

Town of Wolfeboro, New Hampshire Hazard Mitigation Plan Update 2019

Prepared by the:

Wolfeboro Hazard Mitigation Update Committee



Downed trees and power lines in Wolfeboro from the July 24, 2008 tornado

2013

Updated: August 2019

Town of Wolfeboro, New Hampshire Hazard Mitigation Plan Update

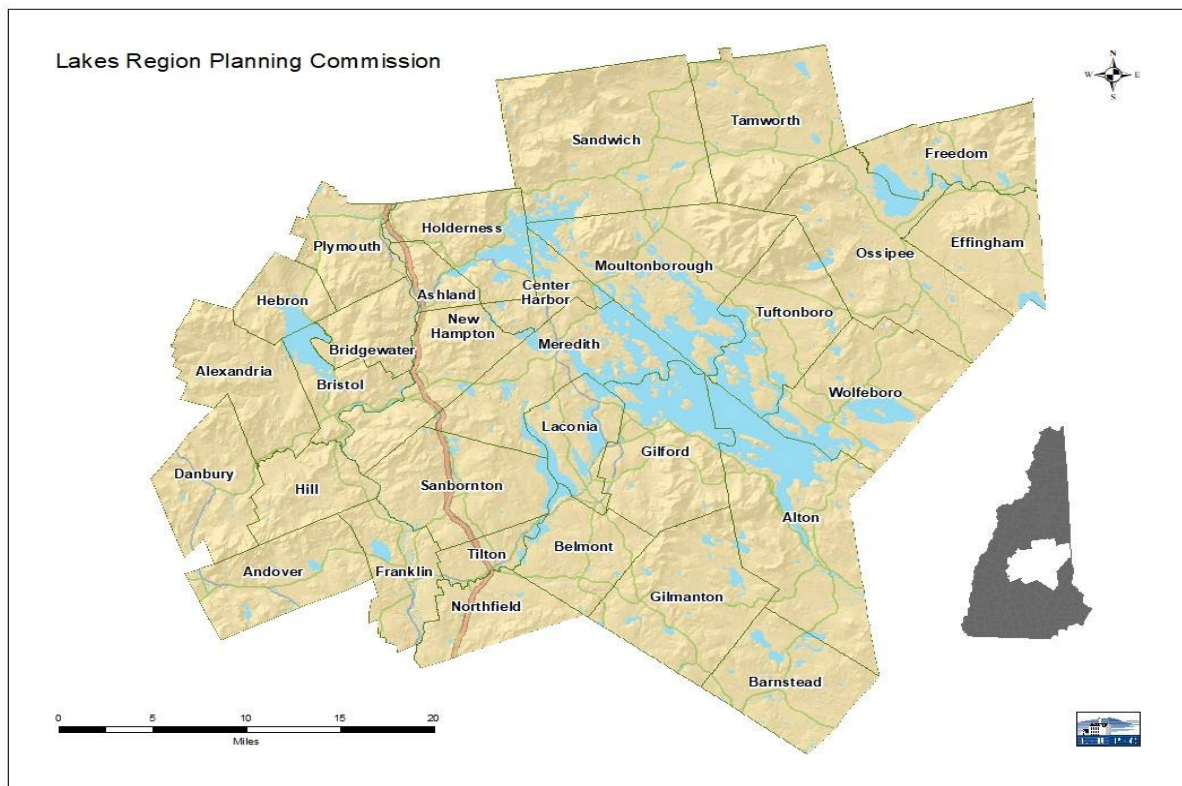
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EXECUTIVE SUMMARY

The *Wolfeboro Hazard Mitigation Plan Update* (the Plan) serves as a means to reduce future losses from natural, technological or human-caused hazard events before they occur. The Plan was developed by the Wolfeboro Hazard Mitigation Planning Committee (the Committee) with assistance from the Lakes Region Planning Commission, and contains statements of policy adopted by the Board of Selectmen in Chapter VI.

Just prior to beginning this Plan revision, the Town updated its Emergency Operations Plan (EOP), which included an analysis of natural and human-caused hazard threats. In the interest of consistency, the Committee decided to adopt the same hazard threat analysis as was adopted in the 2018 Wolfeboro Emergency Operations Plan. That hazard threat analysis can be found in Chapter III. Below are the High and Moderate hazard risks identified in the EOP and incorporated into this Plan:

High Risk	Moderate Risk
Severe Winter Weather & Ice Storms	Hazardous Material Transport
Power Outage	Surface Water Contamination
Conflagration (urban fire)	Flooding (local, riverine, ice jams, beaver dams)
Terrorism	Pandemic/Epidemic
Potable Water Contamination	Severe Rain, Thunderstorm & Lightning

The Committee identified numerous existing programs related to hazard mitigation including the following:

Existing Plans, Regulations and Practices Supporting Hazard Mitigation	
Hazard Mitigation Plan 2012	Lakes Region Household Hazardous Product Facility
Code Enforcement	Public Health Emergency Preparedness Plan
Zoning Ordinance	Subdivision Regulations
Floodplain Ordinance	Bridge Repair and Maintenance Plan
Wetlands Conservation Overlay District	Site Plan Review Regulations
Stormwater Drainage	Master Plan
Emergency Action Plans for Dams	School Emergency Evacuation Preparedness Plans
Water Conservation Plan	Capital Improvement Planning
Emergency Power Generation	Emergency Response Training and Drills
Mutual Aid Agreements	

The Committee developed a list of 27 general and hazard-specific mitigation actions (pp. 48-51). These actions were prioritized based on local criteria. Discussions were held regarding how implementation might occur. The results of these discussions are summarized in the Implementation Schedule for Mitigation Actions (pp. 56-58).

CHAPTER I: PLANNING PROCESS

A. BACKGROUND

Communities are required to have an approved hazard mitigation plan as a condition of receiving hazard mitigation assistance funding as well as some other federal funding programs. Such plans are locally developed and adopted and approved by the Federal Emergency Management Agency (FEMA). Funds from these grants are to be used for hazard mitigation projects and actions that will ultimately reduce and mitigate future losses from natural or human-caused events. The NH Department of Safety's Division of Homeland Security and Emergency Management (HSEM) makes funding available to assist communities with plan development and update. Communities are provided the opportunity to select a contractor. The plan development process generally followed the steps outlined in FEMA's Local Mitigation Planning Handbook (2013).

B. AUTHORITY

The Town of Wolfeboro Hazard Mitigation Plan was prepared pursuant to Section 322, Mitigation Planning of the Robert T. Stafford Disaster Relief and Emergency Assistance Act and Section 104 of the Disaster Mitigation Act (DMA) of 2000. Section 322 of DMA 2000 emphasizes the need for State, local and tribal entities to closely coordinate mitigation planning and implementation efforts.

C. FUNDING SOURCE

The New Hampshire Department of Safety's Homeland Security and Emergency Management (NH HSEM) funded the Plan with matching funds from the Lakes Region Planning Commission.

D. PURPOSE

The Wolfeboro Hazard Mitigation Plan is a planning tool to be used by the Town of Wolfeboro, as well as other local, state, and federal government entities, in their efforts to reduce the effects from natural and human-caused hazards. The Plan contains statements of policy as outlined in the Implementation Schedule for Mitigation Actions and in Chapter VI: Plan Adoption and Monitoring. All other sections of this plan are support and documentation for informational purposes only and are not included as a statement of policy.

E. SCOPE OF PLAN

The scope of this Plan includes the identification of natural and human-caused hazards affecting the Town of Wolfeboro, as identified by the Committee.

F. METHODOLOGY

The Lakes Region Planning Commission (LRPC) met with the Wolfeboro Fire Chief/Emergency Management Director in October 2018 to initiate the hazard mitigation update process in the Town of Wolfeboro. The Fire Chief/EMD established the Wolfeboro Hazard Mitigation Planning Update Committee in November 2018 for the purpose of updating a long-range plan for hazard mitigation.

The Committee consisted of representatives from the departments of Police, Public Works, Fire, Municipal Electric, Planning, representatives from the Board of Selectmen, the Planning Board, Chamber of Commerce, Governor Wentworth Regional School District, and members of the public.

Using the *Guide to Hazard Mitigation Planning for New Hampshire Communities*, the Committee developed the content of the Plan by following the process set forth in the handbook, and by referring to FEMA's *Local Multi-Hazard Mitigation Planning Guidance*. The committee reviewed and referenced a variety of plans, studies, reports and technical information during the development of this Plan Update, a list of many of these resources can be found in Appendix K. The Committee held meetings from November 2018 through April 2019 in order to review and update the existing plan. The following timeline shows the dates and corresponding Committee actions. The planning team reviewed each section of the plan and LRPC provided updated information on hazards in New Hampshire. Each section of the existing plan was revised in order to develop a more comprehensive document.

Committee Meetings

- November 16, 2018:** Introductory Committee Meeting: Abenaki Ski Lodge
Overview of update process
Review goals and objectives
Discuss critical facilities and hazards map
Review development trends and hazard events since 2013
- December 6, 2018:** Committee meeting: Abenaki Ski Lodge
Review and update community mitigation goals
Review critical infrastructure classification
- January 11, 2019:** Committee meeting: Abenaki Ski Lodge
Update table of critical facilities
Review assessed values of critical facilities
Review and update Community Profile
- February 8, 2019:** Committee meeting: Abenaki Ski Lodge
Identify natural hazards
- March 15, 2019:** Committee meeting: Abenaki Ski Lodge
Hazard Risk Assessment
Compare to 2018 State Hazard Mitigation Plan
Compare to 2018 Wolfeboro EOP
Review Mitigation Actions
- April 19, 2019:** Committee meeting: Abenaki Ski Lodge
Review Hazard Risk Analysis
Update Mitigation Actions

Public Involvement

The Wolfeboro Fire Chief/EMD invited a variety of Hazard Mitigation Planning stakeholders to join the Hazard Mitigation Planning Committee. The Committee was well represented by municipal officials, staff and other stakeholders, including representatives of from the Chamber of Commerce and the Governor Wentworth Regional School District. A representative from Carroll County Coalition for Public Health attended one committee meeting. The public was encouraged to attend meetings through press releases and postings on the town and LRPC websites. Any and all public comments on the Plan's development was included in relevant sections. The Fire Department's administrative assistant kept minutes of committee meetings and made them available after each meeting.

G. ACKNOWLEDGMENTS

Special thanks to those who assisted in the development of this Plan:

James Pineo	<i>Chief, Wolfeboro Fire Department, Emergency Management Director, Interim Town Manager</i>
David Senecal	<i>Chairman, Wolfeboro Board of Selectman</i>
Brad Harriman	<i>Vice Chairman, Wolfeboro Board of Selectmen</i>
Katherine Barnard	<i>Chairman, Wolfeboro Planning Board</i>
Adam Tasker	<i>Operations Manager, Wolfeboro Department of Public Works</i>
Matthew Sullivan	<i>Director, Wolfeboro Planning and Development Department</i>
Lisa Rogers	<i>Custodial Supervisor, Governor Wentworth School District, Wolfeboro</i>
Mary DeVries	<i>Executive Director, Wolfeboro Area Chamber of Commerce</i>
Kevin Duffy	<i>Manager of Facilities Operations, Brewster Academy, Wolfeboro</i>
Jeffrey A. Jones	<i>Public Health Emergency Preparedness and Response Coordinator, Carroll County Coalition for Public Health</i>
Cathleen LaPierre	<i>Recording Secretary, Wolfeboro Fire Department</i>
Sarah Silk	<i>Site Coordinator, Lakes Region Household Hazardous Product Facility, Wolfeboro</i>
Chris Connely	<i>Public Member and Volunteer, Wolfeboro Fire Department</i>
Heidi Lawton	<i>Field Representative, NH Homeland Security and Emergency Management</i>
Kayla Henderson	<i>State Hazard Mitigation Planner, NH Homeland Security and Emergency Management</i>
Susan Slack	<i>Principal Planner, Lakes Region Planning Commission</i>

CHAPTER II: COMMUNITY PROFILE

A. GEOGRAPHY

The town of Wolfeboro is located in the southwest corner of Carroll County, on the shores of Lake Winnepesaukee, approximately 40 miles northeast of Concord, the state capital. It also contains Lake Wentworth, Crescent Lake, Beech Pond, and Rust Pond and sits in the heart of the Lakes Region of central New Hampshire. The town is bordered by Tiltonboro to the north, Alton and New Durham to the south, and Ossipee, Brookfield, and Wakefield to the east. Wolfeboro has approximately 17 miles of shoreline along the southeastern portion of Lake Winnepesaukee. Wolfeboro's mainland area is 48.3 square miles and contains 10.1 square miles of inland water.

The topography of the town ranges from steeper terrain in the north, northeast and far south to flatter areas along the southwest shoreline and Lake Wentworth area. The land area of Wolfeboro consists mainly of well-drained sand and gravel soils, glacial till, seasonally wet, and shallow to bedrock soils.¹ Prominent peaks include Moody Mountain (1,420 ft), Whiteface Mountain (1,339 ft), Trask Mountain (1,320 ft), Batson Hill (1,300 ft), and Long Stack Mountain (1,223 ft). Willey Brook is the principal stream within the community. Although not large, the Smith River flows through the village center and forms Back Bay.

B. WEATHER CONDITIONS

Characteristic of the New England region, Wolfeboro's temperatures and precipitation vary greatly. January temperatures range from an average high of 30 degrees Fahrenheit to an average low of 10 degrees Fahrenheit. In July, temperatures range from an average high of 82 degrees Fahrenheit to an average low of 60 degrees Fahrenheit. Annual precipitation totals average 40.9 inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is November with an average rainfall of 4.2 inches. Wolfeboro averages about 70 to 75 inches of snow per year.² According to FEMA, New Hampshire is in a 160 mile per hour wind zone; the majority of the southern portion of the state (including all of Wolfeboro) is located in a hurricane susceptible region (tropic post-cyclonic).

C. PUBLIC UTILITIES AND INFRASTRUCTURE

Wolfeboro residents have access to drinking water through both private wells and municipal water supply. The municipal water supply source is Upper Beech Pond. Because the source of the water supply is relatively remote, there are few concerns about contamination of the water supply. However, infrastructure security is a growing threat nationally. While sufficient for current needs, there is some concern that during very long dry spells the water supply system can be taxed. In some places, the infrastructure is 100 years old; the town is upgrading this aged infrastructure as opportunities arise.

Wolfeboro has its own public wastewater system serving the downtown core area and several branches extending from it. The town is in the process of permitting its new effluent Rapid Infiltration Disposal (RIB) effluent disposal system, which is designed to handle all capacity. The existing spray-field areas will serve as redundancy.

The Wolfeboro Department of Public Works (DPW) is responsible for road construction; highway maintenance on 67.5 miles of town roads and adjacent sidewalks; the sewer, stormwater, and water systems; parking lots, docks, and other infrastructure. The DPW also assists the NH Department of Transportation (NH DOT) with winter maintenance on state roads from time to time. These state

routes (NH Routes 28, 109, and 109A) serve as the major roads through town and are the primary access roads to most of the town's critical facilities.

The Wolfeboro Municipal Electric system is operated by the town and distributes electricity to most of the town's residents and some in neighboring communities. The Wolfeboro Municipal Electric Department is responsible for maintaining electrical system equipment and conducting a regular tree maintenance program.

The governing body of the town is an elected five-member Board of Selectmen and is assisted by a Town Manager. The Selectmen are responsible for formulating policy, adopting an annual budget, enacting most town ordinances, and approving the use and care of town property including buildings, streets and other infrastructure projects. Wolfeboro has a Planning and Zoning Ordinance, which is developed and implemented by the Planning Board and Planning Director and enforced by the Code Enforcement Officer.

Huggins Hospital, located near the center of town, is a critical access hospital that provides care to Wolfeboro and surrounding communities. Emergency medical (ambulance) services are contracted out by the town. The town's fire department has a full-time staff supported by on-call firefighters. The town has a full-time police department with approximately a dozen officers. Wolfeboro has two elementary schools and is home to Kingswood Regional Middle and High Schools. The regional schools serve students from the neighboring communities of Tuftonboro, Ossipee, Effingham, Brookfield, and New Durham. Brewster Academy is private boarding and day school in the center of town serving between 300 and 400 students. Several local churches also serve as emergency shelters. The regional schools can serve as a limited shelter, although the amount of emergency power supply is limited.

D. LAND USE AND DEVELOPMENT TRENDS

As Table I shows, since 1960, Wolfeboro's population has more than doubled. The 2010 Census indicates that the town's population grew at a rate of just 3.1 percent since 2000, a marked decrease in the rate of change from previous decades. Further, New Hampshire Office of Strategic Initiatives estimate indicates a decrease in permanent population between 2010 and 2017. Wolfeboro continues to serve as a summer vacation community and its population swells tremendously during the peak seasons, with the population doubling or tripling at times.

Wolfeboro Population Growth, 1960-2017

Year	Population	Change
2017	6,257	-0.1%
2010	6,269	3.1%
2000	6,083	26.5%
1990	4,807	21.1%
1980	3,968	30.7%
1970	3,036	12.9%
1960	2,689	

State-owned numbered routes carry most of the town's traffic, both year-round and seasonal. The traffic counts conducted by NH DOT indicate that the average daily traffic along these roads ranges from 7,000 to 11,000 vehicles per day. As this is a projected average over the entire year, there are certainly many summer days when the volume of traffic on any one of these roads far exceeds these figures.

Strong market conditions in the period since the 2012 Plan update have resulted in an increase in new residential housing, residential renovations, and residential additions. Commercial development has been limited with the dominant type being infill-based in the commercial core of the community. Limited new commercial and institutional development has also occurred. A significant portion of new development and redevelopment is occurring in close proximity to the community's waterbodies along private roads with limited access and higher vulnerability.

CHAPTER III: RISK ASSESSMENT

A. IDENTIFYING HAZARDS

The town of Wolfeboro is prone to a variety of natural and human-caused hazards. The Committee consulted the *2018 State of New Hampshire Multi-Hazard Mitigation Plan*, developed by the NH Department of Safety's Division of Homeland Security and Emergency Management, to identify hazards that could affect Wolfeboro and Carroll County.⁴ The State plan summarizes the frequency and severity of these hazards, most of which could have statewide impact and thus were considered by the Committee for their impact on Wolfeboro.⁵

Table II. Statewide Risk Assessment – Rating Table

Threat/Hazard	Classification	Human Impact	Property Impact	Economic/ Business Impact	Average Impact Score	Probability of Occurrence	Overall Risk	Counties Most Vulnerable
Avalanches	Natural	1	1	1	1	2	2	Coos, Grafton, and Carroll
Coastal Flooding	Natural	3	6	6	5	3	15	Rockingham and Strafford
Inland Flooding	Natural	6	6	6	6	3	18	Statewide
Drought	Natural	1	3	3	2	2	4	Statewide
Earthquakes (>4.0)	Natural	1	3	1	2	1	2	Statewide
Extreme Temperatures	Natural	3	1	1	2	3	6	Statewide
High Wind Events	Natural	3	6	3	5	3	15	Statewide
Infectious Diseases	Natural	3	1	3	2	2	4	Statewide
Landslide	Natural	1	3	3	2	3	5	Statewide
Lightning	Natural	1	3	1	2	3	6	Statewide
Severe Winter Weather	Natural	6	6	6	6	3	18	Statewide
Solar Storms & Space Weather	Natural	3	1	3	2	1	2	Statewide
Tropical & Post-Tropical Cyclone	Natural	6	6	6	6	2	12	Statewide
Wildfire	Natural	1	1	1	1	2	2	Statewide
Aging Infrastructure	Technological	3	6	3	4	3	12	Statewide
Conflagration	Technological	6	6	6	6	2	12	Statewide
Dam Failure	Technological	3	3	3	3	2	6	Statewide
Known and Emerging Contaminants	Technological	6	6	3	5	3	15	Statewide
Hazardous Materials	Technological	1	3	3	2	3	6	Statewide
Long-Term Utility Outage	Technological	6	6	6	6	1	6	Statewide
Radiological	Technological	1	1	3	2	1	2	Statewide
Cyber Event	Human-caused	3	1	6	3	3	9	Statewide
Mass Casualty Incident	Human-caused	6	1	3	3	1	3	Statewide
Terrorism/Violence	Human-caused	6	3	3	3	3	9	Statewide
Transport Accident	Human-caused	3	3	3	3	3	9	Statewide

Impact Scoring

- 1 – Inconvenience, reduced service/productivity, minor damages, non-life-threatening injuries
- 3 – Moderate to major damages, temporary closure and reduced service/productivity, numerous injuries and deaths
- 6 – Devastation and significant injuries and deaths, permanent closure and/or relocation of services, long-term effects

- 2- 34-66% Probability of occurring within 10 years (Medium)
- 3- 67%-100% Probability of occurring within 10 years (High)

Probability Scoring

- 1- 0-33% Probability of occurring within 10 years (Low)

⁴ https://prd.blogs.nh.gov/dos/hsem/wp-content/uploads/2015/11/State-of-New-Hampshire-Multi-Hazard-Mitigation-Plan-Update-2018_FINAL.pdf, visited July 9, 2019.

⁵ https://prd.blogs.nh.gov/dos/hsem/wp-content/uploads/2015/11/State-of-New-Hampshire-Multi-Hazard-Mitigation-Plan-Update-2018_FINAL.pdf, visited July 9, 2019.

The Committee also considered the various hazards identified in the 2013 Wolfeboro Hazard Mitigation Plan, which identified the following hazard events as the greatest threats to the town at that time.

Hazards Identified in 2013 Wolfeboro Hazard Mitigation Plan

High Risk	Moderate Risk
Flood	Earthquake
Severe Winter Weather	Tornado
Power Outage	Chemical Spill/Water Contamination
Severe Thunderstorm	Drought/Water Shortage
Pandemic/Epidemic	Mass Casualty
Transportation Incident	HazMat (Transportation)
Population Surge	Intentional Water Contamination
	Dam Failure
	Major Woodland Fire
	HazMat (Fixed Location)

In 2018, the New Hampshire Department of Safety's Division of Homeland Security and Emergency Management updated the State of New Hampshire Multi-Hazard Mitigation Plan. In the 2018 plan, the names of some natural hazards were modified, several hazards were added to the list, and one was removed. For example, Extreme Temperatures was added, Tornado/Downburst was changed to High Wind Events, and Radon was removed from the list.

The Committee discussed these changes and the advantages of following the hazard nomenclature used in the State plan. Media archives and internet sources were also reviewed for information about past hazard events in Wolfeboro.

Most importantly, the Committee noted the work the town had recently completed to adopt its updated Emergency Operations Plan in 2018, just prior to undertaking the update of this Hazard Mitigation Plan. The 2018 EOP included a Hazard Threat Analysis that ranked the relative threat of numerous natural and human-caused hazards. The Committee determined that it is to the town's advantage for this Plan's identification of hazard risks to be consistent with the hazard analysis in the 2018 EOP and, therefore, the 2018 EOP Hazard Threat Analysis is incorporated into this Plan. The Hazard Threat Analysis in the Wolfeboro EOP ranked the following high and moderate risk hazards:

Significant Hazards: Wolfeboro, NH

High Risk	Moderate Risk
Severe Winter Weather & Ice Storms	Hazardous Materials (Surface Water Contamination and Transport)
Long-Term Utility Outage (Power Outage)	Inland Flooding (local, riverine, ice jams, beaver dams)
Conflagration (urban fire)	Infectious Diseases (Pandemic/Epidemic)
Terrorism/Violence	Tropical and Post-Tropical Cyclones (Severe Rain and Thunderstorms, Windstorms)
Hazardous Materials (Potable Water Contamination)	Lightning

B. PROFILING HAZARD EVENTS

As stated above, the Committee adopted the Hazard Risk Assessment developed for the 2018 Wolfeboro Emergency Operations Plan. That process considered the likelihood of various hazard events occurring in Wolfeboro, ranking them on a 1 – 5 scale, with 1 having a very low likelihood of occurrence and 5 having a very high likelihood of occurrence. Vulnerability and severity of impact were also rated.

