i>Natural Gas Supplier</i>	None	
<i>Cellular Telephone Access</i>	Limited	
<i>Solar Arrays</i>	No public; 2 privates	
<i>Pipelines</i>	No	
<i>High-Speed Internet</i>	Limited	
<i>Telephone Company</i>	Consolidated Communications	
<b>Transportation</b>		
<i>Primary Evacuation Routes</i>	US Route 4, NH Route 118 (Canaan)	
<i>Secondary Evacuation Routes</i>	River Road (Millbrook in Grafton), Burnt Hill Road, Cardigan Mountain Road, Tuttle Hill Road, Orange Road, Brock Hill Road, Cross Road	
<i>Nearest Interstate</i>	I-89, Exit 17 (14 miles)	
<i>Nearest Airstrip</i>	Lebanon Municipal (5,496 ft. asphalt runway)	
<i>Nearest Commercial Airport(s)</i>	Manchester-Boston Regional Airport, Manchester (64 miles)	
	Logan International Airport, Boston, MA (114 miles)	
<i>Public Transportation</i>	No	
<i>Railroad</i>	No	
<b>Education &amp; Childcare</b>		
<i>Elementary School</i>	No, students attend Canaan Elementary School in Canaan	
<i>Middle School</i>	No, students attend Indian River School in Canaan	
<i>High School</i>	No, students attend Mascoma Valley Regional High School in Canaan	
<i>School Administrative Unit</i>	SAU 62	
<i>Private School</i>	No	
<i>Licensed Childcare Facilities</i>	No	
<b>Conserved Land as a Percent of Land in the Community (GIS Analysis; Conservation Files, Granit, UNH)</b>		
	<b>Square Miles</b>	<b>Percent of Town Land</b>
<i>Approximate Square Miles in Community</i>	23.10	100.0%
<i>Approximate Total Un-Conserved Land</i>	14.26	61.7%
<i>Approximate Total Conserved Land</i>	8.84	38.3%
<i>Municipal/County Land (1)</i>	0.02	0.1%
<i>Federal Owned Land (2)</i>	0.00	0.0%
<i>State Owned Land (3)</i>	7.76	33.6%
<i>Quasi Private (4)</i>	0.00	0.0%
<i>Private Land (5)</i>	1.05	4.6%

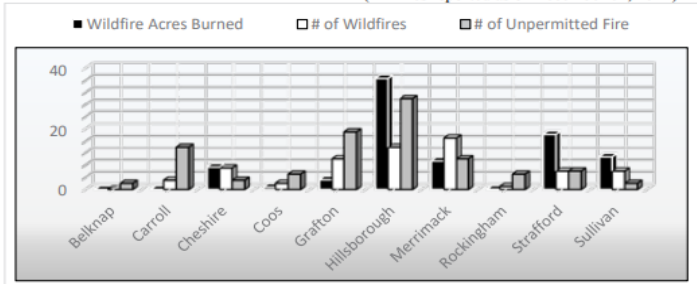


**Table 2.1 - Town Statistics**

**Fire Statistics (NH Division of Forests & Lands, Fire Warden Report)**

**2021 WILDLAND FIRE STATISTICS**

(All fires reported as of December 01, 2021)



\*Unpermitted fires which escape control are considered Wildfires.

Year	Number of Wildfires	Wildfire Acres Burned	Number of Unpermitted Fires*
2021	66	86	96
2020	113	89	165
2019	15	23.5	92
2018	53	46	91
2017	65	134	100

**CAUSES OF FIRES REPORTED**

(These numbers do not include the WMNF)

Arson	Debris Burning	Campfire	Children	Smoking	Railroad	Equipment	Lightning	Misc.*
1	81	25	0	7	1	4	2	41

\*Miscellaneous includes power lines, fireworks, electric fences, etc...

Unless otherwise noted, information in Table 2.1 was derived from the town, the US Census 2020, and the Economic & Labor Market Information Bureau, NH Employment Security, October 2022. Community Response Received 6/6/2022, <https://www.nhes.nh.gov/elmi/products/cp/profiles-pdf/orange.pdf>.



## Chapter 3: Hazard Identification, Risk Assessment & Probability

### A. HAZARD IDENTIFICATION

The first step in hazard mitigation is to identify hazards. The team determined that eleven natural hazards can potentially affect the community. *Table 3.1, Hazard Identification & Risk Assessment (HIRA)*, estimates the level of impact that each listed hazard could have on humans, property, and business and averages them to establish an index of severity. The probability estimate for each hazard is multiplied by its severity to establish an overall relative threat factor.

Some hazards in Table 3.1 include subcategories of hazards. For instance, Severe Winter Weather includes snowstorms, ice storms, blizzards, and nor'easters. In such instances<sup>8</sup>, the analysis included a discussion of the subcategories. However, ultimately, the final analysis was based on the category in general, as shown in Table 3.1. Subcategories are also discussed in Chapter 5.

The NH State Hazard Mitigation Plan includes many of the same potential hazards identified in Orange. However, the team excluded several of the state's hazards from this plan. These hazards, which scored a zero on the HIRA on page 35, include the following:

<u>State Hazard</u>	<u>Reason for exclusion from this plan</u>
Coastal Flooding .....	Distance away from the sea
Solar Storm & Space Weather .....	The team felt this was not something the town could manage
Avalanches .....	No known areas of avalanches
Radiological .....	Distance away from radiological sites
Conflagration .....	No known areas for a conflagration event

Specific hazards that have affected the town, the region, and the state in the past are detailed in *Table 3.2, Historic Hazard Identification*, and Chapter 5.

### B. RISK ASSESSMENT

The hazards listed in Table 3.1 were classified based on the "Relative Threat" score as calculated in Column F; these were then separated into three categories using Jenks Optimization, also known as the natural breaks classification<sup>9</sup>. The "Relative Threat" score was then labeled into three categories, *High Risk, Medium Risk, and Low Risk*, as shown in Table 3.1, Column G; these categories are also indicated in Chapter 5, Sections B-D. The plan demonstrates each hazard's likelihood of occurrence and its potential effect on the town. This process illustrates a comprehensive hazard statement and helps the town understand which hazards should receive the most attention.

In addition to the relative threat analysis in Table 3.1, the team used *Tables 4-1-4.4, Critical Infrastructure & Key Resources (CIKR)*, to identify and analyze the potential hazard risk based on a scale of 1-3 for each CIKR.

<sup>8</sup> Inland Flooding (Riverine, 100-year, local road flooding, ice jams, dam failure); Extreme Temperatures (hot & cold); High Wind Events (Tornadoes & Downbursts); Infectious Diseases (too many to list)  
<sup>9</sup> The natural breaks classification process is a method of manual data classification partitions data into classes based upon natural groups within the data distribution; ESRI, <http://support.esri.com/en/knowledgebase/GISDictionary/term/natural%20breaks%20classification>

**C. PROBABILITY**

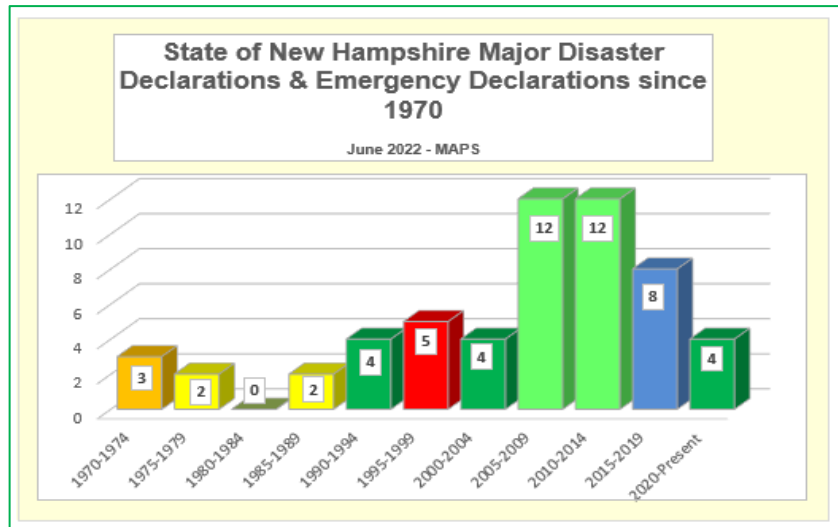
The determination of the probability of occurrence is contained within Column D in Table 3.1, which assesses hazards based on the likelihood that the hazards will occur within 25 years. The probability scores indicate whether the identified hazard has a *Very Low, Low, Moderate, High, or Very High* probability. Probability categories are also indicated in Chapter 5, Sections B-D.

Orange is reasonably safe from natural, technological, and human-caused hazards. However, due to Orange’s geographic location, within the mountains and valleys of Central NH, forested lands, hills, heavy snowpack, and topography, there is always a probability that future hazards will occur.

**HAZARD PROBABILITY & CLIMATE CHANGE**

Although not identified as a natural hazard in this plan, no plan can be considered complete without discussing climate change’s impact on weather patterns. *“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”*, FEMA stated in its State Mitigation Plan Review Guide<sup>10</sup>. FEMA recognizes climate change by including climate change in the hazard mitigation guide for state planners.

The chart to the right shows the increased frequency of Major Disaster Declarations (DR) and Emergency Declarations (EM) in New Hampshire, possibly indicating the impact of climate change.<sup>11</sup> The decade beginning in 2020 includes four disaster declarations: DR-4516 and EM-3445 (Covid-19), DR-4622 (Cheshire County), and DR-4624 (Cheshire and Sullivan Counties).



Communities in New Hampshire, such as Orange, should become increasingly aware of climate change’s impact on the hazards already experienced and anticipate an increase in probability in the future.

**HAZARD PROBABILITY COMBINED WITH LONG-TERM UTILITY OUTAGE**

Any potential disaster in Orange is particularly impactful if combined with a long-term utility outage, as would most likely be true with severe winter storms, blizzards, ice storms, hurricanes, tropical storms, and windstorms. An outage could result in frozen pipes and a lack of water and heat during the winter, a concern for the town’s elderly and vulnerable citizens. The food supply of individual citizens could become quickly depleted should a power failure last for a week or more. When combined with a long-term utility outage, any hazard’s effects could have a higher probability of damaging impacts on the community.

<sup>10</sup> State Mitigation Pan Review Guide, FEMA, Released March 2015, Effective March 2016, Section 3.2, page 13

<sup>11</sup> Derived from FEMA’s record of disasters; categorized by decade since 1970 by the planner; 2020-2029 includes Covid-19

**TABLE 3.1: HAZARD IDENTIFICATION & RISK ASSESSMENT (HIRA)**

Table 3.1 - Hazard Identification & Risk Assessment (HIRA)							
Scoring for Probability (Columns A, B & C)	Column A	Column B	Column C	Column D	Column E (A+B+C)/3	Column F D x E	Column G Risk
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	<b>High</b> 10.0-18.9
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	<b>Low</b> 0.0-4.9
5=Very High (81-100%)							
<b>Natural Hazards</b>							
1) Severe Winter Weather	3.00	4.00	4.00	5.00	3.67	18.33	<b>High</b>
2) Wildfires	4.00	4.00	2.00	4.00	3.33	13.33	<b>High</b>
3) Inland Flooding	1.00	5.00	5.00	3.00	3.67	11.00	<b>High</b>
4) Drought	2.00	3.00	1.00	5.00	2.00	10.00	<b>High</b>
5) Tropical & Post-Tropical Cyclones	2.00	4.00	3.00	3.00	3.00	9.00	<b>Medium</b>
6) Lightning & Hail	1.00	3.00	3.00	3.00	2.33	7.00	<b>Medium</b>
7) Extreme Temperatures	2.00	1.00	1.00	4.00	1.33	5.33	<b>Medium</b>
8) High Wind Events	1.00	2.00	2.00	3.00	1.67	5.00	<b>Medium</b>
9) Infectious Diseases	1.00	1.00	1.00	3.00	1.00	3.00	<b>Low</b>
10) Earthquakes	1.00	2.00	2.00	1.00	1.67	1.67	<b>Low</b>
11) Landslide & Erosion	1.00	1.00	1.00	1.00	1.00	1.00	<b>Low</b>
<b>Technological Hazards</b>							
1) Long Term Utility Outage	1.00	2.00	4.00	4.00	2.33	9.33	<b>Medium</b>
2) Aging Infrastructure	1.00	4.00	4.00	3.00	3.00	9.00	<b>Medium</b>
3) Known & Emerging Contaminants	2.00	1.00	1.00	3.00	1.33	4.00	<b>Low</b>
4) Hazardous Materials	1.00	1.00	1.00	2.00	1.00	2.00	<b>Low</b>
<b>Human-Caused Hazards</b>							
1) Cyber Events	1.00	1.00	3.00	3.00	1.67	5.00	<b>Medium</b>
2) Mass Casualty Incidents	3.00	1.00	1.00	2.00	1.67	3.33	<b>Low</b>
3) Transport Accidents	2.00	2.00	1.00	2.00	1.67	3.33	<b>Low</b>
4) Terrorism & Violence	3.00	2.00	1.00	1.00	2.00	2.00	<b>Low</b>

**D. NATIONAL FLOOD INSURANCE PROGRAM (NFIP) STATUS**

Two small areas, making up 41.37 acres, are located in the FEMA-designated Special Hazard Flood Zone. The areas are near Mirror Lake at the town line with Canaan and along a small portion of Orange Brook, also near the town line.

Orange is not a member of the National Flood Insurance Program and, therefore, has no policies in force and no repetitive losses. The town also does not have a Floodplain Ordinance. The most recent DFIRMS are dated February 20, 2008; the latest Flood Insurance Study (FIS) is also dated February 20, 2008.



As a very small and close-knit community, the Orange Select Board and the hazard mitigation planning team are almost always aware of new construction or substantial improvements in town. The team understands that if they were to join the NFIP in the future, the benefits of the NFIP would also extend to structures, even if they are not in the 100-year floodplain.

The town has decided not to be a member of the NFIP primarily because of two factors: 1) the size of the floodplain is minimal, and 2) flooding has not affected properties in the floodplain in the past. Unless a 1,000-year rain event occurs again, like the one in July 2019, there is little expectation that flooding will occur. The town will work with the Office of Strategic Initiatives if the decision is made to join the NFIP.

**TABLE 3.2: HISTORIC HAZARD IDENTIFICATION**

**Key for Table 3.2**

- 2017 HMPT** ..... 2017 Hazard Mitigation Planning Team
- 2024 HMPT** ..... 2024 Hazard Mitigation Planning Team
- DR** ..... Major Disaster Declarations (DR) since 1953
- EM** ..... Emergency Declarations (EM) since 1953
- FM** ..... Fire Management Assistance Declaration (FM) since 1953

**Table 3.2 includes the following sections:**

<b>A. Inland Flooding</b>	<b>D. Severe Winter Weather</b>	<b>G. Miscellaneous Hazards</b>
<b>B. Wildfires</b>	<b>E. Earthquakes</b>	<b>H. Other Hazards</b>
<b>C. High Wind Events</b>	<b>F. Drought</b>	

Type of Event	Date of Event	Location	Description	Source
<b>A. Inland flooding, including inland, riverine, heavy rainfall, rapid snowmelt, ice jam flooding, flooding due to dam failure, and 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. Flood events have the potential to impact the community on a townwide basis. No significant flooding events have occurred in Orange since July 2019.				
<b>Summary of flood events, including Major Disaster &amp; Emergency Declarations in the state &amp; regionwide</b>				
<b>Flooding</b> Prior to 1970	1927, 1936, 1938, 1943 (2), 1953, 1955, 1959		Spring and fall flooding events resulting from severe storms or heavy snowmelt	See below
<b>Flooding</b> 1970-1979	1972 (DR-327), 1973 (DR-399), 1974 (DR-411), 1976, 1978 (DR-549), 1979 (EM-3073)			
<b>Flooding</b> 1980-1989	1986 (DR-771), 1987 (DR-789)			
<b>Flooding</b> 1990-1999	1990 (DR-876), 1991 (DR-923), 1991 (DR -917), 1995, 1996 (DR-1077), 1996 (DR-1144), 1998 (DR-1231)			
<b>Flooding</b> 2000-2009	2003 (DR-1489), 2005 (DR-1610), 2006 (DR-1643), 2007 (DR-1695), 2008 (DR-1787), 2008 (DR-1799)			
<b>Flooding</b> 2010 - 2019	2010 (DR-1892), 2010 (DR-1913), 2011 (DR-4006), 2012 (DR-4065), 2013 (DR-4139), 2015 (DR-4206), 2017 (DR-4329), 2017 (DR-4355), 2018 (DR-4370), 2019 (DR-4457)			
<b>Flooding</b> 2020 - Present	2021 (DR4622), 2021 (DR-4624)			
<b>A detailed summary of flood events in the community</b>				
<b>Inland Flooding</b> (Heavy Rain)	October 7-18, 2005	Belknap, Cheshire, Grafton, Hillsborough, Merrimack & Sullivan	<b>Major Disaster Declaration DR-1610:</b> State and federal disaster assistance 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. Orange experienced minimal damage.	FEMA, 2017 HMPT & 2024 HMPT
<b>Inland Flooding</b> (Heavy Rain)	May 12-23, 2006	Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham & Strafford	<b>Major Disaster Declaration DR-1643:</b> Flooding occurred in most of southern NH during May 12-23, 2006. (Mother's Day Storm). There was no significant impact in Orange.	FEMA & 2024 HMPT
<b>Inland Flooding</b> (Heavy Rain)	April 15-23, 2007	All Ten NH Counties	<b>Major Disaster Declaration DR-1695:</b> FEMA & SBA obligated more than \$27.9 million in disaster aid for flood damages following the April nor'easter (Tax Day Storm). Significant tree damage and power loss for up to ten days in the area; the ground had unfrozen, and warm rain and winds tipped over trees. The team felt similar damage happened in Orange.	FEMA & 2024 HMPT

Type of Event	Date of Event	Location	Description	Source
<b>Inland Flooding</b> (Heavy Rain & Tornado)	July 24 - August 14, 2008	Belknap, Carroll & Grafton & Coos	<b>Major Disaster Declaration DR-1787:</b> A period of severe storms and flooding from July 24 to August 14 also spawned a tornado on July 24, 2008. Orange experienced straight-line winds that took down trees and power lines; power was out for some time.	FEMA & 2024 HMPT
<b>Inland Flooding</b> (Heavy Rain)	February 23 - March 3, 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	<b>Major Disaster Declaration: DR-1892:</b> See below, Section D	FEMA & 2024 HMPT
<b>Inland Flooding</b> (Heavy Rain)	May 26-30, 2011	Coos & Grafton County	<b>Major Disaster Declaration DR-4006:</b> Flooding and hail occurred due to a severe storm on May 26th-30th, 2011, in Coos & Grafton Counties (Memorial Day Weekend Storm). There was no significant impact in Orange.	FEMA & 2024 HMPT
<b>Inland Flooding</b> (Tropical Storm Irene)	August 26-September 6, 2011	<b>EM 3333:</b> All Ten NH Counties <b>DR-4026:</b> Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan	<b>Major Disaster Declaration DR-4026 &amp; Emergency Declaration EM-3333:</b> See below, Section C	FEMA & 2024 HMPT
<b>Inland Flooding</b> (Heavy Rain)	July 9-10, 2013	Cheshire, Sullivan & Grafton	<b>Major Disaster Declaration DR-4139:</b> Severe storms, flooding, and landslides occurred in Cheshire and Sullivan Counties and southern Grafton County. There was no significant impact in Orange.	FEMA & 2024 HMPT
<b>Inland Flooding</b> (Heavy Rain)	July 1-2, 2017	Grafton & Coos	<b>Major Disaster Declaration DR-4329:</b> The Federal Emergency Management Agency (FEMA) announced that federal disaster assistance was available to supplement state and local recovery efforts in the areas affected by severe storms and flooding from July 1, 2017, to July 2, 2017. Orange experienced minor washouts.	FEMA & 2024 HMPT
<b>Inland Flooding</b> (Heavy Rain)	October 29-November 1, 2017	Sullivan, Grafton, Coos, Carroll, Belknap & Merrimack	<b>Major Disaster Declaration, DR-4355:</b> The Federal Emergency Management Agency (FEMA) announced federal disaster assistance to New Hampshire to supplement state and local recovery efforts in the areas affected by severe storms and flooding from October 29-November 1, 2017. In Orange, this severe rain event resulted in many downed trees and washouts, but most roads remained passable. The exception was one spot on Burnt Hill Road that needed immediate repair. The town also experienced minor power outages during this storm. The town received \$25,000 in FEMA and state grant funding.	FEMA & 2024 HMPT

Type of Event	Date of Event	Location	Description	Source
<b>Inland Flooding</b> (Heavy Rain)	July 11-12, 2019	Grafton	<b>Major Disaster Declaration, DR 4457:</b> The Federal Emergency Management Agency announced a major disaster declaration for a period of severe storms and flooding from July 11-12, 2019, in Grafton County. The July 2019 rain event was one of the worse in Orange's history; road washouts cut the town in half for 22 days. The town also lost a vital fire pond with a dry hydrant on private property on Cardigan Mountain Road. About 1.5 miles of roads were completely washed away, leaving canyons as deep as 7-8 feet. In addition, 2.5 miles of other roadways sustained damage in the form of shoulder and ditch washouts. Most road work completed in 2020-2021 was devoted to permanently repairing the roads, stream embankments, and damaged channels in July 2019. The total damage was estimated to be \$1,000,000, 75% of which FEMA would pay. (See Chapter 5 for more information)	FEMA & 2024 HMPT

**B. Wildfires:** 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. Wildfires have the potential to impact the community on a townwide basis. No significant wildfire events have occurred in Orange since the Cardigan Mountain Fire in 2020.

**Summary of wildfire events, including Major Disaster & Emergency Declarations in the state and other recent large fires**

<b>Wildfire</b> (Shaw Mountain)	July 2, 1953	Carroll County	<b>Major Disaster Declaration DR-11:</b> This wildfire occurred in Carrol County at Shaw Mountain. This fire did not reach Grafton County or Orange.	FEMA & 2024 HMPT
<b>Wildfire</b> (Bayle Mountain)	May 2015	Carroll County	<b>The Bayle Mountain Fire:</b> This Class D fire burned 275 acres and took five days to put out on rocky and steep terrain in Ossipee, NH. Blackhawk and private helicopters and fire crews from all over the state assisted in extinguishing this fire. The Bayle Mountain Fire did no damage to homes. This fire did not reach Grafton County or Orange.	Local Resources
<b>Wildfire</b> (Stoddard)	April 2016	Cheshire County	<b>Fire Management Assistance Declaration, FM-5123:</b> Stoddard, NH. The Stoddard Fire burned 190 acres in April 2016 and caused the evacuation of 17 homes; Class D fire. This fire did not reach Grafton County or Orange.	FEMA & 2024 HMPT
<b>Wildfire</b> (Covered Bridge Fire)	November 2016	Carroll County	<b>The Covered Bridge Fire:</b> A brush fire near the Albany Covered Bridge grew to 329 acres, primarily on White Mountain National Forest land. No structures were lost; Class E fire. This fire did not reach Grafton County or Orange.	Local Resources
<b>Wildfire</b> (Dilly Cliff)	October 2017	Grafton County	<b>The Dilly Cliff Fire</b> in the Lost River Gorge Trail in North Woodstock off Route 112 (Lost River Road); Class C: Human-caused; 75 acres. The Dilly Cliff Fire was determined to be extinguished 36 days after it began. This fire did not reach Orange.	Local Resources
<b>Wildfire</b> (Bemis Fire)	May 2022	Carroll County	The Bemis Fire lasted six days, burning 106 acres on the steep terrain around Bemis Brook in Crawford Notch State Park. There were no structures damaged or injuries. Local firefighters, the NH Division of Forest and Lands, and members of the US Forest Service responded to extinguish the fire. This fire did not reach Grafton County or Orange.	Local Resources



Type of Event	Date of Event	Location	Description	Source
<b>A detailed summary of wildfire events in the community</b>				
<b>Wildfire</b> (Cardigan Mountain)	1855	Orange	In 1855, a devastating wildfire overtook Mount Cardigan, burning most of the old growth and exposing the granite summit. The soil on the top of the mountain has been washed away over time, leaving a treeless summit with spectacular views.	2024 HMPT
<b>Wildfire</b> (Cardigan Mountain)	2020	Orange	A one-acre fire occurred within the Cardigan Mountain State Forest. Access to the location of the fire was difficult, but fortunately, the fire did not grow to more than one acre.	2024 HMPT
<b>Except for the 1-acre Cardigan Mountain Fire, there have been no significant wildfires in Orange since the last hazard mitigation plan.</b>				2024 HMPT
<b>C. High Wind Events including Tropical &amp; Post-Tropical Cyclones, 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 compared to other New England states. A hurricane that is downgraded to a tropical storm is more likely to have an impact in New Hampshire. Tornadoes and other wind events have the potential to impact the community on a townwide basis. No significant high wind events have taken place in Orange since Hurricane Sandy in 2012.				
<b>Summary of high wind events &amp; tropical &amp; post-tropical cyclone events, including Major Disaster &amp; Emergency Declarations in the state &amp; regionwide</b>				
<b>Tropical &amp; Post-Tropical Cyclones</b>	1804, 1869, 1938, 1944, 1954 (2), 1960, 1976, 1978, 1985, 1991 ( <b>DR-917</b> ), 1999 ( <b>DR-1305</b> ), 2005 ( <b>EM-3258</b> ), 2011 ( <b>EM-3333 &amp; DR-4026</b> ), 2012 ( <b>EM-3360</b> )		Number 4 (1938), Number 7 (1944), Carol (1954), Edna (1954), Donna (1960), Belle (1976), Amelia (1978), Gloria (1985), Bob (1991), Floyd (1999), Katrina (2005), Irene (2011), Sandy (2012)	See below
<b>High Wind Events</b> (Tornadoes)	1814, 1890, 1951, 1953, 1957, 1961, 1963, 2008 ( <b>DR-1782</b> )		All listed tornadoes were reported as F2, except for the June 1953 tornado, which was reported as an F3.	See below
<b>A detailed summary of high wind &amp; tropical &amp; post-tropical cyclone events in the community.</b>				
<b>Tropical &amp; Post-Tropical Cyclone</b> (Great New England Hurricane)	September 21, 1938	All Ten NH Counties	<b>The Great New England Hurricane:</b> Statewide there were multiple deaths, and damages in NH were about \$12.3 million in 1938 dollars (about \$200 million now). Throughout New England, 20,000 structures were damaged, 26,000 automobiles, 6,000 boats, and 325,000 sugar maples. 80% of the people lost power. In Orange, one house was lost, a cooperage, and a sawmill were lost, but there were only 40 people residing in the town. Although there was limited local recollection, it was expected that damage would have been similar to the rest of the state. (Source <a href="http://nhpr.org/post/75th-anniversary-new-englands-greatest-hurricane">http://nhpr.org/post/75th-anniversary-new-englands-greatest-hurricane</a> )	FEMA & 2024 HMPT
<b>Tropical &amp; Post-Tropical Cyclone</b> (Hurricanes Carol & Edna)	August 31, 1954	All Ten NH Counties	<b>Hurricanes Carol &amp; Edna:</b> Hurricane Carol resulted in an extensive amount of trees being blown down as well as significant crop losses. Localized flooding and winds measuring over 100 mph also occurred. Hurricane Carol was followed by Hurricane Edna just 12 days later, which caused already weakened trees to fall. Although there was no local recollection, it was expected that damage in Orange would have been similar to the rest of the state. (Source: <a href="http://www.wmur.com/Timeline-History-Of-NH-Hurricanes/11861310">http://www.wmur.com/Timeline-History-Of-NH-Hurricanes/11861310</a> )	FEMA & 2024 HMPT



Type of Event	Date of Event	Location	Description	Source
<b>Tropical &amp; Post-Tropical Cyclone</b> (Tropical Storm Floyd)	September 16-18, 1999	Belknap, Cheshire & Grafton	<b>Major Disaster Declaration DR-1305:</b> The declaration covers damage to public property from the storm that spawned heavy rains, high winds, and flooding throughout September 16-18. There was no significant impact in Orange.	FEMA & 2024 HMPT
<b>Tropical &amp; Post-Tropical Cyclone</b> (Hurricane Katrina evacuation)	August 29-October 1, 2005	All Ten NH Counties	<b>Emergency Declaration EM-3258:</b> Assistance was provided 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 made federal funding available to the state and all 10 New Hampshire counties. There was no significant impact in Orange.	FEMA & 2024 HMPT
<b>Tropical &amp; Post-Tropical Cyclone</b> (Tropical Storm Irene)	August 26-September 6, 2011	<b>EM 3333:</b> All Ten NH Counties <b>DR-4026:</b> Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan	<b>Major Disaster Declaration DR-4026 &amp; Emergency Declaration EM-3333:</b> Tropical Storm Irene, August 26th- September 6, 2011, occurred in seven New Hampshire counties, causing flood and wind damage. In addition, an Emergency Declaration was declared for all ten New Hampshire counties. In Orange, there was significant damage. Many roads and culverts were unearthed or left impassable, including Burnt Hill Road, Tuttle Hill Road, Cardigan Mountain Road, New Colony Road, Williams Road, Cross Road, and Tug Mountain Road. The town had \$218,000 worth of damages and received \$167,000 in Federal disaster funds. Damage left roads impassable for days and up to two weeks of power loss.	FEMA & 2024 HMPT
<b>Tropical &amp; Post-Tropical Cyclone &amp; Long Term Utility Outage</b> (Hurricane Sandy)	October 26-November 8, 2012	<b>DR-4095:</b> Belknap, Carroll, Coos, Grafton, Rockingham & Sullivan <b>EM-3360:</b> All Ten NH Counties	<b>Major Disaster Declaration DR-4095 &amp; Emergency Declaration EM-3360:</b> The declaration covers damage to property from the storm that spawned heavy rains, high winds, high tides, and flooding from October 26-November 8, 2012. Hurricane Sandy came ashore in NJ, bringing high winds, power outages, and heavy rain to six New Hampshire counties. Orange experienced power outages in some places for up to 3 days.	FEMA & 2024 HMPT
<b>D. Severe Winter Weather including Nor'easters, Blizzards &amp; Ice Storms:</b> Severe winter weather in NH may include heavy snowstorms, 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. Severe winter weather and ice storms have the potential to impact the community on a townwide basis. No significant winter weather events have occurred in Orange since December 25, 2020.				
<b>Summary of severe winter weather events, including Major Disaster &amp; Emergency Declarations in the state &amp; nationwide</b>				
<b>Severe Winter Weather</b> (Ice Storms)	1942, 1969, 1970, 1979, 1991, 1998 ( <b>DR-1199</b> ), 2008 ( <b>DR-1812</b> )		Major ice storms that have occurred causing major disruptions to power, transportation, and public and private utilities.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorms)	1920, 1929, 1940, 1950, 1952, 1958 (2), 1960, 1961, 1969, 1978, 1982, 1993 ( <b>EM-3101</b> ), 2001 ( <b>EM-3166</b> ), 2003 ( <b>EM-3177</b> ), 2003 ( <b>EM-3193</b> ), 2004, 2005 ( <b>EM-3207</b> ), 2005 ( <b>EM-3208</b> ), 2005 ( <b>EM-3211</b> ), 2008 ( <b>EM-3297</b> ), 2009, 2011 ( <b>EM-3344 &amp; DR-4049</b> ), 2013 ( <b>EM-1405</b> ), 2015 ( <b>DR-4209</b> ), 2017 ( <b>DR-4316</b> ), 2018 ( <b>DR-4371</b> )		Major severe winter weather events marked by snowfalls exceeding 2' in parts of the state resulted in disruptions to power and transportation systems.	FEMA & 2024 HMPT

