Multi-Hazard Mitigation Plan Update

2024

Town of Middleton, NH

Plan updated by the
Town of Middleton, NH
with Strafford Regional Planning Commission

Acknowledgements

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The following individuals have contributed invaluable assistance and support for this project:

2023 Hazard Mitigation Steering Committee

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Date of Conditional Approval from HSEM:
Date of Adoption by Town:
Date of Final Approval from NH HSEM:

Glossary of Terms

According to FEMA guidance, words, phrases, abbreviations, and acronyms relevant to hazard mitigation and emergency management should be defined. Many terms in emergency management planning have special meanings, so it is important to establish precise definitions.

Access and functional needs: Refers to persons who may have additional needs before, during and after an incident in functional areas, including but not limited to: maintaining health, independence, communication, transportation, support, services, self- determination, and medical care. Individuals in need of additional response assistance may include those who have disabilities; live in institutionalized settings; are older adults; are children; are from diverse cultures; have limited English proficiency or are non-English speaking; or are transportation disadvantaged.

Alert: Time-sensitive tactical communication sent to parties potentially impacted by an incident to increase preparedness and response. Alerts can convey 1) urgent information for immediate action, 2) interim information with actions that may be required in the near future, or 3) information that requires minimal or no action by responders.

At-risk individuals: At-risk individuals are people with access and functional needs that may interfere with their ability to access or receive medical care before, during, or after a disaster or emergency. At-risk individuals may include children, older adults, pregnant women, and individuals who may need additional response assistance. Examples of these populations may include but are not limited to individuals with disabilities, individuals who live in institutional settings, individuals from diverse cultures, individuals who have limited English proficiency or are non-English speaking, individuals who are transportation disadvantaged, individuals experiencing homelessness, individuals who have chronic medical disorders, and individuals who have pharmacological dependency.

Contamination: The undesirable deposition of a chemical, biological, or radiological material on the surface of structures, areas, objects, or people.

Dam: A barrier built across a watercourse for the purpose of impounding, controlling, or diverting the flow of water.

Damage Assessment: The process used to appraise or determine the number of injuries and deaths, damage to public and private property, and the status of key facilities and services such as hospitals and other health care facilities, fire and police stations, communications networks, water and sanitation systems, utilities, and transportation networks resulting from a man-made or natural disaster.

Disaster: An occurrence of a natural catastrophe, technological accident, or human-caused event that has resulted in severe property damage, deaths, and/or multiple injuries.

EMD: Emergency Management Director.

EOC: Emergency Operations Center.

EOP: Emergency Operating Plan. A document that: describes how people and property will be protected in disaster and disaster threat situations; details who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies, and other resources available for use in the disaster; and outlines how all actions will be coordinated. This is sometimes referred to as the LEOP (Local Emergency Operating Plan).

Hazard mitigation: Any action taken to reduce or eliminate the long-term risk to human life and property from hazards. The term is sometimes used in a stricter sense to mean cost-effective measures to reduce the potential for damage to a facility or facilities from a disaster event.

Jurisdictions: Planning areas, such as towns, cities, counties, states, regions, territories, and freely associated states.

Preparedness cycle: A continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action to ensure effective coordination during incident response. This cycle is one element of a broader National Preparedness System to prevent, respond to, and recover from natural disasters, acts of terrorism, and other disasters.

Recovery: The long-term activities beyond the initial crisis period and emergency response phase of disaster operations that focus on returning all systems in the community to a normal status or to reconstitute these systems to a new condition that is less vulnerable.

Warning: The alerting of emergency response personnel and the public to the threat of extraordinary danger and the related effects that specific hazards may cause. A warning issued by the NWS (e.g., severe storm warning, tornado warning, tropical storm warning) for a defined area indicates that the particular type of severe weather is imminent in that area

Watch: Indication by the NWS that, in a defined area, conditions are favorable for the specified type of severe weather (e.g., flash flood watch, severe thunderstorm watch, tornado watch, tropical storm watch).

TABLE OF CONTENTS

EXECUTIVE SUMMARY

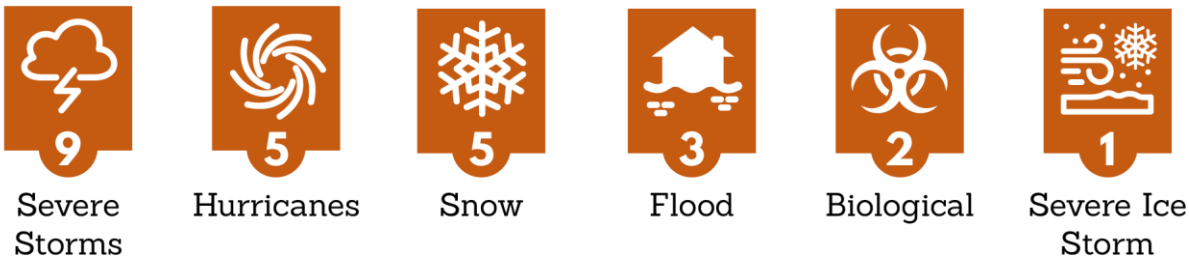
In the United States, millions of dollars are spent each year on disaster response and recovery. By undertaking activities which reduce the impact of future disasters, known as hazard mitigation, local governments can reduce the costs of New Hampshire's response and recovery costs as well as minimize the impacts of future disaster events.