The table below lists hazard events and their likelihood of occurring in Wolfeboro:

Probability of Occurrence

Likely	Occasional	Unlikely
Severe Winter Weather	Flooding	Tornado/Downburst
Severe Rain, Thunderstorm & Lightning	Severe Wind (windstorm)	Major Woodland Fire
Power Outage	Hurricane/Tropical Storm	Earthquake
		Hailstorm
		Landslide
		Drought
		Extreme Temperatures
		Conflagration
		Terrorism
		Potable Water Contamination
		Hazardous Material - Transport
		Surface Water Contamination
		Hazardous Material – Fixed Location
		Pandemic/Epidemic
		Civil Disorder
		Sewer Lagoon Failure
		Aircraft Accident
		Dam Failure (Crescent Lake)

The hazard threat analysis matrix created for the 2018 Wolfeboro EOP appears below:

Hazard Threat Analysis – Wolfeboro Emergency Operations Plan 2018

Table 3.1 Hazard Threat Analysis						
			<i>A natural hazard is a source of harm or difficulty created by a meteorological, environmental, or geological event.</i>			
Scoring for Probability (Columns A, B, & C)	Column A	Column B	Column C	Column D	Columns A+B+C/3	Columns D X E
1=Very Low (0-20%)	What is the probability of death or injury?	What is the probability of physical losses and damages?	What is the probability of interruption of service	How often does it occur?	Average of Human Property & Business Impact	Relative Threat
2=Low (21-40%)						
3=Moderate (41-60%)						
4=High (61-80%)						
5=Very High (81-100%)						
Natural Hazards	Human Impact	Property Impact	Business Impact	Likelihood of Occurrence	Severity	Risk Severity x Probability
Severe Winter Weather & Ice Storms	3	4	4	4	3.67	14.67
Flooding (local, riverine, ice jams, beaver dams)	1	2	3	3	2.00	6.00
Severe Rain, Thunderstorm & Lightning	2	1	1	4	1.33	5.33
Tornado/Downburst	4	4	4	1	4.00	4.00
Hurricane & Tropical Storm	2	2	2	2	2.00	4.00
Severe Wind (windstorm)	1	2	1	3	1.33	4.00
Major Woodland Fire	3	4	2	1	3.00	3.00
Earthquake	2	3	3	1	2.67	2.67
Hailstorm	1	2	1	1	1.33	1.33
Erosion, Landslide & Mudslide	1	2	1	1	1.33	1.33
Drought/Water Shortage	1	1	1	1	1.00	1.00
Extreme Temperatures (hot & cold)	1	1	1	1	1.00	1.00
Human Caused	Human Impact	Property Impact	Business Impact	Likelihood of Occurrence	Severity	Risk Severity x Probability
Power Outage	1	2	4	4	2.33	9.33
Conflagration (urban fire)	4	4	4	1	9.33	9.33
Terrorism	4	3.5	3	1	8.50	8.50
Potable Water Contamination	5	2	4	1	8.33	8.33
Hazardous Material-Transport	3	3	3	1	7.00	7.00
Surface Water Contamination	1	4	4	1	6.33	6.33
Hazardous Material-Fixed Location	3	3	1	1	6.33	6.33
Pandemic/Epidemic	4	1	3	1	6.00	6.00
Civil Disorder	2	3	2	1	5.67	5.67
Sewer Lagoon Failure	1	3	3	1	5.00	5.00
Aircraft Accident	2	2	2	1	4.67	4.67
Dam Failure (Crescent Lake)	1	2	2	1	3.67	3.67

Each of the hazards identified as likely or highly likely to occur in Wolfeboro is profiled below along with some hazards that occur less frequently but due to their potential impact warranted further discussion. It describes the likely location of each natural hazard, the extent of the hazard, and the probability of an occurrence in Wolfeboro.

The **extent** is a description of “how bad the hazard could get,” taking into account three factors: magnitude, onset, and duration. **Magnitude** is size of the hazard, such as depth of floodwaters or wind speed. **Onset** is how quickly the hazard approaches. Depending on geography as well as the nature of a rainstorm, floodwaters might rise over a period of days, or it might take just a few hours to build up a concentrated flow. **Duration** is a matter of how long the hazard is present. A downburst or tornado exists for minutes or hours, while a hurricane or tropical depression is usually around for days. The four terms used to rate the **extent** of a hazard are as follows:

• Weak: limited magnitude, slow onset, short duration
• Moderate: moderate magnitude, moderate onset speed, moderate duration
• Severe: Severe magnitude, fast speed of onset, long duration
• Extreme: Extreme magnitude, immediate onset, extended duration

NATURAL HAZARDS

Note: The update committee discussed the risks of Avalanche and Solar Storms and Space Weather, and chose to omit these natural hazards from the Risk Assessment on page 11. The town had just completed a hazard risk analysis for its 2018 Emergency Operations Plan, and the committee decided there was benefit for the Risk Assessment to be the same in both the EOP and this Plan. However, this Plan includes a discussion of Avalanche (p. 24-25) and Solar Storms and Space Weather (p. 30-31) in the following analysis of Natural Hazards.

Severe Winter Weather

(Snow Storms, Nor’easters, Ice Storms)

Location: Regional

Specific Areas of Concern: Major Roads, Populations to Protect, Emergency Response Facilities, Essential Services, Flat-roofed buildings

Probability of Occurrence: Likely

Vulnerability: High

Impact: Severe

Overall Risk: High



Ice Storm of 1998, Wolfeboro

Image source:

<http://www.youtube.com/channel/UCDralXR2zcQM>

While the town is accustomed to seasonal heavy snowfall, any particularly severe event with significant accumulations, especially combined with severe cold can be a burden. These events often occur concurrent with other hazards such as power loss, ice accumulation, or hazardous materials spills and the generally hazardous conditions they present can significantly increase the vulnerability of populations and facilities.

The fact that Wolfeboro is home to the regional middle, high, and vocational schools as well as to the hospital puts added pressure on DPW crews to clear the local roads and to assist during emergencies on state roads. The resources for the DPW to trim trees over municipal roadways are limited.

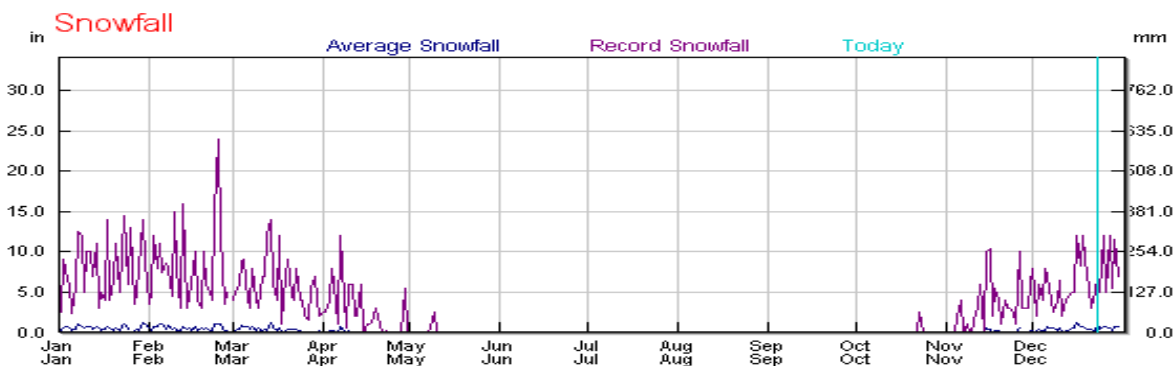
Location: Snow and Ice Storms can affect the entire town. Severe winter weather occurs frequently in the northeast and the possibility exists for accompanying power outages lasting several days. No

one area of the town and region is at greater risk than another, but there are segments of the population that are more at risk. These include the elderly, people in need of regular medical care, and young children. These weather events can vary greatly based on slight differences in temperature, humidity, and elevation. Some events will produce a combination of winter weather types.

Extent: A heavy snowstorm can be defined as one which deposits four or more inches of snow in a twelve hour period. Snowstorms are a common occurrence throughout the Lakes Region. Blizzards, which may dump 12 to 36 inches or more of snow in a one- to three-day period are less frequent, but can have a serious impact on structures, utilities, and services. Snow load in severe winter storms is of concern as well. This is particularly true for flat roofed structures. Several small storms can produce the same snow load as a single larger storm and the combined weight of the snow load can damage rooftops. Ice adds additional weight as well. It is not uncommon in New Hampshire to experience mixes of winter precipitation as temperatures fluctuate above and below the freezing mark. While not widespread, instances of collapsed roofs are not uncommon. The town has made progress in recent years in addressing snow load issues related to municipally owned buildings with flat roofs.

The region typically receives greater than 66 inches of snow annually, but the region's average snowfall on any day from November through April is less than an inch. The record also shows that deposits of more than ten inches have happened in each of these months.

Average and Record Snowfalls for the Laconia, NH Airport¹



In the winter months, the region may experience blizzard conditions. A blizzard is characterized by sustained winds or frequent gusts to 35 miles per hour or greater and considerable amounts of falling or blowing snow that last for a duration of three hours or longer. The combination of winds and snow reduce visibility to less than a quarter mile.²

¹ Laconia is the nearest official station with historical records. Weather Underground, Season Weather Averages <http://www.wunderground.com/NORMS/DisplayNORMS.asp?AirportCode=KLIC&SafeCityName=Bristol&StateCode=NH&Units=none&IATA=LIC>.

² "Winter storm terms," http://www.fema.gov/hazard/winter/wi_terms.shtm, visited February 8, 2011.

New Hampshire generally experiences at least one or two nor'easters each year with varying degrees of severity. A nor'easter is defined as a large anticyclone weather system that resides near the New England region. These storms have the potential to inflict more damage than many hurricanes because high winds can last from twelve hours to three days, while the duration of hurricanes ranges from six to twelve hours. A nor'easter also has the potential to sustain hurricane force winds, produce torrential rain, and create blizzard conditions in winter months.

An ice storm coats trees, power lines, streets, vehicles, and roofs with a very slick and heavy coating of ice. In the winter of 1998, a major ice storm crippled much of New Hampshire, coating everything with as much as three inches of ice. The U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory estimates a 40 – 90 year return period for an event with a uniform ice thickness of between 0.75 and 1.25 inches. Ten years later (2008), however, New Hampshire was struck again by another severe ice storm.

The Sperry-Piltz Ice Accumulation (SPIA) Index is being used to forecast and classify ice storms based on a combination of the average thickness of ice coating (referencing expected temperature and precipitation levels) and wind speed; ratings range from 0 to 5.³ The SPIA Index was first used in the United States in 2009 and is now beginning to be utilized by the National Weather Service.

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	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 0.25 – 0.50	15 – 25 < 15	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	0.10 – 0.25 0.25 – 0.50 0.50 – 0.75	25 – 35 15 – 25 < 15	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	0.10 – 0.25 0.25 – 0.50 0.50 – 0.75 0.75 – 1.00	>= 35 25 – 35 15 – 25 < 15	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	0.25 – 0.50 0.50 – 0.75 0.75 – 1.00 1.00 – 1.50	>= 35 25 – 35 15 – 25 < 15	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	0.50 – 0.75 0.75 – 1.00 1.00 – 1.50 > 1.50	>= 35 >= 25 >= 15 Any	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

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

History:

Hazard	Date	Location	Remarks/Description	Source
Snowstorm	2/8-/ 10/2013	Statewide	Total Public Assistance Grants Dollars obligated was \$6,153,471.49. Snowfall amounts were generally 18". Declared Disaster, DR-4105.	FEMA
Snowstorm	1/26- 1/28/2015	Statewide	Snowfall across the state ranged from 10 to 30 inches. Blizzard conditions led to coastal flooding and splash over. Total Public Assistance Grants Dollars obligated was \$4,939,214.76. Declared Disaster, DR 4209.	FEMA
Snowstorm	3/14- 3/15/2017	Statewide	Primary impact was damage to utilities. Two counties received public assistance totaling \$1,687,439.45. Declared Disaster, DR-4316.	FEMA
Blizzard	3/13- 3/14/2018	Statewide	Declared Disaster, DR-4371	HSEM
Nor'easter	4/27/2007	Statewide	Nor'easter caused flooding, damage in	FEMA

³ SPIA Northeast webpage, <http://www.spia-index.com/neIce.php>, June 3, 2014.

			excess of \$25 million	
Ice Storm	12/11/2008	Statewide	State emergency declaration after major power and transportation disruption. Exceeding \$15 million in damages. Over 400,000 without power, 2 fatalities due to carbon monoxide poisoning.	NH HSEM

NOAA lists an additional 34 heavy snowstorms in Southern Carroll County since 2013 with nearly two dozen of them depositing a foot or more of snow. While these events did impact Wolfeboro, no specific measurements related to Wolfeboro were noted, nor were there deaths, injuries, or structural damages noted.

Inland Flooding

Location: Localized

Specific Areas of Concern: Hilly, upland areas including Beech Pond Road, North Main Street, Clarke Plaza, Sewer Pumps, NH Route 28/109 (Center Street), Downtown

Probability of Occurrence: Occasional

Vulnerability: High

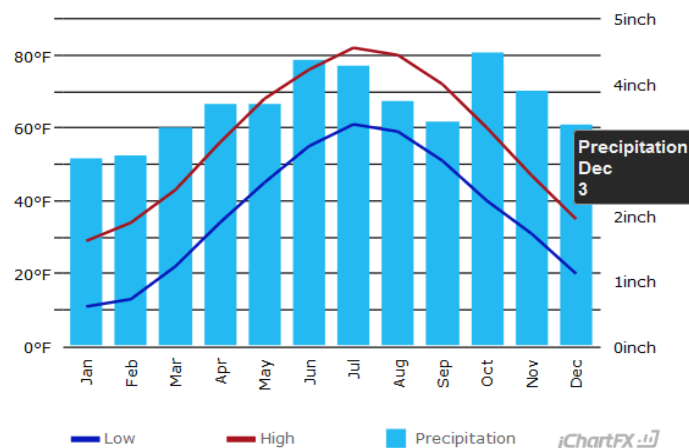
Impact: Severe

Overall Risk: High

Flooding is defined as a temporary overflow of water onto lands that are not normally covered by water. It results from the overflow of rivers and tributaries or inadequate drainage. The most recent series of floods in New Hampshire began in October 2005 with a flood that primarily affected the southwest corner of the state and devastated the town of Alstead. The flood killed seven people. It was followed by floods in May 2006 and April 2007 and a series of floods during the late summer and early fall of 2008. Historically, the state's two largest floods occurred in 1936 and 1938. The 1936 flood was associated with snow melt and heavy precipitation. The 1938 flooding was caused by the Great New England Hurricane of 1938. Those floods prompted the construction of a series of flood control dams throughout New England, built in the 1950s and '60s. They continue to be operated by the US Army Corps of Engineers.⁴

Flooding in the Lakes Region is most commonly associated with structures and properties located within a floodplain. There are numerous rivers and streams within the region and significant changes in elevation, leading to some fast-moving water. The region also has a great deal of shoreline, making it exposed to rising water levels as well. Although historically, there have not been many instances of shoreline flooding, the potential always exists for a major flood event to occur. Recent rain events have proven this is becoming an increasing concern as

Laconia Climate Graph - New Hampshire Climate Chart



⁴ <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html> date visited: January 18, 2011

additional development is contributing to flood hazards. As areas are covered with impervious surfaces, less water is allowed to infiltrate, evaporate, or be transpired by vegetative growth and more of it runs off directly into surface drainages and water bodies. This increases the likelihood of flash floods and substantial overland flow. Of greatest concern are the waterfront properties on the lakes, ponds, and associated tributaries.

Culvert improvements and roadwork have been conducted throughout the region as a result of

localized flooding events. Of particular concern in the region are areas of steep slopes and soils with limited capacity to accept rapid volumes of rainwater. Roads and culverts in close proximity to these conditions are most at risk of localized flooding.

Ice Jam

Ice forming in riverbeds and against structures often presents significant hazardous conditions for communities. Meltwater or stormwater may encounter these ice formations and apply lateral and/or vertical force upon structures. Moving ice may scour abutments and riverbanks. Ice may also create temporary dams. These dams can create flood hazard conditions where none previously existed. According to the Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL), 43% of New Hampshire ice jams have occurred in March and April during the ice breakup on the rivers, while 47% of ice jams occurred in January and February during either ice freeze up or ice break up periods.⁵

Extent: A 1% annual chance flood event does not mean that a flood will occur once in a 100-year period. In the 1960s, the 1-percent annual exceedance probability (AEP) flood was selected as the basis for the NFIP. The 1% AEP was thought to be a fair balance between public safety and overly stringent regulations. A 1% AEP flood has a 1 in 100 probability of being equaled or exceeded in any 1 year. While it is commonly referred to as the 100-year flood, it does not mean that a flood of the AEP magnitude will only occur once every 100 years. Larger events, such as the “500-year” flood corresponds with a 0.2% AEP. (1 in 500 chance).

Impact: In Wolfeboro, despite the large areas of surface water and low slopes relative to the region, there are relatively few low lying areas susceptible to flooding. Flood Insurance Rate Maps (FIRM) developed in 1989 for Wolfeboro (and updated with Digital FIRMs in 2012) show the flood boundaries in the event of a 100-year flood, which is defined as a having a 1 percent chance of flooding each year. The areas depicted by the rate maps indicate areas of floodplain on either side of Back Bay, including the Clarke Plaza and associated with wetlands scattered around town. The Clarke Plaza shopping areas on both sides of NH Routes 28/109 are built over what used to be a small bay that was filled in during the first half of the 20th century; and has flooded frequently in the past. This is also the site of the pumps for the municipal sewer system. In recent years the DPW has kept ahead of any flooding through the use of pumps. Wolfeboro does not have large flowing rivers and is not particularly susceptible to the catastrophic riverine erosion associated with such bodies of water. The potential for shoreland flooding to occur on the largest lakes in Wolfeboro – Lake Winnepesaukee and Lake Wentworth, is reduced by the use of State operated dams that regulate lake water levels.

The town of Wolfeboro actively participates in the **National Flood Insurance Program** through the administration of a floodplain ordinance. As noted above, the Flood Insurance Rate Maps (DFIRM) were updated in 2012 and the town’s Floodplain Ordinance was revised accordingly. Compliance is managed through the town’s floodplain permit process, and is incorporated into the town’s

⁵ “Ice Jams in New Hampshire,” CRREL, <http://www.crrel.usace.army.mil/ierd/tectran/IERD26.pdf> visited February

subdivision and site plan review regulations. The Code Enforcement Officer also is responsible for maintaining floodproofing and elevation certificates. The majority of the floodplain in Wolfeboro is undeveloped with the exception of the Back Bay commercial properties. According to information provided by the NH Office of Strategic Initiatives, here are 37 buildings with flood insurance policies in force (insurance value \$11,189,200). One single family home in the X zone along Bay Street has had two losses for a total of \$43,892, and is therefore considered a repetitive loss property.

The town participates in trainings offered by the State and FEMA, and will communicate NFIP information to the community annually. The town has adopted a steep slopes ordinance to minimize erosion, and has adopted subdivision and site plan regulations that address stormwater runoff.

There are no US Geological Survey (USGS) stream gauges in Wolfeboro or any of the waterbodies entering Wolfeboro. The nearest gauge is in Laconia on the Winnepesaukee River, the outfall of Lake Winnepesaukee. Recent studies of weather records show that the number of heavy precipitation events (> 4" in 48 hours) in New Hampshire has been increasing over the past several decades and models indicate that this will continue into the future.⁶ The extent for flooding was seen as moderate and ice jams as weak.

History:

Hazard	Date	Location	Remarks/Description	Source
Flood	6/26-7/3/2013	Grafton, Sullivan, Cheshire	The total Public Assistance was \$5,903,017.87. Declared Disaster, DR-4139	FEMA
Flood	7/1-7/2/2017	Coos, Grafton	The total Public Assistance \$699,661.26. Flood stages ranged from 9.00ft to 13.00ft. Declared Disaster, DR-4329.	FEMA
Flood	10/29 - 11/1/2017	Coos, Grafton, Carroll, Belknap, Merrimack, Sullivan	The total Public Assistance was \$365,851.11. Flood stages ranged from 8.00ft to 13.00ft. Declared Disaster, DR-4355.	FEMA, NOAA
Flood	3/2-3/8/2018	Rockingham	Declared Disaster, DR-4370.	HSEM

Since 2013 four flood events around the state were designated as Declared Disaster events, including one in Carroll County in 2017. Occasional minor flooding has occurred in Wolfeboro in low-lying areas, usually near the Center Street commercial area.

Tropical and Post-Tropical Storms

Location: State-wide

Specific Areas of Concern: Buildings in the floodplain, Buildings near trees, Populations to protect, Infrastructure

Probability of Occurrence: Occasional

Vulnerability: Moderate

Impact: Moderate

⁶ *Climate Change in Southern New Hampshire: Past, Present, and Future* (Wake, et.al.), 2014. http://www.climatesolutionsne.org/sites/climatesolutionsne.org/files/unhsi-csne-southernnh_climateassessment_june_4_2014.pdf

Overall Risk: Moderate

While hurricanes are not a frequent occurrence in central New Hampshire, there is always a chance that one could hit the area. A hurricane is a large event bringing heavy, extended rains that saturate the ground and strong winds that can topple trees. Damages can occur to homes (downed trees) and roads (erosion and washout), and power outages can accompany such storms. In the fall of 2011 the heavy rains associated with Hurricane Irene (then a tropical depression) resulted in substantial damage in northern Carroll County.

Thunderstorms have several threats associated with them including heavy rain, high wind, and hail. In a heavy rain storm, large amounts of rain may fall in a short period of time, severely impacting roads and low-lying developments. All thunderstorms contain lightning, which can cause death, injury, and property damage and have great potential to cause structure and wildfires.

Hurricanes are severe tropical storms that have winds at least 74 miles per hour. In the Lakes Region they could produce heavy rain and strong winds that could cause flooding or damage buildings, trees, power lines, and cars.⁷ Hurricanes are measured by the **Saffir-Simpson Hurricane Scale**: a 1-5 rating based on a hurricane's intensity using wind speed as the determining factor (see below). The scale is used to give an estimate of the potential property damage and flooding expected from a hurricane landfall.

According to NOAA, 2010 was one of the busiest hurricane seasons on record.⁸ New Hampshire has not experienced a severe hurricane since 1938. On September 21, 1938, a Category 3 hurricane claimed 13 lives in New Hampshire and many more throughout New England. Official records at the Weather Bureau in Concord show sustained winds of 56 miles per hour, but around the state, gusts around 100 miles per hour were reported, mostly due to topographical acceleration. The Merrimack River rose nearly 11 feet above its flood stage, *The Hanover Gazette* reported that in New Hampshire, 60,000 people were homeless and many areas were without power. Damages were estimated at \$22 million.⁹ Hurricane Bob, a category 2 storm, in 1991, was declared a major federal disaster in New Hampshire and is recorded as a severe storm in the state's history.

Saffir-Simpson Hurricane Scale

Category	Characteristics
1	Winds 74-95 mph (64-82 kts or 119-153 km/hr). Storm surge generally 4-5 ft above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage.
2	Winds 96-110 mph (83-95 kts or 154-177 km/hr). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane center. Small craft in unprotected anchorages break moorings.
3	Winds 111-129 mph (96-113 kts or 178-209 km/hr). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Flooding near the coast destroys smaller structures with larger structures damaged by battering from floating debris. Terrain continuously lower than 5 ft above mean sea level may be flooded inland 8 miles (13 km) or more. Evacuation of low-lying residences with several blocks of the shoreline may be required.