Type of Event	Date of Event	Location	Description	Source
<b>A detailed summary of severe winter storm events in the community</b>				
<b>Severe Winter Weather</b> (Snowstorm)	Winter of 1968-69	All Ten NH Counties	The winter of 1968-69 brought record snow to New Hampshire. Pinkham Notch at the base of Mount Washington recorded more than 75" of snowfall in four days at the end of February 1969 in addition to snow that had already fallen in previous storms. NH communities experienced difficulty with snow removal because of the great depths that had fallen from December 1968 to April 1969. There was no recollection of events in Orange; however, it is expected that snow amounts in Orange were similar to accumulation in the rest of the state. The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (High Winds, Coastal Flooding & Snowstorm)	February 16, 1978	All Ten NH Counties	<b>Major Disaster Declaration DR-549:</b> The Blizzard of '78, a regionwide blizzard severely affecting southern New England, resulted in high snow accumulations throughout New England and New Hampshire. Recorded accumulations show up to 28" in northeast New Hampshire, 25" in west-central New Hampshire, and 33" along coastal New Hampshire. This storm also brought hurricane-force winds, which made this storm one of the more intense this century across the northeastern United States. There was no recollection of events in Orange; however, it is expected that snow amounts in Orange were similar to accumulation in the rest of the state. The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorm & High Winds)	March 13-17, 1994	All Ten NH Counties	<b>Emergency Declaration EM-3101:</b> The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Ice Storm) <b>Long Term Utility Outage</b>	January 7-25, 1998	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Strafford & Sullivan	<b>Major Disaster Declaration DR-1199:</b> A significant ice storm struck nearly every part of the state, with a more significant impact in northern communities and areas over 1,000 feet above sea level. In Orange, areas above 700' experienced significant tree damage and financial losses, and some residents experienced utility outages. The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorm)	March 5-7, 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, & Strafford	<b>Emergency Declaration EM-3166:</b> The emergency declaration covers jurisdictions with record and near-record snowfall from a late winter storm that occurred in March 2001 and affected six New Hampshire counties. The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorm)	December 6-7, 2003	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan	<b>Emergency Declaration EM-3193:</b> The emergency declaration covers jurisdictions with record and near-record snowfall that occurred throughout December 6-7, 2003, and affected eight New Hampshire counties. The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT

Type of Event	Date of Event	Location	Description	Source
<b>Severe Winter Weather</b> (Snowstorms)	January 22-23, 2005 February 10-11, 2005 March 11-12, 2005	All Ten NH Counties	<b>Emergency Declaration 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 snowstorms that hit the state in 2005. The total aid for all three storms was \$6,892,0237 (January: \$3,658,114; February: \$1,121,727; March: \$2,113,182). <b>Emergency Declaration EM-3207:</b> The January storm Grafton: \$137,118 <b>Emergency Declaration EM-3208:</b> The February storm Grafton: \$213,539. <b>Emergency Declaration EM-3211:</b> The March Storm was not declared in Grafton County.  The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather &amp; Long Term Utility Outage</b> (Snowstorm & Ice Storm)	December 11-23, 2008	All Ten NH Counties	<b>Major Disaster Declaration DR-1812 &amp; Emergency Declaration EM-3297:</b> Damaging ice storm impacted all 10 New Hampshire counties, resulting in fallen trees and large-scale power outages. Nearly \$15 million in federal aid was obligated by May 2009. In Orange, the 2008 Ice Storm affected trees and power lines, particularly in the higher elevations. Some residents were without power for four days or longer in some locations. Roadways were obstructed for days. The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorm)	February 23 - March 3, 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	<b>Major Disaster Declaration: DR-1892:</b> Flood and wind damage occurred in southern NH, leaving 330,000 homes without power. More than \$2 million was obligated by FEMA by June 2010. In Orange, this snow and ice storm damaged trees and power lines at higher elevations; however, this storm was not as significant as the 1998 and 2008 Ice Storms. The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorm)	October 29-30, 2011	<b>DR-4049:</b> Hillsborough & Rockingham <b>EM-3344:</b> All Ten NH Counties	<b>Major Disaster Declaration DR-4049 &amp; Emergency Declaration EM-3344:</b> A severe winter storm occurred on October 29-30, 2011. <b>EM-3344:</b> The emergency declaration for snow removal and damage repair included all ten NH countries (Snowtober). The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorm)	February 8, 2013	All Ten NH Counties	<b>Major Disaster Declaration DR-4105:</b> A severe winter storm resulted in heavy snow in February 2013 in all ten New Hampshire counties (Nemo). The heavy snow accumulation in Orange was handled by the Road Agent.	FEMA & 2024 HMPT
<b>Severe Winter Weather</b> (Snowstorm)	March 14-15, 2017	Belknap & Carroll	<b>Major Disaster Declaration DR-4316:</b> A severe winter storm and snowstorm occurred on NH's Town Meeting Day in two New Hampshire counties, resulting in disaster aid supplementing state and local recovery efforts. Although this was not declared in Grafton County, the town experienced heavy snow accumulations and wind. The Road Agent handled the snow accumulation, and Town Meeting was held as planned.	FEMA & 2024 HMPT

Type of Event	Date of Event	Location	Description	Source
Severe Winter Weather (Snowstorm)	March 13-14, 2018	Carroll, Strafford & Rockingham	<b>Major Disaster Declaration, DR 4371:</b> A severe winter storm and snowstorm occurred on NH's Town Meeting Day in two New Hampshire counties, resulting in disaster aid supplementing state and local recovery efforts. Although this was not declared in Grafton County, the town experienced heavy snow accumulations and wind. The Road Agent handled the snow accumulation, and Town Meeting was held as planned.	FEMA & 2024 HMPT
Severe Winter Weather (Snowstorm & Rain Events)	December 18, 2020 December 25, 2020	Orange	Severe winter weather produced a 24" snowstorm on December 18, 2020. This storm was followed by 2" of heavy rain on December 25, 2020. The heavy accumulation was handled by the Road Agent.	FEMA & 2024 HMPT

**E. Earthquakes:** According to the NH State Hazard Mitigation Plan, New Hampshire is considered to lie in an area of "moderate" seismic activity compared to other areas of the United States. New Hampshire is bordered to the north and southwest by "major" activity areas. Generally, earthquakes in NH cause little or no damage and have not exceeded a magnitude of 5.5 since 1940. Earthquakes have the potential to impact the community on a townwide basis. No significant earthquakes have occurred in Orange since the prior hazard mitigation plan.

**Summary of earthquakes with a magnitude of 4.0 or greater in the state & nationwide**

Earthquakes	6/11/1638 (Central NH, 6.5), 10/29/1727 (Off Coastline, 6.0-6.3), 11/18/1755 (Off Coastline, 5.8), 11/10/1810 (Portsmouth, NH, 4.0), 7/23/1823 (Off Hampton, NH, 4.1), 12/19/1882 (Concord, NH, Unknown), 3/5/1905 (Lebanon, NH, Unknown), 8/30/1905 (Rockingham County, Unknown), 11/09/1925 (Ossipee, NH, 4.0), 3/18/1926 (New Ipswich, NH, Unknown), 11/10/1936 (Laconia, NH, Unknown), 12/20/1940 (Ossipee, NH, 5.5-5.8), 12/24/40 (Ossipee, NH, 5.5-5.8), 1/19/1982 (Laconia, NH, 4.0), 11/20/1988 (Berlin, NH, 4.0), 4/6/1989 (Berlin, NH, 4.1), 10/16/2012 (Hollis Center, ME, 4.0)	Occurrences of earthquakes with a magnitude of 4.0 or greater in recorded New Hampshire History	State of NH Multi-Hazard Mitigation Plan, Update 2018
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**A detailed summary of earthquakes that were felt in the community since 1940 with a magnitude of 3.0 or greater**

Earthquake	December 20, 1940	Ossipee, NH	Magnitude 5.5	State of NH Multi-Hazard Mitigation Plan, Update 2018 & 2024 HMPT
Earthquake	December 24, 1940	Ossipee, NH	Magnitude 5.5	
Earthquake	June 15, 1973	Quebec Border / NH	Magnitude 4.8	
Earthquake	January 19, 1982	West of Laconia, NH	Magnitude 4.5	
Earthquake	November 20, 1988	Berlin, NH	Magnitude 4.0	
Earthquake	April 6, 1989	Berlin, NH	Magnitude 4.1	
Earthquake	April 20, 2002	Plattsburg, NY	Magnitude 5.1; felt in Orange, but no reported damage	

Type of Event	Date of Event	Location	Description	Source
Earthquake	June 23, 2010	Ontario-Quebec Border	Magnitude 5.0	
Earthquake	September 26, 2010	Boscawen, NH	Magnitude 3.1	
Earthquake	October 16, 2012	Hollis Center, ME	Magnitude 4.0; not felt in Orange	

**F. Drought:** Drought is generally less damaging or disruptive than floods and other hazards and is 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. Droughts have the potential to impact the community on a townwide basis. No significant droughts have occurred in Orange since the 2022 drought, which has abated throughout most of NH, including Orange.

**Summary of drought in the state & regionwide**

<b>Drought</b>	1775, 1840, 1882, 1910's, 1929-1936, 1939-1944, 1947-1950, 1960-1969, 1999; 2001-2002, 2016-2017; 2020-2021	Occurrences of serious droughts in recorded New Hampshire history.	State of NH Multi-Hazard Mitigation Plan, Update 2018
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**Summary of drought in the community since 1929**

<b>Drought</b>	1929-1936	Statewide	Regional	State of NH Multi-Hazard Mitigation Plan, Update 2018 & 2024 HMPT
<b>Drought</b>	1939-1944	Statewide	Severe in the southeast and moderate elsewhere	
<b>Drought</b>	1947-1950	Statewide	Moderate	
<b>Drought</b>	1960-1969	Statewide	Regional longest recorded continuous spell of less than average precipitation	
<b>Drought</b>	2001-2002	Statewide	The third worst drought on record	
<b>Drought</b>	2016-2017	Statewide	Declared drought for the summer of 2016 and into 2017, moderating from extreme in southern New Hampshire to dry in the most northern communities. The drought affected Orange with the loss of a few dug wells and springs.	
<b>Drought</b>	2020-2021	Statewide	Declared drought for the summer of 2020 and into 2021, moderating from extreme in southern New Hampshire to dry in the most northern communities.	Local Resources
<b>Drought</b>	2022	Statewide	A declared drought in the summer and fall of 2022 waned as fall and winter approached and after several periods of rain. This drought moderated from south to north. Significant drought conditions had nearly abated by January 2023. The impact was minimal in Orange.	Local Resources

Type of Event	Date of Event	Location	Description	Source
<b>G. Miscellaneous Past or Potential Hazards:</b> Natural, technological, and human-caused hazards and other unusual hazardous events have been noted throughout New Hampshire. Among others, one concern is transporting hazardous material through communities by rail and tractor-trailer. Other natural, technological, or human-caused hazards have the potential to impact the community on a townwide basis. No additional hazards have taken place in Orange since the 2019 erosion of Orange Brook.				
<b>Infectious Disease</b>	January 20, 2020 – ongoing	All Ten NH Counties	<b>Major Disaster Declaration, DR-4516:</b> The Federal Emergency Management Agency ("FEMA") within the US Department of Homeland Security is giving public notice of its intent to assist the State of New Hampshire, local and tribal governments, and certain private nonprofit organizations under the major disaster declaration issued by the President on April 3, 2020, as a result of the Coronavirus Disease 2019 ("COVID-19").	FEMA & 2024 HMPT
<b>Infectious Disease</b>	January 20, 2020 – ongoing	All Ten NH Counties	<b>Emergency Declaration EM-3445:</b> Ten county declaration provided individual assistance and public assistance as a result of the impact of COVID-19.	FEMA & 2024 HMPT
<b>Landslide &amp; Erosion</b>	2019	Townwide	The 2019 flood caused riverine erosion. Orange Brook and its tributaries jumped their banks and flooded New Colony Road, the end of Williams Road, Eastman Road, and the Bridge on Cardigan Mountain Road. It also undermined a house, damaged a bridge, and took out a fire pond with a dry hydrant. The Orange Brook changed course, and a landslide and debris from the riverbank fell. Repairs have been made, and the river is back to its original channel. Part of the flood damage has been repaired, and embankment armor was restored where the river meets the road (heavy riprap).	2024 HMPT
<b>H. Other Hazards:</b> Identified hazards with no specific example of occurrence.				
<b>Natural Hazards</b>		<p>The team did not identify specific examples or past occurrences of these hazards but felt it worthwhile to list them as potential hazards to the town. These hazards can potentially impact areas of the community or townwide.</p> <p>See <i>Table 3.1, Hazard Threat Analysis</i>, and Chapter 5 for more details on these hazards.</p>		
Lightning & Hail				
Extreme Temperatures				
<b>Technological Hazards</b>				
Aging Infrastructure				
Conflagration				
Known & Emerging Contaminants				
Hazardous Materials				
<b>Human-caused</b>				
Cyber Events				
Mass Casualty Incidents				
Transport Accidents				
Terrorism & Violence				

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

- Website for NH Disasters: <http://www3.gendisasters.com/mainlist/newhampshire/Tornadoes>
- 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>
- EarthquakeTrack.com; <http://www.Earthquaketrack.com>



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

Team discussion and brainstorming identified Critical Infrastructure & Key Resources (CIKR) within Orange. 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 needed during an emergency response.			
Facility	Type of Facility	Hazard Risk	
Town House	Town records, government, Primary EOC, Primary Shelter	All Hazards & Wildfire	2
EMD's Vehicle	Possible Secondary EOC	All Hazards	1
Canaan Fire Rescue	Fire Department	All Hazards	1
Canaan Ambulance	EMS	All Hazards	1
Evacuation Routes			
US Route 4	Primary Evacuation Route	All Hazards & Inland Flooding	2
NH Route 118 (Canaan & Dorchester)	Primary Evacuation Route	All Hazards & Inland Flooding	2
River Road (Orange) / Millbrook Road (Grafton)	Secondary Evacuation Route	All Hazards & Inland Flooding	2
Burnt Hill Road	Secondary Evacuation Route	All Hazards & Inland Flooding	2
Cardigan Mountain Road	Secondary Evacuation Route	All Hazards & Inland Flooding	3
Tuttle Hill Road	Secondary Evacuation Route	All Hazards & Inland Flooding	2
Orange Road (Canaan)	Secondary Evacuation Route	All Hazards & Inland Flooding	2
Brock Hill Road	Secondary Evacuation Route	All Hazards & Inland Flooding	1
Cross Road	Secondary Evacuation Route	All Hazards & Inland Flooding	2
Water Resources for Fire Suppression			
Fire Suppression Pond on Cardigan Mountain Road (private)	Dry Hydrant (destroyed in October 2019 storm)	All Hazards & Inland Flooding	3
Orange Pond (private)	Drafting Site	All Hazards	1
Indian River (draft from Route118 in Canaan)	Drafting Sites	All Hazards	1
Bridges & Culverts			
US Route 4 Bridge (Canaan)	Primary Evacuation Route	All Hazards, Inland Flooding & Erosion	2
Cardigan Mountain Road @ Orange Brook (washed out)	Secondary Evacuation Route & Important Bridge	All Hazards & Erosion	3
Cardigan Mountain Road @ #7 Brook	Secondary Evacuation Route	All Hazards & Erosion	2

EMERGENCY RESPONSE FACILITIES (ERF)			
Tuttle Hill Road bridge (Orange Brook)	Secondary Evacuation Route	All Hazards & Erosion	1
Brock Hill Road culvert (Brown Brook)	Secondary Evacuation Route	All Hazards & Erosion	2
Eastman Road bridge (Orange Brook)	Important Bridge	All Hazards & Erosion	2
Dams			
Orange Pond Fish Screen (Dam)	Non-menace	All Hazards & Dam Failure	1
Farm Pond Dam	Non-menace	All Hazards & Dam Failure	1
Orange Pond (aka Brody Pond)	Non-menace	All Hazards & Dam Failure	1
The NH Department of Environmental Services lists seven dams in Orange, but only three are active. All three active dams listed above are classified as "non-menace" dams.			

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

NON-EMERGENCY RESPONSE FACILITIES (NERF)			
NERFs are facilities that, although critical, are not necessary for immediate emergency response efforts. This would include facilities to protect public health and safety and to provide backup emergency facilities.			
Facility	Type of Facility	Hazard Risk	
Consolidate Communications	Switching Station	All Hazards	1

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

FPPs are facilities that need to be protected because they are essential to the town.			
Facility	Type of Facility	Hazard Risk	
Town House	Historic (State Register)	All Hazards & Wildfire	2

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

POTENTIAL RESOURCES (PR)			
PRs are potential resources that could be helpful for emergency response in the case of a hazardous event.			
Gravel Pit - Bobby Senter	Sand & Gravel, Equipment	All Hazards	1
Gravel Pit - Hammond Grinding	Sand & Gravel, Equipment	All Hazards	1
Residential Homes	Potential Shelters	Not applicable	
Please refer to the Resource Inventory List in the Orange Emergency Operations Plan for additional resources.			

## Chapter 5: Hazard Effects in Orange

### A. IDENTIFYING VULNERABLE CRITICAL INFRASTRUCTURE & KEY RESOURCES (CIKR)

Identifying the Critical Infrastructure & Key Resources (CIKR) that are most likely to be damaged in inland flooding events is important, as inland flooding is the most significant hazard in New Hampshire. Identifying the CIKR with a wildfire risk is also important, as the town is heavily forested.

#### Overall Flood Risk

Orange's CIKR were identified and listed in Chapter 4; each CIKR was analyzed for its flooding potential. This analysis and the red area in the GIS map snip to the right indicate the floodplain. Orange's primary CIKR, the Town House, is not within the FEMA floodplain.

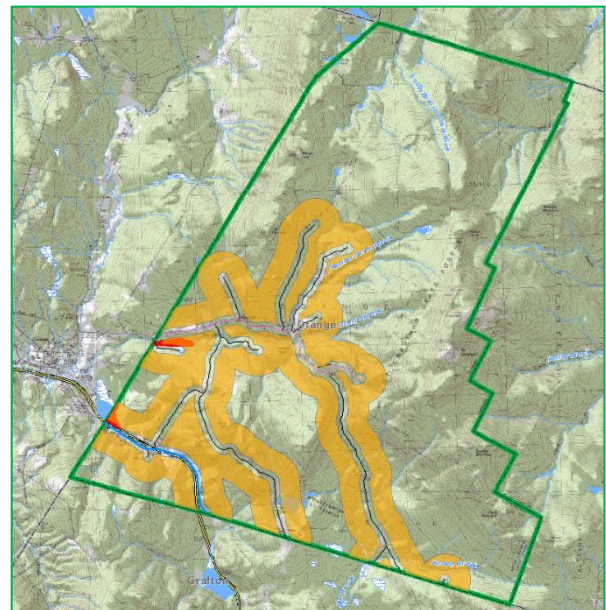
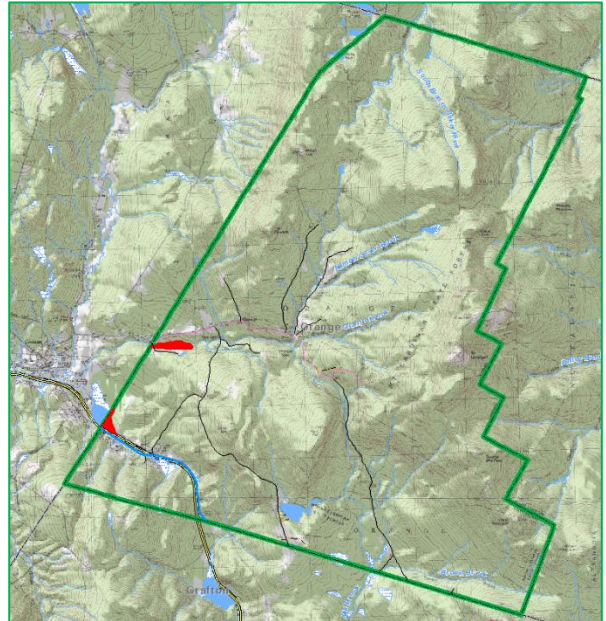
When working on Table 4.1, it is noted that the team felt that all the evacuation routes, particularly Cardigan Mountain Road, may be subject to inland flooding. In addition, the dry hydrant that was once in the fire suppression pond on Cardigan Mountain Road is also subject to flooding. All other facilities listed have a minimal flood risk. Please refer to Chapter 4, Tables 4.1-4.4 for more information.

All other CIKR are outside the flood zone. It is expected that there may be other structures and homes within the flood zone. Town officials should consider all at-risk properties when a flood hazard is likely.

#### Overall Wildfire Risk

CIKR falling within the Wildland Urban Interface (WUI) were reviewed using the same methodology as flooding. Identifying these facilities helped the team create and prioritize wildfire mitigation action items.

Traditionally, the WUI is determined using GIS analysis to create a 300' buffer from the centerline of all Class V roads and an additional 1,320' buffer from the first buffer. The orange symbology in the map snip to the right shows the traditional WUI in Orange. This area is where the urban environment interfaces with the wildland environment and is the most prone to wildfire risk.



The traditional WUI was initially developed to identify human-interface areas that may exceed the typical length of fire hoses. In rural communities, this would virtually cover the entire town. A different method to determine the WUI in suburban communities includes identifying developments, streets, roads with limited egress, a high canopy of old-growth softwoods, or older wooden structures. Orange has a few dead-end and private roads; these may be more prone to wildfires if there is a limited distance between structures, an abundance of old-growth softwoods, or a lack of a second egress. The map snip above does not include Class VI private roads.

The Orange Town House is the only CIKR at high risk for wildfires identified in Tables 4.1-4.4. All structures in Orange are expected to be prone to wildfires, particularly, as suggested above, in neighborhoods with limited egress and a canopy of old-growth trees or where forests surround structures.

Because Orange is so forested, it can be assumed that nearly every structure in town is within the Wildland Urban Interface. Mitigation strategies were discussed to protect structures and educate the citizens about the wildfire risk.

**B. CALCULATING THE POTENTIAL LOSS**

It is difficult to ascertain the dollar amount of damage caused by hazards because the damage will depend on the hazard’s extent and severity, making each hazard event somewhat unique. Therefore, we have assumed that hazards could damage 0-1% or 1-5% of the town’s structures. Structure damage depends on the nature of the hazard and whether the impact is localized.

MS-1 Assessed Value of All Structures			
Type of Structure	Value	1% Damage	5% Damage
Residential	\$20,780,900	\$207,809	\$1,039,045
Manufactured Housing	\$1,010,900	\$10,109	\$50,545
Commercial	\$409,600	\$4,096	\$20,480
Discretionary Preservation Easement	\$0	\$0	\$0
Tax Exempt	\$205,000	\$2,050	\$10,250
Utilities	\$975,200	\$9,752	\$48,760
Totals	\$23,381,600	\$233,816	\$1,169,080

This plan assumes that the potential loss from the identified natural hazards would range from **\$0 to \$233,816** or **\$233,816 to \$1,169,0805**, based on the 2020 MS1 total structure value of **\$23,381,600**. (See chart above)

Human loss of life was not included in the potential loss estimates but could be expected to occur depending on the hazard's severity and type. Although descriptions are given for technological and human-caused hazards, no potential loss estimates for these hazards are provided in this plan.

**C. NATURAL HAZARDS**

The descriptions below represent the **local impact** on the community for the hazards identified by the team. The **extent** of these hazards is shown in *Appendix C, The Extent of Hazards*. 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 Enhanced Fujita Scale for tornadoes are included in Appendix C.

**Table 3.1, The Hazard Identification & Risk Assessment (HIRA), is used to evaluate the probability and the potential impact of all hazards.**

The “Hazard Identification & Risk Assessment (HIRA)” and the “Probability” noted for each hazard below are taken from the analysis done in Table 3.1, *Hazard Identification & Risk Assessment (HIRA)*. The numbers preceding the hazard name in this section correspond to Table 3.1 and are ordered by “Relative Threat”. The estimated loss is determined using the methodology and table, as explained in Section B of this chapter.

**1) SEVERE WINTER WEATHER**

Hazard Identification & Risk Assessment (HIRA) .....	High
Probability .....	Very High
Estimated Structure Loss Value .....	\$233,816 to \$1,169,0805

***Snowstorms, Blizzards & Nor'easters***

Heavy snowstorms typically occur from December through April. New England usually experiences at least one or two heavy snowstorms with varying severity each year. Power outages, extreme cold, and impacts on infrastructure are all effects of past winter storms felt in Orange. These impacts are a risk to the community, including isolation, especially to the elderly (19.9%) and other vulnerable populations. In addition, the ability to get in and out of town and emergency service access can be hindered.

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. Significant snowstorms, nor'easters, and blizzards could diminish food supplies within two days.

As shown in Table 3.2, other snowstorms and nor'easters have struck Orange, but the Road Agent can generally keep up with two to three-foot snowstorms.

In March 2017 and March 2018, snowstorms with unusually high spring accumulation received Major Disaster Declarations (DR-4316 and DR-4371) for some NH counties but not in Grafton, where Orange is located. Heavy snow fell throughout the state on both occasions, but the Orange Road Agent kept roads clear to allow the scheduled Town Meetings and Voting Days to occur. More recently, in December 2020, a snowstorm produced 24" of snow, followed by a rain event a week later that produced 2". Since the last hazard mitigation plan, no other significant snow events have occurred in Orange.

Although Orange's Highway Department handles typical snow amounts without difficulty, poor weather conditions often impact roads. Traveling on US Route 4 and the town's dark, steep, winding, narrow roads can be difficult. Fortunately, the state is responsible for US Route 4, but poor weather conditions may hinder fire and other emergency responses.

***Ice Storms***

Ice storms are more concerning than 2-4' snowstorms, though the probability of a significant ice storm is lower than a significant snowstorm. An ice storm can inflict several million dollars of damage on forests and structures. Unlike typical snowstorms, which are generally handled well by the Road Agent, ice storms present significant problems. Downed power lines and fallen trees make it difficult for the highway crew and emergency responders. School buses are also at risk.

There have been significant ice storms in New Hampshire; in three of the most significant events (1998, 2008, and 2010), there was some damage in Orange. In 1998, areas above 1000' were the most impacted; significant tree damage occurred, and some homeowners experienced a financial loss. The team reported that 1,700 tree tops were broken off during this storm. The 2008 storm was worse than in 1998, causing transportation disruptions and power losses for up to four days. The results of the 2010 storm were like 1998 and 2008, although not as significant.



Since the last hazard mitigation plan, Orange has had no damaging or debilitating winter storm events. However, due to the widespread nature of severe winter weather, particularly from ice storms, the potential loss value is estimated to be between 1% and 5% of the total assessed value of all structures in town.

**2) WILDFIRES**

Hazard Identification & Risk Assessment (HIRA) .....	High
Probability .....	High
Estimated Structure Loss Value .....	\$233,816 to \$1,169,0805

There are two potential losses with a wildfire, the loss of forest land and the threat to the built-up human environment and structures within the Wildland Urban Interface (WUI). In many cases, the only time it is feasible for a community to control a forest fire is when the built-up human environment is threatened.

Any wildfire discussion must include a Wildland Urban Interface (WUI) discussion. The WUI can be determined in various ways; however, it represents the area where the forest and human habitation intersect. At times, the WUI is defined as the area out of reach of available fire hoses and water resources, while other times, it is determined to be areas with substantial tree cover and limited egress. For many New Hampshire communities, entire towns are thought to be in the WUI because of the abundance of hardwood and softwood trees. In more populated areas, the WUI is often determined to be in densely populated neighborhoods where a towering canopy of old-growth trees and limited access make people and structures more vulnerable. All structures within the WUI are assumed to be at some level of risk and, therefore, vulnerable to wildfire. See Section A in this chapter for more discussion on the WUI in Orange.

The team described the forests of Orange as consisting primarily of mixed forests. With a low probability of drought and high humidity, it was felt that some fires are “duff” fires, the burning of *“the layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil.”*<sup>12</sup> However, with climate change, the probability of drought is no longer low in New Hampshire. Burn permits are required in Orange, as they are throughout the state, but often, burning occurs without the proper permits. Sometimes, it’s difficult for the Canaan Fire Department to monitor all conditions, and the occasional unauthorized burn will occur.

Cardigan Mountain State Park is 90% forested and is managed by the state, which has done minimal cutting and clearing. Although the top of the mountain is bare, due to the abundance of slash on the forest floor on the rest of the mountain, there is potential for fast-burning fuels, and a wildfire could potentially occur. Also, outdoor enthusiasts' recreational use of woods trails creates additional risks.

