NATURAL HAZARDS CHAPTER

2015 REGIONAL MASTER PLAN

For the Rockingham Planning Commission Region

Natural Hazards

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Natural Hazards

Introduction

This chapter describes natural hazards that have occurred in the region in the past and discusses the potential risks and extent to which natural hazards could impact the region in the future. Climate change can increase the severity of existing and future hazards such as coastal storms, flooding, strong winds, extreme precipitation, extreme temperatures and drought, and alter the frequency and occurrence of weather related events. The potential impacts of climate change are covered in greater detail in the Existing Conditions section of the Climate Change Chapter.

In hazard planning and management, mitigation refers to measures that result in avoidance and minimization of impacts.

The New Hampshire Department of Safety Division of Homeland Security and Emergency Management (HSEM) has a goal for all communities within the State of New Hampshire to establish local hazard mitigation plans as a means to reduce and mitigate future losses from natural hazard events. Local hazard mitigation plans provide a framework to recognize and address the impacts of natural hazards and climate change. Local officials identify natural hazards most likely to impact their community, document existing programs and policies in place to reduce and prevent these hazards, and develop a mitigation action plan. These plans describe actions the community will undertake to reduce loss and damage of public and private assets. The plans are reviewed by HSEM and Federal Emergency Management Agency (FEMA) and adopted by the local governing body. Hazard mitigation plans offer short and long-term strategies and practices aimed at creating sustainable, disaster-resilient communities.

Hazard mitigation plans offer short and long-term strategies and practices aimed at creating sustainable, disaster-resilient communities.

What are Natural Hazards?

Natural hazards are weather-related events and natural earth processes that can impact lives, property, infrastructure, natural resources and other significant assets. Common natural hazards in the RPC region include flood and severe winter storms. Often, natural hazards can be predicted in a timeframe of days or by long-term trends and models. They tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical and environmental characteristics of an area. Natural hazards include extreme weather and climate events that occur in all parts of the world, although some regions are more vulnerable and susceptible to certain natural hazards than others. The same is true for New Hampshire and the physical geographic diversity that defines the state's distinct ecoregions including the Coastal Lowlands, Eastern New England Upland, and White Mountain Region.

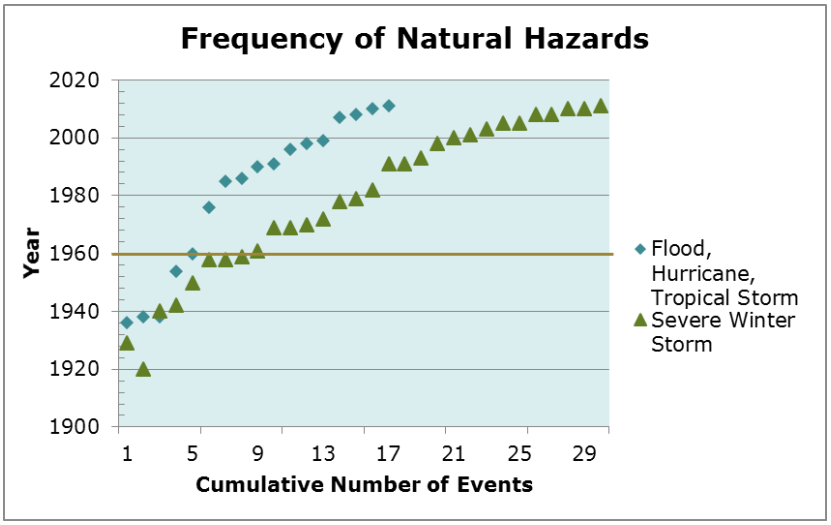


Figure NHZ1. Year and cumulative number of natural hazard events in the region: Severe Winter Storms and Flood, Hurricane, Tropical Storms. Source: State of NH Multi-Hazard Mitigation Plan (2013)

Impacts to the Region

Since the early 1900's, the region has been impacted by a number of natural hazards: 30 Severe Winter Storms, 18 Flood/Hurricane/Tropical Storms, 10 Tornado/Downbursts, 6 Drought Periods, 4 Earthquakes, and 2 Wildfires.

The two most frequent natural hazard events affecting the region are Severe Winter Storms (winter events) and Flood/Hurricane/Tropical Storms (spring through fall events). The frequency of these types of events is reported in Figure NHZ1. Note that the majority of both types of events occur most frequently from 1960 to the present.

What the Region Said About Natural Hazards

Statewide and Regional Surveys

Questions about Emergency Preparedness

Nearly three-quarters of residents (74%) are concerned (34% "very concerned" and 40% "somewhat concerned") with snow or ice storms in their community followed by power outages (73%), wind damage (61%), flooding (48%), drought (30%), and wildfires (23%).

- Households earning less than $40,000 and older people (50 to 59, 70 and older) are *more likely* to be very concerned about drought.
- Older people (70 and older) and households earning less than $40,000 are *more likely* to be very concerned about wildfires.
- Young people (18 to 29), households earning less than $20,000 and more than $160,000 are *more likely* to be very concerned about power outages.

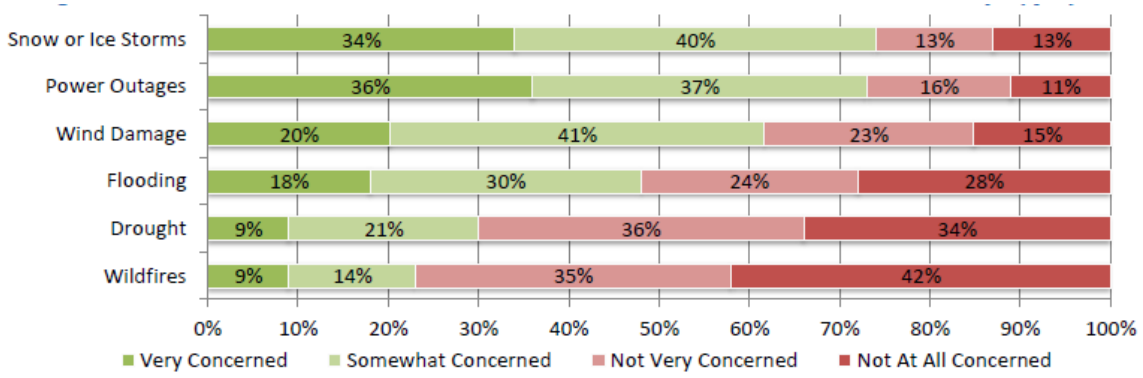


Figure NHZ2. Question - Concern About Weather Related Events In Your Community? (q14

Only 12% of residents are very concerned about their community's level of preparedness in weather-related situations, while 35% are somewhat concerned, 35% are not very concerned, 17% are not at all concerned and 1% said they don't know.

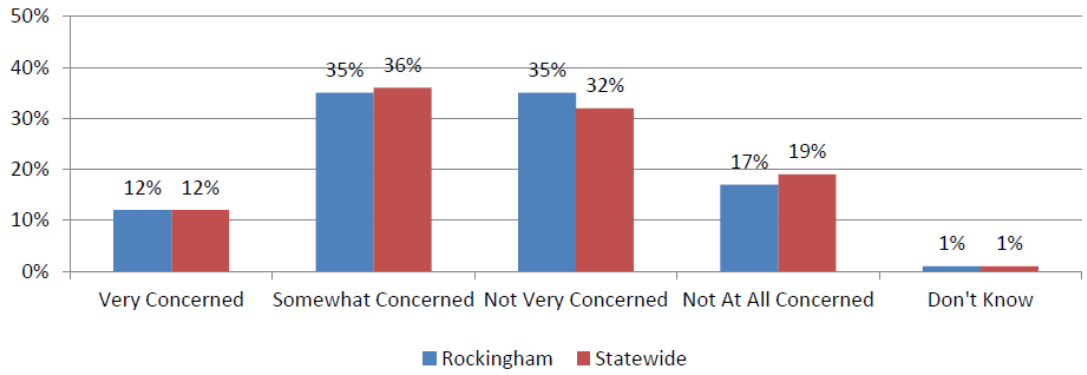


Figure NHZ3. Question - Concern about Your Community's Level of Preparedness? (q15)

RPC Online Survey Results

Respondents expressed a mixture of concern for community emergency preparedness and most respondents indicated they were concerned with power outages and snow storms more than flooding, drought, wind damage, or wildfires.

Regional Visioning Sessions

Following is a summary of common ideas and concerns expressed at topical listening sessions held throughout the region in 2013.

Table NHZ1.Questions about hazard preparedness and response from topical visioning sessions.

***Question** – Have you or your community been affected recently by severe weather events or changes in seasonal weather patterns?*	Damage to trees, powerlines, buildings and private property. Flooding near rivers and in areas not typically prone to flooding. Road damage from undersized culverts, drainage infrastructure. Flooding caused from inadequate drainage infrastructure. Changes to crop production/harvest and growing seasons. Increased frequency and intensity of severe weather events. Prolonged dry periods between storms. More extended periods of power outages over wide areas. More residents and businesses are equipped with generators.
***Question –** How could your community be better prepared to respond to and adapt to changes in seasonal weather patterns, extreme weather and more frequent storm events?*	More community based emergency centers and shelters. Inventory municipal infrastructure and prioritize improvements for under-performing sites. Invest in new infrastructure that is more resilient. Improve drinking water management to increase storage capacity. Improve business resilience and continuity planning. Educate public, citizens, decision makers and land use boards/commissions. Improve power distribution systems, create back-up systems.
***Question** – What investments, assets, resources or populations are most at risk due to changes in seasonal weather patterns, extreme weather and more frequent storm events?*	High risk, vulnerable populations and need for services. Damage to coastal shorelands and structures. Fisheries, winter recreation, agriculture. Flood damage to infrastucture and buildings in floodplains. Water quality and water pollution. Increase in tick and mosquito borne diseases and cases in NH.

Natural Hazards Goals

Goal 1

State and municipalities have the tools necessary to anticipate and plan for natural hazards.

Goal 2

Practitioners, regional partners and municipalities collaborate to identify and address impacts from natural hazards to assets and resources.

Goal 3

The region increases preparedness for and become more resilient to natural hazards.

Goal 4

Municipalities adopt Natural Hazards chapters in local Master Plans. Coastal municipalities adopt Coastal Management Chapters in local Master Plans.

Goal 5

Information from Hazard Mitigation Plans is referenced or applied when preparing municipal Capital Improvement Plans and reviewing development proposals.

Goal 6

Recommendations from the New Hampshire Multi-Hazard Mitigation Plan are implemented.