Middleton's Multi-Hazard Mitigation Plan Update 2023 is an update to the Town's 2017 Multi-Hazard Mitigation Plan and follows the planning requirements as found in the FEMA Local Mitigation Planning Policy Guide, released April 19, 2022, and pursuant to 44 CFR §201.6, which states that Local Mitigation Plans must contain the following information:

- Planning Process
- Hazard Identification and Risk Assessment
- Mitigation Strategy
- Plan Maintenance
- Plan Update
- Plan Adoption
- High Hazard Potential Dams (required for HHPD Grant Program)

The purpose of this Plan is to reduce or eliminate the long-term risk to human life and property from the hazards identified within the Hazard Identification and Risk Assessment (HIRA) before, during, and after an incident or disaster. The Plan was developed by Middleton's Hazard Mitigation Committee with assistance from the Strafford Regional Planning Commission (SRPC), as well as input from the New Hampshire Department of Safety (DOS) Division of Homeland Security and Emergency Management (HSEM) Planning Section, other federal and state agencies, and the public.

Since 1953, Strafford County received 25 major disaster declarations, including nine (9) severe storms; five (5) hurricane or tropical storms; five (5) severe snow events or blizzards; three (3) floods; two (2) biological events; and one (1) severe ice storm.



The Town's plan has five overarching goals, which are adapted from the State of New Hampshire Multi-Hazard Mitigation Plan, and include:

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

This Plan considers Natural, Technological, and Human-caused Hazards (Table 1). After careful review of the hazards listed in the 2023 State of New Hampshire Multi-Hazard Mitigation Plan, several hazards were consolidated and renamed for consistency, and five new hazards were added to the plan for a total consideration of 16 hazards across the three hazard types. Specifically, the plan addresses the following hazards:

Table 1: 2024 Identified Hazards

Natural Hazards	Technological Hazards	Human-caused Hazards
Inland Flooding Drought Earthquakes Extreme Temperatures High Wind Events Infectious Diseases Landslides Lightning Severe Winter Weather Solar Storms &Space Weather Tropical and Post-Tropical Cyclones Wildfire	Long-Term Utility Outage	Cyber Attack Mass Casualty Incident

CHAPTER 1: PLANNING PROCESS

Basic Methodology

The Plan was developed and updated using FEMA's 2013 Local Mitigation Planning Handbook, which sets forth a nine-task planning process (as illustrated in Figure 1) to be undertaken to update a Local Hazard Mitigation Plan, and included substantial local, state, and federal coordination. The completion of this new multi-hazard plan required significant planning preparation and represents the collaborative efforts of the Town of Middleton, the Hazard Mitigation Committee, and SRPC.

Figure 1: Local Mitigation Planning Handbook Tasks

Several of the tasks were accomplished independently while other tasks were completed sequentially. While the 2023 update of the Plan was a complete overhaul to meet FEMA's updated Local Mitigation Planning Policy Guide, much of the historical information came from the 2017 Plan and associated previous editions. During the planning process, careful consideration was given to the new policy guidance to ensure the plan and planning process met the specific requirements.

Jurisdiction

The Plan addresses only one jurisdiction – the Town of Middleton, NH. Once approved by the Hazard Mitigation Committee, the Plan was forwarded to HSEM for review and conditional approval. Upon conditional approval by HSEM, the Middleton Board of Selectmen held a public meeting to consider public comments and signed a Resolution to Adopt the Plan. Lastly, the Plan was sent to FEMA for final approval.

Participation

The Plan was updated with substantial local, state, and federal coordination. The completion of this new multi-hazard plan required significant planning preparation and represents the collaborative efforts of the Town of Middleton, FEMA, HSEM, the ad-hoc local steering committee, and SRPC. Acknowledgement is given to those town representatives shown below that helped in this plan update.

Kate Buzard, *Middleton Conservation Commission Vice Chair*
Greg Cooper, *Middleton Chief of Police*
Timothy Cremmen, *Middleton Select Board*
Jeffrey Eldridge, *Middleton Deputy Fire Chief*
Scott Ferguson, *Middleton EMD, Select Board Vice Chair*
Carol Long, *Middleton Select Board Secretary*
Christine Maynard, *Middleton Planning Board*
John Mullen, *Middleton Planning Board Vice Chair*
Dan Phillips, *Middleton Road Agent*
Kathryn Toussaint, *Middleton Police Department Secretary*