Accessibility to parts of the mountain adds to the wildfire concern; the mountain is steep and heavily forested, and the Canaan Fire Department is some distance away. In fact, a one-acre fire occurred in 2020 within the state forest, and accessibility to the site made it difficult to fight. To help mitigate the effects of wildfire, the Canaan Fire Department strives to improve and maintain firefighting equipment, maintain water resources, and manage a Capital Reserve Fund to help pay costs for new equipment. Since the last hazard mitigation plan, Orange has had no significant wildfires other than the one-acre fire in the state forest.

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<sup>12</sup> <http://www.fs.fed.us/nwacfire/home/terminology.html>



Significant wildfires in New Hampshire are uncommon; five large fires have occurred in the state recently. These include the Bemis Fire in Crawford Notch, the Dilly Cliff Fire in Woodstock, the Covered Bridge Fire in Albany, the Bayle Mountain Fire in Ossipee, and the Stoddard Fire in Stoddard.

Given the right conditions - drought, lightning, human interface - the potential for a significant wildfire is high. The impact of climate change on drought could also play a role in predicting wildfires. Therefore, the potential loss value was estimated to be between 1% and 5% of the total assessed structure value.

**3) INLAND FLOODING**

Hazard Identification & Risk Assessment (HIRA) .....	High
Probability .....	Moderate
Estimated Structure Loss Value .....	\$233,816 to \$1,169,0805

**100-Year Flood Events, Riverine Flooding & Local Road Flooding**

Riverine flooding and 100-year flood events can occur due to hurricanes, tropical and post-tropical cyclones, and heavy summer and fall rains. Local road flooding is often the result of rapid snowmelt and heavy spring or autumn rain events. Heavy rain from tropical downpours, hurricanes, severe thunderstorms, and rapid snowmelt often cause culverts to be overwhelmed and roads to wash out. Additionally, if conducted improperly, undersized or aging culverts, timber harvesting, and inadequate ditching are possible causes of local road flooding.

Based on the Grafton County Floodplain Map and as described in Chapter 3, Section D, Orange has two small floodplain areas, one near Mirror Lake and the other along a portion of Orange Brook. The town is not a member of the National Flood Insurance Program, primarily because of the size and impact of its flood zone.

Although the floodplain is relatively insignificant, Orange is still vulnerable to inland flooding. As rain falls on Cardigan Mountain's high slopes, it creates flash flooding episodes. This flash flooding is more likely to damage roadways than a riverine event. Structures in Orange are somewhat safe from inland flooding.

Table 3.2 details the inland flooding events that occurred in the past and discusses the most recent flood events in Grafton County, DR-4329 in July 2017, DR-4355 in October 2017, and DR-4457 in July 2019. These significant flooding events have occurred since the last hazard mitigation plan.

In July 2017, Orange only experienced a few minor washouts. The October 2017 storm rains and high winds caused some fallen trees and minor washouts. However, roadways remained passable, except for one spot on Burnt Hill Road, which needed immediate repair.

The July 2019 storm, considered a 1,000-year event, significantly damaged roadways in Orange, dropping seven inches of rain in just three hours. This extraordinarily heavy rain filled small brooks and streams as they rushed down the slopes of Cardigan Mountain.

A total of 1.5 miles of roads were thoroughly washed away, leaving canyons as deep as seven or eight feet. Another 2.5 miles of roads also sustained shoulder damage and ditch washouts. The Basin Bridge on Cardigan Mountain Road was utterly destroyed, leaving a 20' by 100' open section at Orange Basin. Significant road washouts cut the town in half for 22 days.

Several homes in town received damage from flood waters, and at least two waterways changed their course. Other roads impacted include New Colony, Tug Mountain, Williams, Tuttle Hill, Cross, Eastman, and Town House Roads. This event was considered one of the worst disasters in the town's history. The total estimated damage was \$1,000,000, 75% of which was expected to be paid by FEMA.

Another impact of the July 2019 storm was the loss of the Cardigan Mountain Pond (filled with silt) and the dry hydrant located there. These losses have the potential to hamper fire response.

There are 17 miles of roads in Orange, only three of which are paved. There are also an estimated 150-200 culverts. While staying within its budget, the Road Agent has proactively maintained and repaired culverts and reduced the incidence of local road erosion and washouts. To further improve stormwater flow in the community, culvert improvement projects are included in *Table 9.1, The Mitigation Action Plan*.



**Damage from the July 2017 storm  
Photo Credit: The Town of Orange**

The expected loss value from inland flooding would be based on the cost of repairing roadways and the potential cost of damage to structures. Flooding can be severe enough to take out utilities and create areas of town that become inaccessible to emergency responders. The economic impact on the community, the loss of accessibility, and the time and cost of road repair also factor into the estimated loss value. Therefore, the estimated loss value was determined to be between 1% and 5% of the total structure value.

**4) DROUGHT**

Hazard Identification & Risk Assessment (HIRA) ..... High  
 Probability ..... Very High  
 Estimated Structure Loss Value ..... \$0 to \$233,816

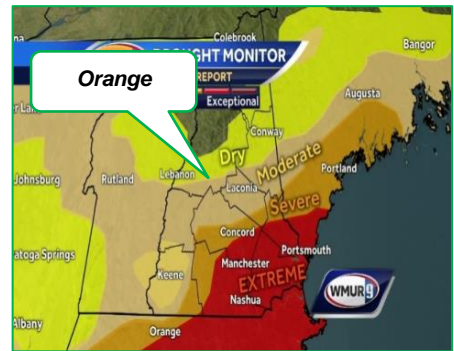
An extended period without precipitation or drought could elevate the risk of wildfire and blowdowns in the community's forested areas. With an extreme drought, the water supply and aquifer levels could be threatened. According to the NH Department of Environmental Services (DES), drought is not rare in New Hampshire. DES states, "In actuality, New Hampshire experiences drought quite frequently. For example, between the years 2000 and 2020, drought conditions occurred within 11 of those 20 years."<sup>13</sup> A concern is that more frequent and longer-lasting droughts will occur with climate change. Only four significant droughts occurred before 2000, while three have occurred in just the past six years (2016, 2020, and 2022). In addition, drought conditions contributed to damage to the local forests. They created an increased risk of wildfire, a considerable concern in Orange, where fire response comes from the neighboring town of Canaan and where water resources are limited, particularly after the loss of the Cardigan Mountain Pond dry hydrant in 2019.

The 2016-2017 drought brought extreme drought conditions in the south and dry or no drought conditions in the north<sup>14</sup>; Orange was in moderate to dry conditions during most of the 2016 drought (see the yellow and beige sections on the map to the right). There were reports of the loss of a few dug wells. Water for fire suppression was not impacted.

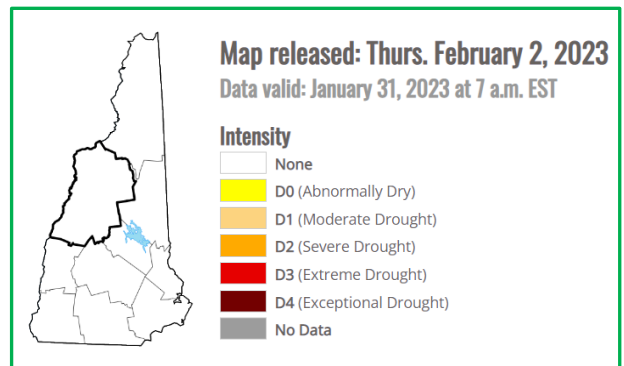
The 2020-2021 drought was less significant than the 2016 drought in southern NH but more significant in northern NH. Orange reported no losses of wells during the 2020-21 drought.

As of February 2023, after the 2022 summer drought and periods of extreme to dry conditions, again moderating from south to north, there is no drought anywhere in the state.<sup>15</sup> The bold black line in the image to the right shows Grafton County.

The cost of future droughts is challenging to calculate as any cost would likely result from associated fire risk, crop loss, and diminished water supply. Based on these assumptions, the structure loss value was not estimated.



WMUR Archives; September 15, 2016



<sup>13</sup> <https://www.des.nh.gov/climate-and-sustainability/storms-and-emergencies/drought#:~:text=In%20actuality%2C%20New%20Hampshire%20experiences,11%20of%20those%20%20years.>  
<sup>14</sup> <https://www.wmur.com/article/extreme-drought-conditions-worsen-in-new-hampshire/5269231>  
<sup>15</sup> <https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?NH>



**5) TROPICAL & POST-TROPICAL CYCLONES**

Hazard Identification & Risk Assessment (HIRA) .....	Medium
Probability .....	Moderate
Estimated Structure Loss Value .....	\$233,816 to \$1,169,0805

Damaging winds due to tropical and post-tropical cyclones (hurricanes) are considered a medium risk, primarily because of Orange's abundance of forested land. Significant forest damage could occur, like during the 1938 hurricane and hurricanes Carol and Edna in 1954. Although tropical and post-tropical cyclones could fit into several categories (wind and flooding), the team considered tropical and post-tropical cyclones separate events. Tropical and post-tropical cyclones are rare in New Hampshire but should be considered potential hazards. In most cases, tropical cyclones have been downgraded to post-tropical cyclones when they reach northern New Hampshire.

Tropical Storm Irene, the remnants of Hurricane Irene, brought heavy rain and wind to the east side of Cardigan Mountain; multiple bridges and culverts failed due to the heavy rains. However, even Tropical Storm Irene did not do the kind of damage that the 2019 rain event caused (see inland flooding). Tropical Storm Sandy had little impact in Orange, except for heavy rain. Since the prior hazard mitigation plan, no tropical or post-tropical cyclones have reached Orange.

The probability that a tropical and post-tropical cyclone would remain a Category 1 or higher in this part of the state is low. However, due to the potential damage to forests, the potential loss value due to tropical and post-tropical cyclones was determined to be between 1% and 5% of the total assessed structure value.

**6) LIGHTNING & HAIL**

Hazard Identification & Risk Assessment (HIRA) .....	Medium
Probability .....	Moderate
Estimated Structure Loss Value .....	\$0 to \$233,816

***Lightning***

Lightning strikes have occurred in Orange because of severe summer storms. Many of the town's structures are old buildings, and wildlands surround most. Dry timber on the forest floor, some of which remains from past ice or windstorms and the age of many buildings and outbuildings combined with lightning strikes, can pose a significant disaster threat. Lightning could damage specific structures, but the direct damage would not be widespread.

Although lightning is a potential problem, there have been no occurrences since the last hazard mitigation plan, and no known lightning strikes on persons on top of the mountain.

It was noted that severe thunder and lightning storms have been happening more often in recent years, perhaps due to climate change. Also concerning are the heavy rains that thunderstorms can produce and the subsequent erosion of ditches and roadways.

**Hail**

Although not common in Orange, hailstorm events resulting from significant thunder and lightning storms can occur anytime. Summer storms may produce hail large enough to damage roofs, siding, and automobiles. Damage from hail could also result in failed crops, thus impacting the local economy and individual citizens. However, it is noted that Orange is not a heavily farmed community. Overall, it was felt that a hailstorm event would be unlikely and would cause minimal damage. Since the last hazard mitigation plan, no significant lightning or hail events have occurred in Orange.

Based on the localized nature of lightning strikes and the minimal damage expected from hail, the potential loss value was determined to be between 0% and 1% of the total assessed structure value.

**7) EXTREME TEMPERATURES**

Hazard Identification & Risk Assessment (HIRA) ..... Medium  
Probability ..... High  
Estimated Structure Loss Value ..... Not estimated

**Extreme Cold & Heat**

Winter temperatures can fall below -30°F, and summer temperatures, laden with high humidity, can soar to nearly 100°F. There was more concern about cold temperatures in the past, but with improved heating systems and local communications, most New Hampshire residents can cope with extreme cold. Many New Hampshire residents have also equipped their homes with generators and woodstoves. Many cities and towns offer warming centers or have established a functional needs list to check vulnerable citizens.

More concerning today is extreme heat conditions, which seem to be more likely with climate change; temperatures above 95° for a week or more can impact the elderly and other vulnerable populations. Few residents, particularly vulnerable populations, have air conditioners and are less able to cope with extreme heat. The estimated elderly population in Orange is 19.9%, and the estimated poverty rate is 9.4% of the total population<sup>16</sup>. The elevations within the community help keep extended heat waves at bay. Since the prior hazard mitigation plan, no deaths or illnesses due to cold or heat have been reported in Orange.

**Extreme Temperatures combined with Long Term Utility Outage**

When combined with power failure, extreme temperatures are of the most concern; power failure could result in no water, heat, or air conditioning for the town’s most vulnerable populations. Town officials and the community as a whole should be concerned; they should look after their 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 in the economic impact on the community and the time and cost of emergency response. The structure loss value due to extreme temperatures was not estimated based on the assumption that damage would not occur to structures.

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<sup>16</sup> US Census Bureau, American Community Survey, ACS, 2015-2019

**8) HIGH WIND EVENTS**

Hazard Identification & Risk Assessment (HIRA) .....	Medium
Probability .....	Moderate
Estimated Structure Loss Value .....	\$0 to \$233,816

***Isolated High Wind Events***

Isolated high winds and downdrafts are likely to occur in Orange. These unpredictable wind events could fall timber, block roadways, down power lines, and impair emergency response. These unexpected windstorms affect old-growth softwood, especially when the water table is high in the spring. Essentially, all of Orange is forested.

Due to Orange’s location on the slopes of Cardigan Mountain, high-wind events are commonplace, although not generally damaging. In August 2020, a high wind event left a good portion of the community without power for two to four days; sustained 40-50 mph winds took down trees and power lines.

The team noted that the power companies have recently increased their trimming efforts. The Road Agent, when possible, and the power companies remove downed trees when necessary.

***Tornadoes & Downbursts (microbursts & macrobursts)***

The most significant difference between tornadoes and downbursts, also known as microbursts and macrobursts, is the direction, size, and direction from which the wind comes; all winds of these types can cause significant damage.

A tornado generally covers a large area, perhaps even several miles. It has winds that blow in a circular fashion leaving behind downed trees lying in a swirling pattern. Straight-line winds and winds that burst downward indicate a microburst; the fallen trees 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 more than 2.5 miles wide and lasting longer than a microburst.

Microbursts are becoming more frequent and often result in damage. Like high winds, the effects would be primarily power outages and blowdowns; however, if a tornado, microburst, or macroburst were severe enough, property damage could also occur. In Orange, a microburst would be more likely than a tornado. Since the previous hazard mitigation plan, Orange has had no reports of microbursts or tornadoes.

Although downbursts are becoming more common, damaging high wind events are rare natural hazards in New Hampshire. Damage from high wind events largely depends on where the hazard strikes. If a high wind event strikes a densely populated or commercial area, the impact could be significant, resulting in personal injury, property damage, and economic hardship. Based on the potential devastation from tornadoes, macrobursts, or microbursts, the potential loss value was estimated to be between 0% and 1% of the total structure value.



**9) INFECTIOUS DISEASES**

Hazard Identification & Risk Assessment (HIRA) ..... Low  
 Probability ..... Moderate  
 Estimated Structure Loss Value ..... Not estimated

*“Infectious diseases are disorders caused by organisms — such as bacteria, viruses, fungi, or parasites. Many organisms live in and on our bodies. They're normally harmless or even helpful, but under certain conditions, some organisms may cause disease.*

*Some infectious diseases can be passed from person to person. Some are transmitted by bites from insects or animals. And others are acquired by ingesting contaminated food or water or being exposed to organisms in the environment.”<sup>17</sup>*

Infectious diseases and epidemics or pandemics present a possible threat to Orange. Orange is susceptible to an epidemic and subsequent quarantine with worldwide pandemics such as Covid-19, Lyme Disease, SARS, the Zika Virus, H1N1, the Avian Flu, and even the common seasonal flu virus. In fact, the United States and the world have been coping with the COVID-19 pandemic for more than three years. All non-essential businesses and schools throughout New Hampshire and most of the United States were closed during the pandemic's early months in the spring of 2020.



No facilities in Orange hold events that could increase the likelihood of spreading infectious diseases, except for planned events at the Town House. However, all of Orange’s students attend schools in the neighboring town of Canaan, thus increasing the chance of the spread of infectious diseases. Some residents also work in Lebanon and Hanover. Churches, meeting houses, social facilities, student interactions, and out-of-town sports teams and clubs invite infectious disease outbreaks.

With assistance from public health networks, town officials did their best to mitigate the onset of Covid-19 in Orange. The Town House remained operating with mitigation measures to accommodate pressing public needs. The town and the Canaan schools continue encouraging social distancing and protecting the town’s most vulnerable citizens. There are no nursing homes in Orange.

As of February 2, 2023, 373,867 Covid-19 cases, 2,949 deaths, and 937 new cases were reported in the State of New Hampshire (see the chart on the right).<sup>18</sup> Deaths by town are no longer available, but it was reported that there were 40 cumulative cases in Orange, 8,267 cumulative cases in the county, and 13 cumulative deaths in Grafton County.<sup>19</sup>

<b>COVID-19 Summary Report</b>	
<i>(data updated as of February 2, 2023, 9:00 AM)</i>	
NH Total Case Count	373,867
New Cases for the Previous Week	937
Deaths Attributed to COVID-19	2,949
Total Current COVID-19 Cases	1,105
Current Hospitalizations Treated for COVID-19	32

<sup>17</sup> Infectious diseases, Overview, <https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173>  
<sup>18</sup> <https://www.covid19.nh.gov/>  
<sup>19</sup> <https://www.covid19.nh.gov/dashboard/map>

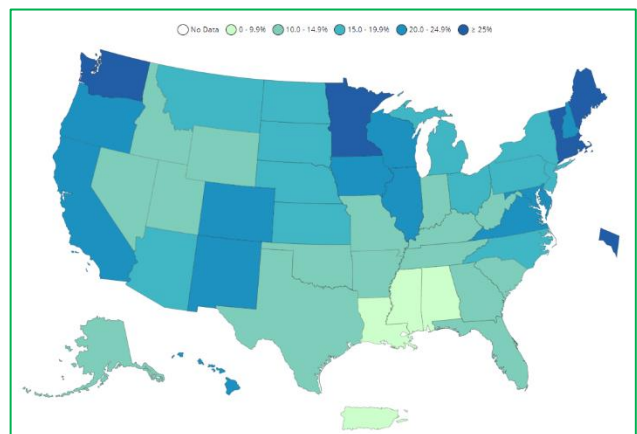
On February 1, 2023, the Center for Disease Control (CDC) reported 1,106,824 Covid deaths in the United States since the pandemic began.<sup>20</sup>

Covid-19, specifically the Omicron BA.5 and its variants, has raised concerns in New Hampshire, the United States, and the world. The virus has consistently changed since early 2020, and in late 2022, it seemed the deadly Delta was behind us, and the fast-spreading Omicron variants and subvariants seemed to be here to stay. Testing and vaccines are helping to keep severe illness to a minimum; vaccines are available for all persons, including young children and toddlers. Although vaccination rates continue to climb slowly, a portion of the public remains unwilling or unable to be vaccinated, thus increasing the threat to our hospital systems. Unvaccinated individuals continue to represent the majority of hospitalizations, severe illnesses, and deaths.

The CDC reported on February 1, 2023, that 81.0% of the US population had received at least one vaccine dose, 69.2% had completed the primary vaccine series, and 15.7% had received the updated (bivalent) booster dose.<sup>21</sup>

The CDC recommends that adults, particularly those who are medically compromised or over 65, receive two doses, two boosters, and a recently introduced vaccine that includes protection from the Omicron BA.5 variant and subvariants. Recommendations for children are slightly different.

The map to the right from the CDC shows the percentage of the population five years or older with an Updated (Bivalent) Booster Dose.<sup>22</sup> The darker the color, the more vaccines have been administered.



As part of our discussion about infectious disease, it makes sense to discuss the opioid epidemic affecting the state and the nation in general. According to the CDC, New Hampshire has the 22<sup>nd</sup> highest rate of opioid-related overdose deaths in the country, with a 30.3% rate, representing the deaths of 393 people in 2020.<sup>23</sup>

Like many New Hampshire communities, Orange has also struggled with citizens' use of opioids. Although the availability and use of NARCAN® have helped lower the death rate in New Hampshire, opioid-related overdoses and deaths are still a common occurrence. However, there were no reports of drug-related calls.

The team felt that an epidemic or pandemic, like Covid-19, would continue to threaten the community's citizens. However, because there would be no direct impact on the town structures, the structure loss value was not estimated.

<sup>20</sup><https://covid.cdc.gov/covid-data-tracker/#datatracker-home>

<sup>21</sup>[https://covid.cdc.gov/covid-data-tracker/#vaccinations\\_vacc-people-second-booster-pop65](https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-people-second-booster-pop65)

<sup>22</sup> total doses administered reported to the CDC by State/Territory and for the Select Federal Entities per 100,000 of the total population; [https://covid.cdc.gov/covid-data-tracker/#vaccinations\\_vacc-people-booster-percent-pop5](https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-people-booster-percent-pop5)

<sup>23</sup>[https://www.cdc.gov/nchs/pressroom/sosmap/drug\\_poisoning\\_mortality/drug\\_poisoning.htm](https://www.cdc.gov/nchs/pressroom/sosmap/drug_poisoning_mortality/drug_poisoning.htm)

**10) EARTHQUAKES**

Hazard Identification & Risk Assessment (HIRA) ..... Low  
Probability ..... Very Low  
Estimated Structure Loss Value ..... \$0 to \$233,816

Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric, and phone lines, and are often associated with landslides and flash floods. Since 1940, only two earthquakes with a magnitude greater than 5.0 have occurred in New Hampshire; both earthquakes occurred in Ossipee in December of 1940 (5.5-5.8). Since 1982, three earthquakes with a magnitude greater than 4.0 have occurred in the state. One of these earthquakes occurred in Laconia in 1982 (4.0); two occurred in Berlin, one in 1988 (4.0), and another in 1989 (4.1).

Many New Hampshire residents felt the most recent earthquake in October 2012, with its epicenter in Hollis Center, ME. The team noted that the Hollis earthquake was not felt in Orange; however, a 5.1 earthquake in Plattsburg, NH, in 2002 was felt in Orange. Although not listed in this plan, small earthquakes frequently occur in New Hampshire.

It is well documented that fault lines run throughout the state, but high-magnitude earthquakes have not been frequent in New Hampshire's history. Although historically, earthquakes have been rare, the potential exists, and depending on the location, the impact could be significant. However, because there are no densely populated areas in Orange, the potential structure loss value due to earthquakes was determined to be between 0% and 1% of the total assessed structure value.

**D. TECHNOLOGICAL HAZARDS**

The following technological 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 worth mentioning as real and possible hazards that could occur in Orange. The estimated structure loss was not determined for technological hazards.

**1) LONG-TERM UTILITY OUTAGE**

Hazard Identification & Risk Assessment (HIRA) ..... Medium  
Probability ..... High

Although rare, long-term utility outages of five or more days have occurred in Orange due to local line damage from high winds, severe storms, and problems with the power grid. A significant or extended power outage lasting more than a week could result in hardship for individual residents, particularly the elderly, disabled, or poor. The team reported that long-term power outages have diminished due to utility companies' efforts to trim trees and branches near power lines. However, the town may lose power for four to five days every three or four years; the last significant event was during the 2008 Ice Storm.

Long-term utility outage is still a concern, particularly when combined with the above natural hazards. An extended power failure's most significant impact would be the inconvenience caused by the inability to pump water for residents who rely on wells. It is also noted that all services, including pharmacies and grocers, are located out of town; driving during severe weather events to obtain necessities can be difficult due to poor road conditions. The team felt that many residents are self-sufficient, as many are now equipped with generators and woodstoves.

As a small, close-knit community, town officials know people who may need help in emergencies. Nonetheless, a long-term utility outage would have a significant impact.

**2) AGING INFRASTRUCTURE**

Hazard Identification & Risk Assessment (HIRA) ..... Medium  
Probability ..... Moderate

*“Infrastructure is the backbone of our community. While we don’t always acknowledge it, the condition of our infrastructure has a very real impact on our lives. We all depend on roads and bridges to get us where we are going, water infrastructure that delivers clean on-demand water, electricity to light our home and office, and schools that will facilitate a learning environment.”<sup>24</sup>*

Aging infrastructure is the continued deterioration of roads, bridges, culverts, ports, railroads, wastewater facilities, airports, dams, utilities, and public water and sewage systems. The State Multi-Hazard Mitigation Plan states that the average lifespan of a bridge is 50 years; the current average age of state-owned bridges in New Hampshire is 52-56 years.<sup>25</sup> The American Society of Civil Engineers gave NH an overall C- in its 2017 report card.<sup>26</sup>

Aging infrastructure has been a concern in Orange as it has been throughout New Hampshire and the United States. In Orange, the devastating 1,000-year storm of 2019 damaged much of the town’s major road infrastructure and a vital pond and dry hydrant. With assistance from FEMA, most of the culverts in the damaged area have been upsized and improved. Repair of the Cardigan Mountain Road pond and dry hydrant is included as an action item in this plan.

The Town House is also part of Orange’s aging infrastructure; this historic structure, while structurally sound, needs a new roof. The Town House may also need lightning protection; a project is included as an action item in this plan with a recommendation that the projects be done simultaneously. Other mitigation action items in Table 9.1 are included in this plan to address aging infrastructure.

**3) KNOWN & EMERGING CONTAMINANTS**

Hazard Identification & Risk Assessment (HIRA) ..... Low  
Probability ..... Moderate

Known contaminants in drinking water occur naturally or when introduced by humans. Damage to the environment, the local flora and fauna, a reduction in land values, restrictions on public water sources, and an increase in short and long-term health issues are just some of the impacts of contaminants. There may also be a need for more robust water treatment equipment. However, emerging contaminants have not been historically monitored due to either a lack of laboratory capabilities or an understanding of the risk posed to human health.<sup>27</sup>

Naturally occurring contaminants could include trace elements such as arsenic, lead, manganese, and uranium. The most concerning of these to private well water is arsenic; arsenic is naturally occurring and common in groundwater. The NH State Multi-hazard Mitigation Plan states that *“...health studies of New Hampshire residents have demonstrated the connection between arsenic and the increased prevalence of conditions such as bladder and other cancers and developmental effects on children.”<sup>28</sup>*

<sup>24</sup> <https://www.infrastructurereportcard.org/wp-content/uploads/2016/10/2017-NH-Report-Card-hq-with-cover.pdf>

<sup>25</sup> NH Multi-hazard Mitigation Plan, 2018, page 156

<sup>26</sup> Ibid

<sup>27</sup> NH Multi-hazard Mitigation Plan-2018

<sup>28</sup> Ibid

Hazardous material spills and other accidental introductions of chemicals into the ground and surface water can affect the safety of public and private water supplies. Human-made contaminants generally include pesticides and metals impacting groundwater or surface water. Emerging contaminants, such as poly or perfluoroalkyl substances (PFAs), have also been found in ground and surface water in New Hampshire; additional emerging contaminants, such as Methyl Tertiary Butyl Ether (MtBE), have also been found. Increased public awareness and testing of PFAs and MtBEs help counteract emerging contaminants' effects.

There are no community wells, and all Orange residents have private well water; thus, radon and arsenic contamination in the aquifer may be a concern. Houses in the community are older structures, so it is expected that pipes, insulation, and other building materials may contain contaminants such as lead. Town officials should encourage testing by individual homeowners for known and emerging contaminants.

**4) HAZARDOUS MATERIALS**

Hazard Identification & Risk Assessment (HIRA) ..... Low  
Probability ..... Low

Hazardous material in fixed locations is a concern in many New Hampshire communities but not a significant concern in Orange. Manufacturers, gas stations, fuel depots, small businesses, and even homes can have hazardous chemicals, explosive materials, or poisons on site. Breaches in the storage, use, production, or disposal can affect the groundwater, aquifers, water supply, and the air we breathe.

Orange has one facility on US Route 4, a recycling facility for commercial debris that could threaten surface water and the aquifer. Currently, however, no issues at this site need attention, but should there be a request for expanded use, the site would be subject to site plan review and planning board approval.

It is noted that residents on private property may also store hazardous materials; to help its residents, the town participates in collecting household waste, such as paint.

Orange is relatively safe from hazardous materials incidents. Since the last hazard mitigation plan, the team did not report any hazardous materials events.



**E. 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 worth mentioning as real and possible hazards that could occur in Orange. The estimated structure loss was not determined for human-caused hazards.

**1) CYBER EVENTS**

Hazard Identification & Risk Assessment (HIRA) ..... Medium  
Probability ..... Moderate

Presidential Policy Directive (PDD-41) describes a cyber incident as *“An event occurring on or conducted through a computer network that actually or imminently jeopardizes the integrity, confidentiality, or availability of computers, information or communications systems or networks, physical or virtual infrastructure controlled by computers or information systems, or information resident thereon. For purposes of this directive, a cyber incident may include vulnerability in an information system, system security procedures, internal controls, or implementation that could be exploited by a threat source.”*<sup>29</sup>

With the increased use of computers and the internet, cyber events could include targets such as banks, hospitals, schools, churches, town, city, and state government operations, emergency operations and critical infrastructure. Cyber events have been known to occur almost anywhere, from very small towns to large facilities in New Hampshire, causing large expenditures, disruption in everyday business practices, and data loss. Several communities in New Hampshire have had their data held for ransom.

The Orange planning team did not report any cyber-attacks, but the threat is certainly real. The town stores essential documents on a server at the Town House; the information is also stored in the “cloud”. Security on computer networks, off-site backup, and user education are vital to protecting sensitive town information and data.

**2) TRANSPORT ACCIDENTS**

Hazard Identification & Risk Assessment (HIRA) ..... Low  
Probability ..... Low

The possibility of vehicular accidents involving hazardous materials is identified as potentially significant in Orange on the small portion of US Route 4 that travels through the community; this highway is known to be used by vehicles carrying hazardous materials. Delivery of petroleum and other unknown products to residents could also be involved in a transport accident.

Orange’s roads are steep, narrow, and winding and are subject to severe winter weather; they become treacherous when affected by flooding, winter snow conditions, and ice. Vehicular accidents, wildlife collisions, and truck accidents involving hazardous materials are always possible in these conditions. A major ice storm or another significant event can make egress and access difficult for individuals and first responders. Orange's roads are susceptible to hazards such as road flooding and high winds, leading to downed trees in the roadways and potentially hazardous materials spills.