Goal 7

Municipalities adopt standards that protect built infrastructure, local and regional assets (eg. cultural, historical, economic) and natural resources from impacts of natural hazards.

Goal 8

Municipalities and regional partners support multi-jurisdictional hazard mitigation planning efforts.

Natural Hazard Goals	**Regional Goal Promote the efficient use of land, resources and infrastructure that:**				
	Creates a high quality built environment while protecting important natural and cultural resources.	Promotes positive effects of development and minimizes adverse impacts.	Promotes economic opportunities and community vitality.	Enhances the coordination of planning between land use, transportation, housing and natural resources.	Considers and incorporates climate change into local and regional planning efforts
NHZ Goal 1	S	S	S	S	S
NHZ Goal 2	S	S	S	S	S
NHZ Goal 3	S	S	S	S	S
NHZ Goal 4	S	S	S	S	S
NHZ Goal 5	S	S	S	S	S
NHZ Goal 6	P	P	P	P	P
NHZ Goal 7	S	S	S	S	S
NHZ Goal 8	P	P	TBD	P	P

S = Goal supports the Regional Goal.
P = Goal partially supports the Regional Goal.
TBD = Goal applicability to support the Regional Goal is not yet known.
N/A = Goal does not apply to the Regional Goal.

Natural Hazard Goals	NH Livability Principles					
	Traditional Settlement Patterns & Development Design	Housing Choices	Transportation Choices	Natural Resources Function & Quality	Community & Economic Vitality	Climate Change & Energy Efficiency
NHZ Goal 1	S	S	S	S	S	S
NHZ Goal 2	P	P	P	S	S	S
NHZ Goal 3	P	P	P	S	S	S
NHZ Goal 4	P	P	P	S	S	S
NHZ Goal 5	S	S	S	S	S	S
NHZ Goal 6	TBD	TBD	TBD	S	S	S
NHZ Goal 7	TBD	TBD	S	S	S	S
NHZ Goal 8	P	P	P	S	S	S

S = Goal supports the NH Livability Principle.
P = Goal partially supports the NH Livability Principle.
TBD = Goal applicability to support the NH Livability Principle is not yet known.
N/A = Goal does not apply to the NH Livability Principle

Existing Conditions

Types of Natural Hazards

Following are descriptions of natural hazards that most frequently affect the region and pose a significant threat in the future. A history of natural hazard events that have impacted the region is provided in Appendix B of this chapter. Following are brief descriptions of these natural hazards.

Flooding is a common hazard throughout the region. Several areas experience chronic reoccurring flooding or high potential for future flooding. All municipalities in the RPC region are enrolled in the National Flood Insurance Program (NFIP). Municipalities in the NFIP must identify local areas of flood concern within their Hazard Mitigation Plans. Areas most likely to have high flood risk are those within or near Flood Zones identified on the FEMA Flood Insurance Rate Maps (FIRMs). The region contains coastal areas, rivers and associated tributaries that fall within identified FEMA flood zones. Both coastal and riverine areas contain flood zones that correspond to Special Flood Hazard Areas (100-year and the 500-year flood zones).

The coastline is particularly vulnerable to flooding from both coastal and upland sources including storm surge, seasonal events, heavy rain, and sea level rise. Vulnerable assets and resources located in the coastal flood zone include buildings, roadways, utilities, infrastructure, beaches, dunes, marshes, wildlife habitat, and cultural and historical sites.

Refer to Appendix D Map NHZ1 for the extent of the 100-year and 500-year flood zones in the coastal area. Flood zones are depicted on the FIRMs as Zones A, VE, AE and X.

Riverine Flooding

Riverine flooding is typically the temporary inundation of water - from ice melt, precipitation, rivers, tide and storm surge - onto lands that are not normally covered by water. Such flooding occurs at regularly throughout the year during spring snowmelt and as a result of seasonal storm events. Refer to the Appendix for a comprehensive list of past flood and storm events.

The specific types of flood events common in the region are described below.

100-year Storm

Floodplains associated with the 100-year storm are usually located in lowlands near rivers and near tidally influenced and coastal areas. The term 100-year flood or the "1% annual chance flood" means there is a one percent chance of a flood of that size happening in any given year.

Upland and freshwater riverine flooding occurs during extreme precipitation events and during periods of rapid snow melt.

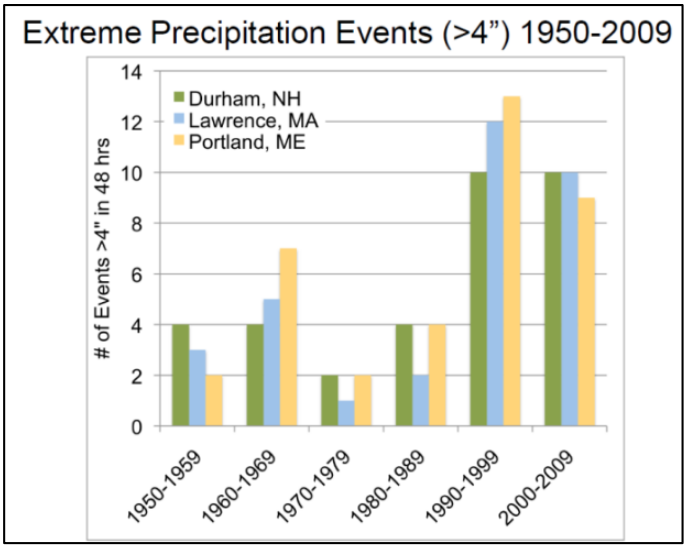


Figure NHZ4. Number and frequency of extreme precipitation events greater than four inches in 48 hours.. (Source: Wake et al, 2013)

Larger volumes of water flowing at greater velocity can result in erosion that undermines roads, culverts, embankments and river channels. Evidence of erosion from extreme precipitation events is well-documented by municipalities across the region. Refer to the Existing Conditions section of Climate Change Chapter for more detailed description of the changes in rainfall in the region.

As shown in Figure NHZ5, since the 1990's the magnitude and frequency of **extreme precipitation** events have increased compared with the historical trends since 1950. This change in precipitation has been documented by the Northeast Regional Climate Center at Cornell University. Their data shows a marked increase in the amount of rain associated with large events such as the 50-year, 100-year and 500-year storms. As a result of these changes, many areas experience extensive flooding including flooding caused by undersized stormwater management infrastructure not designed to manage larger flows.

Refer to the Coastal Flooding section below for information about FEMA Flood Insurance Rate Maps and Federal Flood Insurance.

Erosion

Erosion is the process of wind and water wearing away soil and earth materials. Erosion is a significant threat to populated and development areas during inland floods and coastal storms. During extreme precipitation events, riverine erosion or *fluvial erosion* has caused catastrophic failure of channels, floodplains, and road infrastructure. This type of failure damages buildings, homes, roads and structures and can result in substantial loss of upland. Often such failures are not anticipated with little to no preparation in place. In such cases emergency response is typically needed to close roads, remove debris and rescue stranded people from cars, homes and businesses.

For more information about erosion refer to the Fluvial Erosion Hazards section of the Natural Resources Chapter.

Rapid Snow Pack Melt

Warm temperatures and heavy rains cause rapid snowmelt in winter and spring months. These conditions can result in severe flooding during times when the earth is still frozen and has limited capacity to absorb runoff. The cumulative effect of rapid snowmelt in upper portions of a watershed can result in extensive flooding in lower lying and downstream communities.

River Ice Jams

Rising waters in early spring often break apart ice covering rivers and streams, causing the ice to float downstream and pile up, resulting in flooding. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice floating in rivers can damage bridges, roads, and the surrounding lands, vegetation and aquatic habitats.

Dam Breach and Failure

Dam failure results in rapid loss of water that is normally held by the dam. These kinds of floods are extremely dangerous and pose a significant threat to life, property and aquatic habitats. Refer to the Appendix for a map showing dam locations in the region. For more information about erosion refer to the Dams section of the Natural Resources Chapter.

Note: Coastal flooding from sea level rise and storm surge differs from river flooding, which is generally caused by severe precipitation. Depending on the storm event, in the upper reaches of some tidal rivers, flooding from storm surge may be followed by river flooding from rain in the upland watershed. This can increase the flood severity for coastal municipalities.

Coastal Flooding

Coastal flooding, or coastal inundation, is the flooding of normally dry, low-lying coastal land, primarily caused by severe weather events along the coast, estuaries, and adjoining rivers. These flood events are some of the more frequent, costly, and deadly hazards that can impact coastal communities. Coastal

flooding in the region is primarily due to major rain storms and nor'easters but can also occur from full-moon tides. In some areas, human activities, particularly disruption of natural protective coastal features (e.g. dunes or wetlands) or the lowering of land as a consequence of drainage, may also exacerbate coastal flooding hazards.

Coastal flooding is particularly dangerous when there is a storm surge, which is an abnormal rise in water level, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure. Storm surges are extremely dangerous because they are capable of flooding large coastal areas. According to the National Oceanic and Atmospheric Administration (NOAA) the greatest loss of life and economic damage from a hurricane is due to storm surge. (http://www.noaa.gov/)
There are several factors that contribute to coastal floods:

- Severe weather events create meteorological conditions that drive up the water level, creating a storm surge. These conditions include strong winds and low atmospheric pressure, and can be caused by hurricanes, extra tropical storms such as Nor'easters, or by other severe storm conditions.
- Large waves, whether driven by local winds or swell from distant storms, raise average coastal water levels and individual waves roll up over land.
- High tide levels caused by normal variations in the astronomical tide cycle.
- Other larger scale regional and ocean scale variations are caused by seasonal heating and cooling and ocean dynamics.

Very intense storms, like hurricanes, can generate large and devastating storm surges. The surge occurs when high winds push water toward the shore. The low pressure associated with intense storms has a small effect on surge as well.

The size of a storm surge for a particular location depends on a number of factors. Storm surge is very sensitive to the shape of the coast, and to changes in storm track, intensity, forward speed, and size. Tidal height at the time of maximum storm surge is an important factor, too. (The combined effect of the storm surge and the astronomical tide is called the storm tide.)
The slope of the sea floor also influences the level of surge in a particular area. Areas with a shallow slope of the sea floor off the coast will allow a greater surge. Areas with a steeper slope will not see as much surge, but will generally have large breaking waves that can destroy lower elevation buildings near the coast and open bays.