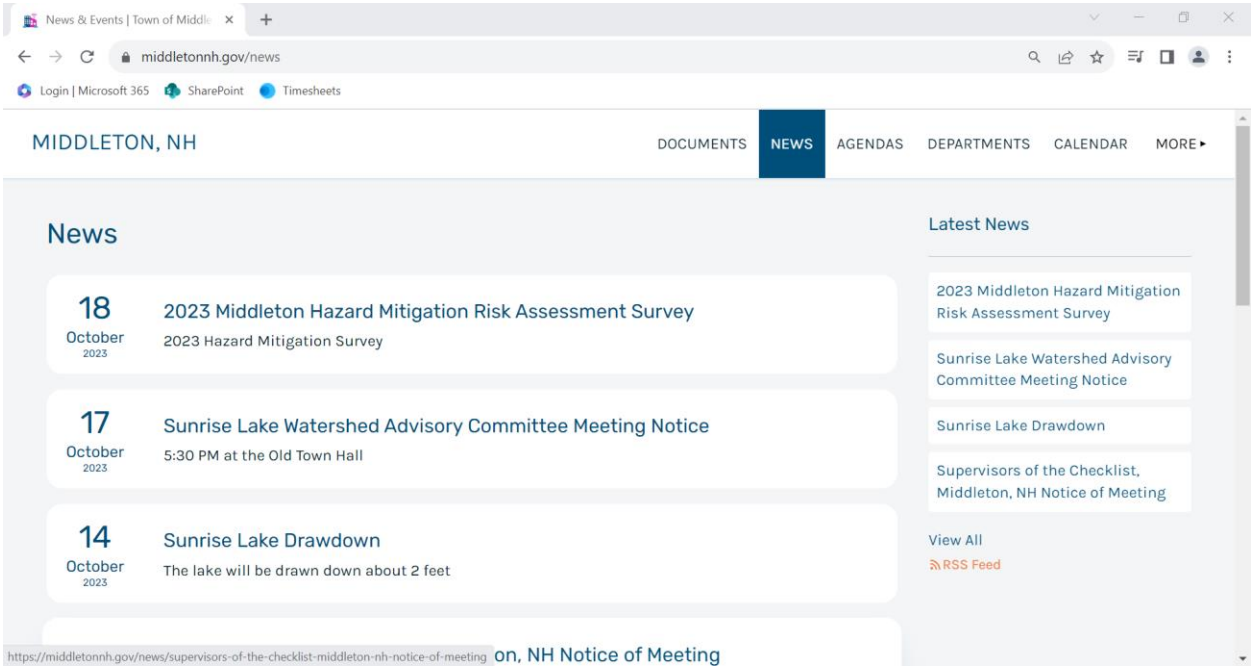
The Hazard Mitigation Committee met five times over a three-month period, between August 14, 2023 and November 1, 2023, to discuss the range of hazards included in this plan as well as brainstorm mitigation needs and strategies to address these hazards and their impacts on people, business, and infrastructure in the Town. All meetings were geared to accommodate brainstorming, open discussion, and an increased awareness of potential threats to the Town. This process results in significant cross talk regarding all types of natural and man-made hazards. All feedback from participants of the planning committee was incorporated into the Plan.

Supporting documentation on the planning process, including agendas and attendance sheets, can be found in Appendix A: Planning Process Documentation.

Public Involvement

Prior to the plan being submitted for conditional approval, Middleton held a public viewing period for the public to review the draft plan and make comments. The public viewing period ran from July. Additionally, an announcement about the Plan update was included on the Strafford Regional Planning Commission's website and information about the Plan was included in SRPC's news updates to ensure that adjacent communities were aware of any upcoming public meetings in Middleton and had the opportunity to attend. An invitation to participate in the meetings was also sent to the abutting towns. In addition, a survey was created for Middleton and posted on their website and social media to reach a broader audience, including the underserved population. The survey included questions about severe weather events and other hazards. Feedback from the public viewing period and the survey was considered and incorporated into the draft where appropriate.

Below is a snapshot of the public posting of the survey on the Town website.



The public will have the opportunity for future involvement as the Plan will be periodically reviewed and invited to participate in all future reviews and updates. There will also be a public meeting before each formal review and before any change/update is sent to HSEM.

Once final approval by HSEM has been received, copies of the Plan will be distributed to the relevant Town departments and personnel, HSEM, and FEMA and other state and local governmental entities; the Plan will then be distributed by these entities per requirements. Copies of the Plan will remain on file at the Strafford Regional Planning Commission in both digital and paper format.

Accomplishments Since Prior Plan Approval

Table 3 displays mitigation strategies identified in Middleton's Multi-Hazard Mitigation Plan 2017. The Hazard Mitigation Committee provided a status update for each mitigation strategy during the preparation of the current Plan.

Table 2: Accomplishments Since Prior Plan Approval

2017 Strategy	2024 Update
Conduct a mapping analysis to identify dead-end streets that do not currently allow for fire vehicles and ambulances to safely turn around. This analysis should inform the Town on which roads may need to be improved and widened.	The map was created. Annual reviews are done to determine which projects to do each year.
Include information about the new school into the next LEOP update.	This was not completed but will be added to the action plan as a new mitigation action.
Coordinate with Community Emergency Response Teams (CERT) in Rochester to assist in transporting residents to the Community Center during an emergency event.	This was not completed but will be added to the action plan as a new mitigation action.
Conduct a fieldwork analysis to identify which existing dry hydrants are operational and which ones need to be repaired. This analysis should also develop an operations and maintenance plan to ensure a schedule is kept avoiding any dry hydrants falling in disarray.	Analysis was done in some locations but was not completed. This will be added to the action plan as a new mitigation action.
Consider revising criteria for new residential and non-residential structures or substantial improvements located within the special flood hazard areas to require an additional two (2) feet of freeboard to the base flood elevation as recommended by the New Hampshire Coastal Risk and Hazards Commission's Final Report and Recommendation (November, 2016). *This strategy will not be completed until new FEMA maps are completed.	This was not completed but will be added to the action plan as a new mitigation action.
Coordinate with NHDOT to address line of site issues at the Route 153 and Governors Road intersection.	This is an ongoing safety issue, but no new actions are needed. NHDOT is aware of the concerns.
Coordinate with the School Board to investigation options to address pedestrian safety issues, including insufficient parking, lack of sidewalks, and lightning problems that are exasperated during winter weather.	This was not completed but will be added to the action plan as a new mitigation action.
Investigate the cost of road surface markings, such as fog line and determine specific locations where it makes the most sense to implement.	This action was completed and should be continued as a new mitigation action.