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<sup>29</sup> PDD-41; <https://obamawhitehouse.archives.gov/the-press-office/2016/07/26/presidential-policy-directive-united-states-cyber-incident>



Losses could be relatively high in property and structural damage in a hazardous materials incident, depending on the scope and location of the incident. However, losses would be expected to be low in Orange, as there are no dense population areas, such as a town center or business district. There have been no significant transport accidents in Orange since the last hazard mitigation plan.

**3) MASS CASUALTY INCIDENTS**

Hazard Identification & Risk Assessment (HIRA) ..... Low  
Probability ..... Low

A Mass Casualty Incident (MCI) is defined as “any number of casualties that exceed the resources normally available from local resources”<sup>30</sup>. MCIs have been known to occur due to bus, auto, train, and aircraft accidents and incidents involving large crowds. MCIs can also result from natural hazards such as hurricanes, floods, earthquakes, and tornadoes.

An MCI could happen anywhere in Orange, but more likely on a small section of US Route 4 in the southwest part of the community. Cardigan Mountain Road, which leads to the state parking lot for hikers, could also be susceptible to an MCI. US Route 4 is heavily traveled year-round but is particularly dangerous during winter storms. Cardigan Mountain Road is far less traveled during the winter but can be pretty active with hikers and local traffic during the summer months. This mountain hike is a well-known destination for area institutions, such as summer camps; it is not unusual to see as many as 100 vehicles in the parking lot and overflowing onto Cardigan Mountain Road, thus hindering emergency response. The top of the Mountain is also subject to lightning strikes.

Animal crossings and poor weather can set up the conditions for an MCI. In addition, with students traveling to Canaan for elementary, middle, and high school, the potential for an MCI is increased. Fortunately, there have been no reported MCIs since the last hazard mitigation plan.

**4) TERRORISM & VIOLENCE**

Hazard Identification & Risk Assessment (HIRA) ..... Low  
Probability ..... Very Low

Terrorism is feared throughout our country and the world; the disruption at soft targets is often the result of terrorist incidents. “Soft Targets and Crowded Places (ST-CPs) are locations that are easily accessible to large numbers of people and that have limited security or protective measures in place making them vulnerable to attack.”<sup>31</sup>

Orange has no soft targets except for hiking trails on Mount Cardigan and the historic Town House. No significant businesses or gathering spots exist within the community, so the terrorism threat is very low.

As with many small towns, the terrorism threat is minimal; if a terrorist incident were to occur, it would most likely be a homegrown terrorist event. There have been no significant terrorist or violent incidents since the prior hazard mitigation plan.

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<sup>30</sup> DeValle Institute Learning Center; <https://delvalle.bphc.org/mod/wiki/view.php?pageid=89>

<sup>31</sup> [https://www.cisa.gov/sites/default/files/publications/DHS-Soft-Target-Crowded-Place-Security-Plan-Overview-052018-508\\_0.pdf](https://www.cisa.gov/sites/default/files/publications/DHS-Soft-Target-Crowded-Place-Security-Plan-Overview-052018-508_0.pdf)

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## Chapter 6: Capabilities Assessment

### A. ANALYSIS OF THE EFFECTIVENESS OF CURRENT PROGRAMS

After researching historic hazards, identifying CIKR, and determining potential hazards, the team determined what was already being done to protect its citizens and structures. Once identified, the team addressed each policy or plan to determine its effectiveness and whether improvements were needed. This analysis became one of the tools the team used to identify mitigation action items for this plan.

Creating new action items was less challenging, knowing what regulations were already in place. In addition, this process helped identify current plans and policies that are working well and those that should be addressed as a new action item and the responsible departments. The following table, *Table 6.1, Policies, Plans & Mutual Aid*, shows the analysis resulting from the team's discussion.

Existing policies, plans and mutual aid that were designated as "Improvements Needed" were added to **Table 9.1, Mitigation Action Items** as new strategies and were reprioritized to meet the current needs of the town.

**TABLE 6.1: CAPABILITIES ASSESSMENT**

#### 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.
- Inadequate**..... The existing program does not work as intended or does not meet its goals.
- Poor** ..... The existing program does not work as intended, often falls short of its goals, or may present unintended consequences.

Current Program or Activity	Description	Managing Department	Effective-ness	Improvements Needed
Public Education & Awareness	The Town of Orange is very well situated to provide public information and outreach to its citizens through various means.	Emergency Management Director & Other Departments	Excellent	<b>Improvements Needed:</b> The town has a website; however, there is no Emergency Management webpage. An emergency webpage is a great way to provide outreach to residents on emergency preparedness and mitigation techniques property owners can use to reduce or eliminate the impact of natural hazards. This strategy is deferred to establish a webpage with robust preparedness and mitigation information and links to other resources. Develop ways to provide alternative public education, such as a discussion at Town Meetings, developing a brochure for a welcome packet or mailing, posting mitigation strategies in the Town Report, or including information on the "Orange" sheet that is mailed to residents annually after Town Meeting and elections. <b>Action Item #7 (also in Table 7.1)</b>

Current Program or Activity	Description	Managing Department	Effective-ness	Improvements Needed
CodeRED	CodeRED is a reverse calling warning system that uses listed phone numbers. CodeRED does not include cell and unlisted numbers or email addresses. The Orange School District uses the "School Messenger" reverse calling system for school activities and emergency notifications.	Emergency Management Director	Poor (for public education)	<b>Improvements Needed:</b> CodeRED is an excellent warning system that only stores landline resident phone numbers. The town has continuously provided information to residents about CodeRED. This is deferred to continue providing public outreach to encourage all residents to contact CodeRED to add cell numbers, emails, unlisted numbers, and verify their information. Use the community website, a possible brochure, the Town Report, available social media platforms, the "Orange" sheet, local newsletters, or a sign-up at Town Meeting. <b>Action Item #8</b>
Tree Removal Program	Tree Removal Program to reduce damage from fallen trees and limbs to power lines, stormwater ditches, and structures and to reduce the risk of wildfire.	Road Agent	Inadequate	<b>Improvements Needed:</b> In addition to work done by and with local utility companies, the Road Agent monitors and maintains brush cutting, drainage system maintenance, and tree removal as part of a tree maintenance program. This strategy is deferred for annual trimming and maintaining trees and brush along town-owned roads to reduce wildfire risk, the potential clogging of drainage systems, the impact of high winds and ice storms, and other natural hazards. <b>Action Item #4 (also in Table 7.1)</b>
Pressurized, Dry Hydrants & other Water Resources	Orange has an excellent and long-standing agreement with the Canaan Fire Department (FD) to provide firefighting services in Orange. The Canaan FD works with the Select Board and the EMD to ensure the functionality of dry hydrants, fire ponds, drafting sites, and other water resources used for fire suppression. There are no pressurized hydrants in Orange.	Canaan Fire Department, Select Board & Emergency Management Director	Excellent (Contract with Canaan FD)  Inadequate (Inspection Schedule)	<b>Improvements Needed:</b> The Canaan Fire Department and Orange have an excellent working relationship. As part of this agreement, water resources are inspected and maintained from time to time. However, due to changing priorities and oversight, an annual inspection schedule has not been established. This strategy is deferred to work with the Canaan Fire Department to establish a regular schedule for the annual inspection and maintenance of the town's water resources. <b>Action Item #5 (also in Table 7.1)</b>
Cardigan Mountain Road pond dry hydrant	Dry hydrant for fire protection	Canaan Fire Chief, Property Owner & Road Agent	Poor	<b>Improvements Needed:</b> The Cardigan Mountain Road pond and the pond's dry hydrant were lost entirely due to the extraordinary rain event of July 2019 (DR: 4457). The pond, located on private property, and this dry hydrant are essential for fire suppression. The strategy is deferred to work with the pond's owner, the Canaan Fire Department, the Road Agent, and others to restore the pond and install a dry hydrant to aid fire suppression. <b>Action Item #16</b>

Current Program or Activity	Description	Managing Department	Effective-ness	Improvements Needed
Emergency Operation Plan (2012)	An Emergency Operations Plan identifies the response procedures and capabilities of the Town of Orange in the event of a natural, technological, or human-caused hazard.	Emergency Management Director	Inadequate	<b>Improvements Needed:</b> The Orange Emergency Operations Plan (EOP) was last updated in 2012 and is overdue for an update based on the state's 5-year recommendation. The new EOP should include an EOC Call Alert List, a detailed Resource Inventory List, and Player Packets. This is deferred to this plan to update the EOP. <b>Action Item #17</b>
Subdivision Regulations (2017) Zoning Ordinances (2018) Site Plan Regulations	The purpose of subdivision regulations is to provide for the town's orderly present and future development by promoting the residents' public health, safety, convenience, and welfare.	Planning Board	Good	<b>Improvements Needed:</b> The Orange Subdivision Regulations (2017), Zoning Ordinances (2018), and Site Plan Regulations are in good shape. The Subdivision Regulations, along with the Driveway Regulations, address setbacks, building on steep slopes, road frontage, steep driveways, stormwater flow, and the size of the lot. The regulations do not address the availability of water resources for fire suppression in new subdivisions. This strategy is deferred to review the Subdivision Regulations, the Zoning Ordinance, and the Site Plan Regulations upon completion of this hazard mitigation plan and discuss changes that will reduce the chance for hazards. <b>Action Item #19</b>
Master Plan (2014)	A Master Plan includes goals, objectives, and expectations for the future development of the town.	Planning Board	Good	<b>Improvements Needed:</b> The Orange Master Plan was last updated in 2014 and will not be ready for a recommended complete update until 2024, which is within the scope of this plan. This is deferred to update the Master Plan according to the state's 10-year recommendation and to consider including a natural hazards section, a discussion on climate change, and action items from this plan into future updates. <b>Action Item #20</b>
E- 911 Signage Compliance	E-911 signage compliance includes markers at driveway entrances that identify residence locations in conjunction with the E-911 alerting system.	Emergency Responders	Poor	<b>Improvements Needed:</b> Orange is about 30% compliant with E-911 signage. This strategy is deferred to this plan to consider ways to get this signage more compliant so that emergency responders can better assist the public in their time of need. Use public outreach opportunities such as an Emergency Management webpage to promote better compliance and develop other means of increasing compliance. Consider offering town-purchased signs for residents to install themselves. Also, consider creating an ordinance for new buildings requiring proper signage. <b>Action Item #2</b>

Current Program or Activity	Description	Managing Department	Effective-ness	Improvements Needed
Orange Hazard Mitigation Plan (2024)	A hazard mitigation plan is designed to address natural, technological, and human-caused hazards and to understand the risks these pose for the community. A hazard mitigation plan aims to create action items that will make the community safer by lessening or eliminating the effects of hazards.	Emergency Management Director	Good	<b>Improvements Needed:</b> The Orange Hazard Mitigation Plan (2017) is being updated with this plan. This strategy is deferred to review this plan, the Orange Hazard Mitigation Plan 2024, on an annual basis and to update the plan again in 2029. <b>Action Item #12</b>
Radio Communications	Radio communications are vital for emergency response to all types of hazards. Radios should be interoperable and up to date with current technology.	Emergency Management Director	Inadequate	<b>Improvements Needed:</b> The Road Agent has radio interoperability. Communications systems and radios are up to date with state and federal requirements and work as intended. Some areas of town have "dead spots" that may benefit from installing repeater(s). This strategy is deferred to add more radios for town personnel and research the possibility of improving coverage across town. <b>Action Item #14</b>
NIMS & ICS Training	The National Incident Management System (NIMS) and the Incident Command System (ICS) provide training that can help ensure effective command, control, and communications during emergencies.	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 town officials as they become elected or appointed. <b>Action Item #6</b>
Culvert & Stormwater Maintenance Plan	A Culvert & Storm Water Maintenance Plan includes an inventory of all culverts and ditches in the community along with a record of the location, size, etc. The Orange Road Agent and the NH DOT clean the drainage basins once a year, and after major flooding events, culverts are repaired as needed.	Road Agent	Good	<b>Improvements Needed:</b> Although the Orange Road Agent does an excellent job cleaning and repairing drainage basins and culverts, a written Culvert & Stormwater Maintenance Plan should be developed to ensure continuity of actions and efficient stormwater management. This strategy is deferred for continued maintenance and to develop a written Culvert & Stormwater Maintenance Plan detailing such items as the size, material, date of installation, recommended date for improvement, GPS location, and any problems associated with the location (i.e., flooding). <b>Action Items #3</b>



Current Program or Activity	Description	Managing Department	Effectiveness	Improvements Needed
Local Road Design Standards	Local road design standards are specifications for the construction of new roads in a community.	Select Board & Road Agent	Good	<b>No Improvements Needed:</b> Local road standards have been established to provide specifications for building new roads to ensure that the town does not assume ownership of substandard roads. The town will not assume ownership of roads not built to Class V standards. Acceptance of new roads is voted at Town Meeting as a Warrant Article.
Emergency Generators	The town has emergency backup power at the Town House, Orange's only Critical Infrastructure & Key Resource (CIKR), which serves as the Primary EOC and the Primary Shelter. No other generators are necessary at this time.	Emergency Management Director	Excellent	<b>No Improvements Needed:</b> The town has emergency backup power at the Town House, Orange's only Critical Infrastructure & Key Resource (CIKR), which serves as both the Primary EOC and the Primary Shelter. No other generators are necessary at this time.
Shoreland Water Quality Protection Act (formerly the Comprehensive Shoreland Protection Act)	The Shoreland Water Quality Protection Act (SWQPA) establishes minimum standards for using and developing shorelands adjacent to the state's public water bodies. The SWQPA includes changes to vegetation requirements within the natural woodland and waterfront buffers, the impervious surface limitations, and the shoreland permit by notification process.	State of NH	Excellent	<b>No Improvements Needed:</b> The Town of Orange follows the regulations detailed in the Shoreland Water Quality Protection Act. Compliance with the Act is encouraged.
Bridge Maintenance Program	There are currently no red-listed bridges in the community. Inspection and clean-up of bridges occur annually. The state inspects all state-owned bridges every other year and maintains state bridges regularly.	NH DOT & Road Agent	Good	<b>No Improvements Needed:</b> The Orange Road Agent has established short- and long-term bridge maintenance and replacement schedules. Currently, there are no "red-listed" town-owned bridges.

Current Program or Activity	Description	Managing Department	Effectiveness	Improvements Needed
NH Forest and Lands & Fire Permits	NH Forest & Lands, a division of the NH Department of Natural & Cultural Resources (DNCR), regulates open burning and permits.	NH Forests & Lands (DNCR) & Local Fire Warden	Good	<b>No Improvements Needed:</b> The system in place with NH Forests & Lands (DNCR) and the local fire warden works well. The public is aware of fire permitting requirements.
State Health Department Public Health Plan	The state health department's "Influenza, Pandemic, Public Health Preparedness and Response Plan" is written by the state health department to be prepared for any public health emergency. The town is part of the Upper Valley Regional Public Health Emergency Annex.	Upper Valley Regional Public Health Network	Good	<b>No Improvements Needed:</b> The State Public Health Plan assists the community as part of the services provided by the Upper Valley Regional Public Health Network. The Orange Health Officer attends public health meetings whenever possible.
Capital Reserve Fund (CRF)	A type of account on a town's balance sheet reserved for long-term capital investment projects or any other large and anticipated expense(s) that will be incurred in the future. Reserve funds are set aside to ensure adequate funding to at least partially finance future projects, equipment, and other expenditures.	Select Board	Good to Inadequate	<b>No Improvements Needed:</b> The town's Capital Reserve Funds are set aside each year at budget time to assist the town's departments with planned purchases of equipment and supplies or in emergencies. The Orange Capital Reserve Funds work well and are part of the town warrant at the annual Town Meeting, although it would be advantageous to grow the funds to robust levels.
Building Code & Permits	The town has not adopted International Building Codes (IBC) or International Residential Codes (IRC). However, it does require builders to follow the state-adopted codes for new construction so that national standards for flood, wind, earthquake, fire, and snow load are met.	Building Inspector	Excellent	<b>No Improvements Needed:</b> The Town of Orange has a Building Inspector. The permitting process requires builders to abide by the International Building Codes (IBC) and the International Residential Codes (IRC) adopted by the State of New Hampshire.

Current Program or Activity	Description	Managing 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 appropriate to the emergency's scope.	Police, Fire & Road Agent & EMS	Excellent	<b>No Improvements Needed:</b> The Town of Orange is a NH Public Works Mutual Aid Association member. Canaan Fire and Ambulance covers Orange and has mutual aid with the Upper Valley Regional Emergency Services Association (URISA). The NH State Police are responsible for law enforcement and patrol in Orange. Mutual aid systems in and associated with Orange work well.
Burning Index	New Hampshire Forests & Lands (DNCR) has a burning index that measures the risk for wildfires and how likely fires are to start on a given day. It also evaluates the potential damages wildfires can create, the number of people needed to fight it, and the type of equipment that might be needed.	NH Hampshire Forests & Lands (DNCR) & Canaan Fire Department	Excellent	<b>No Improvements Needed:</b> The Canaan 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. A Fire Danger Sign is on Dorchester Road in Canaan, at the Canaan Public Safety Building.

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## Chapter 7: Last Mitigation Plan

### A. DATE OF LAST PLAN

Based on the Disaster Mitigation Act (DMA) of 2000, Orange has developed hazard mitigation plans in the past. The most recent update was formally approved in 2017. The Orange, NH Hazard Mitigation Plan Update 2024 updates the 2017 plan.

Below are the action items that were identified in the 2017 plan. The team identified the current status of each strategy based on three sets of questions:

#### COMPLETED

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

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

#### 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?
- Should this strategy be reconsidered and included as a new action item for this plan if the strategy was not completed?

In *Table 7.1: Accomplishments since the Last Plan*, the team assessed what had been accomplished and determined what additional work may be needed. Columns in red font were extracted word-for-word from the 2017 Hazard Mitigation Plan. Two additional columns not shown here – *Responsibility or Oversight and Funding or Support*– can be found in the 2017 Hazard Mitigation Plan.

**TABLE 7.1: ACCOMPLISHMENTS SINCE THE LAST PLAN**

Rank	New Mitigation Project	Time Frame	Completed, Deleted, or Deferred
1-L	Educate property owners on steps they can take reduce the impact of hazards on their home and business	Short	<p><b>Completed &amp; Deferred:</b> Although some emergency and mitigation education has been provided to residents in the past, the town has not developed an Emergency Management (EM) web page. An emergency webpage is a great way to reach out to residents on emergency preparedness and mitigation techniques they can use to reduce or eliminate the impact of natural hazards. This strategy is deferred to establish a webpage and provide robust information and links to other resources to educate the public on general and seasonal mitigation techniques. Develop ways to provide alternative public education, such as a discussion at Town Meetings, developing a brochure for a welcome packet or mailing, posting mitigation strategies in the Town Report, or including information on the "Orange" sheet that is mailed to residents annually after Town Meeting and elections.</p> <p><b>Action Item #7 (also in Table 6.1)</b></p>

Rank	New Mitigation Project	Time Frame	Completed, Deleted, or Deferred
5-H	Educate citizens about the Code Red notification system	Short	<b>Partially Completed &amp; Deferred:</b> Grafton County CodeRED is an excellent warning system that only stores hardline phone numbers. The town has continuously provided information to residents about CodeRED. This strategy is deferred to continue providing public outreach to encourage all residents to contact CodeRED to add cell numbers, emails, unlisted numbers, and verify their information. Use the community website, a possible brochure, the Town Report, available social media platforms, the "Orange" sheet, local newsletters, or a sign-up at Town Meeting. <b>Action Item #8 (also in Table 6.1)</b>
3-M	Continue selective tree trimming maintenance along Town roads	Short	<b>Completed &amp; Deferred:</b> In addition to work done by and with local utility companies, the Road Agent monitors and maintains brush cutting, drainage system maintenance, and tree removal as part of a tree maintenance program. This strategy is deferred for annual trimming and maintaining trees and brush along town-owned roads to reduce wildfire risk, the potential clogging of drainage systems, the impact of high winds and ice storms, and other natural hazards. <b>Action Item #4 (also in Table 6.1)</b>
2-M	Create an annual inspection and maintenance schedule for dry hydrants	Short	<b>Partially Completed &amp; Deferred:</b> The Canaan Fire Department and Orange have an excellent working relationship. As part of this agreement, water resources are inspected and maintained from time to time. However, due to changing priorities and oversight, an annual inspection schedule has not been established. This strategy is deferred to work with the Canaan Fire Department to establish a regular schedule for the annual inspection and maintenance of the town's water resources. <b>Action Item #5(also in Table 6.1)</b>
3-M	Install surge protection at the Town House	Short	<b>Deferred:</b> Surge protection has not been installed at the Town House due to oversight and changing priorities. This strategy is deferred to work with the Canaan Fire Department to determine what type of surge or lightning protection should be installed at the Town House. This action item could become part of the Town House's roof restoration. <b>Action Item #18</b>
1-L	Create signage for Class VI roads for vehicle safety and road conditions	Long	<b>Deferred:</b> This strategy was not done due to oversight and priorities. This strategy is deferred to create signage for specific Class VI roads to advise visitors that the road is not maintained. <b>Action Item #15</b>
1-L	Replace the culvert over Mill Brook Road to reduce erosion	Long	<b>Deferred:</b> Due to changing priorities and funding, the Mill Brook Road culvert has not been replaced as suggested in the previous plan. This strategy is deferred to replace this culvert to reduce erosion and flooding. <b>Action Item #23</b>
2-M	Bridge repair on Brock Hill over Brown Brook to reduce erosion	Long	<b>Deferred:</b> Bridge repair on Brock Hill Road over Brown Brook has not been replaced as suggested in the previous plan due to changing priorities and funding. This strategy is deferred to repair the bridge to reduce erosion. <b>Action Item #21</b>



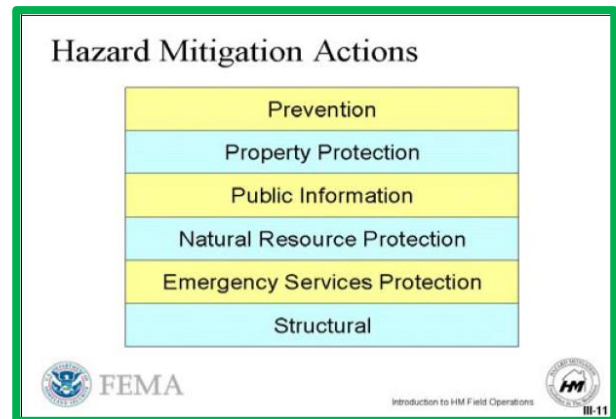
Rank	New Mitigation Project	Time Frame	Completed, Deleted, or Deferred
5-H	Widen corner & eliminate seasonal erosion on Cardigan Mtn Road into State Park	Medium	<b>Completed &amp; Deleted:</b> Due to the July 2019 storm (DR-4457), work was done on Cardigan Mountain Road, Burnt Hill Road, and other roads in Orange; the road damage in Orange from this storm was significant. Although the corner was not widened as suggested in the previous plan, significant improvements were made to drainage; this work included the installation of a new culvert and an asphalt apron at the intersection (planned for Spring 2022). Mitigation has been completed at this site; therefore, this strategy is deleted.
5-H	Monitor culverts and replace as needed along: Burnt Hill Road, Peaslee Road, Tuttle Hill Road, Brock Hill, New Colony Road, Cross Road, and Tug Mt. Road	Long	<b>Completed &amp; Deleted:</b> Monitoring and maintaining culverts is part of <b>Action Item #1</b> in Table 9.1 in this plan. Many of Orange's culverts have been repaired, replaced, and upgraded due to the significant damage caused by the July 2019 storm (DR-4457). However, the culvert on Mill Brook Road still needs repair, <b>Action Item #23</b> . This strategy from the previous plan is deleted as it is addressed in other action items.
0-L	Consider joining the National Flood Insurance Program (NFIP)	Long	<b>Completed &amp; Deleted:</b> It was suggested in the last hazard mitigation plan that the town may want to consider joining the National Flood Insurance Program (NFIP). The current hazard mitigation team has decided that the NFIP is not something they choose to join now. There is a limited amount of floodplain in Orange, and there are inaccuracies in the FEMA DFIRMS; therefore, this strategy is deleted.
4-H	Reinforce the northeast corner of the Town House to increase structural stability	Long	<b>Completed &amp; Deleted:</b> Since the last hazard mitigation plan, support has been added underneath the flooring at the Town House. The retaining wall was built to redirect the water flow from the building. The building's stability issues have been addressed; therefore, this strategy from the last plan is deleted.
3-M	Install signage for the State Park, which directs visitors to 'abandon summit' in the event of approaching thunder and lightning	Short	<b>Deleted:</b> The strategy from the prior plan, which suggested the installation of signage for the State Park to warn hikers to abandon the summit during thunder and lightning storms, was not completed. It was determined that this is the state's responsibility, not the town's; therefore, this strategy was deleted.

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## Chapter 8: New Mitigation Strategies & STAPLEE

### A. MITIGATION STRATEGIES BY TYPE

The following list of mitigation categories and possible strategy ideas was compiled from several sources, including the USFS, FEMA, other planners, and past hazard mitigation plans. This list was used during a brainstorming session to discuss the issues in town. Team involvement and the brainstorming sessions proved helpful in bringing new ideas, better relationships, and 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 Plan
- Rural Fire Water Resource Plan
- NFIP compliance

#### Public Education & Awareness

- Hazard information centers
- Public education and outreach programs
- Emergency website creation
- Firewise® training
- National Flood Insurance Program (NFIP)
- 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
- Floodproofing
- Building codes
- Development regulations

#### Natural Resource Protection

- Best management practices within the forest
- Forest and vegetation management
- Forestry and landscape management
- Development regulations for wetlands
- 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 or realignment

**B. POTENTIAL MITIGATION STRATEGIES BY HAZARD**

To further promote the concept of mitigation, the team was provided with a handout 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 below and on the following page. The planning team considered each item from this comprehensive list of possible mitigation action items to determine if any of these action items could be put in place for Orange, emphasizing new and existing buildings and infrastructure.

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

Natural Hazard Mitigation Ideas	Type of Project
<b>Landslide &amp; Erosion</b>	
• 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
<b>Lightning &amp; Hail</b>	
• Building Construction.....	Property Protection
<b>High Wind Events</b>	
• Construction Standards and Techniques.....	Property Protection
• Safe Rooms.....	Prevention
• Manufactured Home Tie Downs.....	Property Protection
• Building Codes.....	Property Protection
<b>Wildfire</b>	
• 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
<b>Extreme Temperatures</b>	
• Warming & Cooling Stations.....	Prevention
<b>Severe Winter Weather</b>	
• Snow Load Design Standards.....	Property Protection
<b>Subsidence</b>	
• Open Space.....	Natural Resource Protection
• Acquisition, Demolition & Relocation.....	Structural Project
<b>Earthquake</b>	
• Construction Standards and Techniques.....	Property Protection
• Building Codes.....	Property Protection
• Bridge Strengthening.....	Structural Project
• Infrastructure Hardening.....	Structural Project
<b>Drought</b>	
• Water Use Ordinances.....	Prevention

**C. STAPLEE METHODOLOGY**

Table 8.1, *Potential Mitigation Items & the STAPLEE*, reflects the newly identified potential hazard mitigation action items and the results of the STAPLEE evaluation, as explained below. Many of these potential mitigation action items overlap. Some areas identified as “All Hazards” would also apply indirectly to wildfire response.

Each proposed mitigation action item aims “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 a project's social, technical, administrative, political, legal, economic, and environmental characteristics; public administration officials and planners commonly use it to make 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 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 potential benefits?

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

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

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

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 reference):

- **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 before an actual disaster would be listed as a potential mitigation action item. 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 primarily a management document designed to assist the Select Board and other town officials in all aspects of managing and tracking potential emergency planning action items. For instance, the team knew that some of these action items were more appropriately identified as preparedness or readiness issues. As no other established planning mechanism recognizes some of these issues, the team did not want to lose the ideas discussed during these planning sessions and thought this method was the best way to achieve that objective.

The town understands that the action items for a town of 200 may not be the same as those for 30,000. Also, the action items for a town in the middle of predominantly hardwood forests are not the same as those for a town on the Jersey Shore. Therefore, the Town of Orange has accepted the **Mitigation Action Items** in Tables 8.1 and 9.1 as the complete list of action items for this town and only this town. Furthermore, the Town of Orange indicates that having considered a comprehensive list of possible mitigation action items (see sections A & B of this chapter) for this plan, there are no additional action items to add now.

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

Potential mitigation action items in Table 8.1 are listed in numerical order and indicate if they were derived from prior tables in this plan, i.e., (Table 7.1). 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 F: Potential Mitigation Ideas*, for more information.