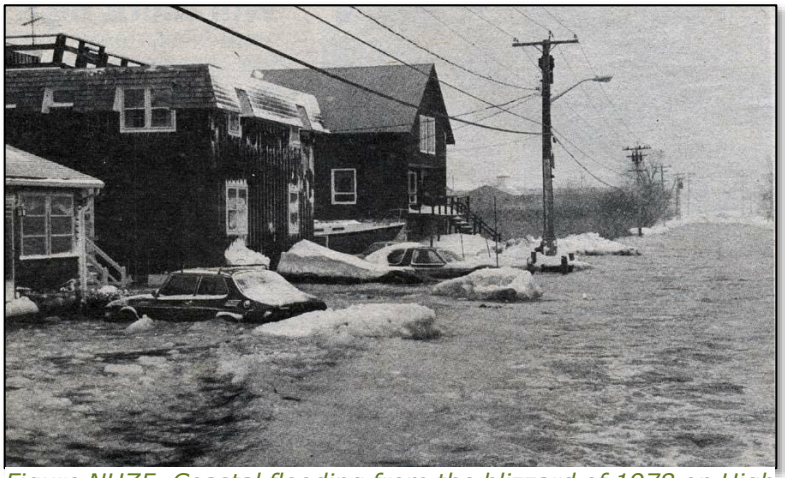


Figure NHZ5. Coastal flooding from the blizzard of 1978 on High Street in Hampton, approximate a half mile from the beach. [Source: www.hampton.lib.nh.us]

A history of coastal storms that have impacted the region can be found in Appendix B of this chapter.

Flood Insurance Rate Maps and Federal Flood Insurance

The FEMA produces regulatory maps - Flood Insurance Rate Maps (FIRMs) - that delineate the 100-year and 500-year floodplains (coastal and upland areas) across the state. The purpose of the maps is to determine areas that flood during such storm events whereby properties within these areas are eligible for federal flood

insurance. Municipalities that adopt the FIRMs along with minimum floodplain regulations in their zoning ordinance are eligible for federal disaster assistance for declared disasters.

Currently, property owners hold 3,414 federal flood insurance policies totaling $677,081,800 of insurance in force. As of March 2014, $13,369,316 has been paid to property owners in the region for building losses and damages and $48,235,266 statewide. By far the Town of Hampton holds the largest number of federal flood insurance policies, insurance in force, and payments for building losses and damages. The majority of these policy owners are located in tidally influenced and coastal areas. The number of NFIP policies does not reflect the number of properties located in the 100-year floodplain as only properties with a mortgage or lean are required to have federal flood insurance.

Table NHZ2. FEMA National Flood Insurance Program Disaster Report – Flood Insurance summary for municipalities in RPC's region.

Municipality	# of Policies	Insurance $ In Force	Total # Paid Losses	Total $ Paid	Repetitive Loss Buildings	Repetitive Loss Payment $
Atkinson	2	610,000	0	0	0	0
Brentwood	10	2,132,700	10	83,730	1	49,752
Danville	13	3,169,600	1	0	0	0
East Kingston	5	820,500	1	1,086	0	0
Epping	29	5,648,600	38	621,278	9	504,627
Exeter	111	21,621,800	88	1,198,416	17	1,032,753
Fremont	37	7,500,600	45	1,098,573	5	214,043
Greenland	16	3,231,100	12	272,095	2	245,488
Hampstead	42	9,502,900	9	80,472	1	48,746
Hampton Falls	12	3,452,000	7	74,529	0	0
Hampton	1,789	317,700,100	681	4,577,739	40	1,821,624
Kensington	The town joined the NFIP in spring of 2014.					
Kingston	39	8,352,300	9	100,318	2	83,102
New Castle	40	11,676,600	8	9,607	0	0
Newfields	8	2,290,800	0	0	0	0
Newington	7	1,999,000	0	0	0	0
Newton	2	52,100	0	0	0	0
North Hampton	59	11,795,000	46	470,422	2	67,665
Plaistow	7	1,412,300	1	0	0	0
Portsmouth	140	41,075,100	31	198,896	2	51,561
Rye	309	79,131,800	255	1,709,579	15	584,940
Salem	432	76,213,100	140	2,485,831	15	1,687,963
Sandown	7	1,795,000	2	6,759	0	0
Seabrook Beach Village District	177	42,122,400	27	170,893	4	135,169
Seabrook	99	18,643,900	47	168,092	2	36,428
South Hampton	3	795,000	6	18,627	1	11,394
Stratham	19	4,337,500	3	22,374	1	17,288
Totals	**3,414**	**677,081,800**	**1,467**	**13,369,316**	**119**	**6,592,543**

Statistics for the policy and insurance in force are current as of March 2014. For the number of paid losses, paid loss amounts, and repetitive loss data, the totals are to date beginning in 1978. [Source: NHOEP 2014]

Updated Coastal Flood Insurance Rate Maps

In 2013, FEMA issued update preliminary FIRMs for tidally influenced and coastal municipalities in NH. The NH Office of Energy and Planning anticipates that the new FIRMs will be finalized by 2015 for adoption by municipalities. On the following page is a summary of the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014 which amended the Biggert-Waters Flood Insurance Reform Act enacted in 2012. As shown in Table 2, the Town of Hampton holds by far the largest number of federal flood insurance policies, insurance in force, and payments for building losses and damages; the majority of these policy owners located in tidally influenced and coastal areas.

Refer to Appendix C for a summary of the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014, a law that repeals and modifies certain provisions of the Biggert-Waters Flood Insurance Reform Act, which was enacted in 2012.

Hurricane and High Wind Events

Significantly high winds occur especially during hurricanes, tornadoes, winter storms and thunderstorms. Downed trees and power lines, and blown and falling objects are dangerous risks associated with high winds. In addition, property damage and downed trees are common during high wind occurrences.

Hurricanes

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

Tornadoes

A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage. Refer to Appendix A for a description of the Fujita Tornado Damage Scale (F-Scale).

The Fujita Scale (refer to Appendix B) is the standard scale for rating the severity of a tornado as measured by the damage it causes. A tornado is usually accompanied by thunder, lightning and heavy rain. In comparison with a hurricane, a tornado covers a much smaller area but can be more violent and destructive.

Severe Thunderstorms

All thunderstorms contain lightning. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction of the air causes a shock wave that we hear as thunder, which can damage building walls and break glass.

Lightning

Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the sun. Lightning strikes can cause death, injury and property damage.

Hail

Hailstones are balls of ice that grow as they are held up by winds, known as updrafts, which blow upwards in thunderstorms. The updrafts carry droplets of super cooled water – water at a below freezing temperature – but not yet ice. The super cooled water droplets hit the balls of ice and freeze instantly, making the hailstones grow.

Downburst

A downburst is a severe, localized wind blasting down from a thunderstorm. These "straight line" winds are distinguishable from tornado activity by the pattern of destruction and debris. Depending on the size and location of these events, the destruction to property can be devastating. Downbursts fall into two categories: Microburst which covers an area less than 2.5 miles in diameter; and Macroburst which covers an area at least 2.5 miles in diameter.

Severe Winter Weather

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

Heavy Snow Storms

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

Ice Storms

An ice storm involves rain, which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires and similar objects, often resulting in widespread power outages. Refer to Appendix A for a description of the Sperry–Piltz Ice Accumulation Index.

Extreme Cold

Extreme cold consists of temperatures and wind chills that are significantly lower than normal and can cause a number of health and safety concerns, including frostbite, hypothermia, carbon monoxide poisoning and fires from alternative heating sources. Extreme winter cold often causes poorly insulated water pipes to freeze. Even some poorly-protected indoor plumbing may rupture as frozen water expands within them, causing property damage. Fires become more hazardous during extreme cold. Water mains may break and water supplies may become unreliable, making firefighting more difficult.

Nor'easters

A nor'easter is a large weather system traveling from south to north passing along or near the seacoast. As the storm approaches New England and its intensity becomes increasingly apparent, the resulting counterclockwise cyclonic winds impact the coast and inland areas from a northeasterly direction. The sustained winds may meet or exceed hurricane force, with larger bursts, and may exceed hurricane events by many hours (or days) in terms of duration.

Drought

Although New Hampshire is typically thought of as a water-rich state, there are times the demand for water can be difficult to meet. A combination of increased population and extended periods of low precipitation can cause reduced water supplies in the state. Drought is a normal, recurrent feature of climate. (NHDES Water Division)

The report *Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future* (Wake, 2011) projects increases in summer temperatures, decreases in the coldest winter temperatures, precipitation in the form of more rain and less snow, and longer dry periods punctuated by extreme storm events. Together these changes point to a greater likelihood of drought in the future.

In 1990, New Hampshire adopted a Drought Management Plan. The purpose of the Plan is to ensure that the state will respond in an organized, responsive and appropriate manner in the event of a drought related water shortage.

Key Issues and Challenges

Natural hazards have impacted and will continue to impact the state and the region. Coupled with climate change, it is very likely that these naturally occurring events may intensify and prove costly to municipalities,

businesses and residents. Impacts will be particularly noticeable on the coast where the combined effects of sea level rise coupled with coastal storm surge and upland flooding can cause the most damage to private and public property, assets and resources.

Municipalities have a critical role to play in natural hazard mitigation. Public Works staff and Emergency Management Directors are on the front lines of identifying mitigation actions, including infrastructure upgrades and public education on storm preparedness. Changes in climate are driving many of the mitigation projects municipalities need to implement to reduce risks posed by natural hazards. The Mitigation Action Plans included in every local Hazard Mitigation Plan provide the information local officials need to increase community resiliency.

Regional Trends

This section will examine trends, challenges and opportunities posed by natural hazards in the region.

Increase in the Magnitude and Frequency of Extreme Precipitation Events

Since the 1990's the magnitude and frequency of extreme precipitation events have increased compared with the historical trends since 1950.

Seasonal Coastal Flooding and Impacts from Sea Level Rise

Seasonal flooding and coastal storm related flooding have worsened.

Sea level rise is impacting coastal wildlife, forests and tidal wetlands.

Increased Investment and Populations in High Risk Areas

Seasonal coastal homes are redeveloped into permanent residences.
Value of coastal property continues to increase despite and overall downturn in market and assessed values.

Current and Future Challenges

Limited Financial Resources for Infrastructure Improvements and Upgrades

The state and municipalities lack consistent and dedicated funding sources to implement necessary upgrades to roads and infrastructure today and to address future impacts of climate change. There is also a lack of information to help prioritize those upgrades.