Table 2: Accomplishments Since Prior Plan Approval	
2017 Strategy	**2024 Update**
Partner with the Conservation Commission to conduct a water consumption and leak detection education and outreach campaign. The Town should investigate funding options through NHDES, which offers leak detection grants.	This action has been deferred and will be added as a new mitigation action.
Purchase a fireboat (rescue boat) for Sunrise Lake.	This action has been deferred and will be added as a new mitigation action to determine the feasibility.
Work with the Town of New Durham to make improvements and upgrades to New Durham/Middleton Road to decrease emergency response times for mutual aid.	This action was completed and should be continued as a new mitigation action.
Partner with the Conservation Commission to provide residents with educational material on the importance of firebreaks in order to contain fires within the boundary of the burn unit and avoid the start of a wildfire.	This action has been partially completed. A new, reworded action will replace this one to include urban interface.
Conduct a mapping analysis to identify potential helipad locations within the town. The current proposed location poses safety issues because of overhead wires.	This action has been completed.
Emergency preparedness fact sheets posted on the website with local emergency contacts and telephone numbers	This action was not completed. The committee determined that it should be deleted and a new (similar) action should be added.
Continue to provide outreach assistance to elderly and special needs populations by organizing staff and coordinating within Town Departments	This action was completed and should be continued as a new mitigation action. Consider developing a list of elderly and special needs populations for emergencies.
Develop a list of residents who have an emergency back-up fuel supply (tanks) that would become available to the Town for use of emergency vehicles in an emergency	This action was not completed and the committee decided that it should be deleted due to lack of community support.
Continue maintenance of dry hydrant systems and establish cistern locations for a new development	This action was completed and should be continued as a new mitigation action.

Status Update:
Completed Action – This program continues to be an implemented mitigation action item since the last updated plan was developed
Deferred Action – At the time of developing this plan, more time is required for completion
Removed Action – This existing program is no longer a priority to the Town
Ongoing Action – This program will occur throughout the life of the plan

CHAPTER 2: EXISTING AND POTENTIAL POLICIES, PROGRAMS, AND RESOURCES

During the 2024 hazard mitigation update process, the Hazard Mitigation Committee discussed Middleton's existing policies, programs, and resources related to hazard mitigation and its ability to expand and improve on these. The purpose of this discussion was to determine the ability of the Town to implement its hazard mitigation strategies and to identify potential opportunities to enhance specific policies, programs, or projects..

Existing Plans, Studies, and Reports

To improve resilience from natural hazards, the Town has taken a proactive approach in gaining a better understanding of risk and risk tolerance. Through a series of planning efforts, Middleton has demonstrated its commitment to guiding and managing growth in a responsible manner. The following is an abbreviated summary of the relevant plans, studies, practices, and reports already in place. Each one should be considered as an available mechanism for incorporating the recommendations of the Middleton Hazard Mitigation Plan Update 2023.

Table 3: Existing Plans, Studies, and Reports

Plan, Policy, Regulations	Description
Master Plan	A guiding document used to manage Middleton's growth and development through municipal land use regulations
Capital Improvements Program	A program that helps to address improvement projects over a period of time
Floodplain Management Ordinance	Local site and subdivision requirements, as well as zoning ordinance to regulate development in the FEMA floodplain
Rural Fire Protection Equipment Grants	Provides personal protection gear and equipment for fighting fires
Downstream Impact Management	Design standards that mandate water containment facilities to control runoff from roads and project site
Shoreland Protection Overlay Ordinance	Performance standards for areas within 250 feet of a lake or pond
Building Code/ Permits	Establishes regulations for the design and installation of building systems
Emergency Operations Plan	Defined notification procedures and actions that should be taken in different situations
Emergency Communications	News updates from town departments are sent out through the website and other news media channels

National Flood Insurance Program

Communities that participate in the National Flood Insurance Program (NFIP) have adopted and enforce community floodplain regulations. One of the community's requirements is to require and obtain certain elevation data for all new and substantially improved structures located in a special flood hazard area. Community permitting officials must review this elevation data to ensure floodplain development complies with the regulations.

National Flood Insurance Program Status and Compliance

Middleton has been a member of the National Flood Insurance Program (NFIP) since August 1, 1988. The Town does have significant portions of land in the 100-year floodplain; along the Branch River, Jones Brook, Horn Brook, Moose Brook, and along portions of the unnamed stream that flows south from Sunrise Lake to Currier's Pond. There has been limited development within this floodplain according to available GIS Flood Insurance Rate Map (FIRM) data, available building permit data, and aerial imagery.