⁷ http://www.fema.gov/hazard/hurricane/hu_about.shtm, visited January 25, 2011.

⁸ http://www.noaanews.noaa.gov/stories2010/20101129_hurricanesseason.html visited January 25, 2011.

⁹ <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html>, visited January 25, 2011.

4	Winds 130-156 mph (114-135 kts or 210-249 km/hr). Storm surge generally 13-18 ft above normal. More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles (10 km).
5	Winds greater than 156 mph (135 kts or 249 km/hr). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required.

Source: <http://www.nhc.noaa.gov/aboutsshs.shtml>

According to NOAA, 2010 was one of the busiest hurricane seasons on record.¹⁰ However, the position of the jet streams kept the northeastern Atlantic region dry as a barrier to the storms. New Hampshire has not experienced a severe hurricane since 1938. On September 21, 1938, a Category 3 hurricane claimed 13 lives in New Hampshire and many more throughout New England.

Official records at the Weather Bureau in Concord show sustained winds of 56 miles per hour, but around the state, gusts around 100 miles per hour were reported, mostly due to topographical acceleration. The Merrimack River rose nearly 11 feet above its flood stage, *The Hanover Gazette* reported that in New Hampshire, 60,000 people were homeless and many areas were without power. Damages were estimated at \$22 million.¹¹ Hurricane Bob, a category 2 storm, in 1991, was declared a major federal disaster in New Hampshire and is recorded as a severe storm in the state's history.¹²

History: In the past five years no hurricanes have hit Wolfeboro or the Lakes Region. By the time that a hurricane reaches central New Hampshire, it is rare that it retains the characteristics of a hurricane. Wind speeds usually dissipate but they can still bring a great deal of rainfall to the region. That was the case with the remnants of Hurricanes Irene and Sandy, which hit the area in 2011 and 2012 as tropical depressions. There was little impact to Wolfeboro from these events.

Lightning

Location: Localized

Specific Areas of Concern: Open bodies of water, higher elevations, athletic fields, campgrounds

Probability of Occurrence: Likely

Vulnerability: High

Impact: Severe

Overall Risk: Moderate

Definition: Lightning is a visible electric discharge produced by a thunderstorm. The discharge may occur within or between clouds, between a cloud and the air, between a cloud and the ground, or between the ground and a cloud. The discharge of lightning causes an intense sudden heating of air. The air rapidly expands when heated then contracts as it cools, causing a shock wave that we hear as thunder. This shock wave is sometimes powerful enough to damage windows and structures.

¹⁰ http://www.noaa.gov/stories2010/20101129_hurricanesseason.html visited January 25, 2011.

¹¹ <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html>, visited January 25, 2011.

¹² <http://www.fema.gov/news/event.fema?id=2118> visited January 25, 2011

The frequency of lightning strikes is correlated with the severity of thunderstorms. Lightning strikes the ground in the United States approximately 25 million times per year. The chance that a lightning strike could injure or kill a person during any given year is one in 240,000.

Extent: The National Weather Service utilized a six-point scale for characterizing lightning activity called the Lightning Activity Level (LAL) based on frequency of ground strikes along with rainfall and ground conditions.¹³

Lightning Activity Level (LAL)	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five-minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5-minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5-minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5-minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Location and Impact: Lightning strikes are of particular concern in the summer months, when Wolfeboro's population more than doubles with summer residents, tourists, and campers enjoying outdoor recreational activities, including boating and swimming. Lightning damages cost the insurance

industry more than \$5 billion annually in the United States.¹⁴ In the Lakes Region, however, fewer than two lightning strikes occur per square kilometer annually.¹⁵ While this value is not particularly high, the concern that lightning might ignite a wildfire is quite high since a large percentage of the region is rural and forested.

History:

Hazard	Date	Location	Remarks/Description	Source
Lightning	6/24/2013	West Alton/Gilmanton	Large hail and wet microbursts were main concerns. 30 people were injured by lightning at a Boy Scout camp in Gilmanton.	NOAA
Lightning	7/18/2013	Melvin Village (Tuftonboro)	Wind damage and heavy rain were the main concerns as the storm moved through the region. Lightning struck two sailboats causing them to catch fire and sink in Lake Winnepesaukee.	NOAA

While there are no known damage causing lightning strikes that occurred in Wolfeboro since the last Plan, one lightning events occurred in the Lakes Region since then that merited documentation.

¹³ NWS Definitions webpage, <http://graphical.weather.gov/definitions/defineLAL.html>. Accessed June 3, 2014.

¹⁴ National Lightning Safety Institute webpage, http://www.lightningsafety.com/nlsi_lls/nlsi_annual_usa_losses.htm visited February 8, 2011.

¹⁵ Northeast States Emergency Consortium, <http://www.nesec.org/> visited January 25, 2011.

In June 2013 there was a strike at a scout camp in nearby Gilmanton (Belknap County), sending two dozen people to local hospitals; no deaths or serious injuries occurred. Numerous lightning events take place in Wolfeboro each year; however, many go unrecorded.

High Wind Events

(windstorms, downbursts, tornados)

Location: Localized

Specific Areas of Concern: All areas in town, All critical facilities

Probability of Occurrence: Occasional

Vulnerability: High

Impact: Severe

Overall Risk: Moderate

In Wolfeboro, the major damage from downbursts or tornados comes from falling trees, which may take down power lines, block roads, or damage structures and vehicles. A wind event occurred in nearby Moultonborough on July 26, 1994 and was classified as a macroburst. It affected an area one-half mile wide by 4 to 6 miles in length. On July 24, 2008 a tornado cut a 50-mile swath through central New Hampshire on the eastern side of Lake Winnepesaukee that took down trees and electrical lines and damaged buildings in parts of Wolfeboro. Fortunately, no lives were lost in town, but one death in New Hampshire was related to the tornado. Although tornados do not strike New Hampshire with the same frequency as the South and Midwest, the 2008 tornado illustrates that they can strike with



severity. This storm also brought to light how quickly such storms can form and how limited the local warning system is.

The Lakes Region is at risk of several types of high winds events, including nor'easters, downbursts, hurricanes and tornados. The wind zones map below indicates the building standards that should be implemented in the various wind zones throughout the United States. The northeast is located in a zone that should indicate structures should be built to withstand 160 mile an hour wind gusts.

Tornado/Downburst

On average, six tornadoes touch down somewhere in New England each year. There is no way of knowing where or when the next damaging tornado will strike as they are among the most unpredictable weather phenomena. Tornados are violent rotating storms that extend to the ground with winds that can reach 300 miles per hour. They are produced from thunderstorms and can uproot trees and buildings. Although tornados are locally produced, damage paths can be in excess of one mile wide and 50 miles long.¹⁶ The Fujita Scale (below) is used to measure the intensity of a tornado (or downburst) by examining the damage caused in the aftermath.¹⁷ An F2 tornado ripped through a 50-mile section of central New Hampshire in 2008, from Epsom to Ossipee, leading to requests for federal disaster declarations in several counties¹⁸.

¹⁶ FEMA Hazards: Tornadoes <http://www.fema.gov/business/guide/section3e.shtm>, visited February 8, 2011.

¹⁷ <http://www.tornadoproject.com/fscale/fscale.htm> visited March 8, 2011.

¹⁸ <http://www.fema.gov/news/newsrelease.fema?id=45525> visited March 8, 2011.

Enhanced Fujita Scale						
EF Number	0	1	2	3	4	5
3-Second Gust (mph)	65-85	86-110	111-135	136-165	166-200	Over 200
Damage Indicator		Small barns, Farm Outbuildings	One-or two-family residences	Single-Wide Mobile Home	Double-Wide Mobile Homes	Apt, Condo, Townhouse (3 Stories or less)

Operational Enhanced Fujita (EF) Scale

According to the National Oceanic and Atmospheric Administration (NOAA) a downburst is a strong downdraft, rotational in nature, which causes damaging winds on or near the ground. Winds can exceed 130 mph.¹⁹ Downbursts are 10 times more likely to occur than tornadoes and fall into two categories based on their size:

- microbursts, which cover an area less than 2.5 miles in diameter, and
- macrobursts, which cover an area at least 2.5 miles in diameter.

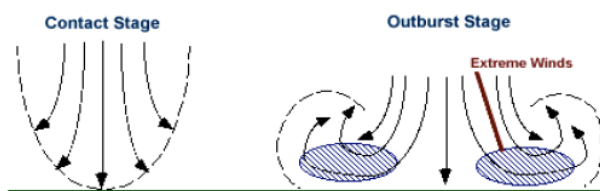


Image source: NH HSEM

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes 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 13-19 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	High waves (23-32 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (29-41 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 (37-52 ft) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

Beaufort Wind Scale²⁰

The major damage from downbursts comes from falling trees, which may take down power lines, block roads, or damage structures and vehicles. The tornado and downburst risk for an individual community in New Hampshire is relatively low compared to many other parts of the country.

¹⁹ *Weather Glossary*. National Oceanic and Atmospheric Administration, <http://www.weather.gov/glossary/index.php?letter=d>, visited March 8, 2011.

²⁰ <https://www.spc.noaa.gov/faq/tornado/beaufort.html>

Though the danger that these storms presents may be high, the frequency is relatively low to moderate. However, on July 24, 2008 a tornado affected ten New Hampshire communities including several in Carroll County.

History: NOAA reports three tornados in New Hampshire since 2013; no injuries or deaths were reported. In this same time period, there were more than 60 reports of thunderstorm/high wind (>40 mph) events in Carroll County with no deaths or injuries and \$1,000 in damages recorded. Four of these thunderstorm/high wind event reports came from the Wolfeboro area (9/11/13, 7/3/14 (two), 9/11/16) and one was reported over Lake Winnepesaukee (10/8/14). There were reports of downed trees and some power lines, but no injuries or structural damages were reported.



Downed trees and power lines from the 2008 tornado

Hazard	Date	Location	Remarks/Description	Source
Tornado	7/4/2014	Gilford, Center Harbor	A waterspout touched down on Lake Winnepesaukee briefly. No damage was reported.	NOAA
Tornado	7/30/2015	Warner	An EF0 touched down briefly in Warner. It snapped about 25 trees and tore a roof off a large storage building.	NOAA
Tornado	7/18/2016	Pittsburg	A tornado touched down with winds of about 75 mph and a maximum path width of about 200 yards. 100s of trees were snapped and wires down in multiple locations.	NOAA

Infectious Diseases

(Pandemic, epidemic)

Location: Local or State-wide

Specific Areas of Concern: Throughout town including schools, senior centers, populations to protect, Huggins Hospital

Probability of Occurrence: Unlikely

Vulnerability: High

Impact: High

Overall Risk: Moderate

Infectious diseases are illnesses 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. Signs and symptoms vary depending on the organism causing the infection, but often include fever and fatigue. Mild infections get better on their own without treatment, while some life-threatening infections may require hospitalization.

Epidemics do occur in Wolfeboro and other Lakes Region communities from time to time. Transmission of germs and diseases between people is accelerated in a close living and socializing environment. Schools, and congregate care centers for the elderly are good places for transmission to

occur. Huggins Hospital does have an emergency operations plan which addresses response to local and regional epidemics. The concerns associated with a **pandemic** include local capacity to respond to not only the residents of Wolfeboro and surrounding communities but also any visitors. The Huggins Hospital staff partners with Carroll County Public Health and other regional health providers.

Extent: Infectious disease is not a “natural hazard” and does not have a true “extent” as far as hazard mitigation planning goes, rather the focus is on preparedness and planning to minimize its impact on people. The magnitude and severity of infectious diseases is described by its speed of onset (how quickly people become sick or cases are reported) and how widespread the infection is. Some infectious diseases are inherently more dangerous and deadly than others, but the best way to describe the extent of infectious diseases relates to the disease occurrence:

- **Endemic** – Constant presence and/or usual prevalence of a disease or infection agent in a population within a geographic area
- **Hyperendemic** – The persistent, high levels of disease occurrence
- **Cluster** – 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
- **Epidemic** – An increase, usually sudden, in the number of cases of a disease above what is normally expected
- **Outbreak** – The same as epidemic, but over a much smaller geographical area
- **Pandemic** – Epidemic that has spread over several countries or continents, usually affecting many people

History: While there certainly have been minor outbreaks of flu in town, no major outbreak of this or any other infectious disease was identified during this process. An epidemic could be categorized by 5 things: Foodborne illnesses (E. Coli), Water (Cholera), Vaccine Preventable (Measles), Sexually Transmitted (HIV), and Person-to-Person (meningitis).

Epidemics may be caused by infectious diseases, which can be transmitted through food, water, the environment or person-to-person or animal-to-person, and noninfectious diseases, such as a chemical exposure, that causes increased rates of illness. Infectious diseases that may cause an epidemic can be broadly categorized into the following groups:

- Foodborne (Salmonellosis, E. Coli)
- Water (Cholera, Giardiasis)
- Vaccine Preventable (Measles, Mumps)
- Sexually Transmitted (HIV, Syphilis)
- Person-to-Person (TB, meningitis)
- Arthropod borne (Lyme, West Nile Virus)
- Zoonotic (Rabies, Psittacosis)
- Opportunistic fungal and fungal infections (Candidiasis)

Avalanche

Definition: An avalanche is a slope failure, like a landslide, consisting of a mass of rapidly moving, fluidized snow that slides down a mountainside. The flow can be composed of ice, water, soil, rock, and trees. Most avalanches result from structural weaknesses in the snowpack caused by temperature fluctuations or multiple snowfall events. Avalanches occur on steep slopes averaging 25 to 50 degrees and are triggered by both natural events (thermal changes, blizzards, seismic activity) and human activities (skiers, hikers, snowmobilers, sound

waves).







Location: Avalanche occurs in the Presidential Range in northern Carroll County, but is not known to occur in Lakes Region in southern Carroll County, including in Wolfeboro.

Extent: The extent of an avalanche prone area is determined by the amount of risk for natural or human triggered reactions based on factors such as snow-pack distribution and other atmospheric conditions. The North American Public Avalanche Danger Scale above shows the five danger classifications that are used to express avalanche risk.

History: There is no known occurrence of avalanche in Wolfeboro.

Impact: Although avalanche is unlikely to occur in Wolfeboro, it would most likely occur in remote, undeveloped areas in the northern sections of the town that lack structures and infrastructure. It is possible that impacts could cause injury to humans, but it is impossible to estimate the cost of damages.

Probability of Occurrence: Unlikely

North American Public Avalanche Danger Scale		
Avalanche danger is determined by the likelihood, size and distribution of avalanches.		
Danger Level		Travel Advice
5 Extreme		Avoid all avalanche terrain.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain not recommended.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.
No Rating		Watch for signs of unstable snow such as recent avalanches, cracking in the snow, and audible collapsing. Avoid travelling on or under similar slopes.
Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.		

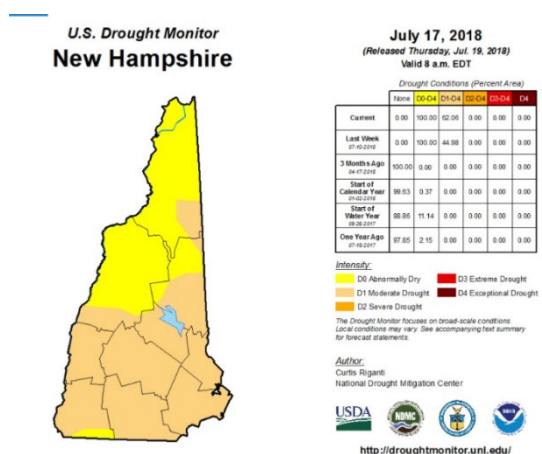
Avalanche Danger Scale²¹

Drought

Location: Drought is a regional hazard, affecting broad sections of the state at any given time. The effects of a drought are felt locally based on local water resources and individual water uses.

Definition and Extent: Moderate

Drought occurs when less than the normal amount of water is available for extended periods of time. Effects may include decreased soil moisture, groundwater levels, streamflow, and lake, pond, and well levels may drop. Factors that may contribute to drought include reduced levels of rain or snow, increased rates of evaporation, and increased water usage. New Hampshire generally receives adequate rainfall; it is rare that the state experiences extended periods of below normal water supplies.



Since 1990 New Hampshire has had a state Drought Emergency Plan, which identifies four levels of action indicating the severity of the drought: Alert, Warning, Severe, and Emergency. The US Drought Monitor²² uses a five-level drought intensity scale ranging from Abnormally Dry to Exceptional Drought.

²¹ <https://avalanche.org/avalanche-encyclopedia/danger-scale/>

²² US Drought Monitor <http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?NH>.

History and Impacts: Six extended droughts have occurred in New Hampshire in the past century: 1929–1936, 1939–1944, 1947–1950, 1960–1969, and 2001–2002.²³ Moderate drought conditions existed in New Hampshire during parts of 2015 and 2016, continuing for nearly a year and ending in April 2017.²⁴ Wolfeboro experienced these conditions since the last update, but the impacts have been minimal.

Probability of Occurrence: Unlikely

Earthquake

Location: An earthquake could affect all areas of Wolfeboro.

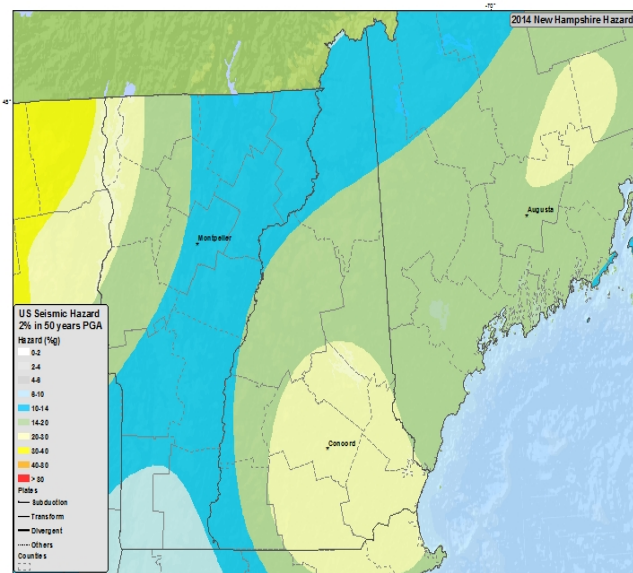
Definition and Extent: An earthquake is a series of vibrations induced in the Earth's crust by the abrupt rupture and rebound of rocks in which elastic strain has been slowly accumulating. Earthquakes are commonly measured using *magnitude*, or the amount of seismic energy released at the epicenter of the earthquake. The Richter magnitude scale is a mathematical device used to compare the size of earthquakes, shown in the table below:²⁵

Richter Magnitude Scale

Magnitude	Earthquake Effects
2.5 or less	Usually not felt but can be recorded by seismograph.
2.5 to 5.4	Often felt, but only causes minor damage.
5.5 to 6.0	Slight damage to buildings and other structures.
6.1 to 6.9	May cause a lot of damage in very populated areas.
7.0 to 7.9	Major earthquake. Serious damage.
8.0 or greater	Great earthquake. Can destroy communities near the epicenter.

New Hampshire is considered to be in an area of moderate seismic activity with respect to other regions of the country. This means the state could experience large (6.5 to 7.0 magnitude) earthquakes. There is the potential for nearby earthquakes to register 5.5 on the Richter Scale, causing slight damage to buildings and structures. Due to the unique geology of New Hampshire, earthquake propagation waves travel up to 40 times farther than they do in the western United States, possibly enlarging the area of damage.²⁶ The strongest earthquakes to strike New Hampshire occurred December 20 and 24, 1940 in the nearby Ossipee. Both earthquakes had a magnitude of 5.5 and were felt over an area of 400,000 square miles.

History: On average, the Lakes Region experiences an earthquake every other year, though



²³ <http://des.nh.gov/organization/divisions/water/dam/drought/documents/historical.pdf>.

²⁴ <https://www.drought.gov/drought/states/new-hampshire>

²⁵ <http://pubs.usgs.gov/gip/earthq4/severitygip.html>, visited February 8, 2011.

²⁶ <http://www.nh.gov/safety/divisions/hsem/NaturalHazards/index.html> visited February 8, 2011.

these earthquakes are mild and go mostly

undetected by people. Tamworth is identified as a major epicenter in the region.²⁷ According to the USGS National Earthquake Information Center database, since 1993 there have been 20 earthquakes (magnitude > 2.5) within a 50 km (31 mi.) radius of Moultonborough; the largest was magnitude 3.9. A 4.0 quake centered in southern Maine (50km away) shook the region on October 16, 2012. No earthquakes of magnitude 2.5 or higher have occurred in the area since the 2013 update and no impacts have been felt in Wolfeboro during that timeframe.

Notable New Hampshire earthquakes are listed below with the extent of the hazard expressed in the Modified Mercalli Intensity scale and the Richter Magnitude.²⁸

Location	Date	MMIntensity	Magnitude
Ossipee	December 24, 1940	7	5.5
Ossipee	December 20, 1940	7	5.5
Ossipee	October 9, 1925	6	4
Laconia	November 10, 1936	5	-
New Ipswich	March 18, 1926	5	-
Lebanon	March 5, 1905	5	-
Rockingham County	August 30, 1905	5	-
Concord	December 19, 1882	5	-
Exeter	November 28, 1852	5	-
Portsmouth	November 10, 1810	5	4
Off Hampton	July 23, 1823	4	4.1
15km SE of Berlin	April 6, 1989	-	4.1
5km NE of Berlin	October 20, 1988	-	4
W. of Laconia	January 19, 1982	-	4.7
Central NH	June 11, 1638	-	6.5

NH Earthquakes of magnitude or intensity 4 or greater (1638-2007).

Damage from an earthquake generally falls into two types: Structural and Nonstructural.

- **Structural Damage** is considered any damage to the load bearing components of a building or other structure.
- **Nonstructural Damage** is considered any portion not connected to the superstructure. This includes anything added after the frame is complete.

Probability of Occurrence: Unlikely

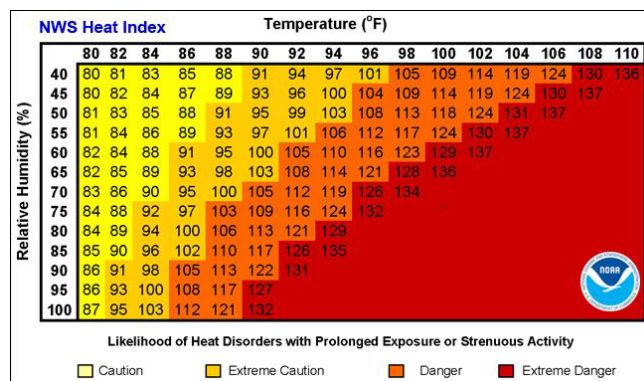
²⁷ <http://des.nh.gov/organization/commissioner/pip/factsheets/geo/documents/geo-3.pdf> , pg. 3, visited January 25, 2011.

²⁸ http://earthquake.usgs.gov/learn/topics/mag_vs_int.php, visited June 8, 2012.

Extreme Temperatures

Extreme temperatures are a period of prolonged and/or excessive hot or cold that presents a danger to human health and life.

Extreme Heat events occur as a result of above normal temperatures, which often coincide with high relative humidity, that increase the likelihood of heat disorders with prolonged exposure or strenuous activity. Heat related disorders include heat cramps, heat exhaustion, and heat stroke. Extreme heat can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.



Extreme Cold events are caused by the southern transport of arctic airmasses into the Northeast. This effect is exacerbated when there are winds present that effectively lower the temperature that is perceived by the human body, known as the wind chill. The risk presented is when the body loses heat faster than it can produce it. Wind acts to carry heat away from the body, therefore amplifying the body's perceived temperature and reducing core temperature. Cold disorders can include frostbite and hypothermia.