Lack of Municipal Inventories and Mapping of Infrastructure, Critical Facilities and Utilities

Many municipalities lack detailed inventories and mapping of infrastructure, critical facilities and utilities. This information is necessary to prepare comprehensive management plans that prioritize improvements for regular maintenance and incorporate actions to address future impacts of climate change.

Lack of Capacity for Coordination and Long Range Planning

Only a handful of municipalities have full-time planning staff. Others have part-time staff or circuit rides, or no planning support. Even those municipalities with planning support find it difficult to increase workloads particularly a complex topic like natural hazards and climate change.

Strategies and Opportunities

State and Federal Assistance

Stafford Act of 1988

The Stafford Act of 1988 (Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988. Pub. L. No. 100-707. Codified at 42 U.S.C. §§ 5121-5207) provides the legal authority for the federal government to provide assistance to states during declared major disasters and emergencies.

The Stafford Act authorizes the president to declare a "major disaster" or "emergency" in response to an incident or threatened incident that is beyond the combined response capabilities of state and local governments. The Federal Emergency Management Agency (FEMA) coordinates administration of disaster relief resources and assistance to states and the presidential declaration specifies the types of assistance authorized which can include other public health emergency response authorities. A presidential declaration enables access to disaster relief assistance and funds as appropriated by Congress. Congress may authorize additional funds as an event dictates. The Disaster Relief Fund is limited to those purposes specifically authorized and defined in the Stafford Act - implementing allowed activities to respond to major disasters and emergencies (Robert T. Stafford Disaster Relief and Emergency-Assistance Act Fact Sheet).

Resources and Assistance Available

Three types of assistance are authorized by the Stafford Act. Assistance includes direct federal aid in terms of services, grants, and technical support, or as reimbursement for services provided by or contracted for by affected states. FEMA has extensive rules, policies, and guidance to further define eligibility and procedures for Stafford Act assistance.

Individual Assistance:- Provides immediate direct and financial assistance to individuals for housing and other disaster related needs.

Hazard Mitigation: Provides grants to affected governments to implement long-term hazard mitigation measures after a major disaster declaration. Only areas within the geographic area designated in the declaration are eligible for hazard mitigation aid. Hazard mitigation assistance is available for major disasters but not emergencies under the Stafford Act.

Public Assistance: Provides aid to eligible applicants seeking assistance with eligible costs for eligible work performed at eligible facilities. Funding for public assistance is divided generally into a 75 percent federal share and 25 percent state share; however, the federal share may be raised in a presidential declaration.

Additional Assistance through Mutual Aid Agreement Reimbursement

FEMA will reimburse for services provided through written mutual aid agreements, like the Emergency Management Assistance Compact (EMAC), for aid provided to states where there has been a presidential declaration, the activities and costs directly relate to the event and eligible work, and costs are reasonable. (Robert T. Stafford Disaster Relief and Emergency-Assistance Act Fact Sheet)

N.H. Office of Energy and Planning

The Office of Energy and Planning (OEP) administers the National Flood Insurance Program (NFIP) in New Hampshire. The NFIP is a partnership between a community and the federal government. Currently, there are 214 communities (91 percent) in New Hampshire that participate in the NFIP. Communities participate by agreeing to adopt and enforce a floodplain management ordinance designed to reduce future flood risks and in return all residents in those participating communities (whether in floodplain or not) can purchase flood insurance. Through FEMA's Community Assistance Program, OEP provides technical assistance to communities and the public on floodplain management and helps to promote sound land use planning techniques that will reduce flood losses. OEP conducts Community Assistance Visits to ensure that communities participating in the NFIP are meeting program goals. OEP staff is available to help you and your community understand the NFIP. OEP provides assistance on Flood Insurance, Floodplain Maps and Studies, Floodplain Outreach, and Floodplain Regulations. For more information and resources about floodplain management, refer to the N.H. Office of Energy and Planning website at http://www.nh.gov/oep/planning/programs/fmp/index.htm. (N.H. Office of Energy and Planning, Floodplain Management Program)

Refer to the following website for federal assistance programs: FEMA's Community Assistance Program, FEMA Community Status Book, FEMA Regional Office in Boston.

N.H. Homeland Security and Emergency Management

The N.H. Homeland Security and Emergency Management HSEM is responsible for coordinating the state's response to natural disasters including hurricanes, floods and severe winter storms. The NH HSEM Planning Section administers the Hazard Mitigation Assistance programs, assisting in the development of comprehensive hazard mitigation plans and projects to protect citizens, and their property from exposure to all hazards including: natural, human caused, and technological. The Planning Section is also responsible for management of the FEMA Public Assistance grant program and the Emergency Management Performance Grant. HSEM also prepares the State Hazard Mitigation Plan (last updated in 2013) which lays out goals and recommendations to protect the state, municipalities and residents from impacts from natural and human caused hazards. (Homeland Security and Emergency Management)

The United States Congress, in 2000, adopted the Disaster Mitigation Act of 2000, providing federal funding for the development of state and local hazard mitigation plans and projects.
States and municipalities must adopt hazard mitigation plans in order to be eligible for federal hazard mitigation project funding and disaster relief. These plans are reviewed and approved by the Federal Emergency Management Agency (FEMA).

For more information about programs and assistance refer to the Homeland Security and Emergency Management website at http://www.nh.gov/safety/divisions/hsem/.

FEMA Community Rating System

To meet the need for property insurance coverage in floodplains, the Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP). The NFIP offers reasonably priced flood insurance in communities that comply with minimum regulatory standards for floodplain management. The NFIP's Community Rating System (CRS) recognizes community efforts beyond those minimum standards by reducing flood insurance premiums for floodplain property owners in participating communities. CRS discounts on flood insurance premiums range from 5% up to 45%.Those discounts provide an incentive for new flood protection activities that can help save lives and property, and reduce impacts in the event of a flood.

To participate in the CRS, communities can choose to undertake some or all of the 18 public information and floodplain management activities in the program. The CRS assigns credit points for each activity. Table __ describes the activities, the possible number of credit points for each activity and the average number of credit points communities earn for each activity. Based on the total number of points earned, the CRS assigns the community to one of ten classes; the class determines the percentage of discount on flood insurance premiums.

Table NHZ3. FEMA community Rating System floodplain management activities.

Series	Description	Maximum Points	Average Points
300	Public Information: *Elevation certificates*, map information service, outreach projects, real estate hazard disclosures, flood protection information, flood protection assistance	936	393
400	Mapping and Regulations: *Additional local flood data*, open space preservation, *higher floodplain regulatory standards*, flood data maintenance, stormwater management	5,895	620
500	Flood Damage Reduction: Floodplain management planning, *acquisition and relocation, flood protection (flood proofing, elevation)*, drainage system maintenance	6,689	653
600	Flood Preparedness: Flood warning program, *levee safety*, dam safety	1,330	357

Total eligible Points	***14,850***	***2,023***
Note: Activities in italics are eligible for the highest number of point in that series.		

Below is an example of a recommendation from the CRS Program, Series 500). The graph below shows the substantial level of savings on NFIP flood insurance premiums associated with raising the first floor elevation of structures above the base flood elevation also referred to as "freeboard".

Note: The Zone VE includes areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action, typically located on the immediate coast. The Zone AE are areas subject to inundation by the 1-percent-annual-chance flood event.

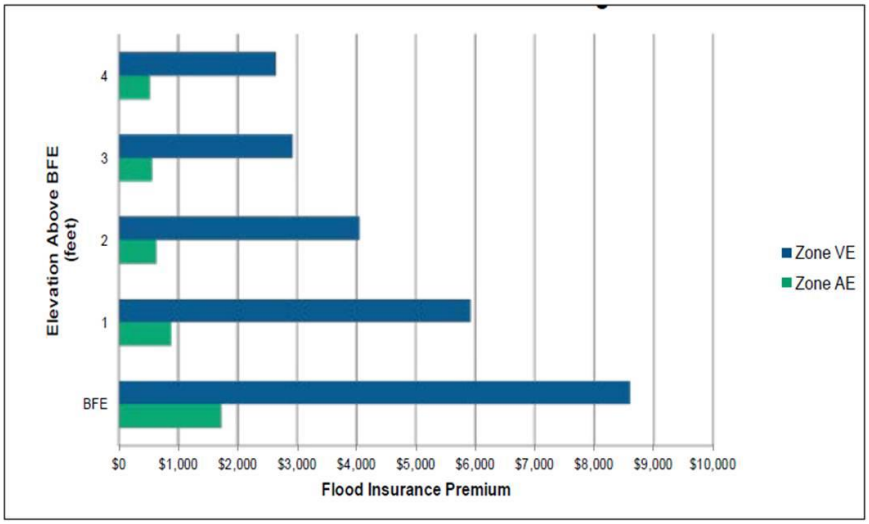


Figure NHZ6. Potential savings on flood insurance policy rates in National Flood Insurance Program flood based on elevating buildings by varying amounts above the base flood elevation.

Regional and Local Initiatives

Local Multi-Hazard Mitigation Plans

Federal Requirements and Plan Preparation

Local hazard mitigation plans create a framework for risk-based decision making to reduce damages to lives, property, and the economy from future hazards including impacts from climate change. Hazard mitigation planning forms the basis for a municipality's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. In 2000, the United States Congress adopted the Disaster Mitigation Act of 2000 [42 U.S.C. §5165], providing Federal funding for the development of State and local hazard mitigation plans and projects. These plans are reviewed by NH HSEM and the Federal Emergency Management Agency (FEMA), and adopted by the local governing body. New Hampshire Homeland Security and Emergency Management (NH HSEM) coordinate the updates of the State Hazard Mitigation Plan and provide technical assistance to state agencies and local governments in developing their hazard mitigation plans and projects. NH HSEM also provides funding assistance to local governments through the regional planning commission to develop their hazard mitigation plans. Hazard mitigation plans are updated every 5 years. (New Hampshire Department of Safety)

The Disaster Mitigation Act of 2000 requires municipalities to adopt a compliant and approved hazard mitigation plan to be eligible for federal disaster relief funds and federal hazard mitigation project funding programs such as FEMA Pre-Disaster Mitigation grants.

FEMA provides comprehensive guidance on how best to prepare and implement hazard mitigation plans to ensure plans provide the maximum benefit to the municipality (see additional resources on their website at http://www.fema.gov/hazard-mitigation-planning-resources).