Article 9 of Middleton's Zoning Ordinance (as amended on May 12, 2016) outlines the Town's floodplain regulations. These regulations apply to all lands designated as special flood hazard areas by the Federal Emergency Management Agency (FEMA) in its Flood Insurance Rate Maps dated May 17, 2005 for Strafford County. The Town's floodplain regulations ensure all proposed development within the floodplain require a permit to determine whether proposed building sites will be reasonable safe from flooding.

According to information from the FEMA Community Overview provided by the State Floodplain Management Program Coordinator at the Office of Planning and Development (emailed dated 10/3/2022), Middleton has 13 total policies (all of which are single family homes) in the floodplain hazard area, has had only 1 paid loss claim, and 0 repetitive loss claims. Of the 13 total policies, three are preferred risk and are not required. Preferred risk offers policies for buildings that are located in moderate-to-low areas (B, C, and X Zones). Table 9 provides more detail on Middleton's insurance policies.

As part of this plan update process, there is a mitigation action for the town to consider revising criteria for new development and redevelopment of residential structures located within the special flood hazard areas to require an additional two (2) feet of freeboard to the base flood elevation as recommended by the New Hampshire Coastal Risk and Hazards Commission's Final Report and Recommendation.

Middleton also implemented a transportation improvement program, which includes replacement and upgrades to existing culverts, road maintenance schedules, and improvements to transportation infrastructure by widening and leveling certain stretches of roadway.

Table 4: Community, Policy, and Claims Information					
Policies in Force	Insurance in Force	Building Type		Number of Paid Losses	Total Amount of Paid Losses
3 (B, C, X Zone)	$2,683,000	Single Family	Non-Residential	1	$1,204.00
10 (A Zone)		13	0		
13		13			

Table 5: Repetitive Loss Information		
Number of Repetitive Loss Buildings	Total Number of Repetitive Losses	Total Amount of Repetitive Loss Payments
0	0	$0

There are no repetitive loss buildings.

Integration of Other Plans

This plan will only enhance mitigation if balanced with all other Town plans. Middleton will take the necessary steps to incorporate the mitigation strategies and other information contained in this plan when updating the Town's Master Plan, Capital Improvements Program, Zoning Ordinances and Regulations, and Emergency Operations Plan, as well as other planning mechanisms, when appropriate. In addition, the Town will review and make note of instances when this has been done and include it as part of their annual review of the Plan.

Pre- and Post-Disaster Mitigation Capability Assessment

As part of the update process, the Hazard Mitigation Committee reviewed and evaluated the effectiveness of both the pre- and post-disaster mitigation capabilities, including local land use programs, emergency preparedness planning, and infrastructure operations and maintenance. As shown below, each capability was reviewed and identified as either Excellent, Good, Average, or Poor. The Hazard Mitigation Committee discussed changes and improvements, as well as suggestions, since the 2017 Plan. Certain capabilities were removed/deleted as they no longer exist or were specifically preparedness/response oriented. During this process, gaps were identified and considered in creation of the 2024 mitigation actions.

<u>Effectiveness Scale</u>

Excellent - The existing program works as intended and is exceeding its goals
Good - The existing program works as intended and meets its goals
Average - The existing program does not work as intended and/or does not meet its goals
Poor - The existing program is negatively impacting the community

Table 5: Mitigation Capability Assessment					
Capability (Program, Plan, Regulation)	Responsibility	Hazard	Effectiveness	Changes since 2017 Plan	Suggested Improvement
Master Plan	Planning	Multi-Hazard	Good	The Master Plan was updated in 2022.	No changes needed at this time.
Capital Improvements Program	Planning	Multi-Hazard	Good	The CIP is updated annually.	This is an ongoing, annual event. Continue to update the CIP annually.
Floodplain Management Ordinance	Planning	Flooding	Good	Zoning Ordinance was updated March 17, 2017.	Revise criteria for new residential and non-residential structures or substantial improvements located within the special flood hazard areas to require an additional two (2) feet of freeboard to the base flood elevation
Rural Fire Protection Equipment Grants	Fire	Wildfire	Good	There is a plan in place to replace the tankers.	Implement the plan to replace the tankers.
Downstream Impact Management	Planning & Public Works	Multi-Hazard	Good	The Town enforces the State regulations.	Continue to enforce the State regulations. No changes needed at this time.
Shoreland Protection Overlay Ordinance	Planning	Multi-Hazard	Good	The Town continues to enforce the State regulations.	Continue to enforce the State regulations on affected waterbodies (Cocheco River, Currier Pond, Jones Brook/Pond, and Sunset Lake). No changes needed at this time.
Building Code/ Permits	Code Enforcement Officer	Multi-Hazard	Good	The Town enforces the State regulations.	Continue to enforce the State regulations. No changes needed at this time.
Emergency Operations Plan	EMD	Multi-Hazard	Average	The EOP needs to be updated.	Update the Emergency Operations Plan.
Emergency Communications	EMD	Multi-Hazard	Excellent	Equipment purchases have been made, including radios and computers. These have improved coordination between State & local agencies.	Consider adding CODE RED, Reverse 911, or other notification system to alert residents of incoming storm.