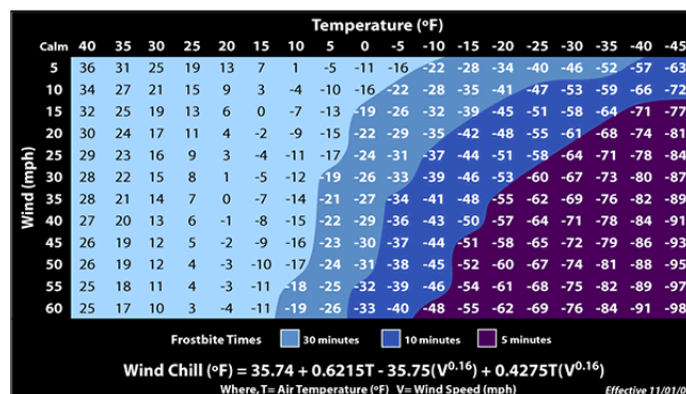
Frostbite occurs when uncovered skin and extremities are exposed to extreme cold and the body tissue is either injured or killed. Hypothermia is when the body is unable to heat itself at the rate it is being cooled and the body's core temperature drops below normal values. A normal core body temperature is 98.6°F; mild hypothermia occurs when core body temperature drops between 90 and 95°F; severe hypothermia occurs at core body temperatures of below 90°F. If left untreated, hypothermia can result in unconsciousness and eventually death. Extreme cold can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.

Location: Extreme temperatures can occur anywhere throughout the town of Wolfeboro. Exposure to the combination of cold and wind could be enhanced at higher, more exposed elevations.

Extent: Moderate

Heat Advisory – Two or more consecutive hours of Heat Index values of 95-99 °F for two or more days OR any duration of Heat Index values of 100-104 °F. A Heat Advisory is issued within 12 hours of the onset of extremely dangerous heat conditions.

- Excessive Heat Warning – Two or more hours with Heat Index values of 105 °F or greater. An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions.
- Excessive Heat Watches—Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.



- Excessive Heat Outlooks—Issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event.
- Wind Chill Watch: NWS issues a wind chill watch when dangerously cold wind chill values are *possible*. As with a warning, adjust your plans to avoid being outside during the coldest parts of the day. Make sure your car has at least a half a tank of gas and update your winter survival kit.
- Wind Chill Advisory: NWS issues a wind chill advisory when seasonably cold wind chill values but not extremely cold values are expected or occurring. Be sure you and your loved ones dress appropriately and cover exposed skin when venturing outdoors. A Wind Chill Advisory is issued for New Hampshire is wind chill values are expected to be -20°F to -29°F and winds are greater than 5 mph.
- Wind Chill Warning: NWS issues a wind chill warning when dangerously cold wind chill values are expected or occurring. A Wind Chill Advisory is issued for New Hampshire is wind chill values are expected to be -30°F and winds are greater than 5 mph.²⁹

History:

Event Date	Event Description	Impacts	Location	Additional Information
July 1911	Heat Wave	Record high temperatures set in Concord, New Hampshire	Statewide	Extreme heat was recorded from July 3 rd through July 5 th , with high temperatures ranging from 101-102°F in Concord on these days. ¹¹⁶ These three days account for three of the top 10 hottest days on record for Concord, New Hampshire.
March 2012	Heat Wave	Record high temperatures set in Concord, New Hampshire	Statewide	High temperature records in Concord, New Hampshire were broken for 5 consecutive days, with the hottest day being 84°F.
September 2017	Heat Wave	High temperature records set across New Hampshire	Statewide	Mount Washington set record a daily high temperatures for four consecutive days. Manchester, Concord, and other areas across the State and New England also saw daily temperature records broken. ¹¹⁷
December 2017	Cold Wave	Record low temperatures set across New Hampshire	Statewide	Record low temperatures were set across the State as a result of a cold wave. Portsmouth saw a low of -1°F and Mount Washington saw a low of -33°F (with a wind chill of -51°). Wind Chill Advisories were posted in central and southern New Hampshire, and Wind Chill Warnings were posted for northern New Hampshire.
February 2018	One Day Winter Heat Wave	High temperature records set across New Hampshire	Statewide	Exceptionally strong high pressure ridge in place across the Eastern Seaboard. Record high temperatures were broken across the State. ¹¹⁸

Wolfeboro has experienced occasional hot and cold temperatures since the last plan update, but the impact has been minimal.

Probability of Occurrence: Unlikely

Landslide

Definition: The downward or outward movement of slope-forming materials reacting to the force of gravity, including mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides and earth flows.

Landslide can result in damages to buildings and infrastructure, and can result in injury or death.

Summit	Elevation
Whiteface Mountain	1339 ft.
Trask Hill	1320 ft.
Baton Hill	1300 ft.
Moody Mountain	1280 ft.
Tibbett's Hill	1278 ft.
Unnamed	1229 ft.
Mt. Long Stack	1223 ft.
Cotton Mountain	1040 ft.

Location: The highest peak in town is Whiteface Mountain in North Wolfeboro. There are eight peaks in

²⁹ Adapted from *State of NH Multi-Hazard Mitigation Plan Update 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.

Wolfeboro with elevation of greater than 1,000 feet.³⁰ However, as with much of the mountainous landscape in New Hampshire, it is relatively stable. Exposure to the risk of landslide is generally limited to areas in northern Carroll County and other parts of the state.

Extent: While no universally accepted standard or scientific scale has been developed for measuring the severity of all landslides, severity can be measured 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 landslides³¹:

- 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

History: There are no known occurrences of landslide or resulting damages or injury in Wolfeboro since the 2012 HMP.

Probability of Occurrence: Unlikely

Solar Storm and Space Weather

Definition: The term space weather is relatively new and describes the dynamic conditions in the Earth's outer space environment, similar to how the terms "climate" and "weather" refer to the conditions in the Earth's lower atmosphere. Space weather includes any and all conditions and events on the sun, in the solar wind, in near-Earth space, and in our upper atmosphere that can affect space-borne and ground-based technological systems. As society becomes increasingly reliant on electronics and technology, the hazards presented by space weather are not to be underestimated. The magnetic disturbances that solar storms can bring can disrupt communications, damage or destroy electronic components, corrode gas and oil pipelines, and cause significant damage to spacecraft and satellites outside the Earth's protective atmosphere. All of Wolfeboro would be vulnerable to these events.

Location: All of Wolfeboro and the entire State of New Hampshire are at risk of solar storms and space weather. Solar storms and space weather always impact the Earth and its atmosphere and are therefore an ongoing threat. While the Earth is somewhat protected from solar storms and space weather by its upper atmosphere, the potential for a loss of communications, power, and GPS exists on a daily basis.

Extent: The *2018 State of New Hampshire Multi-Hazard Mitigation Plan Update* describes three different types of events: Geomagnetic Storms, Solar Radiation Storms, and Radio Blackout. Each of these is then rated on a five-level scale (minor, moderate, strong, severe, extreme), with descriptions of increasing impacts on power,

³⁰ Natural Resources Chapter, Wolfeboro Master Plan, adopted 2011

³¹ <https://oas.org/dsd/publications/Unit/oca66e/ch10.htm>

spacecraft, biological, satellite, high frequency radio, and navigation systems.

Although not much is known locally about the impacts of solar storms and space weather, among other potential vulnerabilities, it is most likely that a solar storm would exacerbate radio communications problems for emergency responders. The following Radio Blackout Scale (below)³² offers a measure of the extent of solar storms on radio communications:

Radio Blackout				
Scale	Description	Effect	Physical measure	Average Frequency (1 cycle = 11 years)
R 5	Extreme	HF Radio: 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 en route aviators in this sector. Navigation: 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.	X20 (2×10^{-3})	Less than 1 per cycle
R 4	Severe	HF Radio: HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. Navigation: Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 (10^{-3})	8 per cycle (8 days per cycle)
R 3	Strong	HF Radio: Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. Navigation: Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R 2	Moderate	HF Radio: Limited blackout of HF radio communication on sunlit side, loss of radio contact for tens of minutes. Navigation: Degradation of low-frequency navigation signals for tens of minutes.	M5 (5×10^{-5})	350 per cycle (300 days per cycle)
R 1	Minor	HF Radio: Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact. Navigation: Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

History: No significant events have been reported in Wolfeboro. Nearby events include Quebec, Canada, which experienced a 9-hour blackout in March 1989 when solar winds caused a fluctuation in the Earth's magnetic field and caused Hydro-Quebec's transmission to go down.³³

Probability of Occurrence: Unlikely

³² https://prd.blogs.nh.gov/dos/hsem/wp-content/uploads/2015/11/State-of-New-Hampshire-Multi-Hazard-Mitigation-Plan-Update-2018_FINAL.pdf, p. 141

³³ Adapted from the *State of New Hampshire Multi-Hazard Mitigation Plan Update (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.

Wildfire

Location: The northern sections of Wolfeboro, away from the downtown center and Lake Winnepesaukee, are heavily wooded.

Extent: A wildfire is defined as a fire in wooded, potentially remote areas that may endanger lives. New

Hampshire has about 500 wild land fires each year; most of these burn less than half an acre. Much of the Lakes Region is forested and susceptible to fire.

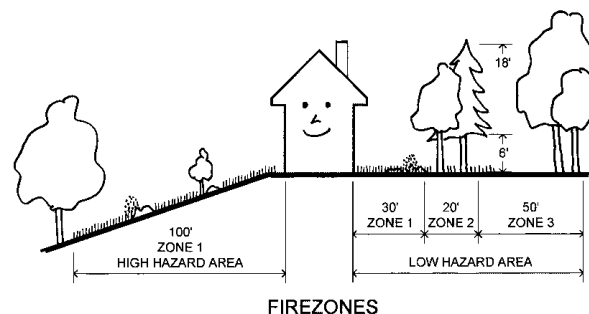
History: No local occurrences have been reported since 2007. Between 2014 and 2018 there were 724 wildfires in New Hampshire, burning 2,007 acres, averaging just under 3 acres per fire. The number of fires per year ranged from 53 (2018) to 351 (2016). Carroll County had 11 wildfires in 2018.³⁴

The National Wildfire Coordinating Group (NWCG) has defined seven classes of wildfire based on size:

- Class A - one-fourth acre or less;
- Class B - more than one-fourth acre, but less than 10 acres;
- Class C - 10 acres or more, but less than 100 acres;
- Class D - 100 acres or more, but less than 300 acres;
- Class E - 300 acres or more, but less than 1,000 acres;
- Class F - 1,000 acres or more, but less than 5,000 acres;
- Class G - 5,000 acres or more.

Several areas in the region are relatively remote in terms of access and firefighting abilities. Of greatest concern are those areas characterized by steep slopes and vast woodlands, with limited vehicular access. In Wolfeboro, these areas are found in the northern section of town, away from the downtown center, and bordering Tuftonboro, Ossipee, and Brookfield.

As these once remote areas begin to see more development (the urban-wildfire interface), care should be taken to ensure that adequate fire protection and buffers are established. Techniques include increased buffers between wooded areas and residential buildings, requirements for cisterns or fire ponds, a restriction on the types of allowable building materials such as shake roofs, and special considerations for landscaping. The greatest risk of wildfire in New Hampshire exists in the spring when the snow has melted and before the tree canopy has developed, and in the late summer into early fall. Appropriate planning can significantly reduce a community's vulnerability for woodland fires. There are four-zone suggestions from the Firewise community program that could be potentially helpful for Wolfeboro's homeowners.³⁵



ZONE 4 is a natural zone of native or naturalized vegetation. In this area, use selective thinning to reduce the volume of fuel. Removing highly flammable plant species offers further protection while maintaining a natural appearance.

ZONE 3 is a low fuel volume zone. Here selected plantings of mostly low-growing and fire-resistant plants provide a decreased fuel volume area. A few well-spaced, fire resistant trees in this zone can further retard a fire's progress.

³⁴ NH Division of Forests and Lands <https://www.nh.gov/nhdfl/documents/2018-forest-fire-town-report.pdf>

³⁵ <http://www.firewise.org> accessed September 21, 2012.

ZONE 2 establishes a vegetation area consisting of plants that are fire resistant and low growing. An irrigation system will help keep this protection zone green and healthy.

ZONE 1 is the protection area immediately surrounding the house. Here vegetation should be especially fire resistant, well irrigated and carefully spaced to minimize the threat from intense flames and sparks.

Probability of Occurrence: Unlikely

TECHNOLOGICAL AND HUMAN-CAUSED HAZARDS

Long-term Utility Outage

Location: Town-wide

Specific Areas of Concern: Water and Sewer Pumping Stations, Populations to Protect, Emergency Response Facilities, Essential Services, Huggins Hospital, downtown restaurants

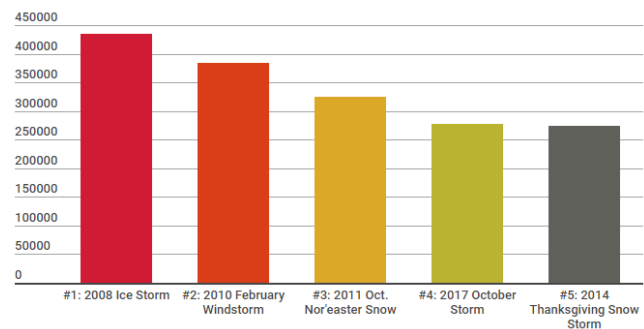
Probability of Occurrence: High

Vulnerability: High

Impact: Severe

Overall Risk: Likely

Power outages, whether associated with natural or human-caused hazards, have the potential to cause great disruption to residents and the functioning of the town. There is back-up power for most municipal facilities and the hospital. The schools have enough emergency power for basic life safety. The elderly and disabled who rely on powered medical devices are at risk and



Top 5 power outages in New Hampshire history. Data provided by NHHSEM. Figure courtesy of NHPR.

provisions need to be made for their needs (the hospital cannot serve this function). The Municipal Electric Department trims trees regularly to reduce damage to power lines. Power outages are the most common utility disruptions in New Hampshire, and they often are the result of strong coastal lows, Nor'easters, and severe thunderstorms. These outages are typically short-lived, but can persist depending on the severity of the weather event. Historically, the State has seen the top 5 largest power outages in its history within the last decade, the largest and longest of which was the Ice Storm of 2008 that left some New Hampshire residents without power for over two weeks. Three out of five of these severe storms resulted in federally declared disasters for the State.

Conflagration

Conflagration is an extensive, destructive fire in a populated area that endangers lives and affects multiple buildings. Many New Hampshire towns were settled in areas along waterways and town centers were at a low point in the topography, resulting in dense residential development on the steeper surrounding hillsides. Hillsides provide a natural updraft that makes fire-fighting difficult. Structural fires spread more



readily in hillside developments because burning buildings pre-heat the structures that are situated above them.

Just south of Wolfeboro, the Alton Bay Christian Conference Center caught fire in 2009, resulting in an 11-alarm fire and destroying more than 40 structures.

Probability of Occurrence: Unlikely

Terrorism/Violence

Terrorism is defined as premeditated, politically motivated violence perpetrated against noncombatant targets by subnational groups or clandestine agents. Terrorism can be international or domestic in nature. While terrorist events are unlikely to occur in Wolfeboro, the severity of their impact makes them high risk events. While no one wants to think that it could happen in their small town, the potential exists that there are some few individuals who wish to do harm to others in the community. Most of the schools in town are quite visible, accessible, and home to the town's most vulnerable population.

Probability of Occurrence: Unlikely

Hazardous Materials

Location: Localized

Specific Areas of Concern: Lake Winnepesaukee, Lake Wentworth, Back Bay, Beech Pond, private wells, Municipal Water System

Probability of Occurrence: Moderate

Vulnerability: Moderate

Impact: Moderate

Overall Risk: Moderate

Wolfeboro depends on a portion of its surface water to provide public drinking water to the community. Area tourism and water recreation also are highly dependent on the availability of clean and attractive water resources. For these reasons the protection of surface waters in Wolfeboro is highly valued both as a necessity and for economic reasons. The leading potential sources of water contamination include in-transit and fixed hazardous materials.

Several transportation connections to points throughout central New Hampshire and beyond pass through Wolfeboro. These major roadways are in many places located in close proximity to local water resources. The town is at risk of an overland hazardous material spill that could cause infiltration of spilled hazardous materials into the water resources.

A **hazardous material** is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Contaminants in drinking water include naturally occurring contaminants associated with the geology in a given region and known man-made contaminants associated with nearby land use activities. Some contaminants are considered emerging contaminants. **Emerging contaminants** are chemicals that historically have not been monitored in drinking water due to the lack of laboratory capabilities to detect the compounds or a lack of knowledge about the use of certain compounds and their potential to cause human health impacts. Emerging contaminants are particularly concerning to the public

because the potential health impacts of these are sometimes uncertain.

The town has ranked **potable water contamination** as a high risk hazard and **surface water contamination** as a moderate risk hazard.

Probability of Occurrence: Unlikely

DAM FAILURE

Definition: The sudden, rapid, and uncontrolled release of impounded water.

Location: There are 12 active dams in Wolfeboro. Crescent Lake Dam, located between Lake Wentworth and Lake Winnepesaukee near the downtown center, and the Wolfeboro Sewage Lagoon, also near the downtown area, are town-owned and are High Hazard dams. Each has an Emergency Action Plan. Failure of these structures would result in property and environmental damage, and could have life safety impacts.

Extent: Dam failure results in rapid loss of water that is normally held back by a dam. These types of floods can be extremely dangerous and pose a threat to both life and property. Dam classifications in New Hampshire are based on the degree of potential damages that a failure or disoperation of the dam is expected to cause. The classifications are designated as non-menace, low hazard, significant hazard, and high hazard and are summarized in greater detail in the table below³⁶.

The designations for these dams relate to damage that would occur if a dam were to break, not the structural integrity of the dam itself. In the Lakes Region, the Town of Alton was impacted by an earthen dam failure on March 12, 1996. Although listed in the NH Hazard Mitigation Plan as a significant hazard, it did result in the loss of one life.

New Hampshire Dam Classifications

Classification	Description
Non-Menace (Class AA)	No Possible loss of Life or Property. Less than six feet in height if it has a storage capacity greater than 50 acre-feet. Less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.
Low Hazard (Class A)	No Possible loss of Life. Low economic loss to structures or property. Potential structural damage to local roads and infrastructure. Potential release of material if the storage capacity is less than 2 acre-ft and is located more than 250 feet from a water body or water course. Reversible environmental losses to environmentally sensitive sites.
Significant Hazard (Class B)	No Probable loss of Lives. Major economic loss to structures or property. Structural damage to Class I or II roads that could render the road impassable or interrupt public safety services. Major environmental or public health losses, including one or more of the following: Damage to a public water system, as defined by RSA 485:1-a, XV, which will take longer than 48 hours to repair; The release of liquid material if the storage capacity is 2 acre-feet or more; Irreversible environmental losses.
High Hazard (Class C)	Potential to cause failure of habitable building foundations. Water levels to rise above first floor elevation of habitable structure. Structural damage to an interstate highway that could render the road impassable or interrupt public safety services. The release of a quantity and concentration of "hazardous waste" as defined by RSA 471-A:2 VI. Any other circumstances that would more likely than not cause one or more deaths.

History: There have been no known dam failures in Wolfeboro.

³⁶ <http://des.nh.gov/organization/commissioner/pip/factsheets/db/documents/db-15.pdf>
visited January 18, 2011

Probability of Occurrence: Unlikely

Summary

It is cost prohibitive to make the built environment resistant to the most devastating natural hazards that could occur, though reasonable measures can be taken to minimize loss of life and property damage. Wolfeboro may be affected by an unavoidable extraordinary circumstance such as a violent earthquake, but historically, events of this magnitude have been infrequent. Those natural events that are common to the northeast also have common elements of concern for public safety. These include the potential for long-term power outages, the potential need for short-term sheltering facilities, and the availability of equipment and trained personnel. Key to loss prevention in these relatively common event scenarios is pre-event planning that critically assesses communications within the community, mutual aid resources regionally, public awareness and education, and emergency response training.

CHAPTER IV: VULNERABILITY ASSESSMENT

A. CLASSIFICATION OF CRITICAL INFRASTRUCTURE

A list of critical infrastructure for the town of Wolfeboro was identified by the Committee. The complete list with locations, classifications, and values is in Appendix G. The critical infrastructure list is divided into seven categories, 1) Essential Services; 2) Structures and Services; 3) Emergency Shelters; 4) Special Populations; 5) Fuel Locations; 6) Lake Access; 7) Potential Hazard Locations. The first category contains facilities essential in a hazard event. The second contains essential facilities that have been identified by the Committee as facilities to protect in order to minimize additional risk to hazards. The third category is a list of the pre-defined emergency shelters within the community. The fourth category includes populations that the town wishes to protect in the event of a disaster. The fifth includes water access areas. The sixth category lists fueling facilities. The seventh category lists potential hazard locations. The Public Safety Complex serves as the Emergency Operations Center; the Municipal Electric Facility is the secondary EOC.

Wolfeboro Critical Facilities

Facility/Infrastructure	Location	Generator	
Essential Services			
Public Safety Complex/EOC	251 S Main St	Yes	
Town Hall and Annex	84 Main St./ 9 Union St	Yes	
Highway Department	47 Pine Hill Rd	Partial	
Water Treatment Plant	North Line Rd Ext	Yes	
Wastewater Treatment Plant	Filter Bed Rd	Yes	
Municipal Electric Department	133 Middleton Rd	Yes	
Huggins Hospital & Medical Arts/EOC	240 S Main St	Yes	
Electric Substation #1	Filter Bed Rd	No	
Electric Substation #2	Filter Bed Rd	No	
New England Telephone substation	corner of Glendon St & School St	Unknown	
Cellular phone tower (Central Dispatch repeater)	on Bennett Hill	Yes	
Water Storage	16 McManus Road	No	
Structures and Services			
Cellular phone tower - Lehner Street	Lehner St	Battery	
Cellular phone tower - Pierce Camp Birchmont	Pierce Camp Birchmont	Battery	
Cellular phone tower - water tower	16 McManus Road	Yes	
Huggins Hospital Communications Antenna	240 S Main St	Unknown	
Crescent Lake Dam		N/A	

Rust Pond Dam		N/A	
Sewage Lagoon Dam	Filter Bed Rd	N/A	
NH Route 28 (Evacuation)		N/A	
NH Route 109 (Evacuation)		N/A	
WASR tower	Varney St	Unknown	
Rapid Infiltration Basin (RIB)		No	
Solid Waste Facility	400 Beech Pond Rd	N/A	
Lakes Region Household Hazardous Product Facility	404 Beech Pond Rd	No	
Pop Whalen/Abenaki Ski Area	NH Route 109A	No	
Penn Air Air Strip	Penn Air Rd	N/A	
Facility/Infrastructure	Location	Generator	Shelter Capacity
Emergency Shelters			
Sleeping Shelters			
Kingswood Arts Center	396 South Main Street	Partial	180-200
Brewster Academy Complex	80 Academy Drive	Partial (main campus)	500 See note 1
Pet Shelter			
Kingswood School Complex Greenhouse	396 South Main Street	Unknown	Unknown
Warming and Cooling Shelters			
Kingswood Middle School, High School and Tech Center	396 South Main Street	Yes	Unknown
All Saints Episcopal Church	258 South Main Street	No	200
First Congregational Church	115 South Main	No	300
First Christian Church	83 North Main Street	No	100
Warming Only Shelters			
Carpenter School	102 South Main	No	300
Crescent Lake School	75 McManus Road	No	1000
Special Populations			
Christian Ridge	20 Crescent Lake Ave	Unknown	
Sugar Hill Retirement Community	83 Rolling Wood Dr	Unknown	
Genesis (Wolfeboro Bay Care and Rehabilitation)	39 Clipper Rd	Yes	
Taylor Community	11 Taylor Dr	Unknown	
The Ledges	67 Center St	Unknown	
Wolfeboro Area Children's Center	180 S Main St	Yes	
Wolfeboro Nursery School (at All Saints Church)	258 South Main Street	No	
Pierce Camp Birchmont	693 Governor Wentworth Highway	Unknown	
Camp Bernadette	93 Richards Rd	Unknown	
Wolfeboro Camp School	Camp School Rd	Yes	

Fuel Locations			
Town Pumps	47 Pine Hill Rd	Unknown	
7-Eleven (back-up)	670 Center Street	Unknown	
Lake Access			
Mast Landing	3 Silver Street St	N/A	
Dock at the Libby Museum	755 N. Main St	N/A	
Town docks - Dockside Facility	S. Main St	N/A	
Town docks – Railroad Ave Facility	Railroad Ave	N/A	
Potential Hazard Locations		N/A	
Sawmill Boat Club	Bay Street	Unknown	
Fuel stations		Unknown	
Goodhue & Hawkins Navy Yard	244 Sewall Rd	Unknown	
Wolfeboro Corinthian Yacht Club/ Irwin Marine	12 Nancy's Way	Unknown	
Wolfeboro Oil (heating oil)	Wickers Drive	Unknown	
Wolfeboro Oil (diesel fuel)	Lehner Street	Unknown	
Wolfeboro Oil (propane)	Wickers Drive	Unknown	
Dive Winnepesaukee	4 North Main St.	Unknown	

NOTE 1: USED FOR BREWSTER ACADEMY STUDENTS AND STAFF DURING SCHOOL YEAR

B. ESTIMATING POTENTIAL LOSSES

The *Potential Hazards and Critical Facilities Map* (Appendix E) identifies the location of some of the critical facilities in relation to mapped hazard areas.