Benefits to the Municipality

Hazard mitigation plans provide multiple functions and benefits to municipalities. Local plans serve as a framework for many types of planning including emergency preparedness and response, infrastructure and capital improvement investments, land use planning and regulation, public health and safety, public education and outreach, and land conservation. The local hazard mitigation planning process brings together a diverse group of representatives within the municipality allowing a coordinated and collaborative approach across all sectors of governance, planning and regulatory duties. All communities that RPC has assisted with updating their hazard mitigation plans maintain a list of vulnerable residents to provide necessary services during hazard events and emergencies (ill, elderly, day cares, etc.).

In hazard mitigation planning, ***'mitigation'*** refers to application of strategies and practices that reduce risk and vulnerability to natural hazards. Climate change defines mitigation as activities that reduce greenhouse gas emissions, the major cause of climate change.

Climate Change Considerations

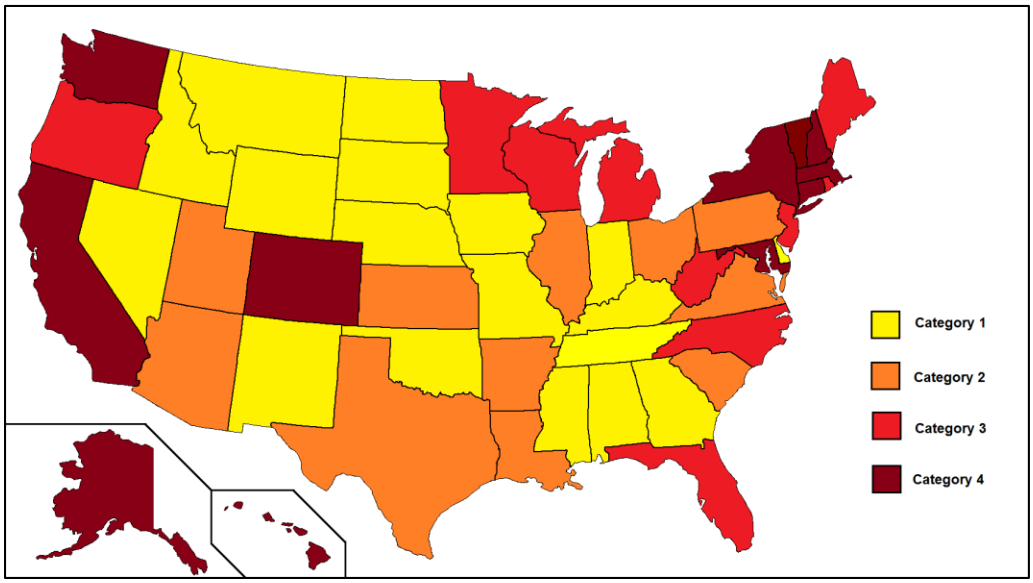
Current and future conditions relating to natural hazards and climate change can be incorporated into hazard mitigation plans; however, FEMA and HSEM offer no specific guidance or standards on how to do so. Being a coastal state that has experienced severe storm events in the past, New Hampshire incorporated climate change goals and recommendations in the 2009 update of the State Hazard Mitigation Plan.

The primary goal of hazard mitigation planning is to reduce loss and damage of public and private assets and resources and provide a long-term plan that results in sustainable, disaster-resilient communities. There are several distinct benefits to using the Hazard Mitigation planning process as a tool for climate adaptation planning.

- ✓ Plans are an existing tool with multiple functions and part of an established local planning process.
- ✓ A FEMA reviewed HMP is required for municipalities to be eligible for disaster relief funds and grant programs.
- ✓ Current and future conditions and associated risk and vulnerability can be incorporated.
- ✓ Plans are updated every five years which allows for iterative and adaptive revisions based on changing conditions.
- ✓ Updates are supported by a dedicated funding source through FEMA.

According to a 2013 study conducted by the Center for Climate Change Law at Columbia Law School, NH's State Hazard Mitigation Plan ranked highest – category 4 along with Vermont, Massachusetts and Connecticut and seven other states – for featuring the most complete and helpful integration of climate change related information. (Babcock, 2013)

Figure NHZ7. Map of the ranking category for each state from the Columbia Law School report State Hazard Mitigation Plans & Climate Change: Rating the States (2013). Category 4 includes states having adopted Hazard Mitigation Plans that have the most complete and helpful integration of climate



The study evaluated the extent climate change related issues are incorporated into existing State Hazard Mitigation Plans, with an emphasis on identifying which states have a more accurate and thorough discussion of the issue. The survey identified those state plans that address climate change and climate-related issues in an accurate and progressive manner, and those that do not. According to the report, the results of the survey indicate that coastal states are more likely to acknowledge climate change, possibly due in part to recent emphasis on and awareness of the relationship between climate change and sea level rise, coastal storms, and related hazards.

Local Emergency Operations Plans

The primary purpose for Local Emergency Operations Plans (LEOPs) is to implement disaster and emergency preparedness, response, and short-term recovery planning. LEOPs describe who will do what, as well as when, with what resources, and by what authority before, during, and immediately after an emergency. Local Emergency operations Plans serve as the basis for effective response to any hazard that threatens a municipality, both natural and man-made. The Plans facilitate integration of mitigation into response and recovery activities, and facilitate coordination with the Federal Government during catastrophic disaster situations that necessitate implementation of the Federal Response Plan (FRP). The specific actions implemented by local emergency operations plans are to:

- Assign responsibility to organizations and individuals for carrying out specific actions at projected times and places in an emergency.
- Establish lines of authority and organizational relationships, and describes assigned actions will be coordinated.
- Describe how people and property will be protected in emergencies and disasters.
- Identify personnel, equipment, facilities, supplies, and other resources available within the municipality or by agreement with other jurisdictions for use during response and recovery operations.
- Identify steps to address mitigation concerns during response and recovery activities.

(Federal Emergency Management Agency, 1996)

Watershed Based Research

Fluvial Geomorphology Studies of the Exeter and Lamprey Rivers

Fluvial geomorphology is the study of how running water shapes the landforms on the Earth's surface. Fluvial erosion is the wearing away of river channel banks and beds by the action of water.

RSA 674:56 II (a) Flood Hazards states **"**Municipalities may adopt fluvial erosion hazard ordinances. Any fluvial erosion hazard zoning shall be based on delineation of zones consistent with fluvial erosion hazard protocols established by the department of environmental services." This statute became effective July 2009. To date no municipalities in the RPC planning region have adopted fluvial erosion hazard zones or ordinances.

However, the fluvial geomorphic studies of the Exeter and Lamprey Rivers contain inventories of erosion hazards with recommendations for repair and restoration of actively eroding areas (buffers, revegetation) along the river and its floodplain, and recommendations for replacing and upgrading infrastructure such as bridges, culverts and stabilizing walls. These inventories and recommendations have been used by several towns to prioritize activities in the river corridor and floodplain and obtain funding for project implementation.

The Exeter and Lamprey River reports are available on the NHDES website at http://des.nh.gov/organization/divisions/water/wmb/was/watershed_based_plans.htm.

Lamprey River Watershed Climate and Land Use Study

Coastal communities in New England are confronting the effects of rapid development and associated land use change, while also dealing with the serious impacts of an increase in extreme precipitation events. Both factors influence the frequency and magnitude of flood events. In response, local decision-makers and regional planners seek improved scientific information regarding flood risk as a basis for guiding development, supporting land use decision-making, and planning infrastructure investments.

To address this gap, NOAA funded a study for the Lamprey River watershed - *Assessing the Risk of 100-year Freshwater Floods in the Lamprey River Watershed of New Hampshire Resulting from Changes in Climate and Land Use* - to assess flood risks based on existing and future land use and climate change scenarios. Key products from this study include maps at the watershed and municipality scale of projected 100-year flood risk areas under modelled land use and development patterns, stormwater runoff generation, and climate change scenarios.

Refer to the section Riverine Flooding on page 7 of this chapter for a definition of the 100-year floodplain.

The full report and additional information about flooding is available on the Carbon Solutions New England website at http://100yearfloods.org/.

Collaborative Networks

Federal and state agencies and regional organizations offer municipalities a wide range of technical assistance, funding and support program for hazard mitigation and emergency planning efforts. The greatest benefit to partnering with these agencies and organizations is the opportunity to participate in collaborative networks that share information and resources, work together to address common problems, and learn from peers about the challenges they face in preparing and protecting their communities for the impacts of natural hazards and disasters.

New Hampshire Public Works Municipal Aid Program

The New Hampshire Public Works Municipal Aid (NHPWMA) program is a network of municipalities that assist one another during emergencies through partnering agreements and a protocol for requesting and receiving aid. Since most disasters impact multiple municipalities, NHPWMA allows communities from all over the state to respond to those most affected. The program maintains contact information and inventories of services and equipment for each member of the program. NHPWMA is currently available to municipalities and other governmental entities including village districts and private water and wastewater utilities. During emergencies, members can either contact other members directly, use the toll-free hotline (877-731-9908) or via email using the pw.net listserv. Providing aid is optional and aid agreements are reciprocal. For more information about the program, visit the University of New Hampshire, Technology Transfer, New Hampshire Public Works Municipal Aid program website.

Nearly half of the municipalities in the region are members of the NHPWMA program, including all seven municipalities immediately bordering the coastline.

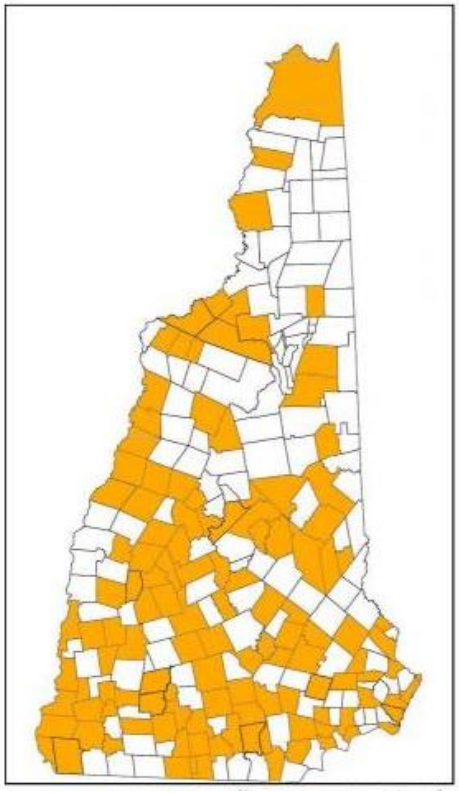


Figure NHZ8. Municipalities participating in the New Hampshire Public Works Municipal Aid (NHPWMA) program.