Proposed Mitigation Action Items	Type of Activity	S	T	A	P	L	E	E	TTL
<p><b>Action Item #1:</b> The Road Agent, working with the Select Board, will continue to replace and maintain culverts and ditches as time and budget allow for the duration of this plan. There are no dire culverts at this time that need improving. (F13)</p>	<p><b>Affected Location</b> -Culverts &amp; Ditches Town Wide</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection -Structural Project</p>	3	3	3	3	3	3	3	21
<p><i>No apparent difficulty with this action item</i></p>									

Proposed Mitigation Action Items	Type of Activity	S	T	A	P	L	E	E	TTL
<p><b>Action Item #2:</b> Improve E-911 signage compliance so emergency responders can better assist the public in their time of need. Use all available public outreach opportunities, including the town's website, an Emergency Management webpage, a possible brochure, the Town Report, and through a presentation at Town Meeting. Consider offering town-purchased signage and possibly an ordinance for new buildings requiring proper signage. <b>(MU14) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Public Education &amp; Awareness -Emergency Service Protection -Property Protection -Natural Resource Protection</p>	3	3	3	3	3	3	3	21
<p><b>Action Item #3:</b> Maintain culverts and ditches in the community and develop and maintain a written stormwater maintenance plan to ensure more efficient stormwater management. Include in this plan, or inventory, the location, date of installation, GPS coordinates, material, 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>	<p><b>Affected Location</b> -Culverts &amp; Ditches</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection</p>	3	3	2	3	3	3	3	20
<p><b>Action Item #4:</b> In addition to work done by and with local utility companies, monitor and maintain brush cutting, drainage system maintenance, and tree removal as part of a tree maintenance program. Create defensible space around power lines, oil and gas lines, and other infrastructure. Work to reduce wildfire risk by clearing dead vegetation and cutting high grass and other fuel loads in the community. Clear brush from the north and east sides of the Town House to mitigate wildfires. <b>(SW4, WF7, WF9 &amp; F14) (Tables 6.1 &amp; 7.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection</p>	3	3	2	2	2	1	3	16
<p><b>Action Item #5:</b> Work with the Canaan Fire Department to establish a regular schedule for the annual inspection and maintenance of the town's water resources. Inspect the functionality of dry hydrants and maintain and repair hydrants and other water resources in Orange. Consider other areas with limited water resources and address these issues by installing new hydrants, fire ponds, or cisterns. <b>(WF8) (Tables 6.1 &amp; 7.1)</b></p>	<p><b>Affected Location</b> -Water resources townwide</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection</p>	3	3	3	3	3	3	3	21
<p><b>Action Item #6:</b> The Emergency Management Director (EMD) to encourage all town officials who may be required to respond to an emergency and any new emergency responders to take NIMS 700 (S-700) &amp; ICS (ISC100 &amp; ISC200). Additionally, the EMD should encourage key personnel to learn about and become adept with WEB-EOC. <b>(Emergency Preparedness)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection</p>	3	3	3	3	3	3	3	21

Proposed Mitigation Action Items	Type of Activity	S	T	A	P	L	E	E	TTL
<p><b>Action Item #7:</b> Develop robust information on an Emergency Management webpage and educate the public on hazard mitigation and preparedness measures, including information such as emergency contacts, shelter locations, evacuation routes, methods of emergency alerting, 911 compliance, water-saving techniques, earthquake risk, and mitigation activities that can be taken in residents' homes, steps homeowners can take to protect themselves and their properties when extreme temperatures occur, safety measures that can be taken during hail and lightning storms, mitigation techniques for property protection and links to available resources. Educate homeowners regarding the risks of building in hazard zones and encourage homeowners to install carbon monoxide monitors and alarms. Provide public information regarding infectious diseases and known and emergency contaminants. Continue to develop ways to provide public education, such as a discussion at Town Meetings, developing a brochure for a welcome packet or mailing, posting mitigation strategies in the Town Report, or including information on the "Orange" sheet that is mailed to residents annually after Town Meeting and elections. (MU14, SW7, WF11, T3, D9, EQ7, ET1, ET4, L2, WW5, HA3) (Tables 6.1 &amp; 7.1)</p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Public Education &amp; Awareness -Property Protection</p>	2	3	1	3	2	3	3	17
<p><b>Action Item #8:</b> Provide public outreach to encourage all residents to contact CodeRED to add cell numbers, unlisted numbers, and emails and to verify their information. Use the community website, a possible brochure, the Town Report, available social media platforms, the "Orange" sheet, local newsletters, or a sign-up at Town Meeting. (MU14) (Tables 6.1 &amp; 7.1)</p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Public Education &amp; Awareness -Emergency Service Protection</p>	2	3	1	3	2	3	3	17
<p><b>Action Item #9:</b> Post important information on the town's Emergency Management webpage and notices of red flag burning days. Obtain and have available Firewise® brochures to educate homeowners on methods to reduce fire risk around their homes and provide a link to Firewise® on the Emergency page of the town's website. Provide Firewise® brochures to residents seeking burn permits (if not obtained online); advise residents of the importance of maintaining defensible space and removing dead or dry leaves, needles, twigs, and combustible materials from roofs, decks, eaves, porches, and yards. (WF10 &amp; 12)</p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Public Education &amp; Awareness</p>	3	3	3	3	3	3	3	21

Proposed Mitigation Action Items	Type of Activity	S	T	A	P	L	E	E	TTL
<p><b>Action Item #10:</b> Provide public outreach to Orange's citizens regarding the Town House's availability as a warming center during extended low temperatures. Arrange to obtain a collection of phone chargers for residents to use at the Town House. <b>(ET3 &amp; WW6)</b></p>	<p><b>Affected Location</b> -Town House (warming only)</p> <p><b>Type of Activity</b> -Prevention -Public Education &amp; Awareness</p>	3	3	3	3	3	3	3	21
		No apparent difficulty with this action item							
<p><b>Action Item #11:</b> To promote private mitigation efforts, provide public outreach to the citizens of Orange on the importance of maintaining private roads to allow for safe access for fire apparatus into wildland-urban interface neighborhoods and properties. This will help to ensure accessibility for emergency response and decrease the risk of wildfire. <b>(MU16)</b></p>	<p><b>Affected Location</b> -Private Roads</p> <p><b>Type of Activity</b> -Prevention -Public Education &amp; Awareness -Emergency Service Protection</p>	3	3	3	2	3	3	3	20
		<i>Political: Some people may decide not to do this.</i>							
<p><b>Action Item #12:</b> Provide an annual review of the Orange, NH Hazard Mitigation Plan Update 2024, including a review of the status of the "Action Items" listed in this plan to encourage completion. Obtain approval from the local elected body annually and provide a complete plan update in five years. <b>(MU11) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention</p>	3	3	3	3	3	3	3	21
		No apparent difficulty with this action item							
<p><b>Action Item #13:</b> Obtain approval of this hazard mitigation plan as a Community Wildfire Protection Plan (CWPP) to enable potential assistance from the state and federal governments for future wildfire mitigation projects. Explore the potential of obtaining grant funding to reduce the fuel load on fire lanes and other community areas. <b>(WF2)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Property Protection -Natural Resource Protection</p>	3	3	3	3	3	3	3	21
		No apparent difficulty with this action item							
<p><b>Action Item #14:</b> Determine possible locations in Orange where repeaters can be installed to increase the town's communications capabilities. Provide radios to additional town personnel (Town House, Road Agent, and Emergency Management Director) to help improve communications capabilities. <b>(Emergency Preparedness) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection</p>	3	3	3	3	3	3	3	21
		No apparent difficulty with this action item							
<p><b>Action Item #15:</b> Purchased signage for specific Class VI roads to advise visitors that the road is not maintained. <b>(MU14) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Public Education &amp; Awareness -Emergency Service Protection</p>	3	3	3	3	3	3	3	21
		No apparent difficulty with this action item							

Proposed Mitigation Action Items	Type of Activity	S	T	A	P	L	E	E	TTL
<p><b>Action Item #16:</b> Work with the pond owner on Cardigan Mountain Road, the Canaan Fire Department, the Road Agent, and others to maintain/restore the pond and install a dry hydrant to aid fire suppression. <b>(WF4 &amp; WF8) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Cardigan Mountain Pond (dry hydrant)</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection -Structural Project</p>	3	3	2	3	2	2	1	16
<p><b>Action Item #17:</b> Update the Orange Emergency Operations Plan to coincide with the new state 18-ESF format. Include an analysis of the impact of natural hazards on Critical Infrastructure &amp; Key Resources that may be needed during an emergency. Also, include an EOC Call Alert List, a detailed Resource Inventory List, and Player Packets. <b>(Emergency Preparedness) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection</p>	3	3	3	3	3	3	3	21
<p><b>Action Item #18:</b> Work with the Canaan Fire Department to determine what type of surge or lightning protection should be installed at the Town House. This action item could become part of roof restoration and mitigation. <b>(L1) (Table 7.1)</b></p>	<p><b>Affected Location</b> -Orange Town House</p> <p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection</p>	3	3	2	2	2	1	3	16
<p><b>Action Item #19:</b> Review the Orange Subdivision, Zoning, and Site Plan Regulations after approval of the Orange, NH Hazard Mitigation Plan Update 2024 is received. Integrate concepts, ideas, and action items from this plan into other town regulatory documents to help mitigate the impact of natural hazards. <b>(MU6) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Property Protection -Natural Resource Protection</p>	3	3	3	3	3	3	3	21
<p><b>Action Item #20:</b> Review this plan, the Orange, NH Hazard Mitigation Plan Update 2024, whenever an annual review or complete update of the Master Plan is done, and consider incorporating a discussion on climate change, a natural hazards section, and mitigation action items from this plan. <b>(MU6) (Table 6.1)</b></p>	<p><b>Affected Location</b> -Townwide</p> <p><b>Type of Activity</b> -Prevention -Property Protection -Natural Resource Protection</p>	3	3	3	3	3	3	3	21

Proposed Mitigation Action Items	Type of Activity	S	T	A	P	L	E	E	TTL
<p><b>Action Item #21:</b> Stabilize the Brock Hill Road culvert area using rip rap and other stabilization techniques to prevent further erosion around the culvert and the potential for future inland flooding. <b>(F13) (Table 7.1)</b></p>	<p><b>Affected Location</b> -Brock Hill Road Bridge</p>	3	3	3	3	3	3	3	21
	<p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection -Structural Project</p>	<p><i>No apparent difficulty with this action item</i></p>							
<p><b>Action Item #22:</b> Obtain funding and upgrade the existing 48" cast iron New Colony culvert with a new galvanized pipe of at least 36" inches, depending on engineering studies, to alleviate the stabilization and erosion issues around the culvert and prevent local flooding. <b>(F13)</b></p>	<p><b>Affected Location</b> -New Colony Road Culvert</p>	3	3	3	3	3	2	2	19
	<p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection -Structural Project</p>	<p><b>Economical:</b> Budget constraints <b>Environmental:</b> DES approvals are needed</p>							
<p><b>Action Item #23:</b> Obtain funding and upgrade the Mill Brook Road culvert with a concrete box culvert or other solution, depending on engineering studies, to alleviate the stabilization and erosion issues around the culvert and prevent local flooding. <b>(F13) (Table 7.1)</b></p>	<p><b>Affected Location</b> -Mill Brook Road Culvert</p>	3	3	3	3	3	3	3	21
	<p><b>Type of Activity</b> -Prevention -Emergency Service Protection -Property Protection -Natural Resource Protection -Structural Project</p>	<p><i>No apparent difficulty with this action item</i></p>							



## Chapter 9: Implementation Schedule for Prioritized Action Items

### A. PRIORITY METHODOLOGY

After reviewing the finalized STAPLEE numerical ratings, the planner and the team developed *Table 9.1, The Mitigation Action Plan*. To do this, the planner created four categories in which to place the potential mitigation action items.

#### CATEGORY A

Category A includes those items that are being done and will continue to be done in the future.

#### CATEGORY B

Category B includes 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 C

Category C includes those items that the town does not have sole authority to act upon, those for which funding might be beyond the town's capability, and those generally taking 13-36 months to complete.

#### CATEGORY D

Category D includes those items that would take a significant funding effort, those that the town has little control over the final decision, and those that would take more than 37 months to complete.

Each potential mitigation action item was placed in one of these four categories. Then, those action items were prioritized within each category according to cost-benefit, time frame, and STAPLEE scores. Actual cost estimates were unavailable during the planning process. However, the team could agree on the cost-benefit for each proposed action item using the STAPLEE process and a Very Low Cost to High-Cost estimate (see the following page).

The following criteria were considered 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 committee evaluate the new hazard mitigation action items they brainstormed throughout the planning process. While all actions would 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 to outline responsibilities, time frames, and methods for implementing each action item. The following questions were asked 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 and on the following pages). 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 operations plan and implemented through that planning effort.

**TABLE 9.1: THE MITIGATION ACTION PLAN**

*Table 9.1, The Mitigation Action Plan*, beginning on the following page, includes problem statements expressed by the planning team. These action items are listed by priority and indicate if they were derived from other tables in this plan.

Key to the Estimated Cost	
<b>Very Low Cost</b> .....	\$0-\$1,000 or staff time only
<b>Low Cost</b> .....	\$1,000-\$20,000
<b>Medium Cost</b> .....	\$20,000-\$100,000
<b>High Cost</b> .....	\$100,000 or more

Key to the Time Frame	
<b>Life of Plan</b> .....	Starting on Plan adoption 2024-2029 (0-60 months)
<b>Short Term</b> .....	1 year 2024-2025 (0-12 months)
<b>Medium Term</b> .....	2 years starting in 2025 – 2027 (12 – 36 months)
<b>Long-term</b> .....	3 years starting in 2026 – 2029 (36 -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 F: Potential Mitigation Ideas* for more information.

Mitigation Action Items are listed in order of priority.

Final R/P	Problem Statement New Mitigation Action Item	Type of Hazard	Managing Department	Funding or Support	Time Frame	Est. Cost
A-1	<p><b>Problem Statement:</b> <i>The Orange Road Agent lists stormwater systems with culvert conditions ranging from one to five, with five being the most critical. Within this list, several culverts are indicated as fours and fives, but no culverts require immediate attention at this time.</i></p> <p><b>Action Item #1:</b> The Road Agent, working with the Select Board, will continue to replace and maintain culverts and ditches as time and budget allow for the duration of this plan. There are no dire culverts at this time that need improving. <b>(F13)</b></p>	Inland Flooding	Select Board & Road Agent	Local & Grants	Life of the Plan	As the budget allows
A-2	<p><b>Problem Statement:</b> <i>The town has continuously used public outreach to remind residents of the need for proper E-911 signage. However, the town is only about 30% compliant with the proper E-911 signage.</i></p> <p><b>Action Item #2:</b> Improve E-911 signage compliance so emergency responders can better assist the public in their time of need. Use all available public outreach opportunities, including the town's website, an Emergency Management webpage, a possible brochure, the Town Report, and through a presentation at Town Meeting. Consider offering town-purchased signage and possibly an ordinance for new buildings requiring proper signage. <b>(MU14) (Table 6.1)</b></p>	All Hazards	Select Board	Local	Life of the Plan	Low Cost (\$1,000-\$20,000)
A-3	<p><b>Problem Statement:</b> <i>Although the Orange Road Agent works or oversees work to clean and repair drainage basins and culverts, an updated written stormwater maintenance plan should be developed to ensure continuity of actions and efficient stormwater management.</i></p> <p><b>Action Item #3:</b> Maintain culverts and ditches in the community and develop and maintain a written stormwater maintenance plan to ensure more efficient stormwater management. Include in this plan, or inventory, the location, date of installation, GPS coordinates, material, 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>	Inland Flooding	Road Agent	Local	Life of the Plan	Very Low Cost (\$0 - \$1,000 or staff time only)

Final R/P	Problem Statement New Mitigation Action Item	Type of Hazard	Managing Department	Funding or Support	Time Frame	Est. Cost
A-4	<p><b>Problem Statement:</b> As trees become damaged and threaten power lines and structures on town roads, the Road Agent removes them. NH DOT does this for state roads along with utility companies as needed. There is a need to continue to work to keep this hazard to a minimum.</p> <p><b>Action Item #4:</b> In addition to work done by and with local utility companies, monitor and maintain brush cutting, drainage system maintenance, and tree removal as part of a tree maintenance program. Create defensible space around power lines, oil and gas lines, and other infrastructure. Work to reduce wildfire risk by clearing dead vegetation and cutting high grass and other fuel loads in the community. Clear brush from the north and east sides of the Town House to mitigate wildfires. <b>(SW4, WF7, WF9 &amp; F14) (Tables 6.1 &amp; 7.1)</b></p>	High Wind Events, Wildfire, Severe Winter Weather-Ice Storms & Inland Flooding	Road Agent	Local	Life of the Plan	Medium Cost (\$20,000-\$100,000)
A-5	<p><b>Problem Statement:</b> The Canaan Fire Department and Orange have an excellent working relationship. As part of this agreement, water resources are inspected and maintained from time to time. However, due to changing priorities, an annual inspection schedule has not been established. Inspection and maintenance of water resources need to continue.</p> <p><b>Action Item #5:</b> Work with the Canaan Fire Department to establish a regular schedule for the annual inspection and maintenance of the town's water resources. Inspect the functionality of dry hydrants and maintain and repair hydrants and other water resources in Orange. Consider other areas with limited water resources and address these issues by installing new hydrants, fire ponds, or cisterns. <b>(WF8) (Tables 6.1 &amp; 7.1)</b></p>	Wildfire & Conflagration	Select Board & Emergency Management Director	Local	Life of the Plan	Low Cost \$1,000-\$20,000
A-6	<p><b>Problem Statement:</b> Although first responders, including firefighters, have received NIMS &amp; ICS training, not all of Orange's town officials have.</p> <p><b>Action Item #6:</b> The Emergency Management Director (EMD) to encourage all town officials who may be required to respond to an emergency and any new emergency responders to take NIMS 700 (S-700) &amp; ICS (ISC100 &amp; ISC200). Additionally, the EMD should encourage key personnel to learn about and become adept with WEB-EOC. <b>(Emergency Preparedness)</b></p>	All Hazards	Emergency Management Director	Local	Life of the Plan	Very Low Cost (\$0 - \$1,000 or staff time only)

Final R/P	Problem Statement New Mitigation Action Item	Type of Hazard	Managing Department	Funding or Support	Time Frame	Est. Cost
A-7	<p><b>Problem Statement:</b> <i>The town has not established an Emergency Management page to educate the public on emergency preparedness and mitigation.</i></p> <p><b>Action Item #7:</b> Develop robust information on an Emergency Management webpage and educate the public on hazard mitigation and preparedness measures, including information such as emergency contacts, shelter locations, evacuation routes, methods of emergency alerting, 911 compliance, water-saving techniques, earthquake risk, and mitigation activities that can be taken in residents' homes, steps homeowners can take to protect themselves and their properties when extreme temperatures occur, safety measures that can be taken during hail and lightning storms, mitigation techniques for property protection and links to available resources. Educate homeowners regarding the risks of building in hazard zones and encourage homeowners to install carbon monoxide monitors and alarms. Provide public information regarding infectious diseases and known and emergency contaminants. Continue to develop ways to provide public education, such as a discussion at Town Meetings, developing a brochure for a welcome packet or mailing, posting mitigation strategies in the Town Report, or including information on the "Orange" sheet that is mailed to residents annually after Town Meeting and elections. <b>(MU14, SW7, WF11, T3, D9, EQ7, ET1, ET4, L2, WW5, HA3) (Tables 6.1 &amp; 7.1)</b></p>	All Hazards including Severe Wind, Drought, Earthquake, Extreme Temperatures, Hail, Lightning, Severe Winter Weather, Tornado, Wildfire, Known & Emergency Contaminants & Infectious Disease	Select Board & all other departments	Local	Life of the Plan	Very Low Cost (\$0 - \$1,000 or staff time only)
A-8	<p><b>Problem Statement:</b> <i>CodeRED (NH Emergency Notification System (ENS) is an excellent warning system that only stores hardline resident phone numbers. Residents may not be aware that they can add cell numbers, emails, and unlisted numbers.</i></p> <p><b>Action Item #8:</b> Provide public outreach to encourage all residents to contact CodeRED to add cell numbers, unlisted numbers, and emails and to verify their information. Use the community website, a possible brochure, the Town Report, available social media platforms, the "Orange" sheet, local newsletters, or a sign-up at Town Meeting. <b>(MU14) (Tables 6.1 &amp; 7.1)</b></p>	All Hazards	Select Board & Emergency Management Director	Local	Life of the Plan	Very Low Cost (\$0 - \$1,000 or staff time only)

Final R/P	Problem Statement New Mitigation Action Item	Type of Hazard	Managing Department	Funding or Support	Time Frame	Est. Cost
A-9	<p><b>Problem Statement:</b> Although the town does a great job communicating with its residents to promote preparedness, residents may not know the steps they can take to reduce the fire risk at their homes.</p> <p><b>Action Item #9:</b> Post important information on the town's Emergency Management webpage and notices of red flag burning days. Obtain and have available Firewise® brochures to educate homeowners on methods to reduce fire risk around their homes and provide a link to Firewise® on the Emergency page of the town's website. Provide Firewise® brochures to residents seeking burn permits (if not obtained online); advise residents of the importance of maintaining defensible space and removing dead or dry leaves, needles, twigs, and combustible materials from roofs, decks, eaves, porches, and yards. <b>(WF10 &amp; 12)</b></p>	Wildfire & Conflagration	Select Board & Emergency Management Director	Local	Life of the Plan	Very Low Cost (\$0 - \$1,000 or staff time only)
A-10	<p><b>Problem Statement:</b> Although public outreach has been done to advise the citizens of Orange of the possibility of using the Town House as a warming center in times of extended cold temperatures, additional public outreach needs to be done.</p> <p><b>Action Item #10:</b> Provide public outreach to Orange's citizens regarding the Town House's availability as a warming center during extended cold temperatures. Arrange to obtain a collection of phone chargers for residents to use at the Town House. <b>(ET3 &amp; WW6)</b></p>	Extreme Temperatures & Severe Winter Weather	Select Board & Emergency Management Director	Local	Life of the Plan	Very Low Cost (\$0 - \$1,000 or staff time only)
A-11	<p><b>Problem Statement:</b> Residents may not be aware of the importance of maintaining their private roads to allow access to emergency responders and to prevent wildfires.</p> <p><b>Action Item #11:</b> To promote private mitigation efforts, provide public outreach to the citizens of Orange on the importance of maintaining private roads to allow for safe access for fire apparatus into wildland-urban interface neighborhoods and properties. This will help to ensure accessibility for emergency response and decrease the risk of wildfire. <b>(MU16)</b></p>	Wildfire & Conflagration	Select Board & Emergency Management Director	Local	Life of the Plan	Very Low Cost (\$0 - \$1,000 or staff time only)



Final R/P	Problem Statement New Mitigation Action Item	Type of Hazard	Managing Department	Funding or Support	Time Frame	Est. Cost
B-1	<p><b>Problem Statement:</b> <i>The Orange, NH Hazard Mitigation Plan Update 2024 plan will require an annual review and a complete update in five years.</i></p> <p><b>Action Item #12:</b> Provide an annual review of the Orange, NH Hazard Mitigation Plan Update 2024, including a review of the status of the "Action Items" listed in this plan to encourage completion. Obtain approval from the local elected body annually and provide a complete plan update in five years. <b>(MU11) (Table 6.1)</b></p>	All Hazards	Select Board & Emergency Management Director	Local	<b>Short Term</b> (0-12 months; then, annually)	<b>Low Cost</b> \$1,000-\$20,000
B-2	<p><b>Problem Statement:</b> <i>This plan, the Orange, NH Hazard Mitigation Plan Update, 2022, will need to be approved as a Community Wildfire Protection Plan (CWPP).</i></p> <p><b>Action Item #13:</b> Obtain approval of this hazard mitigation plan as a Community Wildfire Protection Plan (CWPP) to enable potential assistance from the state and federal governments for future wildfire mitigation projects. Explore the potential of obtaining grant funding to reduce the fuel load on fire lanes and other community areas. <b>(WF2)</b></p>	Wildfire & Conflagration	Mapping & Planning Solutions	Local	<b>Short Term</b> (0-12 months)	<b>Very Low Cost</b> (\$0 - \$1,000 or staff time only)
B-3	<p><b>Problem Statement:</b> <i>The Orange Road Agent has good radio operability with other communities; radios are up to date and work properly. However, dead spots remain in the community, and additional radios are needed.</i></p> <p><b>Action Item #14:</b> Determine possible locations in Orange where repeaters can be installed to increase the town's communications capabilities. Provide radios to additional town personnel (Town House, Road Agent, and Emergency Management Director) to help improve communications capabilities. <b>(Emergency Preparedness) (Table 6.1)</b></p>	All Hazards	Select Board, Road Agent & Emergency Management Director	Local & Grants	<b>Short Term</b> (0-12 months)	<b>Low Cost</b> \$1,000-\$20,000
B-4	<p><b>Problem Statement:</b> <i>Class VI roads need signage to advise visitors that the road is not maintained.</i></p> <p><b>Action Item #15:</b> Purchased signage for specific Class VI roads to advise visitors that the road is not maintained. <b>(MU14) (Table 6.1)</b></p>	All Hazards	Emergency Management Director	Local	<b>Short Term</b> (0-12 months)	<b>Very Low Cost</b> (\$0 - \$1,000 or staff time only)

Final R/P	Problem Statement New Mitigation Action Item	Type of Hazard	Managing Department	Funding or Support	Time Frame	Est. Cost
C-1	<p><i><b>Problem Statement:</b> The Cardigan Mountain Road pond and the pond's dry hydrant were lost entirely due to the extraordinary rain event of July 2019 (DR: 4457).</i></p> <p><b>Action Item #16:</b> Work with the pond owner on Cardigan Mountain Road, the Canaan Fire Department, the Road Agent, and others to maintain/restore the pond and install a dry hydrant to aid fire suppression. <b>(WF4 &amp; WF8) (Table 6.1)</b></p>	Wildfire & Conflagration	Select Board, Emergency Management Director & Canaan Fire Department	Local & Grants	<b>Medium Term</b> (13-36 months)	<b>Medium Cost</b> (\$20,000-\$100,000)
C-2	<p><i><b>Problem Statement:</b> The Orange Emergency Operations Plan (EOP) was last updated in 2012 and is overdue for an update.</i></p> <p><b>Action Item #17:</b> Update the Orange Emergency Operations Plan to coincide with the new state 18-ESF format. Include an analysis of the impact of natural hazards on Critical Infrastructure &amp; Key Resources that may be needed during an emergency. Also, include an EOC Call Alert List, a detailed Resource Inventory List, and Player Packets. <b>(Emergency Preparedness) (Table 6.1)</b></p>	All Hazards	Emergency Management Director	Local & Grants	<b>Medium Term</b> (13-36 months)	<b>Low Cost</b> \$1,000-\$20,000
C-3	<p><i><b>Problem Statement:</b> Surge protection has not been installed at the Town House due to oversight and changing priorities. The Town House roof also needs restoration.</i></p> <p><b>Action Item #18:</b> Work with the Canaan Fire Department to determine what type of surge or lightning protection should be installed at the Town House. This action item could be part of the roof restoration at the Town House.</p>	Lightning	Emergency Management Director	Local & Grants	<b>Medium Term</b> (13-36 months)	<b>High Cost</b> (\$100,000 or more for the roof replacement)
C-4	<p><i><b>Problem Statement:</b> The Orange Subdivision, Zoning, and Site Plan Regulations work well to serve the community's needs, although they do not address the need for water resources in new subdivisions. The town's regulatory documents should be reviewed and integrated with this hazard mitigation plan upon completion.</i></p> <p><b>Action Item #19:</b> Review the Orange Subdivision, Zoning, and Site Plan Regulations after approval of the Orange, NH Hazard Mitigation Plan Update 2024 is received. Integrate concepts, ideas, and action items from this plan into other town regulatory documents to help mitigate the impact of natural hazards. <b>(MU6) (Table 6.1)</b></p>	All Hazards	Planning Board & Zoning Board of Adjustment	Local	<b>Medium Term</b> (13-36 months)	<b>Very Low Cost</b> (\$0 - \$1,000 or staff time only)

Final R/P	Problem Statement New Mitigation Action Item	Type of Hazard	Managing Department	Funding or Support	Time Frame	Est. Cost
C-5	<p><b>Problem Statement:</b> <i>The Orange Master Plan (2014), which is reviewed annually and will need an update in 2024 (based on the state's 10-year recommendation), does not have a "Natural Hazards" section.</i></p> <p><b>Action Item #20:</b> Review this plan, the Orange, NH Hazard Mitigation Plan Update 2024, whenever an annual review or complete update of the Master Plan is done, and consider incorporating a discussion on climate change, a natural hazards section, and mitigation action items from this plan. <b>(MU6) (Table 6.1)</b></p>	All Hazards	Planning Board	Local	Medium Term (13-36 months)	Very Low Cost (\$0 - \$1,000 or staff time only)
C-6	<p><b>Problem Statement:</b> <i>The Brock Hill Bridge needs maintenance to further stabilize the area around the culvert to prevent future erosion and flooding.</i></p> <p><b>Action Item #21:</b> Stabilize the Brock Hill Road culvert area using rip rap and other stabilization techniques to prevent further erosion around the culvert and the potential for future inland flooding. <b>(F13) (Table 7.1)</b></p>	Inland Flooding & Erosion	Road Agent	Local & Grants	Medium Term (13-36 months)	Low Cost \$1,000-\$20,000
D-1	<p><b>Problem Statement:</b> <i>The aging culvert on New Colony Road needs replacement.</i></p> <p><b>Action Item #22:</b> Obtain funding and upgrade the existing 48" cast iron New Colony culvert with a new galvanized pipe of at least 36" inches, depending on engineering studies, to alleviate the stabilization and erosion issues around the culvert and prevent local flooding. <b>(F13)</b></p>	Aging Infrastructure	Road Agent	Local & Grants	Long Term (37-60 months)	Medium Cost (\$20,000-\$100,000)
D-2	<p><b>Problem Statement:</b> <i>A general evaluation of the Mill Brook Culvert determined that slope stabilization around the culvert is needed to prevent erosion and the potential for future flooding. A better but more long-term solution would be to replace the culvert.</i></p> <p><b>Action Item #23:</b> Obtain funding and upgrade the Mill Brook Road culvert with a concrete box culvert or other solution, depending on engineering studies, to alleviate the stabilization and erosion issues around the culvert and prevent local flooding. <b>(F13) (Table 7.1)</b></p>	Inland Flooding & Erosion	Road Agent	Local & Grants	Long Term (37-60 months)	Medium Cost (\$20,000-\$100,000)

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## 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. It will incorporate periodic monitoring and evaluation mechanisms to review successes and failures or simple updates.

The Orange, NH Hazard Mitigation Plan Update 2024 is considered a work in progress. Three situations will prompt revisiting this plan:

- First, at minimum, it will be reviewed annually or after a disaster to assess whether the existing and suggested mitigation action items were successful. This review will assess the Plan's effectiveness, accuracy, and completeness in achieving its stated purpose and goals. The review will also address recommended improvements to the Plan as contained in the FEMA plan review checklist and any weaknesses the Town identified that the Plan did not adequately address.
- Second, the Plan will be thoroughly updated every five years. This review will assess the Plan in the same manner that it is assessed annually, but it will undergo a thorough update based on changing conditions, development, and climate change. The five-year update will use the same planning process as used to develop this Plan.
- *Third, if the town adopts any significant modifications to its land-use planning documents, the jurisdiction will conduct a plan review and make changes as applicable.*

The Emergency Management Director is responsible for initiating plan reviews and will consult with the hazard mitigation planning team identified in this plan. In keeping with the adoption process, the public and stakeholders will have the opportunity for future involvement as they will be invited to participate in future reviews or updates. Before any review or update, public notice will be given through press releases in local papers, listservs, or social media platforms; public notice will ensure that all comments and revisions from the public and stakeholders will be considered.