The critical facilities identified in Wolfeboro have a combined assessed value of \$215,126,515 (see Appendix F). However, this does not include contents and does not necessarily reflect the cost of full replacement. Also not reflected in this assessment is the value of built infrastructure such as streets, bridges, curbs, sidewalks, drainage, and utility transmission lines. These values can also be used to determine potential loss estimates in the event that a natural or human-caused hazard damages a part of or an entire facility. The estimates were generated by the town assessor and are based on property tax documentation. Many of the facilities listed here are privately owned but represent service that the Committee considered to be essential in terms of mitigating vulnerability to hazards, such as the provision of medical services and communications. A listing of Wolfeboro's critical facilities can be found in Appendix G.

The assessed value of Wolfeboro's 3,547 parcels of land with residential buildings is \$1,640,037,700, resulting in a median residential value of \$270,800. The value of the town's 234 commercial/industrial properties (land and buildings) is \$119,810,200.

CHAPTER V: MITIGATION STRATEGIES

A. STATE OF NEW HAMPSHIRE HAZARD MITIGATION GOALS

The *2018 State of New Hampshire Multi-Hazard Mitigation Plan*, prepared and maintained by the New Hampshire Homeland Security and Emergency Management (NH HSEM), sets forth the following overarching hazard mitigation goals for the State of New Hampshire:

- 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 protection of the general population, citizens, and guests of the State of New Hampshire before, during, and after a hazard event through public education about disaster preparedness and resilience, and expanded awareness of the threats and hazards which face the State
- Promote continued comprehensive hazard mitigation planning at the State and local levels to identify, introduce, and implement cost effective hazard mitigation measures
- Address the challenges posed by climate change as they pertain to increasing the risk and impacts of the hazards identified within this plan
- Strengthen Continuity of Operations and Continuity of Government across the State and local levels to ensure continuation of essential services

B. WOLFEBORO, NEW HAMPSHIRE HAZARD MITIGATION GOALS

The Wolfeboro Hazard Mitigation Planning Committee concurs with the State Multi-Hazard Mitigation overarching goals and has determined that the town goals from the 2012 plan are still appropriate, with some minor additions. Based on the hazards studied, and the assessment of current and proposed mitigation strategies, the Committee recommends the following hazard mitigation goals for the town of Wolfeboro:

Goal I: Community and Resources Protection: Reduce the potential impact of natural and man-made hazards on the town's residents and visitors, as well as its critical facilities, property, economy, and natural resources, while improving the emergency communication, alert, and response systems.

Goal II: Public Education: Improve public awareness and knowledge of hazard preparedness and impacts of potential hazards, while increasing the public's involvement in emergency response and recovery through social media, public television, radio and print media.

Goal III: Inter/Intra Departmental Coordination: To build an awareness of hazard mitigation efforts through coordination within Wolfeboro, its schools and hospital, and between other communities, the region, county, state, and federal government agencies, and related organizations, while engaging in planned prevention through further consideration of hazard mitigation in the local land use process.

Goal IV: Damage Prevention and Reduction: Continue to develop methods to identify specific hazard areas and populations vulnerable to hazards to minimize the resultant public and private expenditures and damage.

Goal V: Fire Protection: Ensure adequate fire protection exists in all areas of the community.

C. CURRENT PLANS, POLICIES, AND REGULATIONS

The planning decisions that affect community growth patterns have evolved over the years as the population and demographics in Wolfeboro have grown and changed. Many local programs have the effect of mitigating disasters; some of these have been in effect for years, others have been implemented as a result of the 2012 Hazard Mitigation Plan. A review of existing mitigation strategies was conducted and included review of the zoning ordinance, subdivision regulations, emergency management plan, site plan regulations, and discussion with Committee members. The following strategies detail existing plans and regulations related to hazard mitigation.

Type of Existing Protection	Description	Area Covered	Enforcement	Source
Building and Fire Codes				
	Construction must conform to the following: the 2009 International Building, Residential, Energy Conservation, Plumbing, and Mechanical Codes with amendments, the 2011 National Electrical Code, and the 2015 Life Safety Code and Uniform Code NFPA 1 2009.	Town wide	Code Enforcement Officer Fire Dept.	RSA 153:5
Zoning Ordinance				
	Prohibits land use or structure from generating hazardous and toxic waste without permit from the Planning Board.	Town wide	Planning Board	Zoning Chapter 175-48

All construction new, remodeled, or renovated shall maintain a setback of 75 ft from very poorly drained soils, 30 feet from poor drained soils, and 50 feet from surface water.

Town wide

Planning
Board & Code
Enforcement
Officer

Zoning Chapter
ARTICLE II,
Wetlands
Conservation Overlay
District
Section 175-3 -10

Specific characteristics identifying hazardous conditions involving excessive slope, where development is prohibited.

Site specific

Planning
Board

Steep slope ordinance was adopted March 2012 and amended in 2018.

Ensure that development projects comply with the existing mitigation strategies of the subdivision regulations, site plan review, and building codes.

Town-wide

Planning
Board

Flood Hazard Mitigation

Regulations to minimize impact of flooding of structures, utilities, and other facilities, which can occur in identified Special Flood Hazard Areas (SFHA).

Site Specific; Refer to flood maps

Type of Existing Protection

Description

Area Covered

Enforcement

Source

The High Hazard and Significant Hazard dams are evaluated on a regular basis and during high water events.

Areas near and downstream from dams

Operations
Director
(Public
Works)

NHDES Water
Resources Division

Dam Emergency Action Plans are reviewed annually and updated as needed.

Areas near and downstream from dams

Operations
Director
(Public
Works)

NHDES Water
Resources Division

National Flood Insurance

Member since 1989.

37 policies
written

Planning
Board & Code
Enforcement
Officer

Revisions were adopted in 2012

Wetlands Conservation Overlay District

Regulating the use of land and development to prevent the destruction of or significant changes to wetlands.

Soil specific

Planning
Board & Code
Enforcement
Officer

Zoning Chapter
ARTICLE II,
Wetlands
Conservation Overlay
District
Section 175-3 -10

Storm Water Drainage

Calculations comparing Pre and Post-Development stormwater runoff rates (cubic feet per second) and volumes (cubic feet) based on a 1-inch rainstorm, and the 2-year, 10-year, 25-year and 100-year 24-hour frequency storms based on current design depths from the Northeast Regional Climate Center or NHDES. Post-development equal to or less than pre-development runoff

Project
specific

Planning
Board

Site Plan Review
Regulations and
Subdivision
Regulations

Municipal Electric Department

Right-of-way tree clearing of power lines to reduce risk of power outages; one-tenth of town's lines are cleared annually; NESC 2017 construction standards

Town-wide

Municipal Electric Department

Emergency Operations Plan

The Wolfeboro Emergency Operations Plan (EOP) establishes a framework for local government to provide assistance in an expeditious manner to save lives and to protect property in the event of a disaster.

Emergency Management Director

2018 & NFSHFODZ
0QFSBUJPOT IMBO

Fire-Rescue Department

Members attending training that included firefighter certification, technical rescue, infection control, hazardous material decontamination, building/fire code seminars, emergency medical services, responding to terrorist attacks, and incident

Town-wide

Chief of Fire-Rescue Department

management

Fire Warden, Fire Department, and the NH Division of Forests & Fire Lands work collaboratively to reduce the risk and frequency of wildland fires.

Town-wide

Chief of Fire-Rescue Department and Fire Warden

Treated Effluent Storage Pond

Measures taken to reduce the volume in the lagoon; Rapid Infiltration Basin to become primary effluent disposal system with sprayfields as redundancy

Town-wide

Department of Sewer

Type of Existing Protection	Description	Area Covered	Enforcement	Source
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Drinking Water Management

Inspections are conducted to identify leaks in the municipal water network.

site-specific

Department of Environmental Services

There is a Water Conservation Plan in place for low water years.

Town-wide

Department of Water

Backup Power

Require periodic testing of all Essential Services backup power systems.

Town Departments

Department heads

Education/Outreach

Proactively educate public in best practice methods to help themselves and neighbors in a post-hazard scenario.

Town-wide

EMD

Preparedness Training

Emergency Services personnel participate in NIMS training.

Town-wide

EMD

Regional and Departmental Coordination

Mutual Aid agreements are maintained for Police, Highway, Building Officials, Water, Sewer, and Municipal Electric, and Fire assistance.

Town-wide

EMD

All Health Hazard Planning

The Carroll County Coalition for Public Health provides regional-based training for the public and CERT teams.

Town-wide

EMD

Review and update of Plans

The CERT meets quarterly to review the HMP and update the EOP each spring.

Town-wide

EMD

Annual Concurrence is completed for both the EOP and Hazard Mitigation Plan in September.

Town-wide

Board of Selectmen
Emergency Management Director

C. IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

Numerous mitigation strategies from the 2012 Plan have been completed or are no longer applicable. The status of the mitigation actions recommended in the 2012 Plan is indicated in the table below as either Completed, Deleted, or Deferred. Deferred Actions (or portions of Actions) are carried forward to be considered as new Mitigation Action.

1. Status of Mitigation Actions from the 2012 Wolfeboro Hazard Mitigation Plan

	Project	Status
1	Improve the intersection of Center and Lehner Streets (dangerous intersection with hazardous materials in the vicinity).	Completed
2	Evaluate alternatives to improve the turn on NH Route 28 in South Wolfeboro at Weston's Auto Body.	Evaluation completed; Improvements deferred
3	Conduct a study to improve the intersection of North Line Road and NH Route 28.	Deleted
4	Adopt an alternative routing plan within the Village Core.	Deleted – SOPs would apply
5	Collate existing data on the vulnerability of flat roofs on critical facilities.	Completed – monitoring and following SOPs for ensuring severe weather doesn't compromise existing flat roofs
6	Formulate a water conservation study and educate the public on water conservation methods.	Completed – Education ongoing
7	Work with the Department of Safety, 911 Mapping Bureau to fix known problems with GIS road data to limit confusion in emergency planning and emergency response.	Completed
8	Implement an Asset Management system for tracking the condition and planning the maintenance of bridges and culverts.	Deferred – In progress
9	Work with NHDES and the Municipal Water Department on upgrading and implementing the town's policy for protecting its water supply.	Deferred – In progress
10	Update vulnerable culverts and bridges on Cross Road.	Completed
11	Develop and implement a tree trimming policy for road right-of-way purposes and to eliminate hazards.	Development Completed Implementation ongoing
12	Include in the plan submission sections of both site plan and subdivision regulations a reference to the Hazard Mitigation Plan, and require the applicant to articulate how the proposal complies with the standards of the plan and achieves a “no adverse impact” status as it relates to emergency situations are at a potentially damaging weight.	Deleted – ‘scattered and premature’ provision already included in site plan and subdivision regulations

	Project	Status
13	Upgrade the drainage system on Beech Pond Road from Boucher Hill to Nelson Hill. This is a 2,000' gravel section between two paved hills. Need to upgrade drainage and pave.	Deferred
14	Upgrade drainage system along North Main Street from Lakeview to Mill Street due to the age of the system.	Deferred
15	Mitigate flooding issues on Center Street from Pickering Corner to Grove Street. Upgrade culverts per the existing drainage study.	Completed culverts Ongoing annual maintenance on pump
16	Conduct outreach to local businesses regarding floodproofing, especially those that may be storing hazardous materials. Outreach from EMD with DES guidelines for storage and containment.	Deferred – outreach ongoing
17	Repair the roof on the fire station garage (hardening of critical facility)	Roof repair completed Hardening of Public Safety Building – deferred – ongoing
18	Ensure that roads on which there is new development meet town road standards.	Deferred - ongoing
19	Be prepared to notify residents in the event of an emergency through mobile signage (electronic message board).	Completed
20	Notify residents of emergency preparedness steps that they can take to reduce the likelihood of loss of life or property (various methods of notification).	Deferred - ongoing
21	Ensure that the Town Fueling Station can be used during a power outage.	Completed
22	Ensure that back-up power is available at designated shelters.	Completed
23	Create a town-wide alert system using reverse-911.	Deferred
24	Initiate departmental NIMS training.	Deferred - ongoing
25	Create a "calling-tree" communication network to increase the efficiency of communicating emergency information between departments and town officials.	Deferred - ongoing
26	Improve sheltering capacity during a power outage.	Completed

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The discussion of current and future mitigation actions yielded an updated list of recommended mitigation strategies. These strategies can be used to reduce the effects of hazards on both new and existing buildings and infrastructure of the community.

2. Recommended Mitigation Strategies

Key: CRP – Community and Resources Protection

PE – Public Education

IDC – Inter/Intra Departmental Coordination

DPR – Damage Prevention and Reduction

Project ID	Hazard	Project	Mitigation/ Response	Goal	Type of Mitigation Action	Estimated Cost	Existing/ New Structure
1	Transportation incident near sensitive environment	Implement safety improvements at the turn on NH Route 28 in South Wolfeboro at Weston's Auto Body.	M	CRP	Protect Emergency Services (long-term continuity)	\$10,000	E
2	Severe Winter Weather	Monitor and follow SOPs for ensuring severe winter weather does not compromise existing flat roofs on critical facilities.	M	DPR	Protect Emergency Services (long-term continuity)	Staff time	E
3	Drought	Educate the public on water conservation methods.	M	DPR PE	Public Education and Awareness	\$3,000/year	E
4	All Hazard	911 Mapping on Mobile Data Terminals interfaced with IMC software	M	IDC	Protect Emergency Services (long-term continuity)	Staff time	E/N
5	All Hazard	Implement an Asset Management system for tracking the condition and planning the maintenance of bridges and culverts.	M	DPR	Protect Emergency Services (long-term continuity)	\$18,000	E/N
6	Water Contamination	Work with NHDES and the Municipal Water Department on upgrading and implementing the town's policy for protecting its water supply.	M	CRP	Protect Emergency Services (long-term continuity)	50 hours of Staff time	E/N

Project ID	Hazard	Project	Mitigation/ Response	Goal	Type of Mitigation Action	Estimated Cost	Existing/ New Structure
7	High Winds	Implement a tree trimming policy for road right-of-way purposes and to eliminate hazards.	M	CRP	Property Protection	100 hours of Staff time	E/N
8	Flooding, Washout, Erosion	Upgrade drainage system along North Main Street from Lakeview to Mill Street due to the age of the system.	M	CRP	Protect Emergency Services (long-term continuity)	>\$1 million	E/N
9	Flooding, Washout, Erosion	Mitigate flooding issues on Center Street from Pickering Corner to Grove Street through ongoing annual maintenance on pump	M	CRP	Protect Emergency Services (long-term continuity)	< \$5,000	E/N
10	Flooding, Water Contamination	Conduct outreach to local businesses regarding floodproofing, especially those that may be storing hazardous materials. Outreach from EMD with DES guidelines for storage and containment.	M	PE CRP	Public Education and Awareness	50 hours Staff time	E/N
11	Severe Winter Weather	Ongoing hardening of Public Safety Facility	M	CRP	Protect Emergency Services (long-term continuity)	\$10,000	E
12	Flooding, Washout, Erosion	Ensure that roads on which there is new development meet town road standards.	M	CRP	Prevention	Staff time	N
13	All Hazard	Promote use of NH Alerts and notify residents of emergency preparedness steps and mitigation techniques that they can take to reduce the likelihood of loss of life or property (various methods of notification).	M	PE	Public Education and Awareness	\$500	E/N
14	All Hazard	Upgrade generator at Town Fueling Station to automatic.	M	CRP	Protect Emergency Services (long-term continuity)	<\$5,000	E

Project ID	Hazard	Project	Mitigation/ Response	Goal	Type of Mitigation Action	Estimated Cost	Existing/ New Structure
15	All Hazard	Upgrade generator at Town Fueling Station to automatic.	M	CRP	Protect Emergency Services (long-term continuity)	<\$5,000	E
16	All Hazard	Investigate the best town-wide alert system for Wolfeboro, such as Code Red or reverse 911.	R	IDC PE	Public Education and Awareness	Staff time	E/N
17	All Hazard	Continue regular departmental NIMS training.	R	IDC		Staff time	E/N
18	All Hazard	Create a "calling-tree" communication network to increase the efficiency of communicating emergency information between departments and town officials.	R	IDC		50 hours of Staff time	E/N
19	Flooding	Make FEMA floodplain maps available on town's website	M	PE	Public Education and Awareness	Staff time	E/N
20	Lightning	Regular maintenance of surge protection systems on critical electronic equipment	M	DPR	Protect Emergency Services (long-term continuity)	< \$500	E/N
21	All Hazard	Determine a process of coordinating and updating annual progress on mitigation actions	M	CRP	Prevention	Staff time	E
22	Severe Winter Weather	Work with private road associations on ensuring agreements in place for winter road maintenance	M	CRP	Public Education and Awareness	Staff time	E
23	Flooding	Drainage study to determine adequacy of culverts in Townsend Brook area	M	DPR	Prevention	Staff time	E/N
24	Flooding	Study improvements and recommend amendments to stormwater regulations	M	DPR	Prevention	Staff time	E/N

25	Infectious Diseases	Coordinate public outreach, utilizing social media and other methods, to raise awareness of vaccination programs, tick prevention, and other public health issues	M	PE	Prevention	Staff time	E/N
26	Water Contamination	Study and implement water supply security improvements near Upper Beech Pond Road	M	CRP	Prevention	\$10,000	E/N
27	Flooding	Map locations of beaver dams and develop SOP for regular inspection	M	DPR	Prevention	Staff time	E/N

These strategies were then prioritized as High, Medium or Low priority for implementation, but the time frame for when the actions are executed is dependent on staff time and budgetary limitations. The priority assigned to the mitigation actions takes into account the ranking of hazards in the Hazard Risk Assessment on page 11 (the higher the hazard risk, the more likely it was that the mitigation would be given a high priority). Another factor influencing the High, Medium, and Low rankings was the benefit of mitigation actions that apply to All Hazards. Most of the All Hazard mitigation actions were ranked as High priority. The STAPLEE Criteria (Social, Technical, Administrative, Political, Legal, Economic and Environmental) were utilized to guide the prioritization of mitigation actions in the 2012 Plan. Many of the mitigation actions in that Plan were deferred to this 2019 Plan, or are in progress and, rather than utilize STAPLEE again, the same priorities given these actions in 2012 were utilized. Factors discussed in implementation of mitigation actions (page 58) also contributed to prioritizing mitigation actions. The implementation schedule on page 58 indicates the estimated cost of implementation, potential funding sources, the parties responsible for bringing about these actions, and implementation time frame. Given its Hazard Risk Assessment and Recommended Mitigation Actions, the town's priorities have remained consistent with recommendations in the 2012 Plan.

The table below indicates the prioritization of the recommended mitigation actions.

3. Recommended Mitigation Actions by Hazard and in Ranked Order

Hazard	Project	Mitigation/ Response	Type of Mitigation Action	Estimated Cost	Existing/ New Structure	Priority
Transportation incident near sensitive environment	Implement safety improvements at the turn on NH Route 28 in South Wolfeboro at Weston's Auto Body.	M	Protect Emergency Services (long-term continuity)	\$10,000	E	H
Severe Winter Weather	Monitor and follow SOPs for ensuring severe winter weather does not compromise existing flat roofs on critical facilities.	M	Protect Emergency Services (long-term continuity)	Staff	E	H
All Hazard	911 Mapping on Mobile Data Terminals interfaced with IMC software	M	Protect Emergency Services (long-term continuity)	\$500	E/N	H
Water Contamin ation	Work with NHDES and the Municipal Water Department on upgrading and implementing the town's policy for protecting its water supply.	M	Protect Emergency Services (long-term continuity)	50 hours of Staff time	E/N	H

Hazard	Project	Mitigation/ Response	Type of Mitigation Action	Estimated Cost	Existing/ New Structure	Priority
High Winds	Implement a tree trimming policy for road right-of-way purposes and to eliminate hazards.	M	Property Protection	100 hours of Staff time	E/N	H
Severe Winter Weather	Ongoing hardening of Public Safety Facility	M	Protect Emergency Services (long-term continuity)	\$10,000	E	H
All Hazard	Promote use of NH Alerts and notify residents of emergency preparedness steps and mitigation techniques that they can take to reduce the likelihood of loss of life or property (various methods of notification).	M	Public Education and Awareness	\$500	E/N	H
All Hazard	Investigate the best town-wide alert system for Wolfeboro, such as Code Red or reverse 911.	R	Public Education and Awareness	Staff time	E/N	H
All Hazard	Create a "calling-tree" communication network to increase the efficiency of communicating emergency information between departments and town officials.	R		50 hours of Staff time	E/N	H
Flooding	Drainage study to determine adequacy of culverts in Townsend Brook area	M	Prevention	20 hours of Staff time	E/N	H
Flooding	Study improvements and recommend amendments to stormwater regulations	M	Prevention	Staff time	E/N	H

Hazard	Project	Mitigation/ Response	Type of Mitigation Action	Estimated Cost	Existing/ New Structure	Priority
Water Contamination	Study and implement water supply security improvements near Upper Beech Pond Road	M	Prevention	\$10,000	E/N	H
All Hazard	Implement an Asset Management system for tracking the condition and planning the maintenance of bridges and culverts.	M	Protect Emergency Services (long-term continuity)	\$18,000	E/N	M
Flooding, Washout, Erosion	Upgrade the drainage system on Beech Pond Road from Boucher Hill to Nelson Hill. This is a 2,000' gravel section between two paved hills. Need to upgrade drainage and pave.	M	Control the hazard (Structural Projects)	\$220,000	E/N	M
Flooding, Washout, Erosion	Upgrade drainage system along North Main Street from Lakeview to Mill Street due to the age of the system.	M	Protect Emergency Services (long-term continuity)	>\$1 million	E/N	M
Flooding, Water Contamination	Conduct outreach to local businesses regarding floodproofing, especially those that may be storing hazardous materials. Outreach from EMD with DES guidelines for storage and containment.	M	Public Education and Awareness	50 hours Staff time	E/N	M
All Hazard	Upgrade generator at Town Fueling Station to automatic.	M	Protect Emergency Services (long-term continuity)	<\$5,000	E	M
All Hazard	Continue regular departmental NIMS training.	R		Staff time	E/N	M
Lightning	Regular maintenance of surge protection systems on critical electronic equipment	M	Protect Emergency Services (long-term continuity)	< \$500	E/N	M
All Hazard	Determine a process of coordinating and updating annual progress on mitigation actions	M	Prevention	Staff time	E	M

Hazard	Project	Mitigation/ Response	Type of Mitigation Action	Estimated Cost	Existing/ New Structure	Priority
Severe Winter Weather	Work with private road associations on ensuring agreements in place for winter road maintenance	M	Public Education and Awareness	\$0 Staff time	E	M
Drought	Educate the public on water conservation methods.	M	Public Education and Awareness	\$3,000/year	E	L
Flooding, Washout, Erosion	Mitigate flooding issues on Center Street from Pickering Corner to Grove Street through ongoing annual maintenance on pump	M	Protect Emergency Services (long-term continuity)	> \$5,000	E/N	L
Flooding, Washout, Erosion	Ensure that roads on which there is new development meet town road standards.	M	Prevention	Staff time	N	L
Flooding	Make FEMA floodplain maps available on town's website	M	Public Education and Awareness	Staff time	E/N	L
Flooding	Map locations of beaver dams and develop SOP for regular inspection	M	Prevention	Staff time	E/N	L

Cost to Benefit Review

The Wolfeboro HMP Committee considered 27 Action items. Those actions that cost the least amount or impart the highest benefit to the residents are not always the first Actions to be implemented. This simple benefit-to-cost review evaluates the Actions in a somewhat different manner and should also be considered by the town when working to complete the various recommended Actions.