CHAPTER 3: HAZARD IDENTIFICATION

Introduction

The impact of expected, but unpredictable, natural, technological, and human-caused events can be reduced through emergency management and strategic planning. That planning must be grounded in the rational evaluation of the hazards and the risks they pose to prioritize actions designed to mitigate their effects. The first step in hazard mitigation is to identify the threats and hazards that have the potential to impact the Town of Middleton. The following threats are included, assessed, and reviewed in the 2024 Plan.

2024 Plan Update Hazard Identification

As a result of input from Hazard Mitigation Committee, SRPC, and HSEM, revisions were made including the consolidation and renaming of several hazards for consistency with the NH State Plan; a general re-organization of hazards into three categories (natural, technological, and human-caused); and the addition of four new hazard to make a total of 16 hazards. The following threats are included, assessed, and reviewed in the 2024 Plan.

Table 6: 2017 Identified Hazards	
Flooding	Earthquake & Landslide
Dam Failure	Extreme Temperatures
Hurricanes & Tropical Storms	Drought
Tornado & Downburst	Public Health Threats
Severe Winter Weather	Hazardous Materials
Wildfire	

Table 7: 2024 Identified Hazards		
Natural Hazards	**Technological Hazards**	**Human-caused Hazards**
Flooding	Long-Term Utility Outage	Cyber Attack
Drought	Dam Failure	Mass Casualty Incident
Earthquake	Hazardous Materials	
Extreme Temperature		
High Wind Event		
Infectious Disease		
Landslide		
Lightning		
Severe Winter Weather		
Solar Storms & Space Weather		
Tropical Storm and Hurricane		
Wildfire		

Hazard Revisions Between 2017 and 2024

The following is a summary of revisions made between the 2017 and 2024 Plans.

Table 8: Summary of Hazard Revisions between 2017 and 2024		
2017	2024	Change
Flooding	Flooding	No change
Dam Failure	Dam Failure	Moved to Technological Hazards
Hurricanes & Tropical Storms	Tropical Storm and Hurricane	Changed name
Tornado & Downburst	High Wind Event	Changed name
Severe Winter Weather	Severe Winter Weather	No change
Wildfire	Wildfire	No change
Extreme Temperatures	Extreme Temperatures	No change
Drought	Drought	No change
Public Health Threats	Infectious Disease	Changed name
Hazardous Materials	Hazardous Materials	No change
Earthquake & Landslide	Earthquake	Split hazard name/category
	Landslide	Split hazard name/category
	Lightning	New hazard
	Solar Storms & Space Weather	New hazard
	Long-term Utility Outage	New hazard
	Cyber Attack	New hazard
	Mass Casualty Incident	New hazard

Strafford County, the county in which Middleton is located, has experienced 25 disaster declarations, including Presidential Declarations (DR) and Emergency Declarations (EM), since 1953 that amount to over $266 million in federal assistance. These were the result of multiple hazard types, with the most common being severe weather events. Since the 2017 Plan, there have been 9 major disaster declarations.

List of Major Disaster Declarations Between 2017 and 2023

Table 9: List of Emergency Declarations					
DR #	Date	Description	Type	Total Funds	Local Impact
4329	8/9/2017	Severe Storms and Flooding	Major Disaster Declaration	$ 9,953,803	Minor impact to town services
4355	1/2/2918	Severe Storms and Flooding	Major Disaster Declaration	$12,434,377	Minor impact to town services
4370	6/8/2018	Severe Weather and Flooding	Major Disaster Declaration	$ 895,861	Minor impact to town services
4371	6/8/2018	Severe Winter Weather and Snowstorm	Major Disaster Declaration	$3,477,506	Minor impact to town services
4457	8/15/2019	Severe Storm and Flooding	Major Disaster Declaration	$ 3,202,283	Minor impact to town services
2020-04	3/13/2020	Public Health Outbreak	Governor Executive Order - State of Emergency	N/A	Minor impact to town services
3445	3/13/2020	COVID-19	Emergency Declaration	N/A	Town Hall operations; some business impact
4516	4/3/2020	COVID-19	Major Disaster Declaration	$ 126,873,601	Town Hall operations; some business impact
4622	9/30/2021	Severe Storms and Flooding	Major Disaster Declaration	TBD	Minor impact to town services
4624	10/4/2021	Severe Storms and Flooding	Major Disaster Declaration	TBD	Minor impact to town services
4693	12/22-25/2022	Severe Storm and Flooding	Major Disaster Declaration	TBD	Minor impact to town services