Review forms for post-hazard or annual reviews are available in Chapter 11 of this plan. After this plan's approval, the town is encouraged to use these forms to document changes and accomplishments. Forms are available for years 1-4, expecting the five-year annual update to 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. Orange completed its last hazard mitigation plan in 2017 and has completed projects from that plan. Examples in Table 7.1 include providing ongoing fire and flood education, educating residents about CodeRED, and replacing multiple culverts after the July 2019 storm. The town was able to integrate these actions into other town activities, budgets, plans, and mechanisms.

The Town of Orange has agreed to incorporate a Community Wildfire Protection Plan (CWPP) into this planning document, the Orange, NH Hazard Mitigation Plan Update 2024. As part of this plan, the town will adopt the CWPP, which will be approved by the Department of Natural and Cultural Resources (DNCR).

The town will incorporate elements from this plan into the following documents:

**ORANGE MASTER PLAN**

Traditionally, Master Plans are updated every 5 to 10 years. A complete update of Orange's Master Plan was completed in 2014 and is due for a recommended update in 2026. Future reviews and updates of the Master Plan will consider integrating concepts, ideas, and action items from this Hazard Mitigation Plan (**Action Item #20**).

**ORANGE EMERGENCY OPERATIONS PLAN 2012 (EOP)**

The EOP is designed to allow the town to respond more effectively to disasters and mitigate the risk to people and property. EOPs are generally reviewed after each hazardous event and updated every five years. The last Orange EOP was completed in 2012. An update for the Emergency Operations Plan is expected after completing this plan. The new EOP will incorporate elements from this hazard mitigation plan (**Action Items #17**).

**TOWN BUDGET & CAPITAL RESERVE FUNDS**

The Town of Orange maintains Capital Reserve Funds (CRFs) for major expenditures. The CRFs and the CIP are adjusted annually in coordination with the Select Board and other town department heads and committees at budget time. The budget is then voted on at the annual Town Meeting. During the annual budget planning process, specific mitigation actions identified in this plan that require town fiscal support will be reviewed for incorporation into the budget. **Refer to those Action Items that require local money or match money (multiple Action Items) or address the CIP and CRF.**

**THE ORANGE ORDINANCES & SUBDIVISION REGULATIONS**

As time goes by and the needs of the town change, the town's planning mechanisms will be reviewed and updated. In coordination with these actions, the Planning Board will review this plan and incorporate any changes that help mitigate the community's susceptibility to the dangers of natural, technical, or human-caused disasters. An example of this integration can be seen in this plan's mitigation action item (**Action Item #19**).

The local governments will modify other plans and actions to incorporate hazard or wildfire issues. The Select Board ensures this process will be followed in the future.

**C. PLAN APPROVAL & ADOPTION**

This plan was completed in a series of open meetings beginning on April 12, 2021. The plan was presented to the town for review, submitted to HSEM/FEMA for Conditional Approval (*APA, Approved Pending Adoption*), formally adopted by the Select Board, and resubmitted to HSEM/FEMA for Final Approval. Once Final Approval from HSEM/FEMA was met, copies of the plan were distributed to the town, HESM, FEMA, DNCR, 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 digital and paper formats.



## Chapter 11: Signed Community Documents and Approval Letters

### A. PLANNING SCOPE OF WORK & AGREEMENT



## ORANGE HAZARD MITIGATION PLAN UPDATE (REV1)

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### PARTIES TO THE AGREEMENT

Mapping and Planning Solutions

Town of Orange, NH

Current Plan Expiration: 12/20/21

PDM19 Grant Expiration: 5/29/2023

This agreement between the Town of Orange (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 to produce the Orange 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 (also known as Approved Pending Adoption or APA) is received from NH Homeland Security (HSEM) on behalf of FEMA. When adopted, the plan guides the town, commissions, and departments; adopted plans do not include any financial commitments by the town. Additionally, all adopted plans should address mitigation strategies for reducing the risk of natural, technological, human-caused, and wildfire disasters on life and property and be 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.
- With the assistance of the team, MAPS will coordinate and facilitate six to seven two-hour meetings and provide any materials, handouts, and maps necessary to provide a full understanding of each step in the planning process. These meetings may be held online or in person, depending on COVID-19 conditions at the time.
- MAPS will assist the team in the development of goals, objectives, and action items and will clearly define the processes needed for 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 before submitting the plan to HSEM for conditional approval. Upon conditional approval by HSEM, MAPS will provide the planning team with the necessary documents for plan adoption by the Orange Selectboard and continue to work with the town until final approval and distribution of the plan are complete.
- MAPS shall provide, at its office, all supplies and space necessary to complete the Orange Hazard Mitigation Plan.
- Once final documents are received, the plan will be printed and distributed by MAPS. The final documents include the HSEM formal approval email, the FEMA formal letter of approval, and the approved Community Wildfire Protection Plan (CWPP) documents. MAPS will provide the town with one hard copy of the plan containing all signed documents and approvals 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. Copies of the plan will be distributed by MAPS to collaborating agencies including, but not limited to, HSEM, FEMA, the Department of Natural and Cultural Resources (DNCR), and the US Forest Service.
- MAPS will provide all "Quarterly Reports" that are required by HSEM for the duration of this project. These quarterly reports will be done online, and a copy of the report will be forwarded to the primary contact for Orange.
- MAPS will provide annual plan maintenance reminders leading to the next five-year plan update.
- Understanding that emergencies can and do happen, MAPS will make every effort to proceed with meetings. However, the town shall ensure that attendance at any given meeting is adequate to proceed with the meeting. Mapping and Planning Solutions reserves the right to invoice the town for travel, meal expenses, and staff costs that are incurred when meeting attendance is inadequate.

***The Town - Responsibilities include but are not limited to the following:***

- The town shall ensure that the planning team includes members who can 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 Selectboard 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 principal 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 handouts, and placement of meeting announcements. Also, 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 and the Code of Federal Regulations (CFRs).
- The proposed plan shall be submitted to the Selectboard for consideration and adoption.
- After adoption and final approval from HESM 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 ensure 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 \$6,999.75; 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 .....\$3,500.00
  - 2. Second payment upon plan submittal to HSEM for Conditional Approval .....\$3,300.00
  - 3. Final payment upon project completion and receipt of final plan copy .....\$199.75
- Total Fees.....\$6,999.75

➤ **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, provided prescribed match amounts have been met.

➤ **Required Matching Funds:** The total cost for this project under PDM19 is \$9333.00, with a federal share of \$6,999.75 and a matching amount of \$2,333.25 (75%/25% split). Matching funds are the responsibility of the Town of Orange, not MAPS. The town will be responsible for providing and documenting all resources to be used to meet the FEMA required match. 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 the 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 a date yet to be determined or whenever the planning process is complete. The project period may be extended by a 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.

The grant provided for this project is funded through PDM19. Per the grant agreement between the town and HSEM, all work must be completed by May 29, 2023. It is expected that this project will be completed long before the grant expiration date of May 29, 2023.

➤ **Ownership of Material:** The town shall own all maps, reports, documents, and other materials produced during the project period; 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 diligently and efficiently according to the terms of this

agreement. MAPS's responsibilities under this agreement depend upon the cooperation of the Town of Orange. 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 HSEM and FEMA relieve Mapping and Planning Solutions of content liability. MAPS carries general liability insurance.

➤ **Amendments:** Changes, alterations, or additions to this agreement may be made if agreed to in writing between both the Town of Orange 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 65 Hazard Mitigation Plans, more than 65 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
- Climate Change Adaptation Planning, AWR-347
- ALICE; School Shooting Workshop, Littleton High School
- L0550 Continuity Planners Workshop (2320EM1216)

➤ **Contacts:**

**For Mapping & Planning Solutions**

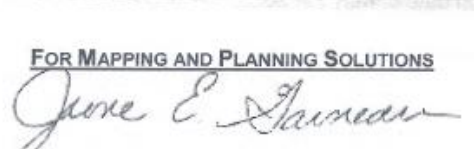
June Garneau  
Mapping and Planning Solutions  
105 Union Street  
Whitefield, NH 03598  
jgarneau@mappingandplanning.com  
(603) 837-7122; (603) 991-9664 (cell)

**For the Town**

Dorothy Heinrichs, Select Board Chair  
Town of Orange  
8 Town House Road, PO Box 37  
Orange, NH 03741  
nhdorothy@gmail.com  
(603) 523-7054

**Signature below indicates acceptance of and agreement to the details outlined in this agreement.**


FOR THE TOWN OF ORANGE, NH  
  
Signature  
Chair, Selectboard  
Printed Name/Title  
March 24, 2021  
Date

FOR MAPPING AND PLANNING SOLUTIONS  
  
Signature  
June Garneau, Owner  
December, 28, 2021


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

**B. APPROVED PENDING ADOPTION (APA) EMAIL**


## HMP Approvable Pending Adoptio...




**Neiderbach, Josiah** <josiah.ne  
 To townoforangenh@gmail.com  
 Cc Bogdan, Kerry; **+7 others**



Tue 4:41 PM

 You replied to this message on 12/20/2023 11:03 AM.


Orange NH APA Review.docx 95 KB

Reference: Adoption Required to Finish Local Mitigation Plan Process

Dear Official:

The Risk Analysis Branch of the FEMA Region 1 Mitigation Division has determined the *Orange Hazard Mitigation Plan Update 2023* meets all applicable FEMA Mitigation Planning requirements (Local Mitigation Planning Policy Guide, effective April 19, 2023), except its adoption by: Town of Orange, NH. |

**This status is “Approvable Pending Adoption” (APA). Plan adoption is required to receive formal FEMA approval.**

Local governments, including special districts, with a plan status of “Approvable Pending Adoption” are not eligible for FEMA mitigation grant programs with a mitigation plan requirement.

The next step in the approval process is to formally adopt the mitigation plan and send a resolution or adoption documentation in accordance with Element F1 of the [Local Mitigation Planning Policy Guide](#) on pages 31-32, to the State for submission to FEMA. A sample adoption resolution can also be found in Appendix B of the Policy Guide.

**It is critical for the jurisdiction to adopt the plan as soon as possible.** Jurisdictions that adopt the plan more than one year after APA status has been issued must either:

- Validate that their information in the plan remains current with respect to both the risk assessment (no recent hazard events, no changes in development) and their mitigation strategy (no changes necessary); or
- Make the necessary updates before submitting the adoption resolution to FEMA.

An approved local mitigation plan, including adoption by the local government, is one of the conditions for applying for and/or receiving FEMA mitigation grants from the following programs:

- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance (FMA)
- Hazard Mitigation Grant Program (HMGP)
- HMGP Post-Fire
- If applicable, High Hazard Potential Dams Grant Program (HHPD)

If a plan does not meet the HHPD requirements, then the jurisdiction is not eligible for assistance from the HHPD Grant Program. If any jurisdiction with HHPDs is interested in this assistance, they should contact the FEMA Regional Mitigation Planner listed below to learn more about how to include all dam risks in the plan, or at least their portion of the plan.

We look forward to receiving the adoption resolution/documentation soon and discussing options for implementing this mitigation plan. If we can assist in any way, please contact Jay Neiderbach at 202-285-7769 and [josiah.neiderbach@fema.dhs.gov](mailto:josiah.neiderbach@fema.dhs.gov).

Sincerely,

Jay

Joelah (Jay) Neiderbach, Mitigation Planner  
 Risk Analysis Branch | Mitigation Division | DHS / FEMA, Region I  
 M: 202.285.7769 E: [josiah.neiderbach@fema.dhs.gov](mailto:josiah.neiderbach@fema.dhs.gov)


Attachment: FEMA Local Mitigation Plan Review Tool

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



C. FORMAL APPROVAL LETTER FEMA

U.S. Department of Homeland Security  
FEMA Region 1  
220 Binney Street  
Cambridge, MA 02142



February 12, 2024

Robert M. Buxton, Director  
New Hampshire Homeland Security and Emergency Management  
33 Hazen Dr.  
Concord, NH 03305

Dear Director Buxton:

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region 1 Mitigation Division has approved the *Orange, NH Hazard Mitigation Plan Update 2024* effective February 12, 2024 through February 11, 2029 in accordance with the planning requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended; the National Flood Insurance Act of 1968, as amended; the National Dam Safety Program Act, as amended; and Title 44 Code of Federal Regulations (CFR) Part 201.

With this plan approval, the jurisdiction (Town of Orange, NH) is eligible to apply to New Hampshire Homeland Security and Emergency Management for mitigation grants administered by FEMA. Requests for funding will be evaluated according to the eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in this community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

The plan must be updated and resubmitted to the FEMA Region 1 Mitigation Division for approval every five years to remain eligible for FEMA mitigation grant funding.

Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please contact Jay Neiderbach at (202) 285-7769 or [josiah.neiderbach@fema.dhs.gov](mailto:josiah.neiderbach@fema.dhs.gov).

Sincerely,

**DEAN J SAVRAMIS** Digitally signed by DEAN J SAVRAMIS  
Date: 2024.02.15 13:06:32 -05'00'

Dean Savramis  
Mitigation Division Director  
DHS, FEMA Region 1

DS:jn

cc: Austin Brown, Mitigation & Recovery Section Chief, NH HSEM  
Ginny Clasby, State Hazard Mitigation Officer, NH HSEM  
Lynne Doyle, State Planner, NH HSEM  
[NH.HM@dos.nh.gov](mailto:NH.HM@dos.nh.gov)

[www.fema.gov](http://www.fema.gov)

Signatures are scanned facsimile; original signatures are on file.



**D. SIGNED CERTIFICATE OF ADOPTION**

**CERTIFICATE OF ADOPTION**

**ORANGE, NH**

**SELECT BOARD**

**A RESOLUTION ADOPTING THE ORANGE, NH HAZARD MITIGATION PLAN UPDATE 2024**

WHEREAS, the Town of Orange 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 Orange has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Orange, NH Hazard Mitigation Plan Update 2024 under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between April 12, 2021, to January 31, 2022, regarding the development and review of the Orange, NH Hazard Mitigation Plan Update 2024 and

WHEREAS, the plan specifically addresses hazard mitigation strategies and plan maintenance procedures for the Town of Orange; and

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

RESOLVED by the Select Board:

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

Orange, 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 five (5) years from the date of this resolution;
- 4. An annual report on the progress of the plan's action items shall be presented to the Select Board by the Emergency Management Director.

Adopted this day, the third of January, 2024

Select Board Chair

Tamara Fairbank  
Signature

TAMARA FAIRBANK  
Print Name

Member of the Select Board

Aaron B. Allen  
Signature

AARON B. ALLEN  
Print Name

Member of the Select Board

Betsy Cable  
Signature

Betsy Cable  
Print Name

Emergency Management Director

Doug Weekes  
Signature

Doug Weekes  
Print Name

IN WITNESS WHEREOF, the undersigned has affixed their signature and the corporate seal of the Town of Orange on this day, Jan 3, 2024

Catherine Souza Catherine Souza  
Notary

4/28/28  
Expiration

1/3/24  
Date



Signatures are scanned facsimile; original signatures are on file.

**E. CWPP APPROVAL LETTER FROM DNCR**

**Orange, NH  
A Resolution Approving the  
Orange, NH Hazard Mitigation Plan Update 2024  
As a Community Wildfire Protection Plan**

Several public and committee meetings were held between April 12, 2021, and January 31, 2021, regarding developing and reviewing the Orange, NH Hazard Mitigation Plan Update 2024. The Orange, NH Hazard Mitigation Plan Update 2024 contains potential future projects to mitigate hazard and wildfire damage in the Town of Orange.

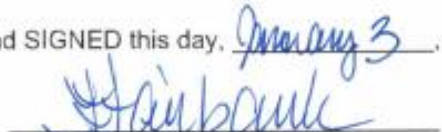
The Canaan Fire Chief, the Orange Select Board, and the Orange Emergency Management Director would like this plan accepted by the Department of Natural and Cultural Resources (DNCR) as a Community Wildfire Protection Plan, having adhered to the requirements of said plan.

The Select Board, the Emergency Management Director, and the Canaan Fire Chief approve the Orange, NH Hazard Mitigation Plan Update 2024 and understand that with approval by DNCR, this plan will also serve as a Community Wildfire Protection Plan.

**For the Town of Orange**


**For the Town of Orange**

APPROVED and SIGNED this day, January 3, 2024.

  
Orange Chairman of the Select Board

  
Printed Name

  
Orange Emergency Management Director


  
Printed Name

  
Canaan Fire Chief

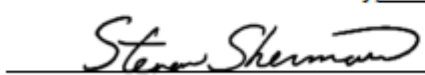
  
Printed Name

**For the Department of Natural & Cultural Resources (DNCR)**

APPROVED and SIGNED this day, March 13, 2024.

  
Forest Ranger – NH Division of Forest and Lands, DNCR

APPROVED and SIGNED this day, March 14, 2024.

  
Steve Sherman, Chief, Forest Protection Bureau – NH Division of Forests & Lands, DNCR

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

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**F. ANNUAL OR POST HAZARD REVIEW FORMS**

**YEAR ONE - Annual or Post Hazard Review Form**

CHECK ALL THAT APPLY

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

After inviting the public and stakeholders to hearings, the town’s governing body and the designated Emergency Management Director shall execute this page annually.

Orange, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

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

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

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

Emergency Management Director

CONCURRENCE OF APPROVAL

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

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

Chairman of the Select Board

Changes and notes regarding the 2024 Hazard Mitigation Plan Update

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**Please use the reverse side for additional notes** 





**YEAR TWO - Annual or Post Hazard Review Form**

**CHECK ALL THAT APPLY**

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

After inviting the public and stakeholders to hearings, the town’s governing body and the designated Emergency Management Director shall execute this page annually.

Orange, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

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

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

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

Emergency Management Director

CONCURRENCE OF APPROVAL

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

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

Chairman of the Select Board

Changes and notes regarding the 2024 Hazard Mitigation Plan Update

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***Please use the reverse side for additional notes*** 



YEAR THREE - Annual or Post Hazard Review Form

CHECK ALL THAT APPLY

Annual Review - Year Three: \_\_\_\_\_ (Date)

Annual Review – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

Annual Review – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

After inviting the public and stakeholders to hearings, the town’s governing body and the designated Emergency Management Director shall execute this page annually.

Orange, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

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

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

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

Emergency Management Director

CONCURRENCE OF APPROVAL

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

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

Chairman of the Select Board

Changes and notes regarding the 2024 Hazard Mitigation Plan Update

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Please use the reverse side for additional notes 



YEAR FOUR - Annual or Post Hazard Review Form

CHECK ALL THAT APPLY

Annual Review - Year Four: \_\_\_\_\_ (Date)

Annual Review – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

Annual Review – Post Hazardous Event: \_\_\_\_\_ (Event/Date)

After inviting the public and stakeholders to hearings, the town’s governing body and the designated Emergency Management Director shall execute this page annually.

Orange, NH  
Hazard Mitigation Plan Update

REVIEWED AND APPROVED

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

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

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

Emergency Management Director

CONCURRENCE OF APPROVAL

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

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

Chairman of the Select Board

Changes and notes regarding the 2024 Hazard Mitigation Plan Update

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Please use the reverse side for additional notes 

**Additional Notes – Year Four:**

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## Chapter 12: Appendices

- Appendix A: Bibliography
- Appendix B: Technical and Financial Assistance for Hazard Mitigation
  - *Hazard Mitigation Grant Program (HMGP)*
  - *Pre-Disaster Mitigation (PDM)*
  - *Flood Mitigation Assistance (FMA)*
  - *Repetitive Flood Claims (RFC)*
  - *Severe Repetitive Loss (SRL)*
- Appendix C: The Extent of Hazards
- Appendix D: Major Disaster & Emergency Declarations
- Appendix E: Acronyms
- Appendix F: Potential Mitigation Ideas

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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**
  - Orange Hazard Mitigation Plan, 2017
  - Landaff Hazard Mitigation Plan, 2020
  - Pittsburg Hazard Mitigation Plan, 2020
  - Enfield Hazard Mitigation Plan, 2022
- **NH State Multi-Hazard Mitigation Plan**, 2018
  - [https://prd.blogs.nh.gov/dos/hsem/wp-content/uploads/2015/11/State-of-New-Hampshire-Multi-Hazard-Mitigation-Plan-Update-2018\\_FINAL.pdf](https://prd.blogs.nh.gov/dos/hsem/wp-content/uploads/2015/11/State-of-New-Hampshire-Multi-Hazard-Mitigation-Plan-Update-2018_FINAL.pdf)
- **NH Division of Forests and Lands Quarterly Update**
  - <http://www.nhdf.org/fire-control-and-law-enforcement/fire-statistics.aspx>
- **Disaster Mitigation Act (DMA) of 2000**, Section 101, b1 & b2 and Section 322a
  - <http://www.fema.gov/library/viewRecord.do?id=1935>
- **Economic & Labor Market Information Bureau**, NH Employment Security, October 2022; Community Response for Orange, Received, 6/6/2022, Census 2000 and Revenue Information derived from this site.
  - <http://www.nhes.nh.gov/elmi/products/cp/profiles-htm/Orange.htm>

### **Photos**

- Photos are taken by MAPS unless otherwise noted.

### **Map Snips**

- Map snips are created by MAPS using readily available data from NH Granit, unless otherwise indicated

### **Wildfire Links**

- US Forest Service; <http://www.fs.fed.us>
- US Fire Administration; <http://www.usfa.dhs.gov/>
- US Department of Agriculture Wildfire Programs: <http://www.wildfireprograms.usda.gov/>
- Firewise®; <http://www.firewise.org/>
- Fire Adapted Communities; [www.fireadapted.org](http://www.fireadapted.org)
- Wildfire Preparedness Guide to Forest Wardens; [www.quickseries.com](http://www.quickseries.com)
- Ready Set Go; [www.wildlandfires.org](http://www.wildlandfires.org)
- Fire education for children; [www.smokeybear.com](http://www.smokeybear.com)

### **Additional Websites**

- NH Homeland Security & Emergency Management; <http://www.nh.gov/safety/divisions/hsem/>
- US Geological Society; <http://water.usgs.gov/ogw/subsidence.html>
- Department Environmental Services;  
<http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf>
- 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)
- NOAA, National Weather Service; <http://www.nws.noaa.gov/glossary/index.php?letter=w>
- NOAA, Storm Prediction Center; <http://www.spc.noaa.gov/faq/tornado/beaufort.html>
- National Weather Service; [http://www.nws.noaa.gov/om/cold/wind\\_chill.shtml](http://www.nws.noaa.gov/om/cold/wind_chill.shtml)
- Center for Disease Control; <https://www.cdc.gov/disasters/winter/index.html>
- Slate; <http://www.slate.com/id/2092969/>
- NH Bureau of Economic Affairs; <http://www.nh.gov/osi/planning/index.htm>
- Code of Federal Regulations; Title 14, Aeronautics and Space; Part 1, Definitions and Abbreviations;  
[https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title14/14tab\\_02.tpl](https://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title14/14tab_02.tpl)
- Federal Aviation Administration; <http://faa.custhelp.com>
- US Legal, Inc.; <http://definitions.uslegal.com/v/violent-crimes/>

**APPENDIX B: HAZARD MITIGATION ASSISTANCE (HMA)**

The Federal Emergency Management Agency’s (FEMA’s) HMA programs promote funding for mitigation measures that reduce or eliminate long-term risk to people and property from future disasters. These programs allow communities across the nation to enhance mitigation and take steps that will foster greater resilience and reduce disaster suffering<sup>32</sup>:

**HAZARD MITIGATION GRANT PROGRAM (HMGP)**

HMGP provides funding to rebuild communities in a way that mitigates future disaster losses in those communities. Funding is made available after the President issues a major disaster declaration. It is based on up to 15% or 20% of the estimated federal assistance provided.

**HAZARD MITIGATION GRANT PROGRAM POST FIRE (HMGP POST FIRE)**

The HMGP Post Fire program provides funding after a Fire Management Assistance Grant (FMAG) is declared, and helps communities implement hazard mitigation measures after wildfire disasters. State, local tribal, and territorial governments are eligible to apply for funding. The funding amount is pre-calculated and based on historical FMAG declarations and is reassessed every fiscal year.

**FLOOD MITIGATION ASSISTANCE (FMA)**

FMA is a competitive grant program that provides funding to states, local communities, tribes, and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program (NFIP). The program is funded by an annual congressional appropriation and since 2016 has made \$160 million available for mitigation projects.

<b>HMA Eligible Activities</b>				
<b>MITIGATION PROJECTS</b>	<b>HMGP</b>	<b>HMGP POST FIRE</b>	<b>BRIC</b>	<b>FMA</b>
Property Acquisition	Yes	Yes	Yes	Yes
Structure Elevation	Yes	Yes	Yes	Yes
Mitigation Reconstruction	Yes	Yes	Yes	Yes
Flood Risk Reduction Measures	Yes	Yes	Yes	Yes
Dry Floodproofing Non-Residential Buildings	Yes	Yes	Yes	Yes
Tsunami Vertical Evacuation	Yes	Yes	Yes	-
Safe Rooms Construction	Yes	Yes	Yes	-
Wildfire Mitigation	Yes	Yes	Yes	-
Retrofitting	Yes	Yes	Yes	Yes
Generators	Yes	Yes	Yes	-
Earthquake Early Warning System	Yes	Yes	Yes	-
<b>CAPABILITY AND CAPACITY BUILDING</b>				
New Plan Creation and Updates	Yes	Yes	Yes	Yes
Planning-Related Activities	Yes	Yes	Yes	Yes
Project Scoping/ Advance Assistance	Yes	Yes	Yes	Yes
Financial Technical Assistance	-	-	-	Yes

Note: The table above is not an exhaustive list of eligible activities. Please see program guidance or Notice of Funding Opportunity (NOFO) for more information on eligible activities.

<sup>32</sup> [https://www.fema.gov/sites/default/files/documents/fema\\_hma-trifold\\_2021.pdf](https://www.fema.gov/sites/default/files/documents/fema_hma-trifold_2021.pdf); sections of this appendix are taken directly from this Hazard Mitigation Assistance flier, although not all sections are quoted

**BUILDING RESILIENT INFRASTRUCTURE AND COMMUNITIES (BRIC)**

BRIC is a competitive grant program that provides funding for mitigation projects to reduce the risks from disasters and natural hazards. The BRIC program was designed to foster innovation and provides a yearly grant cycle, offering applicants a consistent source of funding. The amount of funding is based on a 6% set aside of the assistance FEMA provides following major disaster declarations through the Public Assistance and Individuals and Households Program.

**PRE-DISASTER MITIGATION (PDM)**

PDM is a grant program that helped state, local, tribal, and territorial governments plan and implement hazard mitigation projects. For 20 years, PDM funded mitigation projects, but in FY 2020 BRIC replaced PDM for any new funding. Any grant awarded in FY 2019 will continue to be managed under PDM for any new funding.

**ROLES OF APPLICANTS AND SUBAPPLICANTS**

Mitigation project subapplications are developed by local governments (subapplicants) and submitted to their state, territory, or tribal government (applicant). States, territories, and tribes are responsible for selecting the subapplications that align with their mitigation priorities and submit these in an application to FEMA. FEMA conducts a final eligibility review of all subapplications to ensure compliance with federal regulations. For competitive mitigation grants, FEMA will select projects for funding. All HMA grants have programmatic and administrative requirements that are the responsibility of the applicant and subapplicant.

**ADDITIONAL RESOURCES**

For general questions about the HMA programs, please contact your State Hazard Mitigation Officer or FEMA Region. Other resources are available; see the Hazard Mitigation Assistance flier, FEMA, or go to [www.fema.gov/hazard-mitigation-assistance](http://www.fema.gov/hazard-mitigation-assistance).<sup>33</sup>

<b>Who is eligible to apply?</b>				
APPLICANTS	HMGP	HMGP POST FIRE	BRIC	FMA
State/territorial agencies	Yes	Yes	Yes	Yes
Federally recognized tribes	Yes	Yes	Yes	Yes

SUBAPPLICANT	HMGP	HMGP POST FIRE	BRIC	FMA
State agencies	Yes	Yes	Yes	Yes
Federally recognized tribes	Yes	Yes	Yes	Yes
Local governments/communities	Yes	Yes	Yes	Yes
Private nonprofit organizations	Yes	Yes	-	-

<b>Cost-share requirements</b>	
PROGRAM	COST SHARE*
<b>HMGP</b>	75 / 25
<b>HMGP Post Fire</b>	75 / 25
<b>BRIC</b>	75 / 25
<b>BRIC (Economically Disadvantaged Rural Communities**)</b>	90 / 10
<b>FMA (Community Flood Mitigation, Project Scoping, Individual Mitigation of Insured Properties, and Planning Grants)</b>	75 / 25
<b>FMA (Repetitive loss properties)</b>	90 / 10
<b>FMA (Severe repetitive loss properties)</b>	100 / 0

\* Percent of federal/non-federal cost share  
 \*\* Economically Disadvantaged Rural Communities" is synonymous with small impoverished communities as used in the Stafford Act.