Participation in the program provides the region with enhanced response capacity and ability to provide timely services during hazardous events or life threatening circumstances. Coordinating regional systems such as evacuation routes, local flooding and damage to infrastructure will assist residents, businesses and visitors to execute their own safety and preparedness plans.

Best Practices to Minimize Impacts and Create Resilience

Understanding community vulnerability and the level of risk posed by natural hazards is the first step in prioritizing municipal response. Municipal mitigation action plans that are developed as part of local hazard mitigation plans identify many proven projects or programs that improve community preparedness and response. The following practices can be incorporated into municipal policies plans and procedures. Adopting proactive practices to reduce risk and exposure to natural hazards, in addition to emergency response planning, can help to increase municipal and community-wide resilience and preparedness.

Table NHZ4. Best practices for municipalities to minimize impacts and create resilience.

Implementation Methods	Integrated Practices
Emergency Response Plan **Disaster Response and Recovery Plan** **Hazard Mitigation Plan** **Capital Improvement Plan** **Zoning and Land Development Regulations** **Master Plan**	Conduct an annual culvert inspection and maintenance program. Work with utilities and public works departments to trim trees overhanging utility wires and poles. Conduct outreach and education programs on homeowner and business preparedness. Adopt hazard resilient stormwater management regulations. Activate emergency notification call systems. Update Emergency Response Plan with best available information (including sea level rise, flooding and infrastructure mapping). Establish goals that address emergency management, climate change and management of critical assets and resources.

Best Practices by Municipalities in the Region

Every town in the region has a Natural Hazards Mitigation Plan. These plans describe actions being undertaken by towns to increase resiliency to natural hazards and climate change and increase effectiveness of local response to weather related events. Examples of these best practices include:

- Conserving shoreland and associated uplands to enable flood storage and reduce the impact of flooding;
- Conducting regular inspection and maintenance of drainage systems, including clearing debris and sediment from drains, culverts and roadside ditches;
- Elevating roads and bridges above base flood elevation;
- Educating residents seasonally about how to prepare their homes and businesses for natural hazards;
- Using social media to alert and inform residents about pending weather related events;
- Referring to local, county and state natural hazard mitigation plans when developing master plans, land use regulations, capital improvement plans, and land conservation plans;

Refer to the Climate Change Chapter for a detailed list and description of climate adaptation strategies that increase resilience and reduce risk and exposure.

Federal, State and Regional Resources

An effective strategy to address impacts of natural hazards is to build networks to encourage collaboration with agencies, academia and other practitioners to improve preparedness and reduce loss and damage. Each organization listed in the table below offers tools, technical assistance or financial resources for hazard mitigation planning, project implementation and community outreach and engagement. Municipalities benefit immensely from partnering with these organizations by increasing their knowledge of and capacity to address hazards through thoughtful planning and investment.

Table NHZ5. Agencies and organizations assisting with hazard preparedness and climate adaptation. To be Completed.

Agency/Organization	Tools-Resources
N.H. Homeland Security and Emergency Management	Provides guidance and informational materials. Assists with applying for FEMA grant funds and disaster relief. Manages and funds (through FEMA) Hazard Mitigation Plan updates.
N.H. Office of Energy and Planning Jennifer Gilbert, CFM, ANFI State Coordinator – Floodplain Management Program Voice: (603) 271-1762 Email: jennifer.gilbert@nh.gov	National Flood Insurance Program (NFIP) compliance assistance. Technical assistance to communities and the public on floodplain management. Community Assistance Visits to evaluate/update floodplain standards. Community Rating System Program assistance
Coastal Adaptation Workgroup	Assists communities to prepare for the effects of extreme weather events and other effects of long term climate change. Provides communities with resources, education, facilitation and guidance materials. Collaborative network support. Website at http://nhblog.stormsmart.org/
N.H. Department of Environmental Services (DES): NH Coastal Program Air Resources Division Water Resources Division	Provides technical assistance and resources. Coastal management and information and website at http://des.nh.gov/organization/divisions/water/wmb/coastal/index.htm
Climate Research Centers at University of New Hampshire and Antioch University	Research, conferences, technical assistance. Collaborative network support.
N.H. Coastal Risks and Hazards Commission	Science and Technical Advisory Panel Report (2014). Recommendations on legislation and other actions (in process through 2016).
Association of State Floodplain Managers (ASFM)	Promote education, policies, and activities that mitigate current and future losses, costs, and human suffering caused by flooding. Protect the natural and beneficial functions of floodplains - all without causing adverse impacts. ASFM website at http://www.floods.org/

Natural Hazards Recommendations

Recommendation 1

Incorporate information on future hazards and climate change in municipal planning documents (e.g. Hazard Mitigation Plans, Master Plans, capital improvement plans, and open space and land conservation plans).

Actions

- Prepare multi-hazard and climate change vulnerability assessments for coastal and Great Bay municipalities (including inventories of existing infrastructure, assets and facilities).
- Support municipalities in adopting a Climate Change Chapter in their local hazard mitigation plans.
- Adopt natural hazards and climate adaptation measures in municipal infrastructure and facilities management plans.
- Adopt long term goals in local Master Plans to reduce risk and exposure to natural hazards and climate change impacts based on recommendations from vulnerability assessments and local Hazard Mitigation Plans.
- State and regional partners (such as NH HSEM, Coastal Adaptation Workgroup, NH Coastal Program and RPC) secure funding for regional and local hazard mitigation planning and climate adaptation projects.

Recommendation 2

Implement strategies to minimize impacts to people, property, and infrastructure.

Actions

- Work with state agencies, utilities and municipalities to plan for future use of lands in high risk areas served by state, municipal and private infrastructure, considering adaptive reuse, relocation, and retreat strategies.
    - Assess risk and level of exposure of key regional and local infrastructure and facilities.
    - Identify strategies to implement phased and iterative adaptation measures through the life-cycle of infrastructure and facilities in high hazard areas.
    - Plan for future relocation or replacement of infrastructure and facilities in high risk areas.
- Evaluate new and alternative funding mechanisms for upgrades and planned actions that address future impacts of climate change.
- Create local multi-sector planning committees to identify and integrate key cross-cutting issues and recommendations into municipal policies and programs, regulations and building codes.
    - Committees may consist of elected officials, department heads and staff, land use boards and commissions and water/sewer utilities.
- Adopt standards in local zoning and land development regulations that protect and minimize impacts to public and private investments, and critical resources.

Recommendation 3

Implement strategies to conserve and minimize impacts to ecosystems, natural resources and historical and cultural resources.

Actions

- Assess risk and level of exposure of critical ecosystems, environmental services, and historical and cultural resources to natural hazards and climate change.
- Collaborate with natural resource and environmental agencies and organizations to prepare resource based plans (natural, historical, cultural) at the (sub)watershed scale that consider existing hazards and future impacts of climate change.
- Collaborate with natural resource and environmental agencies and organizations to conserve and protect environmental services provided by natural landscapes.
- Develop technical assessment tools to guide planning and regulatory decisions that consider both the human and natural environments.

Recommendation 4

Local emergency response and planning officials develop regional and/or local disaster response and recovery plans.

Actions

- Encourage municipalities to participate in the New Hampshire Public Works Municipal Aid program.
- Coordinate federal, state and municipal regulatory and permitting standards following a disaster or extreme event.
    - Determine what types of structures may be rebuilt and to what standards.
    - Identify lands where rebuilding is not feasible or able to be supported by infrastructure.
    - Identify restoration opportunities for natural systems.
- Integrate response and recovery plans with local Hazard Mitigation Plans, Master Plans, zoning and land development regulations.

Recommendation 5

Municipalities proactively communicate and provide resources to residents and businesses about the impacts of natural hazards and how to better prepare for such events.

Actions

- Provide informational materials and guidance to property owners about the FEMA National Flood Insurance Program, ways to reduce exposure and risk, and manage costs of insurance premiums.
- Provide information to residents and businesses on ways to improve preparedness before and after hazardous events.
- Require information about existing and potential future hazards be provided to prospective property buyers.
- Communicate the level of municipal costs associated with declared disasters and other hazardous events and ways these costs might be minimized or avoided through changes to municipal decisions and regulatory requirements.

- Coastal Adaptation Workgroup provides technical resources and guidance to municipalities, residents and businesses in the region.

Natural Hazard Goals and Recommendations Matrix

	NHZ Goal 1	NHZ Goal 2	NHZ Goal 3	NHZ Goal 4	NHZ Goal 5	NHZ Goal 6	NHZ Goal 7	NHZ Goal 8
Recommendation 1	P	S	S	S	S	S	S	S
Recommendation 2	S	S	S	P	P	S	S	S
Recommendation 3	S	S	S	P	P	S	S	S
Recommendation 4	S	S	S	P	P	S	S	S
Recommendation 5	P	P	S	P	TBD	S	P	S

S = Natural Hazards Recommendation supports the Energy Goal.
P = Natural Hazards Recommendation partially supports the Energy Goal.
TBD = to be determined
N/A= not applicable

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Appendices

Appendix A. Description of Less Frequent Natural Hazards That Affect the Region

Below are descriptions of natural Hazards that infrequently affect the region but have caused damage and disruption in the past occurrences.

Wildfire

Wildfire is an uncontrolled and rapidly spreading fire which generally occurs in woodland and grassy areas. New Hampshire forests occupy 84 percent or 4.8 million acres making these areas vulnerable to wildfire particularly during periods of drought and/or large-scale natural disturbances causing unusual buildup of deadfall. The most recent significant wildfire in the region occurred in 1963 involving 760 acres in the towns of Kensington and Exeter.

The proximity of many developed areas to forested lands exposes their populations to the potential impact of wildfire. New Hampshire is the second most forested state in the United States. Growth in the region has extended commercial and residential development into previously forested areas. Although this development has slowed, the "sprawl effect" has increased risk of damage in remaining heavily forested.

New Hampshire experiences an average of 350-400 wildfires involving 200-250 acres per year. Approximately 95% of these fires are caused by humans, whereas the remaining 5% are caused by lightning. The primary causes of wildfires in the state are escaped debris burns, miscellaneous causes from power lines, fireworks, and campfires. (NH Homeland Security and Emergency Management)

Fires typically occur in April and May with fewer occurring in October and November. The reason the majority of fires occur in spring and fall are due to the fact that the predominant forest type is hardwood trees. While most of the State is covered in northern hardwood forests containing maple, birch and beech, there are numerous smaller "pockets" of high-hazard fuel types scattered throughout the state consisting of pitch pine/scrub oak, spruce-fir, and oak-pine forests. Phragmites, pervasive on the seacoast area and freshwater wetland complexes, also provides fuel for wildfires.