\$10,000 or less

Twenty-four mitigation actions are estimated to cost less than \$10,000. Many of the \$0 Actions account for labor and in-kind costs to the respective town departments and utilize existing equipment. Minor costs may be incurred for copying, public notices, or legal review because these Actions are performed by volunteers such as the Planning Board or by paid staff as part of their regular duties. Where possible, committee members estimated the number of hours required to complete the job.

The highest benefit for each Action item is dependent upon the chances of a hazard event occurring, the type of hazard, and its severity. However, the following may provide the best cost to benefit relationship.

- ❖ Promote use of NH Alerts and notify residents of emergency preparedness steps that they can take to reduce the likelihood of loss of life or property (various methods of notification).
- ❖ 911 Mapping on Mobile Data Terminals interfaced with IMC software
- ❖ Investigate the best town-wide alert system for Wolfeboro, such as Code Red or reverse 911.

\$10,001 to \$50,000

One mitigation action is estimated to cost between \$10,001 and \$50,000. The highest benefit for the cost again depends upon the chances of a hazard event occurring, the type of hazard, and its severity. The potential loss of life and property are very difficult to predict or quantify. However, the following may provide the best benefit to cost relationship within the medium cost category based on their capability to positively impact a large number of people.

- ❖ Implement an Asset Management system for tracking the condition and planning the maintenance of bridges and culverts

Over \$50,000

Two mitigation actions are estimated to cost more than \$50,000. Most of these projects are Capital Improvement projects and address the town's infrastructure. The highest benefit is difficult to anticipate; however, the following may provide the best benefit to cost relationship within this highest cost category based on their capability to positively affect a large number of people.

- ❖ Upgrade the drainage system on Beech Pond Road from Boucher Hill to Nelson Hill. This is a 2,000' gravel section between two paved hills. Need to upgrade drainage and pave.
- ❖ Upgrade drainage system along North Main Street from Lakeview to Mill Street due to the age of the system.

D. IMPLEMENTATION OF MITIGATION ACTIONS

There are many factors that influence how a town chooses to spend its energy and resources in implementing recommended actions. Factors include:

- Urgency
- How quickly an action could be implemented
- Likelihood that the action will reduce future emergencies
- Regulations required to implement the action
- Administrative burdens
- Time (both paid and volunteer)
- Funding availability
- Political acceptability of the action.

In the context of these factors, the Committee discussed the mitigation actions and their relative level of priority, recognizing that some actions are of greater priority to different town departments. This implementation schedule contains a matrix indicating the implementation time frame, parties responsible for bringing about these actions, and potential funding sources. Though a number of recommended mitigation actions are high priorities, the time frame for which the actions are executed is dependent on budgetary limitations and staff time.

These are listed in order of their Time Frame. To keep the plan current, the implementation schedule should be updated and re-evaluated on a regular basis as outlined in the monitoring section of this plan.

All actions taken by the town shall comply with federal, state, and local standards.

Implementation Schedule for Mitigation Actions

Time	Action	Responsible Party	Estimated Cost	Potential Funding	Hazard	Type of Mitigation Action	Status/Notes
2020, '22, '24	Implement safety improvements at the turn on NH Route 28 in South Wolfeboro at Weston's Auto Body.	DPW, BoS, Town Manager	\$10,000	Budget, NH DOT	Transportation incident near sensitive environment	Protect Emergency Services (long-term continuity)	Route 28 Improvements project included in NH Ten Year Transportation Improvements Plan
2020, '21, '22, '23, '24	Monitor and follow SOPs for ensuring severe winter weather does not compromise existing flat roofs on critical facilities.	DPW, EMD	Staff time	n/a	Severe Winter Weather	Protect Emergency Services (long-term continuity)	
2021	911 Mapping on Mobile Data Terminals interfaced with IMC software	BoS, Town Manager	\$500	n/a	All Hazard	Protect Emergency Services (long-term continuity)	
2020	Work with NHDES and the Municipal Water Department on upgrading and implementing the town's policy for protecting its water supply.	DPW	50 hours of Staff time	n/a	Water Contamination	Protect Emergency Services (long-term continuity)	Cross Road is in the permitting stage
2020, '21, '22, '23, '24	Implement a tree trimming policy for road right-of-way purposes and to eliminate hazards.	DPW	100 hours of staff time	Budget	High Winds	Property Protection	Policy development has been completed
2020, '21, '22, '23, '24	Ongoing hardening of Public Safety Facility	DPW	\$10,000	Budget, HMPG	All Hazard	Protect Emergency Services (long-term continuity)	
2020, '21, '22, '23, '24	Promote use of NH Alerts and notify residents of emergency preparedness steps that they can take to reduce the likelihood of loss of life or property (various methods of notification).	EMD	\$500	Budget	All Hazard	Public Education and Awareness	

Time	Action	Responsible Party	Estimated Cost	Potential Funding	Hazard	Type of Mitigation Action	Status/Notes
2020	Investigate the best town-wide alert system for Wolfeboro, such as Code Red or reverse 911.	EMD, Town Manager	\$0 - Staff	n/a	All Hazard	Public Education and Awareness	
2020	Create a "calling-tree" communication network to increase the efficiency of communicating emergency information between departments and town officials.	EMD, Town Manager	50 hours of Staff time	n/a	All Hazard	Prevention	
2021	Drainage study to determine adequacy of culverts in Townsend Brook area	DPW	20 hours of Staff time	n/a	Flooding	Prevention	
2020	Study improvements and recommend amendments to stormwater regulations	Planner, Planning Board	20 hours of Staff time	n/a	Flooding	Prevention	
2020	Coordinate public outreach, utilizing social media and other methods, to raise awareness of vaccination programs, tick prevention, and other public health issues	DPW	Staff time	n/a	Infectious Diseases	Public Education and Awareness	
2021, '22	Study and implement water supply security improvements near Upper Beech Pond Road	EMD	\$10,000	Budget	Water Contamination	Prevention	
2021	Implement an Asset Management system for tracking the condition and planning the maintenance of bridges and culverts	DPW	\$18,000	T2	All Hazard	Protect Emergency Services (Long-term continuity)	
2022	Upgrade the drainage system on Beech Pond Road from Boucher Hill to Nelson Hill. This is a 2,000' gravel section between two paved hills. Need to upgrade drainage and pave	DPW	\$220,000	Budget, HMPG	Flooding, Washout, Erosion	Control the hazard (structural projects)	Highly erodible gravel hill. It could be used as a cut through in emergency situations
2024	Upgrade drainage system along North Main Street from Lakeview to Mill Street due to the age of the system.	DPW	> \$1 million	Budget, HMPG, NH DOT	Flooding, Washout, Erosion	Protect Emergency Services (Long-term continuity)	State Highway
2020, '21, '22, '23, '24	Conduct outreach to local businesses regarding floodproofing, especially those that may be storing hazardous materials. Outreach from EMD with DES guidelines for storage and containment.	EMD	50 hours Staff Time	n/a	Flooding, Water Contamination	Public Education and Awareness	Post on website and use Chamber of Commerce

Time	Action	Responsible Party	Estimated Cost	Potential Funding	Hazard	Type of Mitigation Action	Status/Notes
2022	Upgrade generator at Town Fueling Station to automatic.	DPW	<\$5,000	Vehicle Fund, HMPG	All Hazard	Protect Emergency Services (long-term continuity)	
2020, '21, '22, '23, '24	Continue regular departmental NIMS training.	EMD - Town Mgr., Huggins, CCC Public Health	\$0 Staff time	n/a	All Hazard	Protect Emergency Services (long-term continuity)	Staffing and training capacity have been issues. CCC Public Health and Huggins Hospital may be able to provide assistance.
2020, '21, '22, '23, '24	Regular maintenance of surge protection systems on critical electronic equipment	EMD	<\$500	Budget	Lightning	Protect Emergency Services (long-term continuity)	
2020	Determine a process of coordinating and updating annual progress on mitigation actions	BoS, Town Manager, EMD	Staff time	n/a	All Hazards	Prevention	
2020, '21, '22, '23, '24	Work with private road associations on ensuring agreements in place for winter road maintenance	Town Manager, DPW	Staff time	n/a	Severe Winter Weather	Public Education and Awareness	
2020, '21, '22, '23, '24	Educate the public on water conservation methods.	DPW	\$3,000/yr	Budget.	Drought	Public Education and Awareness	
2020, '21, '22, '23, '24	Mitigate flooding issues on Center Street from Pickering Corner to Grove Street through ongoing annual maintenance on pump	DPW	< \$5,000	Budget	Flooding, Washout, Erosion	Prevention	
2020, '21, '22, '23, '24	Ensure that roads on which there is new development meet town road standards.	CEO, Planner	Staff time	n/a	Flooding, Washout, Erosion	Protect Emergency Services (long-term continuity)	
2020	Make FEMA floodplain maps available on town's website	Town Manager, Planner	Staff time	n/a	Flooding	Public Education and Awareness	
2022	Map locations of beaver dams and develop SOP for regular inspection	DPW, Planner	Staff time	n/a	Flooding	Prevention	

CHAPTER VI: PLAN ADOPTION AND MONITORING

A. IMPLEMENTATION

The Wolfeboro Hazard Mitigation Plan Update Committee, established by the EMD and Board of Selectmen, will meet regularly to review the Plan and provide a mechanism for ensuring that an attempt is made to incorporate the actions identified in the plan into ongoing town planning activities. Essential elements of implementation require that all responsible parties for the various recommendations understand what is expected of them, and that they are willing to fulfill their role in implementation. It is therefore important to have the responsible parties clearly identified when the town adopts the final plan. Where appropriate it would be helpful to have any hazard mitigation activities identified in job descriptions.

NH RSA 674:2(e) enables inclusion of a natural hazard section in the town master plan. Inclusion of this document as an addendum to the Wolfeboro Master Plan, following the process set forth in RSA 675:6, provides an opportunity for issues addressed in this plan to be taken into consideration when planning for development within the community.

A Capital Reserve Fund for Hazard Mitigation projects may be established to set aside funding for the projects identified in the Hazard Mitigation Plan. The Hazard Mitigation Committee will work to with the Selectmen and Capital Improvements Plan (CIP) Committee to incorporate the various projects into subsequent budgets.

If mitigation actions involve either revisions to subdivision or site plan review regulations, or other development standards, the Hazard Mitigation Committee will work with the Planning Board to develop appropriate language.

When appropriate, an effort will be made to incorporate this plan into other town plans and policies. With this Plan, an intentional effort was made to reflect priorities established in the Emergency Operations Plan, updated in 2018. Also, policies and priorities established in the 2013 Plan have been incorporated into planning and zoning actions, such as stormwater management regulations. Within a year after the town officially adopts the 2019 update to the Hazard Mitigation Plan, an attempt will be made to have hazard mitigation strategies integrated into these existing mechanisms and into all other ongoing town planning activities.

B. PLAN MAINTENANCE & PUBLIC INVOLVEMENT

The Wolfeboro Hazard Mitigation Planning Committee and the Selectboard, in order to track progress and update the mitigation strategies identified in Chapter V, will review the Wolfeboro Hazard Mitigation Plan annually or after a hazard event. Town of Wolfeboro Emergency Management Director is responsible for initiating this review and will consult with members of the Wolfeboro Committee identified in this Plan. Changes will be made to the Plan to accommodate projects that have failed, are no longer consistent with the timeframe identified, are no longer consistent with the community's priorities, or lack funding resources. Priorities that were not ranked high, but identified as potential mitigation strategies, will be reviewed during the monitoring and update of this Plan to determine feasibility of future implementation. The public will be asked to comment on the Plan, and comments will be included in relevant sections.

The Emergency Management Director is also responsible for updating and resubmitting the plan to FEMA to be re-approved every five years. The EMD will convene a plan update committee in mid-2024 to begin updating this plan before it expires.

On behalf of the Hazard Mitigation Committee, the Emergency Management Director, under direction of the Selectboard, will be responsible for ensuring that town's departments and the public have adequate opportunity to participate in the planning process during the Plan's annual review and during any Hazard Mitigation Committee meetings. Administrative staff may be utilized to assist with the public involvement process.

For each committee meeting, and the annual update process, techniques that will be utilized for public involvement include:

- ❖ Provide invitations to Budget Committee members;
- ❖ Provide invitations to municipal department heads;
- ❖ Post notices of meetings at the Town Hall, Fire Station, Library, and on the town website;
- ❖ Submit press releases for publication in the Granite State News and other appropriate newspapers or media outlets.

Entities to invite to future Hazard Mitigation plan updates include the Emergency Management Directors of the neighboring communities of Tuftonboro, Ossipee, Brookfield, New Durham, and Alton.

C. SIGNED CERTIFICATE OF ADOPTION**Certificate of Adoption – Town of Wolfeboro
A resolution adopting the Wolfeboro Hazard Mitigation Plan Update 2019**

Plan dated: 2019

Conditionally approved: _____

WHEREAS, the town of Wolfeboro received funding from the NH Office of Homeland Security and Emergency Management under a Pre-Disaster Mitigation Grant and assistance from the Lakes Region Planning Commission for the preparation of the Wolfeboro Hazard Mitigation Plan Update 2019; and

WHEREAS, several public planning meetings were held between November 2018 and May 2019 regarding the development and review of the Wolfeboro Hazard Mitigation Plan Update 2019; and

WHEREAS, the Wolfeboro Hazard Mitigation Plan Update 2019 contains several potential future projects to mitigate hazard damage in the town of Wolfeboro and,

WHEREAS, a duly noticed public meeting was held by the Selectmen on _____ 2019 to formally approve and adopt the Wolfeboro Hazard Mitigation Plan Update 2019.

NOW, THEREFORE BE IT RESOLVED that the Wolfeboro Board of Selectmen adopts the Wolfeboro Hazard Mitigation Plan Update 2019.

ADOPTED AND SIGNED this day of _____ 2019.

WOLFEBORO BOARD OF SELECTMEN_____
David A. Senecal, Chairman_____
Linda T. Murray, Selectman_____
Brad Harriman, Vice-Chairman_____
Q. David Bowers, Selectman_____
Paul O'Brien, Selectman

Town Seal or Notary

Date: _____

APPENDIX A: TECHNICAL RESOURCES

NH Homeland Security and Emergency Management	271-2231
http://www.nh.gov/safety/divisions/HSEM/	
Hazard Mitigation Section.....	271-2231
http://www.nh.gov/safety/divisions/HSEM/HazardMitigation/index.html	
Federal Emergency Management Agency	(617) 223-4175
http://www.fema.gov/	
FEMA, National Flood Insurance Program, Community Status Book	
http://www.fema.gov/fema/csb.htm	
NH Regional Planning Commissions:	
Central NH Regional Planning Commission.....	796-2129
http://www.cnhrpc.org/	
Lakes Region Regional Planning Commission.....	279-8171
http://www.lakesrpc.org/	
Nashua Regional Planning Commission	883-0366
http://www.nashuarpc.org/	
North Country Council.....	444-6303
http://www.nccouncil.org/	
Rockingham Regional Planning Commission	778-0885
http://www.rpc-nh.org/	
Southern New Hampshire Regional Planning Commission.....	669-4664
http://www.snhpc.org/	
Southwest Regional Planning Commission	357-0557
http://www.swrpc.org/	
Strafford Regional Planning Commission.....	742-2523
http://www.trafford.org/	
Upper Valley Lake Sunapee Regional Planning Commission.....	448-1680
http://www.uvlsrpc.org/	
NH Governor's Office of Energy and Planning	271-2155
http://www.nh.gov/oep/index.htm	
NH Department of Transportation	271-3734
http://www.nh.gov/dot/index.htm	
NH Department of Cultural Affairs	271-2540
http://www.nh.gov/nhculture/	
Division of Historical Resources	271-3483
http://www.nh.gov/nhdhr/	
NH Department of Environmental Services	271-3503
http://www.des.state.nh.us/	
Air Resources.....	271-1370
http://www.des.state.nh.us/ard_intro.htm	
Waste Management.....	271-2900
http://www.des.state.nh.us/waste_intro.htm	
Water Division.....	271-3406
http://www.des.state.nh.us/water_intro.htm	

Pollution Prevention Division	271-6460
http://www.des.state.nh.us/nhppp/	
NH Municipal Association	224-7447
http://www.nhmunicipal.org/LGCWebsite/index.asp	
NH Fish and Game Department	271-3421
http://www.wildlife.state.nh.us/	
NH Department of Resources and Economic Development	271-2411
http://www.dred.state.nh.us/	
Natural Heritage Inventory	271-3623
http://www.dred.state.nh.us/divisions/forestandlands/bureaus/naturalheritage/aboutus.htm	
Division of Forests and Lands.....	271-2214
http://www.dred.state.nh.us/divisions/forestandlands/index.htm	
Division of Parks and Recreation.....	271-3255
http://www.nhparks.state.nh.us/	
NH Department of Health and Human Services	271-8835
http://www.dhhs.nh.gov/DHHS/DHHS_SITE/default.htm	
Greater Plymouth Public Health Network Coordinator:	
Ann Graves.....	536-1120
http://www.dhhs.state.nh.us/DHHS/CDCS/LIBRARY/Fact+Sheet/PPCC-AHR-Map.htm	
Northeast States Emergency Consortium, Inc. (NESEC)	(781) 224-9876
http://www.nesec.org/	
US Department of Commerce	(202) 482-2000
http://www.commerce.gov/	
National Oceanic and Atmospheric Administration	(202) 482-6090
http://www.noaa.gov/	
National Weather Service, Eastern Region Headquarters	
http://www.erh.noaa.gov/	
National Weather Service, Tauton, Massachusetts	(508) 824-5116
http://www.erh.noaa.gov/er/box/	
National Weather Service, Gray, Maine.....	(207) 688-3216
http://www.erh.noaa.gov/er/gyx/	
US Department of the Interior	
http://www.doi.gov/	
US Fish and Wildlife Service.....	225-1411
http://www.fws.gov/	
US Geological Survey.....	225-4681
http://www.usgs.gov/	
US Geological Survey Real Time Hydrologic Data	
http://waterdata.usgs.gov/nwis/rt	
US Army Corps of Engineers	(978) 318-8087
http://www.usace.army.mil/	
US Department of Agriculture	
http://www.usda.gov/wps/portal/usdahome	
US Forest Service.....	(202) 205-8333
http://www.fs.fed.us/	

Public Service of New Hampshire	436-7708
http://www.psnh.com/	
Cold Region Research Laboratory	646-4187
http://www.crrel.usace.army.mil/	
National Emergency Management Association	(859) 244-8000
http://nemaweb.org	
National Aeronautics and Space Administration	
http://www.nasa.gov/	
NASA – Goddard Space Flight Center “Disaster Finder”	
http://disasterfinder.gsfc.nasa.gov/	
NASA Optical Transient Detector	
http://thunder.msfc.nasa.gov/	
Dartmouth Flood Observatory	
http://www.dartmouth.edu/artsci/geog/floods/	
National Lightning Safety Institute	
http://lightningsafety.com/	
The Tornado Project Online	
http://www.tornadoproject.com/	
National Severe Storms Laboratory	
http://www.oar.noaa.gov/atmosphere/atmos_nssl.html	
Plymouth State University Weather Center	
http://vortex.plymouth.edu/	

APPENDIX B: MITIGATION FUNDING RESOURCES

There are numerous potential sources of funding to assist with the implementation of mitigation efforts. Two lists of state and federal resources are provided below. Some of these may not apply or be appropriate for Effingham. The NH Homeland Security and Emergency Management Field Representative for Carroll County can provide some assistance.

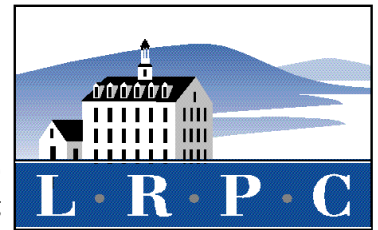
404 Hazard Mitigation Grant Program (HMGP)	NH Homeland Security and Emergency Management
406 Public Assistance and Hazard Mitigation.....	NH Homeland Security and Emergency Management
Community Development Block Grant (CDBG).....	NH HSEM, NH OEP, also refer to RPC
Dam Safety Program	NH Department of Environmental Services
Emergency Watershed Protection (EWP) Program	USDA, Natural Resources Conservation Service
Flood Mitigation Assistance Program (FMA).....	NH Homeland Security and Emergency Management
Highway Safety Improvement Program.....	NH Department of Transportation
Pre-Disaster Mitigation Assistance Planning (PDM).....	NH Homeland Security and Emergency Management
Mutual Aid for Public Works.....	NH Municipal Association
National Flood Insurance Program (NFIP)	NH Office of Energy & Planning
Project Impact.....	NH Homeland Security and Emergency Management
Roadway Repair & Maintenance Program(s)	NH Department of Transportation
Shoreline Protection Program	NH Department of Environmental Services
Various Forest and Lands Program(s).....	NH Department of Resources & Economic Development
Wetlands Programs.....	NH Department of Environmental Services
State Aid Bridge Program for Communities	NH Department of Transportation
Contribution to Damage Losses (RSA 235:34).....	NH Department of Transportation

APPENDIX C: SAMPLE MEETING NOTICE

LAKES REGION PLANNING COMMISSION

April 19, 2019

103 Main Street, Suite #3
Meredith, NH 03253
tel (603) 279-8171
fax (603) 279-0200
www.lakesrpc.org



For Immediate Release

Contact: Susan Slack, 279-5337, sslack@lakesrpc.org

Wolfeboro Hazard Mitigation Plan Committee to Meet

The Wolfeboro Hazard Mitigation Plan Committee is updating the town's 2012 Hazard Mitigation Plan and will meet on Friday, April 19, 2019 at the Lodge at Abenaki Ski Area, 390 Pine Hill Road in Wolfeboro from 10 am to noon.

Residents of Wolfeboro and representatives from neighboring towns are encouraged to attend and provide input.

The committee is represented by a variety of local interests including representatives from the Fire, Police, Public Works, and Planning departments, along with members of the Planning Board and Board of Selectmen.