<sup>33</sup> [https://www.fema.gov/sites/default/files/documents/fema\\_hma-trifold\\_2021.pdf](https://www.fema.gov/sites/default/files/documents/fema_hma-trifold_2021.pdf)

**APPENDIX C: THE EXTENT OF NATURAL HAZARDS**

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

**\*SEVERE WINTER WEATHER**

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

**Snowstorms**

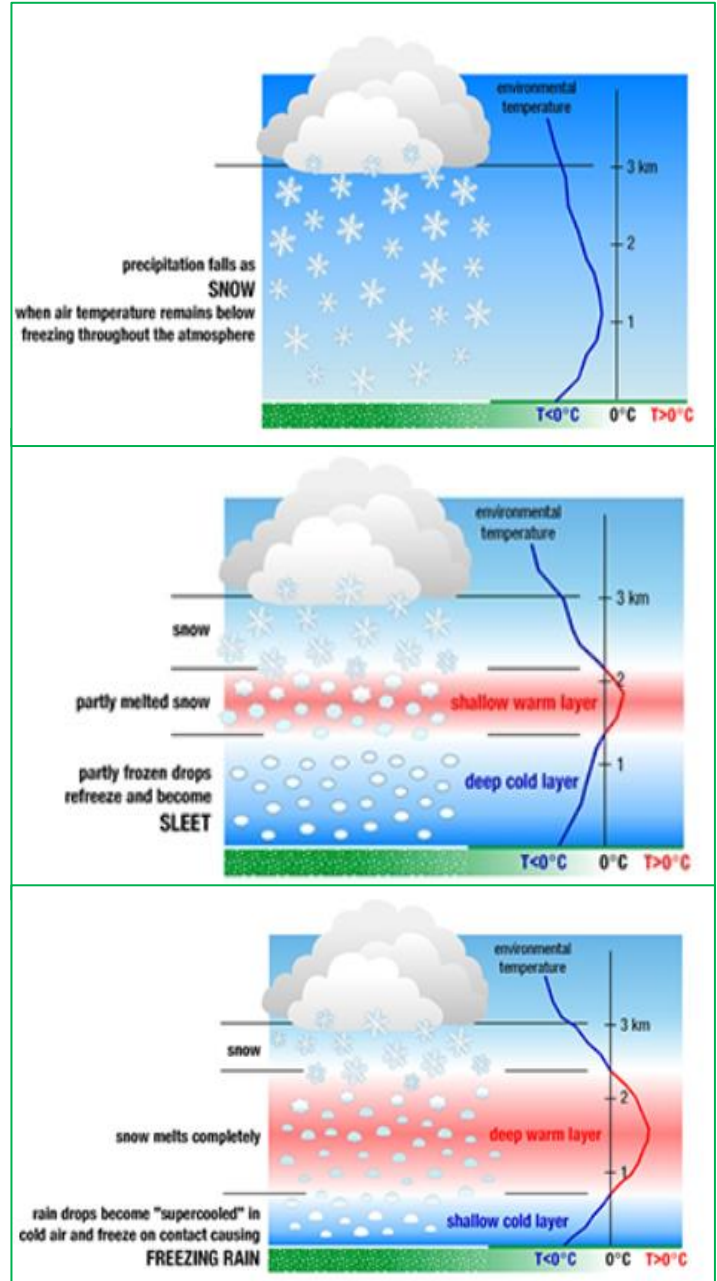
A winter storm can range from moderate snow to blizzard conditions. Blizzard conditions are considered blinding wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow for 12 hours or six inches for 24 hours.

**Sleet**

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

**Freezing Rain & Ice Storms**

Snowflakes melt as they fall through a warm band of air and 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 below 32 degrees Fahrenheit. This freezing accumulates ice on roads, trees, utility lines, and other objects, resulting in an “ice storm”. “Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects.”<sup>34</sup>



<sup>34</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>35</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
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	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	
2	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	
3	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	
4	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	
5	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	

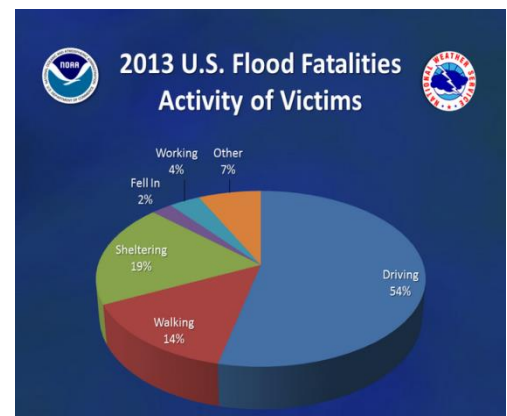
(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

**\*INLAND FLOODING**

**General Flooding Conditions**

Floods are defined as a temporary overflow of water onto lands that are not usually covered by water. Flooding results from the overflow of major rivers and tributaries, storm surges, 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 increased rainfall and snowmelt; however, floods can occur anytime. 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 flood conditions. Also, rising waters in early spring often break the ice into chunks that float downstream and pile up, causing flooding behind them. Small rivers and streams pose unique flooding risks because jams easily block them. Ice in riverbeds and against structures presents a significant flooding threat to bridges, roads, and the surrounding lands.



<sup>35</sup> The Weather Channel, <http://www.weather.com/news/weather-winter/rating-ice-storms-damage-sperry-piltz-20131202>

**Flooding (Dam Failure)**

Flooding due to dam failure can be small enough to affect the immediate area of the dam or large enough to cause catastrophic results to cities, towns, and human life below the dam. The amount of flooding depends mainly on the dam's size and the water held by the dam. The size of the breach, the amount of water flowing from the dam, and the amount of human habitation downstream are also factors.

A "Dam" means any artificial barrier, including appurtenant works, which impounds or diverts water, has a height of 4 feet or more, or a storage capacity of two acres or more, or is located at the outlet of a great pond<sup>36</sup>. A dam failure occurs when water overtops the dam or there is a 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>37</sup>:

Classification	Description	Inspection Intervals
<b>Non-Menace</b>	A dam is not a menace because it is in a location and size that failure or misoperation of the dam would not result in probable loss of life or 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 six 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 watercourse, and/or reversible environmental losses to environmentally-sensitive sites.	Every six 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 a 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 pro-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 two acre-feet or more; or damage to an environmentally-sensitive site that does not meet the definition of reversible environmental losses.	Every four 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 two years

<sup>36</sup> 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>37</sup> <http://des.nh.gov/organization/commissioner/pip/factsheets/db/documents/db-15.pdf>

**Flooding (local, road erosion)**

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

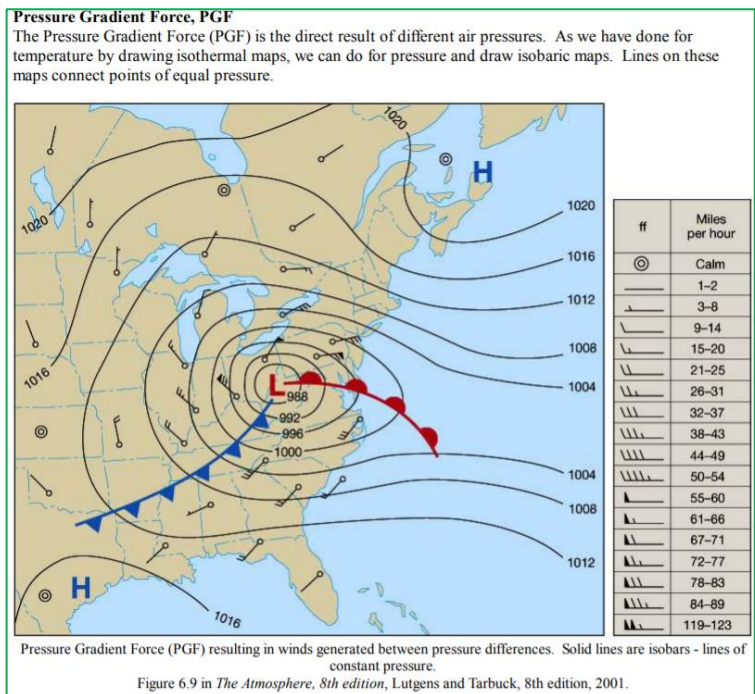
**Flooding (Riverine)**

Floodplains are usually located in lowlands near rivers; floodplains experience flooding regularly. The term 100-year flood does not mean that floods 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. Using “1% annual chance of flood” is more accurate. Flooding is often associated with hurricanes, heavy rains, ice jams, and rapid snowmelt in the spring.

**\*HIGH WIND EVENTS**

**Windstorm**

NOAA (National Oceanic & Atmospheric Administration) stated that wind is “The horizontal motion of the air past a given point.” Winds begin with differences in air pressures. Air pressures higher in one place than another set up a force pushing from the high pressure toward the low pressure. The more significant the difference in pressures, the stronger the force. The distance between high and 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. No set number divides high and low pressure. Wind is used to describe the prevailing direction from which the wind is blowing with speed given usually in miles per hour or knots.” Also, NOAA’s issuance of a Wind Advisory occurs when sustained winds reach 25 to 39 mph and gusts to 57 mph.<sup>38 39</sup>



<sup>38</sup> NOAA; <http://www.nws.noaa.gov/glossary/index.php?letter=w>

<sup>39</sup> Pressure Gradient Force Chart “snipped” from *Air Pressure and Wind*; [https://www.weather.gov/media/zhu/ZHU\\_Training\\_Page/winds/pressure\\_winds/pressure\\_winds.pdf](https://www.weather.gov/media/zhu/ZHU_Training_Page/winds/pressure_winds/pressure_winds.pdf)

**Tornado**

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

Tornadoes produce the most violent winds on Earth at 280 mph or more speeds. Also, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be more than 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. A tornado covers a much smaller area than a hurricane 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 introducing the Fujita Scale in 1971. The new scale identifies 28 different free-standing structures most affected by tornadoes considering 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>40</sup>* The chart (right), adapted from wunderground.com, compares the Fujita Scale to the Enhanced Fujita Scale.

EF SCALE	OLD F-SCALE	TYPICAL DAMAGE
EF-0 (65-85mph)	F0 (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.
EF-1 (86-110 mph)	F1 (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.
EF-2 (111-135 mph)	F2 (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 the ground.
EF-3 (136-165 mph)	F3 (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.
EF-4 (166-200 mph)	F4 (207-260 mph)	<b>Devastating damage.</b> Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF-5 (>200 mph)	F5 (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	F6-F12 (319 mph to speed of sound)	<b>Inconceivable damage.</b> Should a tornado with a maximum wind speed in excess of EF5 occur, the extent and types of damage may not be conceivable. A number of missiles, such as iceboxes, water heaters, storage tanks, automobiles, etc., will create secondary damage to structures.

<sup>40</sup> Enhance Fujita Scale, [http://www.wunderground.com/resources/severe/fujita\\_scale.asp](http://www.wunderground.com/resources/severe/fujita_scale.asp)

**Downburst**

According to NOAA, a downburst is a strong downdraft that causes damaging winds on or near the ground. Not to be confused with a downburst, the term "microburst" describes the size of the downburst. Comparing 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 and lasting 5 to 30 minutes. Damaging winds, causing widespread, tornado-like damage, could be as high as 134 MPH.<sup>41</sup>

Below is the Beaufort Wind Scale, showing expected damage based on the wind (knots), developed in 1805 by Sir Francis Beaufort of England and posted on NOAA’s Storm Prediction Center website.<sup>42</sup>

Force	Wind (Knots)	WMO Classification	The 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 begin 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 the 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 the wind
9	41-47	Strong Gale	High waves (20 ft.), the sea begins to roll, dense streaks of foam, the 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 the 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>41</sup> NOAA - <http://www.srh.noaa.gov/jetstream/tstorms/wind.html>

<sup>42</sup> NOAA, Storm Prediction Center, <http://www.spc.noaa.gov/faq/tornado/beaufort.html>

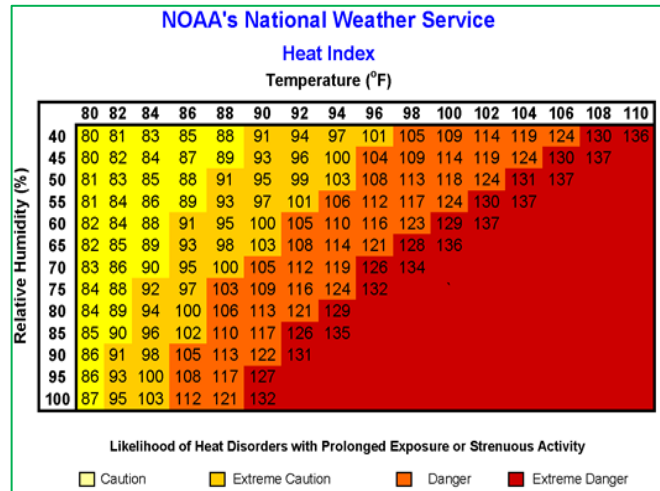


**\*EXTREME TEMPERATURES**

**Extreme Heat**

A heatwave 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.

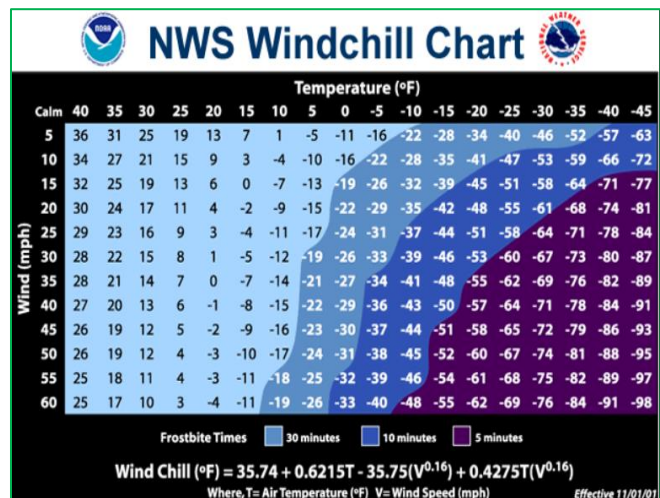
Most heat disorders occur when a victim is overexposed to heat or has over-exercised for their age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.



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 a prolonged heat wave than those in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, producing higher nighttime temperatures known as the "urban heat island effect."<sup>43</sup> The chart above explains the likelihood of heat disorders that may result from high heat.<sup>44</sup>

**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 average and wind speed increases, heat can leave your body more rapidly; these weather-related conditions may lead to serious health problems. Extreme cold is dangerous; it can bring on health emergencies in susceptible people without shelter, those who are stranded or live in poorly insulated homes or without heat.<sup>45</sup> The National Weather Service Chart (to the right) shows windchill due to wind and temperature.<sup>46</sup>



<sup>43</sup> NOAA, Index/Heat Disorders; <http://www.srh.noaa.gov/ssd/html/heatwv.htm>

<sup>44</sup> NOAA; <http://www.nws.noaa.gov/os/heat/index.shtml>

<sup>45</sup> CDC; <http://www.bt.cdc.gov/disasters/winter/guide.asp>

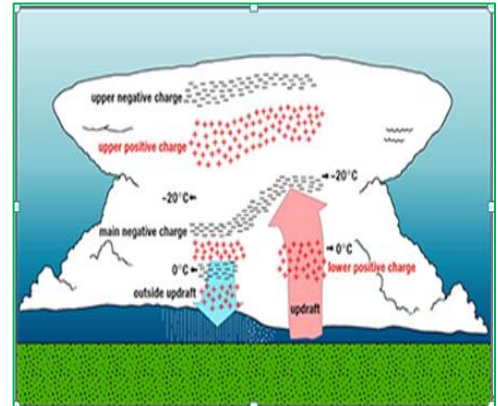
<sup>46</sup> National Weather Service; <http://www.nws.noaa.gov/om/windchill/>

**\*LIGHTNING & HAIL**

**Lightning**

The NOAA National Severe Storms Laboratory (NSSL) stated, “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>47</sup>

Thunder, a result of lightning, is created when the “lightning channel heats the air to around 18,000 degrees Fahrenheit...”<sup>48</sup> thus causing the rapid expansion of the air and the sounds we hear as thunder. Although thunder heard during a storm cannot hurt you, the lightning associated with the thunder can strike people and strike homes, outbuildings, grass, and trees, sparking disaster. In addition, wildfires and structure loss are at 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 and late afternoon or early evening; they may even occur during a winter snowstorm. Trees, tall buildings, and mountains are often lightning targets because their tops are closer to the cloud; however, lightning is unpredictable and does not always strike the tallest thing in the area.

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

In general, lightning decreases across the US mainland toward the northwest. Over the entire year, the highest frequency of cloud-to-ground lightning is in Florida between Tampa and Orlando. This phenomenon is due to the presence, on many days during the year, of significant moisture content in the atmosphere at low levels (below 5,000 feet) and high surface temperatures that produce strong sea breezes along the Florida coasts. The western mountains of the US also produce strong upward motions and contribute to frequent cloud-to-ground lightning. There are also high frequencies along the Gulf of Mexico, the Atlantic coast, and the southeast United States. US regions along the Pacific west coast have the least cloud-to-ground lightning.”<sup>49</sup>

<sup>47</sup> NOAA National Severe Storms Laboratory, <https://www.nssl.noaa.gov/education/svrwx101/lightning>

<sup>48</sup> Ibid

<sup>49</sup> Ibid



**Hailstorm**

**Lightning Activity Level (LAL) Grid**

The lightning activity level is a common parameter of fire weather forecasts nationwide. LAL is a measure of the amount of lightning activity using values 1 to 6 where:

LAL	Cloud & Storm Development	Lightning Strikes 15 Minutes
1	No thunderstorms	-
2	Cumulus clouds are common, but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered, and more than three must occur within the observation area. Moderate rain is common, and lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy, and lightning is frequent and intense.	>25
6	Similar to LAL 3, except thunderstorms are dry.	

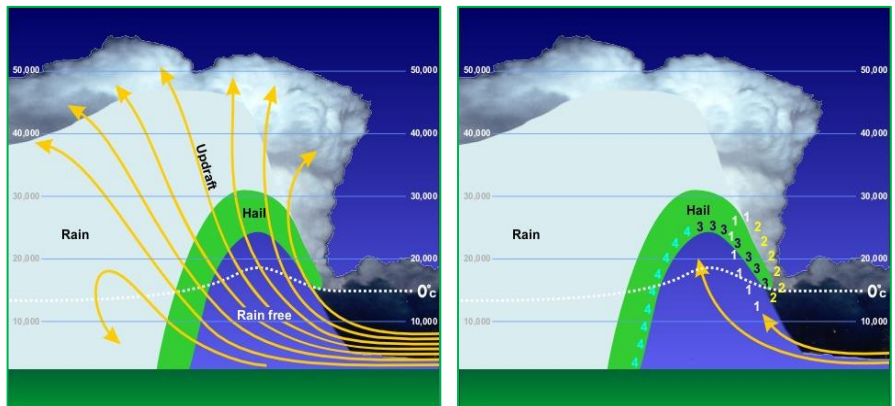
<http://www.prh.noaa.gov/hnl/pages/LAL.php>

Hailstones are balls of ice that grow as they are 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 ice balls 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>50</sup>

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



How hailstones grow is 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>51</sup> The charts to the right show how hail is formed.<sup>52</sup>



<sup>50</sup> NOAA National Severe Storms Laboratory; <https://www.nssl.noaa.gov/education/svrwx101/hail/>

<sup>51</sup> <http://www.pinterest.com/pin/126171227030590678/>

<sup>52</sup> <http://oceanservice.noaa.gov/education/yos/resource/JetStream/tstorms/hail.htm#hail>

**\*WILDFIRES**

The National Wildfire Coordinating Group (NWCG) states that wildfires are designated into seven categories, as seen in the top chart to the right.<sup>53</sup> For statistical analysis, the US Forest Service recognizes the cause of fires according to the bottom chart to the right:<sup>54</sup>

According to the International Wildland-Urban Interface Code (IWUIC), the definition of wildfire is “an uncontrolled fire spreading through vegetative fuels exposing and possibly consuming structures”. In addition, the IWUIC defines the Wildland Urban Interface (WUI) area as “that geographical area where structures and other human development meets or intermingles with wildland or vegetative fuels.”<sup>55</sup>

There are two major potential losses from wildfire: the forest and the threat to the built-up human environment. 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.

**\*TROPICAL & POST-TROPICAL CYCLONES**

**Cyclones (Hurricanes)**

A hurricane is a tropical cyclone where winds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center. The storm's eye 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” (on the following page<sup>56</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 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>57</sup>

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

**Post-Tropical Cyclones**

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

Class	Aces 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>53</sup> <http://www.nwcg.gov/pms/pubs/glossary/s.htm>

<sup>54</sup> [https://www.fs.fed.us/cgi-bin/Directives/get\\_dirs/fsh?5109.14](https://www.fs.fed.us/cgi-bin/Directives/get_dirs/fsh?5109.14)

<sup>55</sup> International Wildland-Urban Interface Code, 2012, International Code Council, Inc.

<sup>56</sup> National Hurricane Center; <http://www.nhc.noaa.gov/aboutsshws.php>

<sup>57</sup> National Hurricane Center, NOAA; <http://www.nhc.noaa.gov/aboutsshws.php>

Rainfall from tropical storms has been reported at up to 6 inches per hour; 43 inches of rain in 24 hours was reported in Alvin, TX, due to Tropical Storm Claudette.<sup>58</sup>

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 the 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 will likely result in power outages that could last 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 significant roof and siding damage. In addition, many shallowly rooted trees will be snapped or uprooted, blocking 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 significant 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 by losing most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles will be 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)	157 mph or higher 137 kt. or higher 252 km/h or higher	<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.

**\*EARTHQUAKES**

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. More significant 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. An earthquake's underground point of origin is called its focus; the point on the surface directly above the focus is the epicenter. Two scales widely determine the magnitude and intensity of an earthquake. These two scales are the Richter scale (which measures strength or magnitude) and the Mercalli Scale (which measures intensity or severity). The chart to the right shows the two scales relative to one another. The Richter scale measures earthquakes starting at one as the lowest, with each successive unit being about ten times stronger and more severe than the previous one.<sup>59</sup>

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

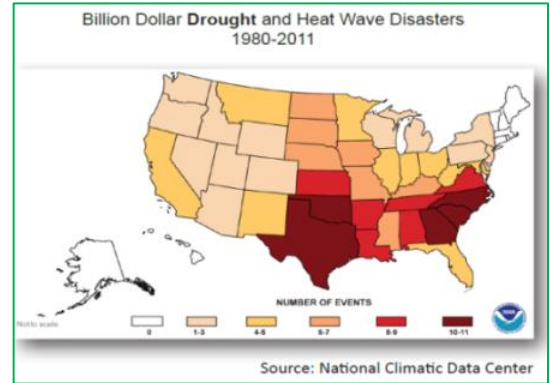
Modified Mercalli Scale		Richter Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at rest, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as earthquake; standing autos rock slightly, vibration 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

<sup>58</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)

<sup>59</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)

**\*DROUGHT**

A drought is a long period of abnormally low precipitation that adversely affects the growing season or living conditions of plants and animals. Droughts are rare in New Hampshire. They are generally less damaging and disruptive than floods and are more difficult to define. The effect of drought is indicated through measurements of soil moisture, groundwater levels, and streamflow.



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 streamflow. Low stream flow also correlates with low groundwater levels because groundwater discharge to streams and rivers maintains streamflow during extended dry periods. Low streamflow and low groundwater levels commonly cause diminished water supply.

The US Drought Monitor provides an intensity scale, as shown below, to indicate the “Category” of drought at any given time. During the peak months of the 2016 drought in New Hampshire, the southern part of the state was in Category D3 or Extreme Drought.

Category	Description	Possible Impacts	Ranges				
			Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	<ul style="list-style-type: none"> <li>Going into drought:                             <ul style="list-style-type: none"> <li>short-term dryness slowing planting, growth of crops or pastures</li> </ul> </li> <li>Coming out of drought:                             <ul style="list-style-type: none"> <li>some lingering water deficits</li> <li>pastures or crops not fully recovered</li> </ul> </li> </ul>	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	<ul style="list-style-type: none"> <li>Some damage to crops, pastures</li> <li>Streams, reservoirs, or wells low, some water shortages developing or imminent</li> <li>Voluntary water-use restrictions requested</li> </ul>	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	<ul style="list-style-type: none"> <li>Crop or pasture losses likely</li> <li>Water shortages common</li> <li>Water restrictions imposed</li> </ul>	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	<ul style="list-style-type: none"> <li>Major crop/pasture losses</li> <li>Widespread water shortages or restrictions</li> </ul>	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	<ul style="list-style-type: none"> <li>Exceptional and widespread crop/pasture losses</li> <li>Shortages of water in reservoirs, streams, and wells creating water emergencies</li> </ul>	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

<https://droughtmonitor.unl.edu/AboutUSDM/AbouttheData/DroughtClassification.aspx>

### \*LANDSLIDE & EROSION

Erosion is the wearing away of lands, such as riverbank loss, 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 surges, and windstorms, but may be intensified by human activities. Long-term erosion results from 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, erosion can destroy buildings and infrastructure.<sup>60</sup>

While no universally accepted standard or scientific scale has been developed for measuring the severity of all landslides, severity can be measured in several other ways:

- Steepness/grade of the Slope (measured as a percent)
- Geographical Area
  - Measured in square feet, square yards, etc.
  - More accurately measured using LIDAR/GIS systems
- Earthquake, either causing the event or caused by the event (measured using the Moment Magnitude Intensity or Mercalli Scale)

There are also multiple types of landslides:

- Falls: A mass detaches from a steep slope or cliff and descends by free-fall, bounding, or rolling
- Topples: A mass tilts or rotates forward as a unit
- Slides: A mass displaces on one or more recognizable surfaces, which may be curved or planar
- Flows: A mass moves downslope with a fluid motion. A significant amount of water may or may not be part of the mass

Like flooding, landslides are unique in how they affect different geographic, topographic, and geologic areas. Therefore, consideration of many measurements is required to determine the severity of the landslide event.<sup>61</sup>

### \*INFECTIOUS DISEASES

#### ***Bacterial & Viral Infections***

Many organisms live inside our bodies and on our skin. Although these organisms are generally harmless and sometimes helpful, they can cause illnesses. Infectious diseases can be transmitted from one person to another by bites from animals or insects (zoonotic), from the environment, or by consuming food or water that has been contaminated. In addition, infectious diseases may be caused by bacteria, viruses, fungi, and parasites.<sup>62</sup>

Some of the more common infectious diseases include Lyme disease, HIV/AIDS, Tuberculosis, Rabies, West Nile Virus, Eastern Equine Encephalitis (EEE), Ebola, Avian Flu, Enterovirus D-68, Influenza, Hepatitis A, Zika Virus, Meningitis, Legionella, Sexually Transmitted Diseases (STD), Hepatitis C, Salmonella, SARS, and Staph.<sup>63</sup>

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<sup>60</sup> Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, FEMA, January 2013

<sup>61</sup> State of New Hampshire Multi-Hazard Mitigation Plan Update 2018 & <https://oas.org/dsd/publications/Unit/oea66e/ch10.htm>

<sup>62</sup> <https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173>

<sup>63</sup> <https://www.dhhs.nh.gov/dphs/cdcs/index.htm>



*“Throughout history, millions of people have died of diseases such as bubonic plague or the Black Death, which is caused by Yersinia pestis bacteria, and smallpox, which is caused by the variola virus. In recent times, viral infections have been responsible for two major pandemics: the 1918-1919 “Spanish Flu” epidemic that killed 20-40 million people, and the ongoing HIV/AIDS epidemic that killed an estimated 1.5 million people worldwide in 2013 alone.*

*Bacterial and viral infections can cause similar symptoms such as coughing and sneezing, fever, inflammation, vomiting, diarrhea, fatigue, and cramping – all of which are ways the immune system tries to rid the body of infectious organisms. But bacterial and viral infections are dissimilar in many other important respects, most of them due to the organisms’ structural differences and the way they respond to medications.”<sup>64</sup>*

In early 2020, a novel coronavirus emerged in China, spreading worldwide to become the worst pandemic since the 1918 Spanish Flu. Known as Covid-19, this novel coronavirus has infected 672,165,995 people and caused the deaths of 6,847,466 individuals worldwide as of February 8, 2023. As of this date, confirmed cases in the US were reported to be 1,246,697, with 1,112,300 reported deaths.<sup>65</sup> Most US residents were advised to “stay at home” by State Governors; businesses closed to flatten the rising curve of confirmed cases through mitigation. As of February 2023, mitigation, testing, and vaccination efforts appeared to be working in much of the United States. However, the Delta and Omicron variants appeared in the US in December 2021, causing critical concerns about the possibility of overwhelming the country’s hospital systems.

The pandemic is an evolving worldwide crisis, affecting millions of workers in the United States and presenting massive economic results. Although most people confirmed with Covid-19 eventually recover, the virus has impacted the elderly and compromised individuals, particularly those in confined living quarters such as nursing homes and prisons.

The extent of infectious diseases is generally described by the level and occurrence of a particular disease as follows<sup>66</sup>:

- Endemic.....Disease with a constant presence or usual prevalence in a population within a geographic area
- Sporadic.....Disease that occurs infrequently and irregularly
- Hyperendemic.....Disease that is persistent and has high levels of occurrence
- Epidemic.....Disease that shows an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area
- Outbreak.....Disease that has the same definition as an epidemic but is often used for a more limited geographic area
- Cluster.....Refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.
- Pandemic.....An epidemic that has spread over several countries or continents, usually affecting a large number of people

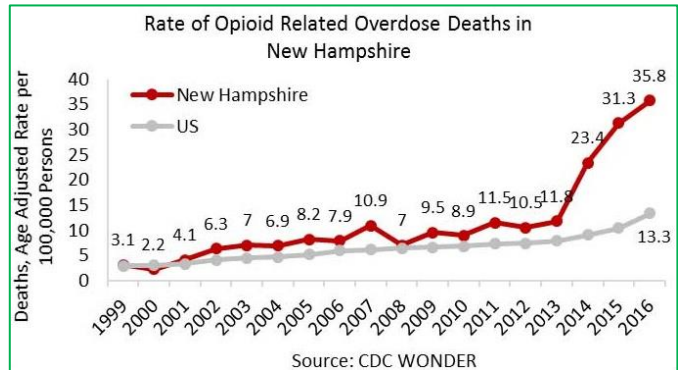
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<sup>64</sup> <https://www.webmd.com/a-to-z-guides/bacterial-and-viral-infections#1>  
<sup>65</sup> <https://coronavirus.jhu.edu/map.html>  
<sup>66</sup> <https://www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section11.html>

**Opioid Crisis**

A revised report by the National Institute of Drug Abuse states, “Every day, more than 130 people in the United States die after overdosing on opioids. The misuse of and addiction to opioids—including prescription pain relievers, heroin, and synthetic opioids such as fentanyl - is a serious national crisis that affects public health as well as social and economic welfare. The Centers for Disease Control and Prevention estimates that the total “economic burden” of prescription opioid misuse alone in the United States is \$78.5 billion a year, including the costs of healthcare, lost productivity, addiction treatment, and criminal justice involvement.”