Source: NH HSEM Declared Disaster Information

Disaster Declarations in Strafford County

List of Emergency Declarations

Table 10: List of Emergency Declarations

Disaster Number	Year	Declaration Title	Amount	Damage Assessments
3101	1993	Blizzards, High Winds & Record Snowfall	$644,698	Snow removal
3166	2001	Snow	$3,433,252	Snow removal
3177	2003	Snow	$2,288,671	Snow removal
3258	2005	Hurricane Katrina Evacuation	$9,887	Limited impacts
3207	2005	Record and/or Near Record Snow	$3,611,491	Snow removal, school closures
3297	2008	Severe Winter Storm	$900,000	Snow removal, school closures
3333	2011	Hurricane Irene	$550,618	Limited local impacts
3344	2011	Severe Storm	-	Widespread power outages
3360	2012	Hurricane Sandy	$644,301	Limited local impacts
3445	2020	COVID-19	-	Widespread shutdowns
10 emergency declarations totaling approximately $12,082,918				

CHAPTER 4: RISK ASSESSMENT

The Hazard Mitigation Committee met to discuss the risk assessment and assign rating scores. Consideration was given to climate change, current capabilities, municipal assets and critical infrastructure and their locations, population data, and previous/historical occurrences when determining the scale of impacts and overall risk (probability of occurrence).

Method for Rating Impacts, Probability of Occurrence, and Overall Risk

Impact Scoring

Impact scoring is an estimate generally based on a hazard's effects on humans, property, and businesses. The Hazard Mitigation Committee came together and determined the impact rating for each of the previously identified hazards. The average impact score was calculated by computing the average of the human, property, and business impact scores. The impact scores were broken into the following categories:

- One (1): Inconvenience to the population, reduced service/productivity of businesses, minor damages to property, and non-life-threatening injuries to people
- Two (2): Moderate to major damages to property, temporary closure and reduce service and/or productivity of businesses, and numerous injuries and deaths
- Three (3): Devastation to property, significant injuries and deaths, permanent closure and/or relocation of services and businesses, and long-term effects on the population

Probability of Occurrence

The probability of occurrence is a numeric value that represents the likelihood that the given hazard will occur within the next 10 years. This value was chosen based on guidance from the 2018 State Plan. The Hazard Mitigation Committee came together and determined the probability of occurrence rating for each of the previously identified hazards. The probability of occurrence ratings was broken into the following categories:

- One (1): 0%-33% Probability of the hazard occurring within 10 years (Low)
- Two (2): 34%-66% Probability of the hazard occurring within 10 years (Medium)
- Three (3): 67%-100% Probability of the hazard occurring within 10 years (High)

Overall Risk

The overall risk is a representation of the combined potential impact and probability of occurrence ratings. This is calculated by multiplying the probability of occurrence rating score by the impact rating score (the average of the human, property, and business impacts). The goal of identifying the overall risk of each identified hazard is to assist the Town in determining which hazards pose the largest potential threats. This will allow the Hazard

Mitigation Committee to use the overall risk ratings to develop targeted mitigation actions that allocate funding and resources to the highest rated hazards first. The overall risk ratings are broken down and color coded into the following categories:

- Low: The hazard poses a low risk in Middleton. Scores between 1-3
- Medium: The hazard poses a medium risk in Middleton. Scores between 4-6
- High: The hazard poses a high risk in Middleton. Scores between 7-9

Summary of Risk Scores for All Hazards

The Hazard Mitigation Committee, during a brainstorming session, used the method outlined above to determine the overall risk associated with hazards in Middleton. Table 12 on the next page is the Town's risk assessment tool and provides a more comprehensive illustration of each hazard and their risk scores.

2 hazards rated as having a **High** overall risk in Middleton:

- Tropical Storms & Hurricane
- Wildfire

13 hazards rated as having a **Moderate** overall risk in Middleton:

- Inland Flooding
- Drought
- Extreme Temperatures
- High Wind Events
- Infectious Disease
- Lightning
- Severe Winter Weather
- Solar Storms a& Space Weather
- Dam Failure
- Hazardous Materials
- Long term Utility Outage
- Cyber Attack
- Mass Casualty Incident

8 hazards rated as having a **Low** overall risk in Middleton:
Tropical and Post-Tropical Cyclones

- Earthquake
- Landslide
- Aging Infrastructure
- Conflagration
- Known and Emerging Contaminants
- Radiological Threats
- Terrorism/Violence
- Transportation Accidents

Table 11: Risk Assessment Tool

Threat/Hazard		Classification	Human Impact	Property Impact	Economic/ Business Impact	Average Impact Score	Probability of Occurrence	Overall Risk
Natural Hazards	Inland Flooding	Medium	2	2	1	1.7	3	5
	Drought	Medium	1	2	1	1.3	3	4
	Earthquakes	Low	1	1	1	1	2	2
	Extreme Temperatures	Medium	2	1	1	1.3	3	4
	High Wind Events	Medium	2	2	2	2	3	6
	Infectious Disease	Medium	2	1	2	1.7	3	5
	Landslide	Low	1	1	1	1	1	1
	Lightning	Medium	1	2	2	1.7	3	5
	Severe Winter Weather	Medium	1	2	2	1.7	3	5
	Solar Storms & Space Weather	Medium	2	1	1	1.3	3	4
	Tropical Storms & Hurricane	High	3	3	3	3	3	9
	Wildfire	High	3	3	3	3	3	9
Technological Hazards	Aging Infrastructure	Low	1	1	1	1	1	1
	Conflagration	Low	1	1	1	1	1	1
	Dam Failure	Medium	3	3	2	2.7	2	5
	Known & Emerging Contaminants	Low	2	1	1	1.3	1	1
	Hazardous Materials	Medium	3	1	1	1.7	3	5
	Long-term Utility Outage (1 weeks)	Medium	2	1	1	1.3	3	4
	Radiological	Low	3	3	3	3	1	3
Human-Caused Hazards	Cyber Attack	Medium	3	1	3	2.3	2	5
	Mass Casualty Incident	Medium	3	1	1	1.7	3	5
	Terrorism/Violence	Low	1	1	1	1	1	1
	Transport Accident	Low	2	1	1	1.3	1	1