The group will focus on assessing hazard risks, such as winter storms and flooding, and recommending actions to mitigate hazards to protect the safety and well-being of town residents and visitors.

With the update to the Hazard Mitigation Plan, town leaders will be able to evaluate the status of current plans, policies, and actions and then develop and prioritize actions to reduce the impacts of these and other hazards. Community leaders want the town to be a disaster resistant community and believe that updating the Hazard Mitigation Plan will bring Wolfeboro a step closer to that goal.

For more information please call Fire and Rescue Chief James Pineo, Wolfeboro's Emergency Management Director, at 569-1400 or Susan Slack, Principal Planner, Lakes Region Planning Commission at 279-5337.

APPENDIX D: SAMPLE AGENDA

Wolfeboro Hazard Mitigation Plan Update Committee

March 15, 2019 10 AM - 12 PM
Lodge at Abenaki Ski Area
390 Pine Hill Road, Wolfeboro, NH



FEMA

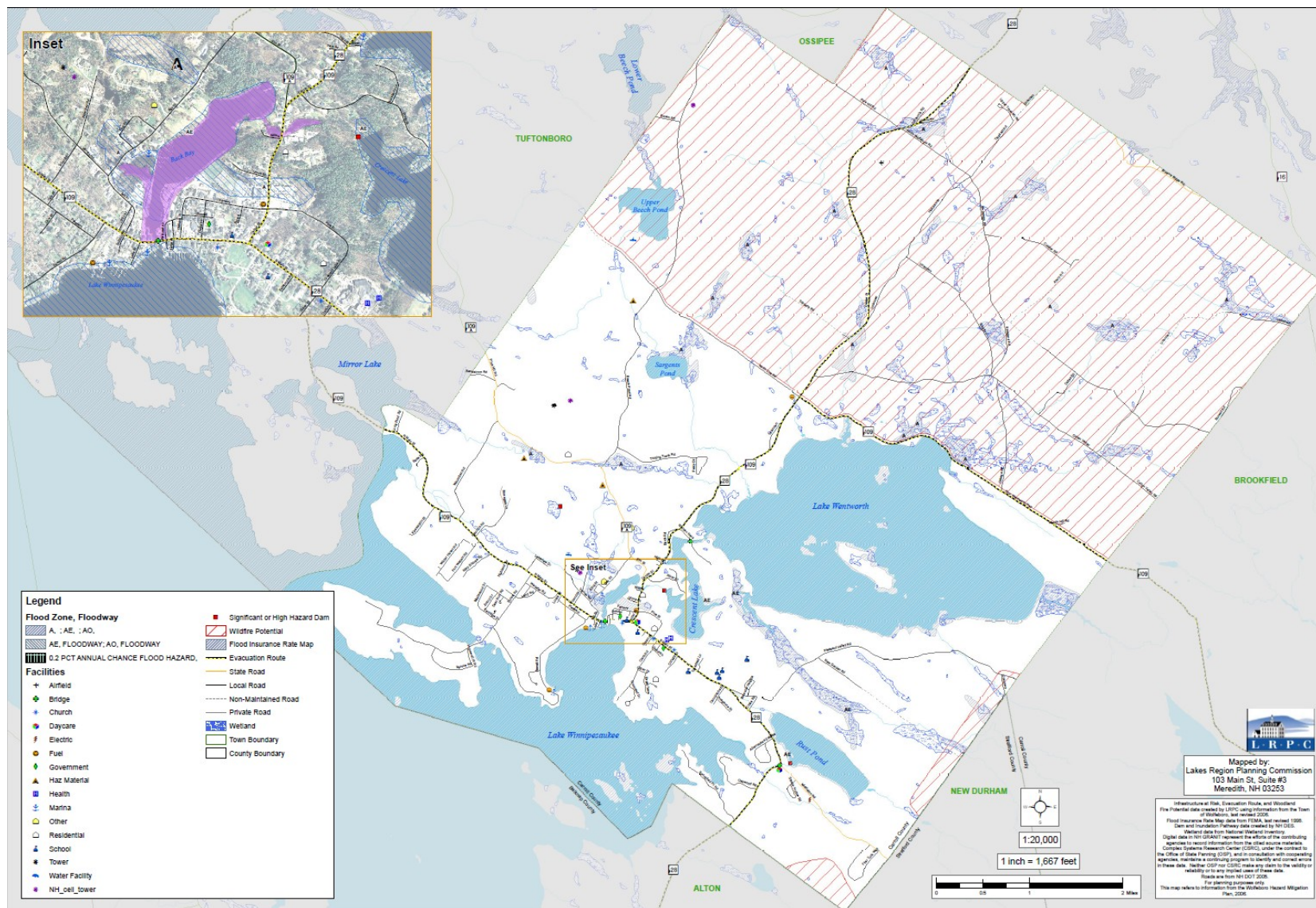


AGENDA

The focus of this process is **mitigation**, which is action taken to reduce or eliminate long-term risk to hazards. **Mitigation is different from preparedness**, which is action taken to improve emergency response or operational preparedness.

1. Introductions
2. Tracking time
3. Hazard Risk Assessment (p. 8 of 2012 Plan)
 - a. Compare with Risk Scoring from Emergency Operations Plan
 - b. Notable hazards/events since 2012 Plan
 - c. Compare to 2018 State Hazard Mitigation Plan list of natural hazards
 - d. Potential hazards not included in 2012 Plan
 - e. List hazards, rank low, moderate, etc. (p. 27-28 of 2012 Plan)
4. Mitigation Actions
 - a. P. 44-47, p. 48-54, p. 55-58
5. Critical Facilities
 - a. Table XII – Critical Facilities list – check most recent changes
 - b. Assessed values of Critical Facilities – check most recent changes– **Cathleen LaPierre**
 - c. Updated Map – Locations to add to map – **Matt Sullivan**
6. Next Meeting – April 5, 2019
7. Public Input

APPENDIX E: CRITICAL FACILITIES & POTENTIAL HAZARDS MAP



Wolfeboro Critical Facilities

APPENDIX F: CRITICAL FACILITIES ASSESSMENT
Wolfeboro, NH Critical Facilities

Facility/Infrastructure	Location	Owner	Assessed Value	Tax Map #	Generator
Essential Services					
Public Safety Complex	251 S Main St	Town	\$1,029,100	231-57	Yes
Town Hall and Annex	84 Main St/9 Union St	Town	\$1,253,500	218-144	Yes
Highway Department	43 Pine Hill Road	Town	\$642,200	190-30	Partial
Water Treatment Plant	51 North Line Rd	Town	\$2,721,100	52-1	Yes
Wastewater Treatment Plant	46 Filter Bed Rd	Town	\$3,066,100	189-8	Yes
Municipal Electric Department	133 Middleton Rd	Town	\$245,500	268-16	Yes
Huggins Hospital & Medical Arts/EOC	240 S Main St	Private	\$30,425,600	231-90	Yes
Electric Substation #1	46 Filter Bed Rd	Town	\$2,991,100	189-8	No
Electric Substation #2	46 Filter Bed Rd	Town	\$2,991,100	189-8	No
New England Telephone Substation	43 Glendon St	Private	\$421,900	217-62	
Cellular Phone Tower (Central Dispatch Repeater) Bennett Hill	on Bennett Hill	Private	\$362,300	129-001-TWR	Yes
Water Storage	16 McManus Rd		\$442,000	244-63	No
Structures and Services					
Cellular Phone Tower - Lehner St	Lehner St	Private	\$105,000	217-70-TWR	Yes
Cellular Phone Tower - Pierce Camp Birchmont	Pierce Camp Gov Wentworth Hwy	Private	\$336,400	196-6-TWR	Yes
Cellular Phone Tower - Water Tower	16 McManus Rd		\$204,700	244-63-TWR	Yes
Huggins Hospital Communications Antenna	240 S Main St		\$30,425,600		
Crescent Lake Dam	River Street	Town			
Rust Pond Dam	642 S Main St	Private	\$5,015	260-73	
Sewage Lagoon Dam	46 Filter Bed Rd	Town	\$2,991,000	189-8	

NH Route 28 (Evacuation)	1031 Center St	State			
NH Route 109 (Evacuation)		State			
WASR Tower	73 Varney St	Private	\$176,400	203-3	
Rapid Infiltration Basin (RIB)	109 A	Town	\$34,700	96-13	No
Solid Waste Facility	400 Beech Pond Rd	Town	\$218,500	82-19	No
LR Hazardous Household Hazardous Product Facility	404 Beech Pond Rd	Town	\$187,900	82-20	No
Pop Whalen/Abenaki Ski Area	390 Pine Hill Rd	Town	\$1,691,900	144-6	No
Penn Air Air Strip	Penn Air Rd	Private	\$755,500		
Emergency Shelters					
Sleeping Shelter					
Kingswood Arts Center - Primary	396 South Main St	GWRSD	\$55,435,300	244-64	Yes
Brewster Academy Complex	80 Academy Dr	PVT	\$997,900	218-150-T	Partial (Main Campus)
Pet Shelter					
Kingswood School Complex Greenhouse	396 South Main St	GWRSD	\$55,435,300		
Warming and Cooling Shelters					
Kingswood Middle School, High School and Tech Center	396 South Main St	GWRSD	\$55,435,300		
All Saints Episcopal Church	258 S Main St	PVT	\$1,743,400	231-87	No
First Congregational Church	115 S Main St	PVT	\$2,087,400	218-149	No
First Christian Church	83 N Main St	PVT	\$443,300	217-10	No
Warming Only Shelters					
Carpenter School	102 S Main St	GWRSD	\$3,414,800	218-142	No
Crescent Lake School	75 McManus Rd	GWRSD	\$55,435,300	244-64	No

Facility/Infrastructure	Location	Owner	Assessed Value	Tax Map #	Generator
Special Populations					
Christian Ridge	20 Crescent Lake Ave		\$1,610,800	218-78	

Sugar Hill Retirement Community	83 Rolling Wood Dr		\$9,527,100	145-20	
Genesis (Wolfeboro Bay Care & Rehabilitation)	39 Clipper Rd		\$3,238,600	231-26	Yes
Taylor Community	11 Taylor Dr		\$4,088,500	203-47	
The Ledges	67 Center St		\$2,569,500	204-49	
Wolfeboro Area Children's Center	180 S Main St		\$1,193,000	218-89	Yes
Wolfeboro Nursery School (at All Saints Church)	258 S Main St			231-87	
Pierce Camp Birchmont	693 Governor Wentworth Hwy		\$4,364,500	182-10	
Camp Bernadette	83 Richards Rd		\$2,331,800	220-19	
Wolfeboro Camp School	93 Camp School Rd		\$5,957,800	253-7-A	Yes
Fuel Locations					
Town Pumps	47 Pine Hill Road				
7-Eleven (back up)	670 Center Street				
Lake Access					
Mast Landing	3 Silver Street		\$203,000	190-108	
Dock at the Libby Museum	755 N. Main St		\$1,108,800	142-2	
Town docks - Dockside Facility	32 Central Ave	Town	\$1,834,500	217-94	
Town docks - Railroad Ave Facility	Railroad Ave				
Potential Hazard Locations					
Sawmill Boat Club	33-35 Bay St		Non Taxable	203-68	
Fuel Stations					
Goodhue & Hawkins Navy Yard	244 Sewall Rd		\$2,144,200	241-36	
Wolfeboro Corinthian Yacht Club/Irwin Marine	12 Corinthian's Way		\$2,780,500	217-125	
Wolfeboro Oil (heating oil)	Wickers Drive		\$659,000	161-016-001	
Wolfeboro Oil (diesel fuel)	Lehner Street		\$310,900	218-013	
Wolfeboro Oil (propane)	Wickers Drive		\$659,000	161-016-001	
Dive Winnepesaukee	4 N. Main St.				

APPENDIX G: Past Hazard Events in the Wolfeboro Area

Hazard	Date	Location	Remarks/Description	Source
Snowstorm	2/8-/10/2013	Statewide	Total Public Assistance Grants Dollars obligated was \$6,153,471.49. Snowfall amounts were generally 18". Declared Disaster, DR-4105.	FEMA
Snowstorm	1/26-1/28/2015	Statewide	Snowfall across the state ranged from 10 to 30 inches. Blizzard conditions led to coastal flooding and splash over. Total Public Assistance Grants Dollars obligated was \$4,939,214.76. Declared Disaster, DR 4209.	FEMA
Snowstorm	3/14-3/15/2017	Statewide	Primary impact was damage to utilities. Two counties received public assistance totaling \$1,687,439.45. Declared Disaster, DR-4316.	FEMA
Blizzard	3/13-3/14/2018	Statewide	Declared Disaster, DR-4371	HSEM

Hazard	Date	Location	Remarks/Description	Source
Flood	6/26-7/3/2013	Grafton, Sullivan, Cheshire	The total Public Assistance was \$5,903,017.87. Declared Disaster, DR-4139	FEMA
Flood	7/1-7/2/2017	Coos, Grafton	The total Public Assistance \$699,661.26. Flood stages ranged from 9.00ft to 13.00ft. Declared Disaster, DR-4329.	FEMA
Flood	10/29 - 11/1/2017	Coos, Grafton, Carroll, Belknap, Merrimack, Sullivan	The total Public Assistance was \$365,851.11. Flood stages ranged from 8.00ft to 13.00ft. Declared Disaster, DR-4355.	FEMA, NOAA
Flood	3/2-3/8/2018	Rockingham	Declared Disaster, DR-4370.	HSEM

Past Hazard Events in the Wolfeboro Area from 2013 Hazard Mitigation Plan

Hazard	Date	Location	Remarks/Description	Source
Aircraft Crash	August 31, 1989	Wolfeboro	Nonfatal	4
Aircraft Crash	August 10, 1994	Wolfeboro	Nonfatal	4
Aircraft Crash	August 27, 1994	Wolfeboro	Nonfatal	4
Aircraft Crash	May 9, 1996	Wolfeboro	Nonfatal	4
Aircraft Crash	July 2, 1996	Wolfeboro	Nonfatal	4
Aircraft Crash	April 5, 1997	Wolfeboro	Nonfatal	4
Aircraft Crash	February 28, 1999	Wolfeboro	Nonfatal	4
Hazard	Date	Location	Remarks/Description	Source
Aircraft Crash	October 2, 1999	Wolfeboro	Nonfatal	4
Aircraft Crash	August 14, 2004	Wolfeboro	Nonfatal	4
Aircraft Crash	November 4, 2004	Wolfeboro	Nonfatal	4
Drought	1929-1936	Statewide	Regional	5
Drought	1939-1944	Statewide	Severe in Southeast	5
Drought	1947-50	Statewide	Moderate	5
Drought	1960-69	Statewide	Longest recorded continuous period of below normal precipitation	5
Drought	June 1, 1999	Most of NH	Governor's Office declaration, moderate drought for most of the state	5
Earthquake	December 20, 1940	Ossipee	Magnitude 5.5	6
Earthquake	December 24, 1940	Ossipee	Magnitude 5.5	6
Earthquake	January 19, 1982	West of Laconia	Magnitude 4.5	6

Fire - Conflagration	Winter 1956	Wolfeboro	Block fire	
Fire (woodland)	October, 1947	Freedom, NH to Atlantic Ocean	205,678 acres burned; 16 fatalities	7
Flood	7/1/1986 – 8/10/1986	Statewide	FEMA DR-771-NH: Severe summer storms with heavy rains, tornadoes; flash flood and severe winds.	2
Flood	8/ 7/1990 - 8/11/1990	Statewide	FEMA DR-876-NH: A series of storm events from August 7-11, 1990 with moderate to heavy rains produced widespread flooding in New Hampshire.	2
Flood	8/19/1991	Statewide	FEMA DR-917-NH: Hurricane Bob struck New Hampshire causing extensive damage in Rockingham and Stafford counties, but the effects were felt statewide.	2
Flood	3/13/1996	Alton	Dam break. \$500,000. 1 fatality. Not weather related.	3
Flood	June 14, 1998	Carroll County	FEMA DR-1231-NH: Damage estimate - \$550, 000	3
Flood	October, 2005	Wolfeboro	Town reported flood	8
Flood	May, 2006	Wolfeboro	Town reported flood	8
Flood	4/16/2007	Wolfeboro	FEMA funds were made available in Wolfeboro	8
Flood	3/9/2008	Conway		3
Flood	4/29/2008	Conway		3
Flood	8/28/2011	Ossipee, Moultonborough, Sandwich	Tropical Storm Irene \$575K in damages to roads and bridge	3
Hail	July 16, 1984	Carroll County	Hail accumulation ~ 1.75 inches	3
Hazard	Date	Location	Remarks/Description	Source
Hail	June 13, 1987	Carroll County	Hail accumulation ~ 1.0 inches	3
Hail	August 1, 2005	Wolfeboro	Hail accumulation ~ 1 inch	3
Hail	6/20/2006	Alton	1.75 inch diameter	3
High Winds	July 15, 1974	Carroll County	winds > 56 knots	3

High Winds	July 26, 1994	Carroll County	T-storm and winds caused 1 injury; damage estimate - \$5 million	3
High Winds	8/25/2007	Moultonborough	Winds > 50 knots	3
High Winds	6/22/2008	Tamworth	Winds > 50 knots	3
High Winds	7/09/2008	Water Village	Winds > 50 knots	3
High Winds	7/19/2010	Melvin Village	Winds > 50 knots	3
Hurricane	9/21/1938	Statewide	13 Deaths, 2 Billion feet of marketable lumber blown down, flooding throughout the State, total Direct Losses - \$12,337,643 (1938 Dollars)	2
Hurricane	9/9/1991	Statewide	Hurricane Bob, severe storms	5
Hurricane Floyd	October 18, 1999	Carroll and other counties	Reported damages - \$800,000	3
Lightning	August 2, 1993	Carroll County	Lightning caused 3 injuries	3
Lightning	August 12, 1998	Wolfeboro	Lightning; damage estimate \$22,000	3
Lightning	June 9, 2004	Wolfeboro	Lightning; damage estimate \$50,000	3
Lightning	10/20/2006	Meredith	Three injuries and \$20,000 in damages.	3
Lightning	9/27/2007	Alton	\$200,000 in damage to home.	3
Macroburst	July 26, 1994	Moultonborough	Left 1,800 people without power	2
Tornado	July 18, 1963	Carroll County	F2	1
Tornado	July 28, 1970	Carroll County	F1	1
Tornado	August 9, 1972	Carroll County	F1	1
Tornado	August 25, 1972	Carroll County	F1	1
Tornado	August 7, 1986	Carroll County	F1 - Two F1 tornadoes were reported; damage estimate - \$2.75 million	1 & 3
Tornado	7/24/2008	Five counties, including Belknap, Strafford, and Carroll	F2 - 50-mile swath cut through south-central part of NH. Nineteen homes destroyed. One death. State and federal disaster declared in five	2, 8

			counties.	
Winter - Ice	1/5/1979	Statewide	Power and Transportation disruptions. More than \$17 million in damage in NH alone	2
Winter - Heavy Snow	March 16, 1993	Statewide	High winds and record snowfall	2
Hazard	Date	Location	Remarks/Description	Source
Winter - Ice Storm	January 7, 1998	Carroll and other counties	67,586 without power; damage estimate - \$17 million to NH Public Services	2
Winter - Heavy Snow	January 15, 2004	Carroll and other counties		2
Winter - Nor'easter	4/27/2007	Statewide	Nor'easter caused flooding, damage in excess of \$25 million	5
Winter - Ice	12/11/2008	Statewide	State emergency declaration after major power and transportation disruption. Exceeding \$15 million in damages. Over 400,000 without power, 2 fatalities due to carbon monoxide poisoning.	2

Table Sources:

1 = <http://www.tornadoproject.com>

2 = New Hampshire Homeland Security and Emergency Management (NHHSEM)

3 = National Oceanic and Atmospheric Administration (NOAA)

4 = National transportation Safety Board (NTSB)

5 = Federal Emergency Management Agency (FEMA)

6 = Northeast States Emergency Consortium (NESEC)
 7 = National Interagency Fire Center (NIFC): <http://www.nifc.gov/stats/historicalstats.html>
 8 = Wolfeboro Hazard Mitigation Plan Update Committee

APPENDIX H: SAMPLE MEETING MINUTES

TOWN OF WOLFEBORO

Hazard Mitigation Plan Update Committee

April 19, 2019

MINUTES

Present:

James Pineo, Fire Chief/Emergency Management Director
Susan Slack, Principal Planner
Kathy Barnard, Planning Board
Brad Harriman, Board of Selectman
Matt Sullivan, Town Planner
Adam Tasker, Public Works
Sarah Silk, LRHHPF
Cathleen LaPierre, Recording Secretary
Kayla Henderson, Home Land Security
Heidi Lawton, Field Representative for NH Homeland Security Emergency Management
Jeffrey Jones, Carroll County Public Health Emergency Preparedness Coordinator

Absent:

Chris Conley, Citizen
Kevin Duffy, Brewster Academy/Citizen
Dave Senecal, Selectman/Health Inspector
Lisa Rogers, Governor Wentworth Regional School District Representative
Mary Devries, Chamber of Commerce

Susan Slack opened the meeting at 10:11 AM at the Lodge at Abenaki Ski Area.

Topics

Hazard Risk Assessment (p. 8, 27, 28 of 2012 Plan)

Susan Slack stated the 2 things to work on today involves looking at the hazards as formulated by the EOP as those were recently updated and will look to compare with the state check list. She noted Severe Winter Weather and Ice Storms to be ranked as the highest risk hazard for the town and questioned if members had chance to look at the mitigation actions in the last plan or those that were completed or new ones to address. She suggested looking at the hazards on pages 47-49 to see what actions to continue and how to address them and make edits as needed.

Sarah Silk agreed and stated it's easier to track it from one plan to another.

Members agreed to incorporate the EOP plan and keep the same format.

Susan Slack questioned how often updates occur.

James Pineo replied every September these will be reviewed and brought to the Board.

Sarah Silk noted the Emergency Management group meets once a year and asked if that would be the group to look at the Hazard Mitigation.

James Pineo replied he was uncertain, they are closely related and could mirror that once up to date.

Susan Slack suggested making note of that as an action: to determine a process of coordinating and updating every year. New actions to discuss are: severe winter weather, ice storms, power outage, and flooding. She questioned if there are types of mitigation actions not seen in the Wolfeboro Plan.

Kayla Henderson stated the majority of actions that are specific to the town involve making a storm water maintenance plan, pointing out specific culverts that are an issue, and rising roads.

Susan Slack asked if there are critical facilities, or buildings that need to be included.

Kayla Henderson stated waste water plants and highway garages are commonly seen as they are in flooding areas. Retaining walls, moving the building etc. are acceptable ways to address these issues.

Matt Sullivan stated the community is mostly flood resilient as most of the critical facilities are out of the flood plain.

Sarah Silk noted Foss Field is a common flooding area and are currently working to resolve.

Matt Sullivan questioned winter weather mitigation strategies.

Kayla Henderson stated hazards overlap and suggested a vulnerable populations list is helpful to have to be able to check in with folks. Snow loads or snow drifts are also of concern but can be controlled with fencing; a potential solution or action to think about and stated one community is looking at purchasing land to dump snow.

Sarah Silk noted many of the issues are being remedied or already have i.e. the library roof is being corrected, buildings are being insulated better etc.

Kayla Henderson stated utility companies are taking blocks and putting in their own transformers to avoid losing an entire section but rather just a small section.

Matt Sullivan stated one concept being discussed in areas involve using neighborhood based batteries and would be nice to have something beyond a generator for the critical facilities.

Kayla Henderson stated in higher locations, solar panels would be beneficial to have a reserve for energy and water supply.

Sarah Silk questioned how many substations are available.

Adam Tasker replied four.

Matt Sullivan suggested working more with private roads and associations to make sure they have agreements and ensure a plan is in place with regard to winter weather.