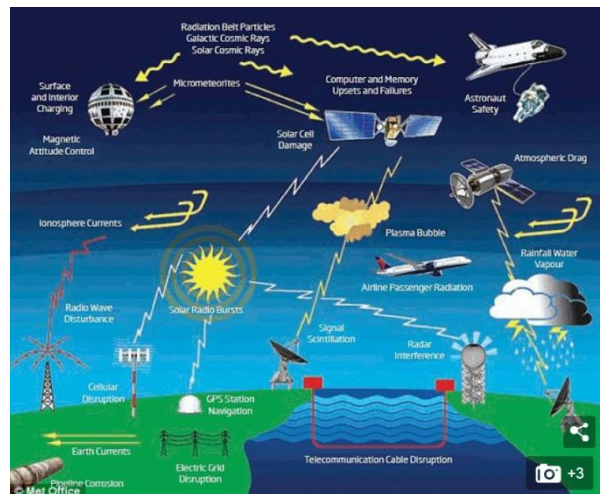
According to the National Institute on Drug Abuse, “New Hampshire has the second highest rate of opioid-related overdose deaths – a rate of 35.8 deaths per 100,000 persons – nearly 3 times higher than the national rate of 13.2 deaths per 100,000. From 2013 through 2016, opioid-related deaths in New Hampshire tripled. This increase was mainly driven by the number of deaths related to synthetic opioids (predominately fentanyl), which increased more than tenfold, from 30 to 363 deaths, during this time.”<sup>67</sup> The chart to the right shows the increase in opioid-related overdose deaths in New Hampshire compared to the US overall.<sup>68</sup>



**SOLAR STORM & SPACE WEATHER**

When sudden amounts of stored magnetic energy and ions are discharged from the Sun’s surface, solar flares, high-speed solar wind streams, solar energetic particles, and coronal mass ejections (CMEs) are possible. This magnetic energy sometimes finds its way to Earth by following the Sun’s magnetic field. Then, upon collision with the Earth’s magnetic field, these charged particles enter the Earth’s upper atmosphere, causing Auroras.

Charged magnetic particles can produce their own magnetic field, disrupting navigation, communication systems, and GPS satellites. In addition, they can potentially produce Geomagnetic Induced Currents (GICs), affecting the power grid and pipelines.



In addition, an electromagnetic surge from a solar storm can produce an Electromagnetic Pulse (EMP). An EMP could cause significant damage to infrastructures such as nuclear power plants, banking systems, the electrical grid, sewage treatment facilities, cell phones, landlines, and even vehicles. The image above shows the potential impacts of solar storms and space weather.<sup>69</sup>

<sup>67</sup> <https://www.drugabuse.gov/drugs-abuse/opioids/opioid-summaries-by-state/new-hampshire-opioid-summary>

<sup>68</sup> Ibid

<sup>69</sup> <https://www.dailymail.co.uk/sciencetech/article-3764842/A-solar-storm-destroy-planet-unless-create-massive-magnetic-shield-protect-Earth-warns-expert.html>



Solar Storm & Space Weather Extent<sup>70</sup>

Geomagnetic Storms				
Scale	Description	Effect	Physical Measure	Average Frequency (1 cycle = 11 years)
G 5	Extreme	<p><b>Power systems:</b> Widespread voltage control problems and protective system problems can occur; some grid systems may experience complete collapse or blackouts. Transformers may experience damage.</p> <p><b>Spacecraft operations:</b> May experience extensive surface charging, problems with orientation, uplink/downlink, and tracking satellites.</p> <p><b>Other systems:</b> Pipeline currents can reach hundreds of amps, HF (high frequency) radio propagation may be impossible in many areas for one to two days, satellite navigation may be degraded for days, low-frequency radio navigation can be out for hours, and aurora has been seen as low as Florida and southern Texas (typically 40° geomagnetic lat.).</p>	Kp. = 9	4 per cycle (4 days per cycle)
G 4	Severe	<p><b>Power systems:</b> Possible widespread voltage control problems and some protective systems will mistakenly trip out key assets from the grid.</p> <p><b>Spacecraft operations:</b> May experience surface charging and tracking problems; corrections may be needed for orientation problems.</p> <p><b>Other systems:</b> Induced pipeline currents affect preventive measures, HF radio propagation is sporadic, satellite navigation is degraded for hours, low-frequency radio navigation is disrupted, and aurora has been seen as low as Alabama and northern California (typically 45° geomagnetic lat.).</p>	Kp. = 8, including a 9-	100 per cycle (60 days per cycle)
G 3	Strong	<p><b>Power systems:</b> Voltage corrections may be required; false alarms are triggered on some protection devices.</p> <p><b>Spacecraft operations:</b> Surface charging may occur on satellite components, drag may increase on low-Earth-orbit satellites, and corrections may be needed for orientation problems.</p> <p><b>Other systems:</b> Intermittent satellite navigation and low-frequency radio navigation problems may occur, HF radio may be intermittent, and aurora has been seen as low as Illinois and Oregon (typically 50° geomagnetic lat.).</p>	Kp. = 7	200 per cycle (130 days per cycle)
G 2	Moderate	<p><b>Power systems:</b> High-latitude power systems may experience voltage alarms; long-duration storms may cause transformer damage.</p> <p><b>Spacecraft operations:</b> Corrective actions to orientation may be required by ground control; possible changes in drag affect orbit predictions.</p> <p><b>Other systems:</b> HF radio propagation can fade at higher latitudes, and aurora has been seen as low as New York and Idaho (typically 55° geomagnetic lat.).</p>	Kp. = 6	600 per cycle (360 days per cycle)
G 1	Minor	<p><b>Power systems:</b> Weak power grid fluctuations can occur.</p> <p><b>Spacecraft operations:</b> Minor impact on satellite operations possible.</p> <p><b>Other systems:</b> Migratory animals are affected at this and higher levels; aurora is commonly visible at high latitudes (northern Michigan and Maine).</p>	Kp. = 5	1700 per cycle (900 days per cycle)

Solar Radiation Storms				
Scale	Description	Effect	Physical Measure (Flux level of >=10 MeV particles)	Average Frequency (1 cycle = 11 years)
S 5	Extreme	<p><b>Biological:</b> Unavoidable high radiation hazard to astronauts on EVA (extra-vehicular activity); passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.</p> <p><b>Satellite operations:</b> Satellites may be rendered useless, memory impacts can cause loss of control, may cause serious noise in image data, star-trackers may be unable to locate sources, and permanent damage to solar panels is possible.</p> <p><b>Other systems:</b> Complete blackout of HF (high frequency) communications possible through the polar regions and position errors make navigation operations extremely difficult.</p>	10 <sup>5</sup>	Fewer than 1 per cycle
S 4	Severe	<p><b>Biological:</b> Unavoidable radiation hazard to astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.</p> <p><b>Satellite operations:</b> May experience memory device problems and noise on imaging systems; star-tracker problems may cause orientation problems, and solar panel efficiency can be degraded.</p> <p><b>Other systems:</b> Blackout of HF radio communications through the polar regions and increased navigation errors over several days are likely.</p>	10 <sup>4</sup>	3 per cycle

<sup>70</sup> Extent charts taken from <https://www.weather.gov/akq/SpaceWeather>

Solar Radiation Storms				
S 3	Strong	<p><b>Biological:</b> Radiation hazard avoidance is recommended for astronauts on EVA; passengers and crew in high-flying aircraft at high latitudes may be exposed to radiation risk.</p> <p><b>Satellite operations:</b> Single-event upsets, noise in imaging systems, and a slight reduction of efficiency in solar panels are likely.</p> <p><b>Other systems:</b> Degraded HF radio propagation through the polar regions and navigation position errors likely.</p>	$10^3$	10 per cycle
S 2	Moderate	<p><b>Biological:</b> Passengers and crew in high-flying aircraft at high latitudes may be exposed to elevated radiation risk.</p> <p><b>Satellite operations:</b> Infrequent single-event upsets are possible.</p> <p><b>Other systems:</b> minor effects on HF propagation through the polar regions and navigation at polar cap locations possibly affected.</p>	$10^2$	25 per cycle
S 1	Minor	<p><b>Biological:</b> None.</p> <p><b>Satellite operations:</b> None.</p> <p><b>Other systems:</b> Minor impacts on HF radio in the polar regions.</p>	10	50 per cycle

Radio Blackout				
Scale	Description	Effect	Physical Measure	Average Frequency (1 cycle = 11 years)
R 5	Extreme	<p><b>HF Radio:</b> Complete HF (high frequency) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and on-route aviators in this sector.</p> <p><b>Navigation:</b> Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.</p>	$X20 (2 \times 10^{-3})$	Less than 1 per cycle
R 4	Severe	<p><b>HF Radio:</b> HF radio communication blackouts on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time.</p> <p><b>Navigation:</b> Outages of low-frequency navigation signals cause increased errors in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.</p>	$X10 (10^{-3})$	8 per cycle (8 days per cycle)
R 3	Strong	<p><b>HF Radio:</b> Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth.</p> <p><b>Navigation:</b> Low-frequency navigation signals degraded for about an hour.</p>	$X1 (10^{-4})$	175 per cycle (140 days per cycle)
R 2	Moderate	<p><b>HF Radio:</b> Limited blackout of HF radio communication on the sunlit side, loss of radio contact for tens of minutes.</p> <p><b>Navigation:</b> Degradation of low-frequency navigation signals for tens of minutes.</p>	$M5 (5 \times 10^{-5})$	350 per cycle (300 days per cycle)
R 1	Minor	<p><b>HF Radio:</b> Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact.</p> <p><b>Navigation:</b> Low-frequency navigation signals are degraded for brief intervals.</p>	$M1 (10^{-5})$	2000 per cycle (950 days per cycle)

**AVALANCHES**

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 specific locations are naturally more dangerous than others. Most avalanches tend to happen during winter, particularly from December to April. However, avalanche fatalities have been recorded for every month of the year.”<sup>71</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 fail. Skiers and recreationists usually trigger smaller, but often more deadly avalanches.”

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 <b>not</b> 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.

An avalanche has three main parts (see the 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>72</sup>

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

The third part of an avalanche is the “runout zone”. The runout zone is where the avalanche has stopped and left the most extensive 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. In addition, some of these conditions, such as temperature and snowpack, can change on a daily or hourly basis.”<sup>73</sup>

When an avalanche is possible, 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 above shows avalanche danger determined by likelihood, size, and distribution.<sup>74</sup>

<sup>71</sup> Copyright Richard Armstrong, NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>

<sup>72</sup> NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>; image credit: Betsy Armstrong

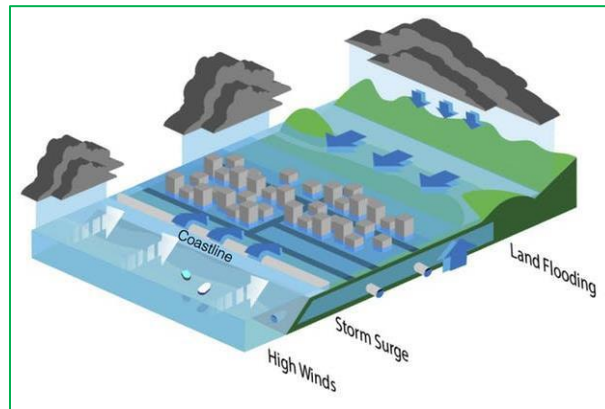
<sup>73</sup> Copyright Richard Armstrong, NSIDC, <http://nsidc.org/cryosphere/snow/science/avalanches.html>

<sup>74</sup> [http://www.avalanche.org/danger\\_card.php](http://www.avalanche.org/danger_card.php)

**COASTAL FLOODING**

Coastal areas are particularly susceptible to flooding, erosion, storm surge, and sea-level rise due to tropical and post-tropical cyclones, heavy rain events, gale-force winds, and other natural phenomena. The flooding that results is “determined by a combination of several factors such as storm intensity, forward speed, storm area size, coastline characteristics, angle of approach to the coast, tide height.”<sup>75</sup>

The severity of the flooding can vary depending on “both the speed of onset (how quickly the floodwaters rise) and the flood duration. Nor’easters can impact the region for several days and produce storm surge with or without the addition of inland runoff from heavy precipitation.”<sup>76</sup> As shown in the image below, storm surge and inland flooding can affect the severity of flooding along the shore.<sup>77</sup>



<sup>75</sup> NH Multi-hazard Mitigation Plan-2018, page 55

<sup>76</sup> Ibid

<sup>77</sup> Ibid, page 53, “Understanding compound flooding from land and ocean sources”, Theodore Scontras, University of Maine)

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**APPENDIX D: NH MAJOR DISASTER & EMERGENCY DECLARATIONS**

**Major Disaster (DR) & Emergency Declarations (EM)**

This list includes one Fire Management Assistance Declaration (FM)  
 Declarations are arranged chronologically; the most recent disaster is listed first

Number	Hazard	Date of Event	Counties	Description
DR-4624	Inland Flooding	July 29-July 30, 2021	Cheshire & Sullivan	<b>Major Disaster Declaration, DR-4624:</b> The Federal Emergency Management Agency announced a major disaster declaration and notification of individual and public assistance on October 4, 2021, for two NH Counties.
DR-4622	Inland Flooding	July 17-19, 2021	Cheshire	<b>Major Disaster Declaration, DR-4622:</b> The Federal Emergency Management Agency announced a major disaster declaration during a period of severe storms and flooding from July 17-19, 2021, in one New Hampshire County.
DR-4516	Infectious Disease	January 20, 2020 ongoing	All Ten NH Counties	<b>Major Disaster Declaration, DR-4516:</b> The Federal Emergency Management Agency ("FEMA") within the US Department of Homeland Security is giving public notice of its intent to assist the State of New Hampshire, local and tribal governments, and certain private nonprofit organizations under the major disaster declaration issued by the President on April 3, 2020, as a result of the Coronavirus Disease 2019 (Covid-19).
EM-3445	Infectious Disease	January 20, 2020 ongoing	All Ten NH Counties	<b>Emergency Declaration EM-3445:</b> A ten-county declaration to provide individual assistance and public assistance as a result of the impact of Covid-19
DR-4457	Severe Storm & Flooding	July 11-12, 2019	Grafton	<b>Major Disaster Declaration, DR-4457:</b> The Federal Emergency Management Agency announced a major disaster declaration for a period of severe storms and flooding from July 11-12, 2019, in one New Hampshire County.
DR-4371	Severe Winter Storms	March 13-14, 2018	Carroll, Strafford & Rockingham	<b>Major Disaster Declaration, DR 4371:</b> The Federal Emergency Management Agency announced a major disaster declaration on June 8, 2018, for a period of a severe winter storm from March 13-14, 2018.
DR-4370	Severe Storm & Flooding	March 2-8, 2018	Rockingham	<b>Major Disaster Declaration, DR 4370:</b> The Federal Emergency Management Agency announced a major disaster declaration on June 8, 2018, for a period of severe storms and flooding from March 2-8, 2018.
DR-4355	Severe Storms, Flooding	October 29-November 1, 2017	Sullivan, Grafton, Coos, Carroll, Belknap & Merrimack	<b>Major Disaster Declaration, DR-4355:</b> The Federal Emergency Management Agency (FEMA) announced that federal disaster assistance was available to supplement state and local recovery efforts in areas affected by severe storms and flooding from October 29-November 1, 2017, in five New Hampshire Counties.
DR-4329	Severe Storms, Flooding	July 1-2, 2017	Grafton & Coos	<b>Major Disaster Declaration DR-4329:</b> The Federal Emergency Management Agency (FEMA) announced that federal disaster assistance is available to the state of New Hampshire to supplement state and local recovery efforts in the areas affected by severe storms and flooding from July 1, 2017, to July 2, 2017, in Grafton County
DR-4316	Severe Winter Storms	March 14-15, 2017	Belknap & Carroll	<b>Major Disaster Declaration DR-4316:</b> Severe winter storm and snowstorm in Belknap & Carroll Counties; disaster aid was provided to supplement state and local recovery efforts.
FM-5123	Forest Fire	April 21-23, 2016	Cheshire	<b>Fire Management Assistance Declaration, FM-5123: Stoddard, NH</b>



Number	Hazard	Date of Event	Counties	Description
DR-4209	Severe Winter Storms	January 26-28, 2015	Hillsborough, Rockingham & Stafford	<b>Major Disaster Declaration DR-4209:</b> Severe winter storm and snowstorm in Hillsborough, Rockingham, and Strafford Counties; disaster aid was provided to supplement state and local recovery efforts.
DR-4139	Severe Storms, Flooding	July 9-10, 2013	Cheshire, Sullivan & Grafton	<b>Major Disaster Declaration DR-4139:</b> Severe storms, flooding, and landslides occurred from 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>Major Disaster Declaration DR-4105:</b> Nemo; heavy snow in February 2013.
DR-4095	Hurricane Sandy	October 26-November 8, 2012	Belknap, Carroll, Coos, Grafton, Rockingham & Sullivan	<b>Major Disaster Declaration DR-4095:</b> The declaration covers damage to property from the storm that spawned heavy rains, high winds, high tides, and flooding from October 26-November 8, 2012.
EM-3360	Hurricane Sandy	October 26-31, 2012	All Ten NH Counties	<b>Emergency Declaration EM-3360:</b> Hurricane Sandy came ashore in NJ, bringing NH high winds, power outages, and heavy rain. It was declared in all ten counties in New Hampshire.
DR-4065	Severe Storm & Flooding	May 29-31, 2012	Cheshire	<b>Major Disaster Declaration DR-4065:</b> Severe Storm and Flood Event May 29-31, 2012, in Cheshire County.
DR-4049	Severe Storm & Snowstorm	October 29-30, 2011	Hillsborough & Rockingham	<b>Major Disaster Declaration DR-4049:</b> Severe Storm and Snowstorm Event October 29-30, 2011, in Hillsborough and Rockingham Counties.
EM-3344	Severe Snowstorm	October 29-30, 2011	All Ten NH Counties	<b>Emergency Declaration EM-3344:</b> Severe storm during October 29-30, 2011, in all ten counties in New Hampshire (Snowtober).
DR-4026	Tropical Storm Irene	August 26-September 6, 2011	Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan	<b>Major Disaster Declaration DR-4026:</b> Tropical Storm Irene Aug 26th- Sept 6, 2011, in Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, & Sullivan Counties.
EM-3333	Tropical Storm Irene	August 26-September 6, 2011	All Ten NH Counties	<b>Emergency Declaration EM-3333:</b> An emergency Declaration was declared for Tropical Storm Irene in all ten counties.
DR-4006	Severe Storm & Flooding	May 26-30, 2011	Coos & Grafton Counties	<b>Major Disaster Declaration DR-4006:</b> May flooding event occurred May 26th-30th, 2011, in Coos & Grafton Counties (Memorial Day Weekend Storm).
DR-1913	Severe Storms & Flooding	March 14-31, 2010	Hillsborough & Rockingham	<b>Major Disaster Declaration DR-1913:</b> Flooding in two NH counties occurred, including Hillsborough and Rockingham counties.
DR-1892	Severe Winter Storm, Rain & Flooding	February 23 - March 3, 2010	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	<b>Major 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>Major Disaster Declaration DR-1812:</b> Damaging ice storms to the entire state, including all ten NH counties; fallen trees and large-scale power outages; five months after December's ice storm battered the region, nearly \$15 million in federal aid had been obligated.
EM-3297	Severe Winter Storm	December 11, 2008	All Ten NH Counties	<b>Emergency Declaration EM-3297:</b> Severe winter storm beginning on December 11, 2008.
DR-1799	Severe Storms & Flooding	September 6-7, 2008	Hillsborough	<b>Major Disaster Declaration: DR-1799:</b> Severe storms and flooding began on September 6, 2008.
DR-1787	Severe Storms & Flooding	July 24 - August 14, 2008	Belknap, Carroll & Grafton & Coos	<b>Major Disaster Declaration DR-1787:</b> Severe storms, a tornado, and flooding occurred on July 24, 2008.



Number	Hazard	Date of Event	Counties	Description
DR-1782	Severe Storms, Tornado, & Flooding	July 24, 2008	Belknap, Carroll, Merrimack, Strafford & Rockingham	<b>Major Disaster 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>Major Disaster Declaration DR-1695:</b> Flood damages; FEMA & SBA obligated more than \$27.9 million in disaster aid following the April nor'easter. (Tax Day Storm)
DR-1643	Severe Storms & Flooding	May 12-23, 2006	Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham & Strafford	<b>Major 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>Major Disaster Declaration DR-1610:</b> State and federal disaster assistance reached more than \$3 million to help residents and business owners in New Hampshire recover from losses from severe storms and flooding in October 2005.
EM-3258	Hurricane Katrina Evacuation	August 29-October 1, 2005	All Ten NH Counties	<b>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 made federal funding available to the state's ten counties.
EM-3211	Snow	March 11-12, 2005	Carroll, Cheshire, Hillsborough, Rockingham & Sullivan	<b>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>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 is <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)
EM 3208-002	Snow	January, February, March 2005	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Rockingham, Merrimack, Strafford & Sullivan	<b>Emergency Declaration EM 3208-002:</b> The Federal Emergency Management Agency (FEMA) has obligated more than \$6.5 million to reimburse state and local governments in New Hampshire for costs incurred in three snowstorms that hit the state earlier this year, according to disaster recovery officials. Total aid for all three storms is \$6,892,023.87 (January: \$3,658,114.66; February: \$1,121,727.20; March: \$2,113,182.01)
EM-3207	Snow	January 22-23, 2005	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Rockingham, Merrimack, Strafford & Sullivan	<b>Emergency Declaration EM-3207:</b> More than \$3.5 million has been approved to help pay for the costs of the heavy snow and high winds; Total aid for the January storm is <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)

Number	Hazard	Date of Event	Counties	Description
EM-3193	Snow	December 6-7, 2003	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan	<b>Emergency Declaration EM-3193:</b> The declaration covers jurisdictions with record and near-record snowfall that occurred throughout December 6-7, 2003
DR-1489	Severe Storms & Flooding	July 21-August 18, 2003	Cheshire & Sullivan	<b>Major Disaster Declaration DR-1489:</b> Floods stemming from persistent rainfall and severe storms caused damage to public property from July 21 through August 18, 2003.
EM-3177	Snowstorm	February 17-18, 2003	Cheshire, Hillsborough, Merrimack, Rockingham & Strafford	<b>Emergency Declaration EM-3177:</b> Declaration covers jurisdictions with record and near-record snowfall from the snowstorm that occurred February 17-18, 2003
EM-3166	Snowstorm	March 5-7, 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham & Strafford	<b>Emergency Declaration EM-3166:</b> Declaration covers jurisdictions with record and near-record snowfall from the late winter storm that occurred in March 2001
DR-1305	Tropical Storm Floyd	September 16-18, 1999	Belknap, Cheshire & Grafton	<b>Major Disaster Declaration DR-1305:</b> The declaration covers damage to public property from the storm that spawned heavy rains, high winds, and flooding throughout September 16-18.
DR-1231	Severe Storms & Flooding	June 12-July 2, 1998	Belknap, Carroll Grafton, Hillsborough, Merrimack & Rockingham	<b>Major Disaster Declaration DR-1231:</b>
DR-1199	Ice Storm	January 7-25, 1998	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Strafford & Sullivan	<b>Major Disaster Declaration DR-1199:</b>
DR-1144	Severe Storms/Flooding	October 20-23, 1996	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	<b>Major Disaster Declaration DR-1144:</b>
DR-1077	Storms/Floods	October 20-November 15, 1995	Carroll, Cheshire, Coos, Grafton, Merrimack & Sullivan	<b>Major Disaster Declaration DR-1077:</b>
EM-3101	High Winds & Record Snowfall	March 13-17, 1994	All Ten NH Counties	<b>Emergency Declaration EM-3101:</b>
DR-923	Severe Coastal Storm	October 30-31, 1991	Rockingham	<b>Major Disaster Declaration DR-923:</b>
DR-917	Hurricane Bob, Severe Storm	August 18-20, 1991	Carroll, Hillsborough, Rockingham & Strafford	<b>Major Disaster Declaration DR-917:</b>

Number	Hazard	Date of Event	Counties	Description
DR-876	Flooding, Severe Storm	August 7-11, 1990	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, & Sullivan	Major Disaster Declaration DR-876:
DR-789	Severe Storms & Flooding	March 30-April 11, 1987	Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan	Major Disaster Declaration DR-789
DR-771	Severe Storms & Flooding	July 29-August 10, 1986	Cheshire, Hillsborough & Sullivan	Major Disaster Declaration DR-771:
EM-3073	Flooding	March 15, 1979	Coos	Emergency Declaration EM-3073:
DR-549	High Winds, Tidal Surge, Coastal Flooding & Snow	February 16, 1978	All Ten NH Counties	Major Disaster Declaration DR-549: Blizzard of 1978
DR-411	Heavy Rains, Flooding	January 21, 1974	Belknap, Carroll, Cheshire & Grafton	Major Disaster Declaration DR-411:
DR-399	Severe Storms & Flooding	July 11, 1973	All Ten NH Counties	Major Disaster Declaration DR-399:
DR-327	Coastal Storms	March 18, 1972	Rockingham	Major Disaster Declaration DR-327:
DR-11	Forest Fire	July 2, 1953	Carroll	Major Disaster Declaration DR-11:

**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: HAZARD MITIGATION PLANNING – LIST OF ACRONYMS**

AAR .....	After Action Report	HSEM.....	Homeland Security Emergency Management
ACS .....	Acute Care Site	HSPD .....	Homeland Security Presidential Directive
ARC .....	American Red Cross	IAP .....	Incident Action Plan
ARES.....	Amateur Radio Emergency Service	IC.....	Incident Commander
BFE.....	Base Flood Elevation	ICC.....	Incident Command Center
BOCA .....	Building Officials and Code Administrators	ICS .....	Incident Command System
CBRNE .....	Chemical, Biological, Radiological,	JIC.....	Joint Information Center
CDC .....	Centers for Disease Control and Prevention	LEOP.....	Local Emergency Operations Plan
CDP .....	Center for Domestic Preparedness	MAPS .....	Mapping and Planning Solutions
CERT .....	Community Emergency Response Team	MCI.....	Mass Casualty Incident
CFR .....	Code of Federal Regulations	MEF.....	Mission Essential Function
CIKR .....	Critical Infrastructure & Key Resources	MOU .....	Memorandum of Understanding
CIP.....	Capital Improvements Program	NAWAS .....	National Warning System
COG .....	Continuity of Government	NEF .....	National Essential Function
COGCON.....	Continuity of Government Readiness Conditions	NERF.....	Non-Emergency Response Facility
COOP .....	Continuity of Operations	NFIP .....	National Flood Insurance Program
CPCC .....	Continuity Policy Coordination Committee	NGVD.....	National Geodetic Vertical Datum of 1929
CWPP .....	Community Wildfire Protection Plan	NIMS .....	National Incident Management System
DBHRT .....	Disaster Behavioral Health Response Team	NOAA .....	National Oceanic and Atmospheric Association
DEMD .....	Deputy Emergency Management Director	NRP.....	National Response Plan
DES .....	Department of Environment Services	NSPD .....	National Security Presidential Directive
DFO .....	Disaster Field Office	NTAS.....	National Terrorism Advisory System Nuclear and Explosive
DHHS .....	Department of Health and Human Services	NWS.....	National Weather Service
DHS .....	Department of Homeland Security	PA .....	Public Assistance
DMCR .....	Disaster Management Central Resource	PDA.....	Preliminary Damage Assessment
DBEA.....	Department of Business & Economic Affairs	PDD.....	Presidential Decision Directive
DNCR .....	Department of Natural & Cultural Resources	PIO .....	Public Information Officer
DOD.....	Department of Defense	PMEF .....	Primary Mission Essential Function
DOE.....	Department of Energy	POD .....	Point of Distribution
DOJ .....	Department of Justice	PPE .....	Personal Protective Equipment
DOT .....	Department of Transportation	PR .....	Potential Resources
DPW .....	Department of Public Works	PSA .....	Public Service Announcement
DRC.....	Disaster Recovery Center	RERP .....	Radiological Emergency Response Plan
EAS .....	Emergency Alert System	RNAT.....	Rapid Needs Assessment Team
EMD.....	Emergency Management Director	SERT.....	State Emergency Response Team
EMS.....	Emergency Medical Services	SITREP .....	Situation Report (Also SitRep)
EO .....	Executive Order	SNS.....	Strategic National Stockpile
EOC.....	Emergency Operations Center	SOG .....	Standard Operating Guidelines
EPA .....	U.S. Environmental Protection Agency	SOP.....	Standard Operating Procedures
EPZ.....	Emergency Planning Zone	SPNHF .....	Society for the Protection of NH Forests
ERF .....	Emergency Response Facility	UC .....	Unified Command
ERG.....	Emergency Relocation Group	USDA-FS .....	US Department of Agriculture – Forest Service
ESF.....	Emergency Support Functions	USGS .....	United States Geological Society
FEMA.....	Federal Emergency Management Agency	VOAD .....	Volunteer Organization Active in Disasters
FIRM.....	Flood Insurance Rate Map	WMD .....	Weapon(s) of Mass Destruction
FPP.....	Facilities & Populations to Protect	WMNF .....	White Mountain National Forest
GIS .....	Geographic Information System	WUI .....	Wildland Urban Interface
HazMat .....	Hazardous Material(s)		
HFRA.....	Healthy Forest Restoration Act		
HMGP .....	Hazard Mitigation Grant Program		
HSAS.....	Homeland Security Advisory System		

**APPENDIX F: POTENTIAL MITIGATION IDEAS<sup>78</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>78</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

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**The Town of Orange**

Doug Weekes  
Emergency Management Director  
PO Box 37  
Canaan, NH 03741  
(603) 523-4467



***Cardigan Mountain***

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**Mapping and Planning Solutions**

June Garneau  
Owner/Planner  
PO Box 283  
91 Cherry Mountain Place  
Twin Mountain, NH 03595  
jgarneau@mappingandplanning.com  
(603) 991-9664 (cell)