Drought

A drought is a natural hazard that evolves over months or even years and can last as short as a few months or as long as several years. The severity of the drought is gauged by the degree of moisture deficiency, its duration and the size of the area affected. The effect of droughts, or decreased precipitation, is indicated through measurements of soil moisture, groundwater levels, lake levels, stream flow and increased fire danger. Not all of these indicators will be minimal during a particular drought. For example, frequent minor rainstorms can replenish the soil moisture without raising ground water levels or increasing stream flow for a sustained period of time.

Low stream flow correlates with low ground water level because it is ground water that discharges to streams and rivers that maintain stream flow during extended dry periods. Low stream flow and low ground water levels commonly cause diminished water supply.

There are five magnitudes of drought outlined in the New Hampshire State Drought Management Plan. The highest magnitude is Exceptional, followed by Extreme, Severe, Moderate and Abnormally Dry. Each level has varying responses. The statistical recurrence interval of each magnitude is summarized in Table 1. Table 2 lists the years in which the magnitude of drought in New Hampshire was at least "Extreme" for some period of time. [Source: State of NH Multi-Hazard Mitigation Plan Update 2013]

The current State Drought Management Plan from 1990 is currently being updated by NHDES. http://nhdrought.org/

Earthquakes

An earthquake is defined as 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. New Hampshire is considered to lie in an area of

moderate seismic hazard compared to other areas within the United States. New Hampshire has had and will continue to experience damaging earthquakes; however, the intervals between such events are greater in New Hampshire than in high hazard areas such as the Pacific Northwest. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, and avalanches. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks and end in vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is determined by the use of scales such as the Richter scale and Mercalli scale.

Earthquakes in New Hampshire cannot be associated with specific, known faults. Although identified active faults in New Hampshire have not been identified, there is little doubt that active faults located beneath the surface do exist. Currently, there is a "zone" that extends from north of the Lakes Region south along the Merrimack River into Massachusetts where most New Hampshire earthquakes have occurred. New Hampshire is in the low attenuation of seismic waves in the eastern United States. Attenuation means the slow loss of intensity of flow through any kind of medium. Seismic waves can cover an area 4 to 40 times greater in the east than they do in the west mainly due to the hard rock geology of New Hampshire. The importance of this to emergency planning and response is that damages can be expected to be spread over a much greater area, and an earthquake's location does not have to be close to a particular point to cause damage. [Source: State of NH Multi-Hazard Mitigation Plan Update 2013]

Tsunamis

Earthquakes can also generate tsunamis. A tsunami is a set of ocean waves caused by any large, abrupt disturbance of the sea-surface. Tsunamis are most commonly generated by earthquakes in marine and coastal regions. Major tsunamis are produced by large (greater than 7 on the Richer scale), shallow focus (< 30km depth in the earth) earthquakes associated with the movement of oceanic and continental plates. They frequently occur in the Pacific, where dense oceanic plates slide under the lighter continental plates. When these plates fracture there is vertical movement of the seafloor that initiates a quick and efficient transfer of energy from the solid earth to the ocean which creates the tsunami.

Appendix B. History of hazardous events and hazard scales used to measure their intensity.

Notable Natural Hazard Events in Southeast New Hampshire Source: State of NH Multi-Hazard Mitigation Plan (2013)				
Hazard	**Date**	**Location**	**Impacted Area**	**Remarks/Description**
Flood, Hurricane, Tropical Storm	March 11-21, 1936	Statewide	$133,000,000 in damage throughout New England, 77,000 homeless.	Double Flood; snowmelt/heavy rain.
Flood, Hurricane, Tropical Storm	September 21, 1938	Statewide	Unknown	Hurricane; stream stage similar to March 1936
Flood, Hurricane, Tropical Storm	July 1986 – August 10, 1986	Statewide	Unknown	**FEMA DR-771-NH**: Severe storms; heavy rain, tornadoes , flash flood, severe wind
Flood, Hurricane, Tropical Storm	August 7-11, 1990	Statewide	Road Network	**FEMA DR-876-NH**: A series of storms with moderate to heavy rains; widespread flooding.
Flood, Hurricane, Tropical Storm	August 19, 1991	Statewide, Primarily Rockingham and Strafford Counties	Road Network	**FEMA DR-917-NH:** Hurricane Bob; effects felt statewide; counties to east hardest hit.
Flood, Hurricane, Tropical Storm	October 28, 1996	Rockingham County	Unknown - Typically structures and infrastructure in the floodplain	North and west regions; severe storms.
Flood, Hurricane, Tropical Storm	June – July 1998	Rockingham County	Heavy damage to secondary roads occurred	**FEMA DR-1231-NH:** A series of rainfall events
Flood, Hurricane, Tropical Storm	May 12, 2006	Central and Southern Regions	100 yr – 500 yr	**FEMA-1643-DR:** Severe storms and flooding. Counties Declared: Belknap, Carroll, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford
Flood, Hurricane, Tropical Storm	April 15 - 23, 2007	Statewide	100 yr – 500 yr	**FEMA-1695-DR:** Severe storms and flooding associated with a Nor'easter. Counties Declared: Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan.
Flood, Hurricane, Tropical Storm	July 24 2008	Central and Southern Regions	100 yr – 500 yr	**FEMA-1782-DR** Severe storms, tornado and flooding. Counties Declared: Belknap, Carroll, Merrimack, Rockingham, and Strafford
Flood, Hurricane, Tropical Storm	March 14 – 31, 2010	Southeastern Region	100 yr – 500 yr	**FEMA-1913-DR** Severe storms and flooding. Counties Declared: Hillsborough and Rockingham County

Flood, Hurricane, Tropical Storm: Great Hurricane of 1938	September 21, 1938	All of Southern New England	2 billion board feet of timber destroyed; electric and telephone disrupted, structures damaged, 1,363 families received assistance.	Max. wind speed of 186 mph in MA and 138mph max. elsewhere 13 of 494 dead in NH; $12,337,643 total storm losses (1938 dollars, timber not included).
Flood, Hurricane, Tropical Storm: Hurricane Carol	August 31, 1954	Southern New England	Extensive tree and crop damage in state.	Saffir/Simpson Hurricane Scale[1] - Category 3, winds 111-130 mph
Flood, Hurricane, Tropical Storm: Hurricane Donna	September 12, 1960	Southern and Central NH	Unknown	Category 3 Heavy Flooding
Flood, Hurricane, Tropical Storm: Hurricane Belle	August 10, 1976	Southern New England	Unknown	Category 1, winds 74-95 mph Rain and flooding in NH
Flood, Hurricane, Tropical Storm: Hurricane Gloria	September 27, 1985	Southern New England	Unknown	Category 2, winds 96-110 mph >70 mph winds; minor wind damage and
Flood, Hurricane, Tropical Storm: Tropical Storm Floyd	September 16-18, 1999	Statewide	Unknown	
Flood, Hurricane, Tropical Storm: Tropical Storm Irene	August 26- September 6, 2011	Carroll, Coos, Grafton, Merrimack, Belknap, Strafford, Sullivan, Hillsborough and Rockingham Counties	Extensive Flooding and power outages due to downed trees	FEMA- 4026-DR Emergency declaration from Tropical Strom Irene for Hillsborough and Rockingham Counties
Tornado	May 21, 1814	Rockingham County	Unknown	F2[2]
Tornado	May 16, 1890	Rockingham County	Unknown	F2
Tornado	August 21, 1951	Rockingham County	Unknown	F2
Tornado	June 9, 1953	Rockingham County	Unknown	F3
Tornado	June 19, 1957	Rockingham County	Unknown	F2
Tornado	July 2, 1961	Rockingham County	Unknown	F2
Tornado	June 9, 1963	Rockingham County	Unknown	F2
Downburst	July 6, 1999	Stratham, NH	Major tree damage, power outages	Microburst - $2,498,974 in damages, Five fatalities, eleven injuries.
Tornado	May 21, 2006	Rockingham County	Unknown	F2
Tornado	July 24, 2008	Rockingham, Merrimack, Belknap, Strafford, Carroll	Unknown	F2
Severe Winter Storm Ice Storm	December 17-20, 1929	NH	Telephone, telegraph and power disrupted.	

[1] For a complete description of the Saffir/Simpson Hurricane Scale see Appendix C.

[2] For a complete description of the Fujita Tornado Damage Scale see Appendix D

Severe Winter Storm Ice Storm	December 29-30, 1942	NH	Unknown- Typically damage to overhead wires and trees.	Glaze storm; severe intensity
Severe Winter Storm Ice Storm	December 22, 1969	Parts of NH	Power disruption	Many communities affected
Severe Winter Storm Ice Storm	January 17, 1970	Parts of NH	Power disruption	Many communities affected
Severe Winter Storm Ice Storm	January 8-25, 1979	NH	Major disruption of Power and transportation	
Severe Winter Storm Ice Storm	March 3-6, 1991	Southern NH	Numerous power outages in southern NH	Numerous in Southern NH
Severe Winter Storm Ice Storm	January 7, 1998	Rockingham County	Power and phone disrupted, communication tower collapsed.	$17,000,000 in damages to PSNH equipment.
Severe Winter Storm Ice Storm	December 12, 2008	New England,	Severe ice storm that caused major damage to private and public utilities.	PSNH states cost of restoration effort Estimated at $75 million for NH alone
Severe Winter Event Ice Jam	Feb 29, 2000	Brentwood, NH Epping River	Unknown	Discharge 570 cfs
Severe Winter Event Ice Jam	Mar 29, 1993	Epping, NH Lamprey River	Road flooding	
Severe Winter Storm	February 4-7, 1920	New England	Disrupt transportation for weeks	Boston 37-50cm of sleet , ice and snow
Severe Winter Storm	February 15, 1940	New England	Paralyzed New England	30cm of snow with high wind.
Severe Winter Storm	February 14-17, 1958	Southern NH	Unknown	20-33” of snow
Severe Winter Storm	March 18-21, 1958	South central NH	Unknown	22-24”of snow
Severe Winter Storm	March 2-5, 1950	Southern NH	Unknown	25”of snow
Severe Winter Storm	January 18-20, 1961	Southern NH	Unknown	Blizzard Conditions; 50cm of snow
Severe Winter Storm	February 8-10, 1969	Southeastern NH	Paralyzing snow	27”of snow and high winds
Severe Winter Storm “Blizzard of’78”	February 5-7 1978	Statewide	Trapped commuters on highways, businesses closed	Hurricane force winds; 25-33”of snow. People disregard warnings due to series of missed forecasts
Severe Winter Storm	April 5-7, 1982	Southern NH	Unknown	Late season with thunderstorms, 18-22” of snow
Severe Winter Storm Snow Emergency	March 2001	Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, and Strafford	Unknown	FEMA-3166-EM $4,500,000
Severe Winter Storm Snow Emergency	March 11, 2003	Cheshire, Hillsborough, Merrimack, Rockingham and Strafford	Unknown	FEMA-3177-EM $3,000,000