Susan Slack stated it could be a public outreach action.

Sarah Silk suggested creating a list to prioritize.

Matt Sullivan suggested educating folks on steps they need to take if they lose power i.e. inform the Electric

Department or Public Safety Building.

Jeffrey Jones stated it is a 2 prong approach; educate people but you also need something for folks who are hospital bed bound or have functional needs where they cannot be without. EMS services and hospitals will be aware of target zones; it might be beneficial to work with Shelly Rondeau.

Matt Sullivan questioned bridges and culverts that are sensitive.

James Pineo noted a conversation took place geared towards Townsend Brook and through the Orchards where it dumps into Lake Wentworth; the culverts are undersized.

Adam Tasker agreed and stated the Townsend Shore Dam is currently being looked at.

Susan Slack questioned the storm water regulations and a need to improve.

Matt Sullivan replied yes, the flood plain regulations are not as frequently applied but storm water, absolutely and the more that can be done to improve these regulations will help. North Main Street is a massive one to be included in the plan.

Susan Slack questioned if there was something in place to cover the flood areas downtown.

Matt Sullivan responded yes; however, we should be thinking about looking beyond a 100 year flood plain and be more restrictive with the flood plain regulations.

Susan Slack stated the state flood plain program allows you to get into the community rating program which can lower flood insurance premiums and suggested making this an action to investigate ways of becoming involved with that program.

Sarah Silk questioned buffers.

Matt Sullivan agreed there is room to improve on buffers and would be good to also look at the standards to be more restrictive.

Kathy Barnard noted it has been discussed to hire someone to come in, take a look, and make improvements to the storm water regulations.

Matt Sullivan agreed and stated it would be helpful/beneficial to look at water sheds as some of these standards are not practical.

Kathy Barnard noted that to be a priority that will be resolved.

Sarah Silk questioned on site sediments with regard to subdivisions.

Matt Sullivan replied the typical erosion control sedimentation plan that's part of the subdivision plan but one thing discussed is whether or not to have, as part of the subdivision, lot by lot storm water requirements that outlive the subdivision process.

Sarah Silk noted Port Weldon has issues.

Matt Sullivan agreed and stated the model was to move the water as quickly as possible; however, now the goal is to retain and infiltrate. Definitely need to change the way storm water is looked at.

Susan Slack suggested moving on to look at Extreme Temperatures.

Sarah Silk asked about cooling and heating stations.

James Pineo noted this was tested; opened a cooling station this past summer which was not utilized.

Kayla Henderson suggested educating the public.

James Pineo replied it was heavily advertised via social media, town web page, and there was recently a discussion of using code red as an option.

Matt Sullivan inquired about dry hydrants.

James Pineo responded cisterns are a better option due to volume.

Sarah Silk questioned the material.

James Pineo replied they are composed of plastic and made in such a manner that multiple cisterns can be placed side by side in the ground.

Matt Sullivan recommended flood plain maps listed online.

Sarah Silk asked if there are grants available through FEMA.

Matt Sullivan replied they could get them up.

Susan Slack noted that to be a good action.

Kayla Henderson stated High Winds is rated a 4 and asked if that was due to wires, branches etc.

Matt Sullivan replied tree trimming is a need.

Sarah Silk stated there were suggestions such as tie downs, nailing patterns etc. on the state plan.

Kayla Henderson asked if there are evacuation plans in place and inquired about trailer parks as they are susceptible. But having an evacuation plan in the event of high winds would be a possibility.

Susan Slack inquired about summer camps.

James Pineo replied they come with their own EOP. However, do need to be able to notify them that something is coming through and there have been discussions surrounding 911 and a code red.

Sarah Silk stated there have been a lot of new poles put in and questioned the upgrades performed and how often are they checked. She noted new poles have been placed down town, Pleasant Valley, out towards Albee Beach and Sewall Road.

Matt Sullivan stated island work is being done now, and there is a plan for upgrades and regular tree trimming.

Kayla Henderson noted the summer season picks up and asked if there are issues pertaining to boaters.

James Pineo replied the boaters appear to be aware of the weather and if unfavorable, keep to the shore.

Kayla Henderson asked if there have been a lot of water rescues.

James Pineo replied that is not an issue.

Sarah Silk asked if the town utilized Marine Patrol.

James Pineo noted them to be stretched thin; however, the town does request assistance for certain events i.e. July 4th.

Kayla Henderson stated Lightening is rated a 3 and inquired about backup systems for the vulnerable systems.

James Pineo believes everything is protected.

Sarah Silk stated the water tower is next to the High School and suggested the antennas could be an issue.

Susan Slack made a note to add and moved on to the next category, Wildfire. The state is separating Wildfire from Conflagration.

James Pineo agreed and stated it's sensible.

Sarah Silk questioned the camps and if their camp fires are inspected.

James Pineo replied they are not, the only ones the Fire Department is involved in inspecting are the camp grounds as the camps take preventative measures and abide by regulations.

Susan Slack inquired about solar storm and space weather mitigation.

Kayla Henderson stated this is new to the state and nation. Gray Maine is at the beginning stages of building a section of their website for solar weather and monitoring it. Right now it's about situational awareness and how it will affect the public; currently working on finding patterns over the next 5 years. One issue currently faced with involves radio black out and recommend paying close attention to those areas to help should an issue arise.

Susan Slack referred to the list and questioned Infectious Diseases.

Kayla Henderson stated the state added in as a natural hazard due to the changes in climate and temperature, i.e. ticks are around longer, bugs are coming up from the South bringing triple E etc. Uncertain of how to address that beyond awareness.

Sarah Silk stated the Maine station has a quick PSA that lasts approximately 10 seconds that asks if you've checked yourself for ticks today.

Jeffrey Jones stated most of the effective mitigation strategies involve public information/education and vaccination. He noted the Lone Star tick is new and give an allergy to red meat. Bed bugs are also on the rise; therefore, should look at social media awareness.

Susan Slack noted this should be a mitigation action.

Jeffrey Jones reiterated public awareness and education to be of importance. Let folks know of vaccination options, i.e. where they can go for free such as Huggins Hospital and local pharmacies. As far as a mitigation action the town should be proactive in making the information available to the public.

Sarah Silk suggested putting on the town website.

Jeffrey Jones recommended utilizing the Department of Public Health Services and Federal CDC's social media campaigns which are new every quarter; a different plan is available to place on social media.

Sarah Silk asked who to contact to have things posted to the town website.

James Pineo suggested coordinating with Keith Simpson.

Susan Slack asked if there was anything else pertaining to Infectious Disease.

Jeffrey Jones replied one action that won't be of much cost is public outreach.

Susan Slack asked who in town would be the responsible person to work on the public health actions.

Sarah Silk suggested Shelly Rondeau.

Jeffrey Jones replied he deals mostly with Shelly Rondeau and Amy Muccio as the Welfare and Health Officers.

Susan Slack asked members what other hazards should be looked at and moved on to Human Caused i.e. portable water contamination.

Kayla Henderson questioned a natural hazard, Drought.

Sarah Silk stated there is a plan in place and have restrictions, she noted most have wells and questioned erosion/land and mud slide.

Matt Sullivan replied there aren't a lot of steep slopes.

Susan Slack questioned Dam Failure.

Adam Tasker stated the biggest issue is sewer lagoon. The next inspection is in the spring.

Susan Slack asked if there are mitigation actions for sewer lagoon.

Adam Tasker stated the action involves keeping it low by inspecting regularly and highway patches prior to becoming an issue.

Brad Harriman noted once getting the RIB's up and running the sewer lagoon won't be utilized as much.

Susan Slack asked if there were any other issues pertaining to Dams.

James Pineo questioned Beaver Dam.

Adam Tasker replied traps are used and they are typically located in the same areas; therefore, is not an issue.

Susan Slack suggested adding a mitigation action to put the regular Maintenance Checks/Dept. Protocols in writing.

Matt Sullivan suggested adding updated mapping.

James Pineo agreed.

Susan Slack asked if there were any other Human Caused mitigation actions needed.

Susan Slack questioned Surface Water Contamination.

Sarah Silk asked if that referred to lakes or our water supply.

Matt Sullivan replied water supply and suggested looking at improving security measures.

Susan Slack made note to add an action to improve security surrounding the water supply located near upper Beach Pond Road.

Brad Harriman stated a drone or fixed cameras would be beneficial/solution.

Members agreed cameras would be beneficial.

Susan Slack questioned Civil Disorder.

Members agreed that shouldn't be rated high.

Susan Slack questioned the dam failure pertaining to Crescent Lake as listed.

Adam Tasker stated Crescent Lake can be drained while Lake Wentworth cannot. Therefore, the only concern is what is located near Crescent Lake and it would need to be catastrophic.

Susan Slack noted to add the following mitigation action: routine dam inspections.

Adam Tasker noted they are currently monitored.

Susan Slack stated the next step will involve putting together a draft of what's been discussed, getting together with James Pineo and Matt Sullivan and return to the Committee to make any final changes within the next month.

Next Meeting
TBD

There being no further business, the meeting adjourned at 11:45 AM.

Respectfully Submitted,
Cathleen LaPierre
Cathy LaPierre

APPENDIX I: EXISTING PLANS, STUDIES, REPORTS, AND TECHNICAL INFORMATION

Wolfeboro Master Plan, 2007

Zoning Ordinance

Subdivision Regulations

Site Plan Regulations

Wolfeboro Hazard Mitigation Plan, 2013

FEMA Community Information System

Hazard Mitigation Assistance Program, Letters of Intent

Rust Pond Association <http://home1.gte.net/~vze3djdz/rustpond/damep4.html>

DPW records regarding FEMA reimbursement

Town Assessor Database

2018 Multi-Hazard Mitigation Plan, NH Homeland Security and Emergency Management

National Oceanic and Atmospheric Administration website

NH Division of Forests and Lands <http://www.nhdf.org/fire-control-and-law-enforcement/fire-statistics.aspx>

Influenza Pandemic Public Health Preparedness & Response Plan

APPENDIX J: MITIGATION ACTION REVIEW RECORD

Periodic Hazard Mitigation Plan Review Record

Meeting Schedule (dates)	Tasks Accomplished	How well (or not- so-well) is implementation progressing?	Lead Parties	Public Involvement (citizens, neighboring communities)

The Action Tracker is a data system FEMA is using to document mitigation ideas and progress for all communities. Check this link to obtain and set up a profile to follow and maintain your community's selected mitigation actions/projects: <http://www.starr-team.com/starr/Pages/default.aspx>

APPENDIX K: FEMA WEBLIOGRAPHY

DISASTERS AND NATURAL HAZARDS INFORMATION

FEMA-How to deal with specific hazards	http://www.ready.gov/natural-disasters
Natural Hazards Center at the University of Colorado	http://www.colorado.edu/hazards
National Oceanic and Atmospheric Administration (NOAA): Information on various projects and research on climate and weather.	http://www.websites.noaa.gov
National Climatic Data Center active archive of weather data.	http://lwf.ncdc.noaa.gov/oa/ncdc.html
Northeast Snowfall Impact Scale	http://www.erh.noaa.gov/rnk/Newsletter/Fall%202007/NESIS.htm
Weekend Snowstorm Strikes the Northeast Corridor Classified As A Category 3"Major"Storm	http://www.publicaffairs.noaa.gov/releases2006/feb06/noaa06-023.html

FLOOD RELATED HAZARDS

FEMA Coastal Flood Hazard Analysis & Mapping	http://www.fema.gov/national-flood-insurance-program-0/fema-coastal-flood-hazard-analyses-and-mapping-1
Floodsmart	http://www.floodsmart.gov/floodsmart/
National Flood Insurance Program (NFIP)	http://www.fema.gov/nfip
Digital quality Level 3 Flood Maps	http://msc.fema.gov/MS/statemap.htm
Flood Map Modernization	http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/map-modernization
Reducing Damage from Localized Flooding: A Guide for Communities, 2005 FEMA 511	http://www.fema.gov/library/viewRecord.do?id=1448

FIRE RELATED HAZARDS

Firewise	http://www.firewise.org
NOAA Fire Event Satellite Photos	http://www.osei.noaa.gov/Events/Fires
U.S. Forest Service, USDA	http://www.fs.fed.us/land/wfas/welcome.htm
Wildfire Hazards - A National Threat	http://pubs.usgs.gov/fs/2006/3015/2006-3015.pdf

GEOLOGIC RELATED HAZARDS

USGS Topographic Maps	http://topomaps.usgs.gov/
Building Seismic Safety Council	http://www.nibs.org/?page=bssc
Earthquake hazard history by state	http://earthquake.usgs.gov/earthquakes/states/
USGS data on earthquakes	http://earthquake.usgs.gov/monitoring/deformation/data/download/
USGS Earthquake homepage	http://quake.wr.usgs.gov
National Cooperative Geologic Mapping Program (NCGMP)	http://ncgmp.usgs.gov/
Landslide Overview Map of the Conterminous United States	http://landslides.usgs.gov/learning/nationalmap/
Kafka, Alan L. 2008. Why Does the Earth Quake in New England? Boston College, Weston Observatory, Department of Geology and Geophysics	http://www2.bc.edu/~kafka/Why_Quakes/why_quakes.html
Map and Geographic Information Center, 2010, "Connecticut GIS Data", University of Connecticut	http://magic.lib.uconn.edu/connecticut_data.html

2012 Maine earthquake	http://www.huffingtonpost.com/2012/10/17/maine-earthquake-2012-new-england_n_1972555.html
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WIND-RELATED HAZARDS

ATC Wind Speed Web Site	http://www.atcouncil.org/windspeed/index.php
U.S. Wind Zone Maps	http://www.fema.gov/safe-rooms/wind-zones-united-states
Tornado Project Online	http://www.tornadoproject.com/
National Hurricane Center	http://www.nhc.noaa.gov
Community Hurricane Preparedness Tutorial	http://meted.ucar.edu/hurricane/chp/hp.htm
National Severe Storms Laboratory, 2009, "Tornado Basics",	http://www.nssl.noaa.gov/primer/tornado/tor_basics.html

GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND MAPPING

The National Spatial Data Infrastructure & Clearinghouse (NSDI) and Federal Geographic Data Committee (FGDC) Source for information on producing and sharing geographic data	http://www.fgdc.gov
The OpenGIS Consortium Industry source for developing standards and specifications for GIS data	http://www.opengis.org
Northeast States Emergency Consortium (NESEC): Provides information on various hazards, funding resources, and other information	http://www.nesec.org
US Dept of the Interior Geospatial Emergency Management System (IGEMS) provides the public with both an overview and more specific information on current natural hazard events. It is supported by the Department of the Interior Office of Emergency Management.	http://igems.doi.gov/
FEMA GeoPlatform: Geospatial data and analytics in support of emergency management	http://fema.maps.arcgis.com/home/index.html

DETERMINING RISK AND VULNERABILITY

HAZUS	http://www.hazus.org
FEMA Hazus Average Annualized Loss Viewer	http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=cb8228309e9d405ca6b4db6027df36d9&extent=-139.0898,7.6266,-48.2109,62.6754
Vulnerability Assessment Tutorial: On-line tutorial for local risk and vulnerability assessment	http://www.csc.noaa.gov/products/nchaz/htm/mitigate.htm
Case Study: an example of a completed risk and vulnerability assessment	http://www.csc.noaa.gov/products/nchaz/htm/case.htm

DATA GATHERING

National Information Sharing Consortium (NISC): brings together data owners, custodians, & users in the fields of homeland security, public safety, & emergency management and response. Members leverage efforts related to the governance, development, & sharing of situational awareness & incident management resources, tools, & best practices	http://nisconsortium.org/
The Hydrologic Engineering Center (HEC), an	http://www.hec.usace.army.mil/

organization in the Institute for Water Resources, is the Center of Expertise for the US Army Corps of Engineers	
National Water & Climate Center	http://www.wcc.nrcs.usda.gov/
WinTR-55 Watershed Hydrology	http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/?&cid=stelpdb1042901
USACE Hydrologic Engineering Center (HEC)	http://www.hec.usace.army.mil/software/
Stormwater Manager's Resource Center SMRC	http://www.stormwatercenter.net
USGS Current Water Data for the Nation	http://waterdata.usgs.gov/nwis/rt
USGS Water Data for the Nation	http://waterdata.usgs.gov/nwis/
Topography Maps and Aerial photos	http://www.terraserver.com/view.asp?tid=142
National Register of Historic Places	http://www.nps.gov/nr/about.htm
National Wetlands Inventory	http://www.fws.gov/wetlands/
ICLUS Data for Northeast Region	http://www.epa.gov/ncea/global/iclus/inclus_nca_northeast.htm

SUSTAINABILITY/ADAPTATION/CLIMATE CHANGE

Planning for a Sustainable Future: The Link Between Hazard Mitigation and Livability	http://www.fema.gov/media-library-data/20130726-1454-20490-3505/fema364.pdf
Why the Emergency Management Community Should be Concerned about Climate Change: A discussion of the impact of climate change on selected natural hazards	http://www.cna.org/sites/default/files/research/WEB%2007%2029%2010.1%20Climate%20Change%20and%20the%20Emergency%20Management%20Community.pdf
NOAA RISA for the Northeast (Regional Integrated Sciences and Assessments)	http://ccrun.org/home
Resilient Sustainable Communities: Integrating Hazard Mitigation& Sustainability into Land Use	http://www.earth.columbia.edu/sitefiles/file/education/documents/2013/Resilient-Sustainable-Communities-Report.pdf
U.S. EPA	http://www.epa.gov/climatechange/
NOAA National Ocean Service (NOS)	http://oceanservice.noaa.gov/
The Northeast Climate Research Center (NRCC) were heavily involved in climate data in the NCA, below. They have a wealth of historic climate data and weather information, trends, etc.	http://www.nrcc.cornell.edu/
Community and Regional Resilience: Perspectives from hazards, disasters, and emergency management	http://www.resilientus.org/library/FINAL_CUTTER_9-25-08_1223482309.pdf
National Fish, Wildlife and Plants Climate Adaptation Strategy	www.wildlifeadaptationstrategy.gov
ICLEI Local Governments for Sustainability	http://www.icleiusa.org/
Kresge Foundation Survey	http://www.kresge.org/news/survey-finds-communities-northeast-are-trying-plan-for-changes-climate-need-help-0
New England's Sustainable Knowledge Corridor	http://www.sustainableknowledgecorridor.org/site/
The Strategic Foresight Initiative (SFI)	http://www.fema.gov/pdf/about/programs/oppa/findings_051111.pdf
Northeast Climate Choices	http://www.climatechoices.org/ne/resources_ne/nereport.html
Northeast Climate Impacts Assessment	http://www.northeastclimateimpacts.org/
Draft National Climate Assessment Northeast Chapter released early 2013	http://ncadac.globalchange.gov/
Northeast Chapter of the National Climate	http://www.globalchange.gov/images/cir/pdf/northeast

Assessment of 2009:	.pdf
NEclimateUS.org	http://www.neclimateus.org
ClimateNE	www.climate-northeast.com
Scenarios for Climate Assessment and Adaptation	http://scenarios.globalchange.gov/
Northeast Climate Science Center	http://necsc.umass.edu/
FEMA Climate Change Adaptation and Emergency Management	https://www.llis.dhs.gov/content/climate-change-adaptation-and-emergency-management-0
Climate Central	http://www.climatecentral.org
EPA State and Local Climate and Energy Program	http://www.epa.gov/statelocalclimate/index.html

PLANNING

American Planning Association	http://www.planning.org
PlannersWeb - Provides city & regional planning resources	http://www.plannersweb.com

OTHER FEDERAL RESOURCES

U.S. Army Corps of Engineers: Provides funding for floodplain management planning and technical assistance and other water resources issues.	www.nae.usace.army.mil
Natural Resources Conservation Service: Technical assistance to individual landowners, groups of landowners, communities, and soil and water conservation districts.	www.nrcs.usda.gov
NOAA Coastal Services Center	http://www.csc.noaa.gov/
Rural Economic and Community Development: Technical assistance to rural areas & smaller communities in rural areas on financing public works projects.	www.rurdev.usda.gov
Farm Service Agency: Manages the Wetlands Reserve Program (useful in open space or acquisition projects by purchasing easements on wetlands properties) and farmland set aside programs	www.fsa.usda.gov
National Weather Service: Prepares and issues flood, severe weather and coastal storm warnings. Staff hydrologists can work with communities on flood warning issues; can give technical assistance in preparing flood-warning plans.	www.weather.gov
Economic Development Administration (EDA): Assists communities with technical assistance for economic development planning	www.osec.doc.gov/eda/default.htm
National Park Service: Technical assistance with open space preservation planning; can help facilitate meetings and identify non-structural options for floodplain redevelopment.	www.nps.gov
Fish and Wildlife Services: Can provide technical & financial assistance to restore wetlands & riparian habitats.	www.fws.gov
Department of Housing & Urban Development	www.hud.gov
Small Business Administration: SBA can provide additional low-interest funds (up to 20% above what an eligible applicant would qualify for) to install mitigation	www.sba.gov/disaster

measures. Can also loan the cost of bringing a damaged property up to state or local code requirements.	
Environmental Protection Agency	www.epa.gov

OTHER RESOURCES

New England States Emergency Consortium (NESEC): NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Resources are available on earthquake preparedness, mitigation, and hurricane safety.	www.nesec.org
Association of State Floodplain Managers (ASFPM): ASFPM has developed a series of technical and topical research papers, and a series of Proceedings from their annual conferences.	www.floods.org
National Voluntary Organizations Active in Disaster (VOAD) is a non-profit, nonpartisan membership organization that serves as the forum where organizations share knowledge and resources throughout the disaster cycle—preparation, response, recovery and mitigation.	http://www.nvoad.org

FEMA RESOURCES

Federal Emergency Management Agency (FEMA)	www.fema.gov
National Mitigation Framework	http://www.fema.gov/national-mitigation-framework
Federal Insurance and Mitigation Administration (FIMA)	http://www.fema.gov/fima
Community Rating System (CRS)	http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-rating-system
FEMA Building Science	http://www.fema.gov/building-science
National Flood Insurance Program (NFIP)	http://www.fema.gov/national-flood-insurance-program
Floodplain Management & Community Assistance Program	http://www.fema.gov/floodplain-management
Increased Cost of Compliance (ICC): ICC coverage provides up to \$30,000 for elevation and design requirements to repeatedly or substantially damaged property.	http://www.fema.gov/national-flood-insurance-program-2/increased-cost-compliance-coverage
National Disaster Recovery Framework	http://www.fema.gov/national-disaster-recovery-framework
Computer Sciences Corporation: contracted by FIMA as the NFIP Statistical Agent, CSC provides information and assistance on flood insurance to lenders, insurance agents and communities	www.csc.com
Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan: A Guidebook for Local Governments	https://www.fema.gov/ar/media-library/assets/documents/89725
Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning	http://www.fema.gov/media-library/assets/documents/4317

Mitigation Best Practices Portfolio <http://www.fema.gov/mitigation-best-practices-portfolio>

FEMA Multi-Hazard Mitigation Planning Website	http://www.fema.gov/multi-hazard-mitigation-planning
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FEMA Resources Page	http://www.fema.gov/plan/mitplanning/resources.shtm
Local Mitigation Plan Review Guide	http://www.fema.gov/library/viewRecord.do?id=4859
Local Mitigation Planning Handbook complements and liberally references the Local Mitigation Plan Review Guide above	http://www.fema.gov/library/viewRecord.do?id=7209
HAZUS	http://www.fema.gov/protecting-our-communities/hazus
Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards	http://www.fema.gov/library/viewRecord.do?id=6938
Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials	http://www.fema.gov/library/viewRecord.do?id=7130
IS-318 Mitigation Planning for Local and Tribal Communities Independent Study Course	http://training.fema.gov/EMIWeb/IS/is318.asp