Severe Winter Storm Snow Emergency	March 30, 2005	Belknap, Carroll, Cheshire, Grafton, Hillsboro, Merrimack, Rockingham, Strafford and Sullivan	Unknown	FEMA-3207-EM $4,654,738
Severe Winter Storm Snow Emergency	April 28, 2005	Carroll, Cheshire, Hillsboro, Rockingham and Sullivan	Unknown	FEMA-3211-EM $2,677,536
Severe Winter Storm	December 1959	Portsmouth		A Nor'easter brought tides exceeding maximum tidal flood levels in Portsmouth. Damage was heaviest along the coast
Severe Winter Storm	February 1972	NH Coast		Coastal NH was declared a National Disaster Area as a result of the devastating effects of a severe coastal storm. Damage was extensive.
Severe Winter Storm	October 1991	NH Coast		"The Perfect Storm" – Tidal surge approximately 3.5 feet
Severe Winter Storm	December 11, 2008	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan	Unknown	FEMA-1812-DR $19,789,657
Severe Winter Storm	February 23, 2010	Merrimack, Rockingham, Strafford, and Sullivan	Unknown	FEMA-1892-DR
Severe Winter Storm	March 14, 2010	Rockingham and Hillsborough Counties	Unknown	FEMA-1913-DR
Sever Winter Storm	October 29-30, 2011	Rockingham and Hillsborough Counties	Unknown	FEMA-4049-DR
Earthquake	December 20, 1940	Ossipee		Richter Magnitude Scale: 5.5
Earthquake	December 24, 1940	Ossipee	Ground cracks and damage over a broad area	Richter Magnitude Scale: 5.5; Felt over 550 KM away.
Earthquake	December 28, 1947	Dover		Richter Magnitude Scale: 4.5
Earthquake	January 19, 1982	West of Laconia		Richter Magnitude Scale: 4.5
Wildfire	1915	Most of NH		29,480 acres
Wildfire	1963	Kensington-Exeter		760 acres
Drought	1929-36	Statewide	Unknown	Regional
Drought	1939-44	Statewide	Unknown	Severe in southeast NH
Drought	1947-50	Statewide	Unknown	Moderate
Drought	1960-69	Statewide	Unknown	Longest recorded continuous period of below normal precipitation
Drought (Warning)	June 6, 1999	Most of State	Unknown	Governor's declaration; Drought Index indicates "moderate drought" statewide.
Drought	2001-2002	Statewide	Unknown	Third worst on record, exceeded only by the drought of 1956-1966 and 1941-1942

Sperry–Piltz Ice Accumulation Index

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

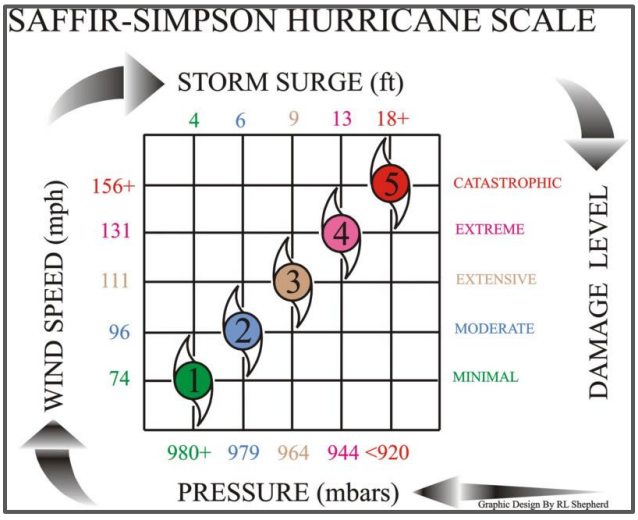
ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions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

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

The Sperry–Piltz Ice Accumulation Index, or SPIA Index, is a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm of researched parameters that, when combined with National Weather Service forecast data, predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness. The SPIA Index is to ice storms what the Enhanced Fujita Scale is to tornadoes, and what the Saffir–Simpson Scale is to hurricanes. Previous to this hazard scale development, no such 'forward-looking' ice accumulation and ice damage index had ever been utilized to predict – days in advance – the potential damage to overhead utility systems, along with outage duration possibilities, from freezing rain and/or ice storm events.

Saffir-Simpson Hurricane Wind Scale

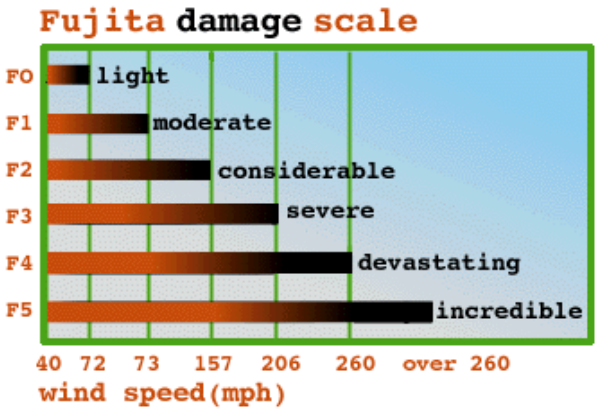
The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.[3]



[Source: Graphic by RL Shepherd]

[3] NOAA National Hurricane Center website at http://www.nhc.noaa.gov/aboutsshws.php

Fujita Tornado Damage Scale



Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale (F-Scale) to provide estimates of tornado strength based on damage surveys. Since it's practically impossible to make direct measurements of tornado winds, an estimate of the winds based on damage is the best way to classify a tornado. The new Enhanced Fujita Scale (EF-Scale) addresses some of the limitations identified by meteorologists and engineers since the introduction of the Fujita Scale in 1971. The new scale identifies 28 different free standing structures most affected by tornadoes taking into account construction quality and maintenance. The range of tornado intensities remains as before, zero to five, with 'EF-0' being the weakest, associated with very little damage and 'EF-5' representing complete destruction, which was the case in Greensburg, Kansas on May 4th, 2007, the first tornado classified as 'EF-5'. The EF scale was adopted on February 1, 2007.[4]

Below is a brief description of the Enhanced Fujita Scale compared with the old Fujita Scale with descriptions of associated damage.

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

[4] http://www.wunderground.com/resources/severe/fujita_scale.asp

Appendix C. Summary of the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014

On March 21, 2014, President Obama signed the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014 into law. This law repeals and modifies certain provisions of the Biggert-Waters Flood Insurance Reform Act, which was enacted in 2012, and makes additional program changes to other aspects of the program not covered by that Act. Many provisions of the Biggert-Waters Flood Insurance Reform Act remain and are still being implemented. Below is a summary of the Senate Menendez/Grimm Bill that amended the 2012 Act which then became the HFIAA. [Source: Insurance Journal, By Andrew G. Simpson, March 13, 2014]

Controls on Rate Increases

- *Creates a firewall on annual rate increases* – Prevents FEMA from raising the average rates for a class of properties above 15% and from raising rates on individual policies above 18% per year for virtually all properties.
- *Repeals the property sales trigger* – Repeals the provision in Biggert-Waters that required homebuyers to pay the full-risk rate for pre-FIRM properties at the time of purchase. This provision caused property values to steeply decline and made many homes unsellable, hurting the real estate market. Under the Menendez/Grimm Bill, homebuyers will receive the same treatment as the home seller.
- *Repeals the new policy sales trigger* – Repeals the provision in Biggert-Waters that required pre-FIRM property owners to pay the full-risk rate if they voluntarily purchase a new policy. This provision disincentivizes property owners from making responsible decisions and could hurt program participation. The Menendez/Grimm Bill allows pre-FIRM property owners to voluntarily purchase a policy under pre-FIRM conditions.
- *Reinstates grandfathering* – Repeals the provision in Biggert-Waters that would have terminated grandfathering. If grandfathering was terminated, property owners mapped into higher risk would have to either elevate their structure or have higher rates phased in over 5 years. The Menendez/Grimm Bill allows grandfathering to continue and sets hard caps on how high premiums can increase annually.
- *Refunds homeowners who overpaid* – Requires FEMA to refund policyholders for overpaid premiums.
- *Affordability goal* – Requires FEMA to minimize the number of policies with annual premiums that exceed one percent of the total coverage provided by the policy.

FEMA Transparency and Outreach Requirements

- *Reimburse successful appeals* – Allows FEMA to utilize the National Flood Insurance Fund to reimburse policyholders and communities that successfully appeal a map determination. Making appeal reimbursement an eligible expense of the NFIF would give FEMA the incentive to "get it right the first time" and repay homeowners and communities for contributing to the body of flood risk knowledge, according to backers.
- *Flood insurance advocate* – Establishes a Flood Insurance Advocate within FEMA to answer current and prospective policyholder questions about the flood mapping process and flood insurance rates..
- *Urban mitigation fairness* – Requires FEMA to establish guidelines on alternative mitigation methods for urban structures where tradition mitigation efforts such as elevation are impractical (i.e. row houses, townhouses). This section makes clear that such alternative forms of mitigation shall be taken into account in the calculation of risk premium rates.
- *Clear communication* – Requires FEMA to clearly communicate full flood risk determinations to policyholders even if their premium rates are less than full risk. This helps to inform policyholders as to their true flood risk.
- *Fairness for small businesses, houses of worship, non-profits and low-income homes* – Requires FEMA to report to Congress on the impacts of rate increases on small businesses, non-profit entities, houses of worship, and residences with a value equal to less than 25% of the area median home value.
- *Mapping accuracy* – Requires FEMA to certify its mapping process is technologically advanced and to notify and justify to communities that the mapping model it plans to use to create the community's new flood map are appropriate. Also requires FEMA to send communities being remapped the data being used in the mapping process.
- *Notification* – Requires FEMA, at least 6 months prior to implementation of rate increases as a result of this Act to make publicly available the rate tables and underwriting guidelines that provide the basis for the change, providing consumers with greater transparency.

Appendix D Map NHZ1 Extent of the 100-year and 500-year flood zones in the coastal area.

Map NHZ1 is attached on the following page.