Asset Inventory and Vulnerability

The following community assets include all public and private facilities that the Hazard Mitigation Committee considers essential for the delivery of vital services for the protection of the community, such as emergency operations centers, shelters, or utilities. All critical facilities and key resources are included in a series of maps in the Appendix. Assets are organized into five categories:

1) Emergency Response Facilities are primary facilities and resources that may be needed during an emergency response
2) Non-Emergency Response Facilities are facilities considered essential, that although critical, not necessary for immediate emergency response effort.
3) Facilities and Populations to Protect can be defined broadly to include those who are not able to access and use the standard resources offered in disaster preparedness and planning, response, and recovery
4) Potential Resources are local assets that may be used during emergencies.
5) Water Resources are water sources that may be used during emergencies.

Table 12: Emergency Response Facilities (ERF)

Facility Name	Type of Facility	Address
Municipal Building	EOC & Standby Power	182 King's Highway
Old Historic Town Hall	Standby Power	200 King's Highway
Fire Station	Standby Power	192 King's Highway
Public Works Garage	Mobile Standby Power, Emergency Fuel,	198 King's Highway
Middleton Elementary School	Helipad, potential warming center	116 King's Highway
Private landing strip	Helipad	

Table 13: Non-Emergency Response Facilities

Facility Name	Type of Facility	Address
Remote Terminal	Telephone Facility	Hollow Road (Route 153)
Remote Terminal	Telephone Facility	182 King's Highway

Table 14: Critical Infrastructure (CI)

Facility Name	Type of Facility	Address
Sunrise Lake Dam	*High Hazard	Tributary to Cocheco River
Ellis Hatch Dam	High Hazard	Jones Brook
Currier Pond Dam	**Low Hazard	Branch Cocheco River

Table 14: Critical Infrastructure (CI)		
Facility Name	Type of Facility	Address
* A high hazard dam has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in probable loss of human life. ** A Low Hazard dam has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in no possible loss of life and low economic loss to structures/property.		

Table 15: Water Resources		
Facility Name	Type of Facility	Address
Well #1	Drinking Water Supply	Beech Tree Drive & Jordan Drive (The Estates)
Well #2	Drinking Water Supply	Beech Tree Drive & Jordan Drive (The Estates)
Water Access	Fire Aid	Sunrise Lake: John's Beach
Water Access	Fire Aid	Sunrise Lake: Lakeshore Road
Water Access	Fire Aid	Sunrise Lake: Tanglewood Beach
Water Access	Fire Aid	Nicola Road - Beach #1
Water Access	Fire Aid	Nicola Road - Beach #2
Fire Pond	Fire Aid	Old Tate Lane/Silver Street
Dry Hydrant	Fire Aid	Silver Street
Dry Hydrant	Fire Aid	Adams Way

Bridges

The following is a list of state and local bridges, which are part of the critical transportation system that moves goods and services, many of which may be vulnerable to flooding and other disruptions. According to the 2018 State Plan, the average lifespan for a bridge is around fifty years, and the current average age of state-owned bridges in New Hampshire is 52-56 years.

Table 16: Bridges		
Bridge ID	Location	Address
Local #082/109	***Transportation	Ridge Road over Jones Brook
State #083/176	Transportation	NH153 over Moose Brook
State #102/102	Transportation	NH153 over Jones Brook
*** Bridges have been identified by the NHDOT Bridge Design Bureau; Dams have been identified by the NHDES, Water Division		

According to the 2021 Municipal and State-Owned Red List Bridge reports, there are no bridges identified as having any major structural elements with a condition rating of poor or determined to be structurally deficient.

There are no projects scheduled in the New Hampshire 2021-2024 Statewide Transportation Improvement Program Report Project List for bridge replacement or improvement.

Dams

The following is a list of state and locally owned dams, which may be vulnerable to flooding and other disruptions.

Table 17: Dams

Hazard Class	Name	River or Stream	Inspection Interval
H	Sunrise Lake Dam	Tributary to Cocheco River	2 years
H	Ellis Hatch Dam	Jones Brook	2 years
L	Currier Pond Dam	Branch/Cocheco River	6 years

CHAPTER 5: HAZARD PROFILES AND HISTORY OF EVENTS

This section contains a compilation of information related to the hazards identified in this Plan, including the definition of the hazard, location, the extent of the hazard, impacts and past occurrences, summation of future risk, and the highest probable extent of the hazard. This assessment includes low, medium, and high risk natural hazards, however, it only includes the medium and high risk technological and human-caused hazards. The committee felt that the low technological and human-caused hazards were too small or non-existent to include in the rest of the plan.

The Hazard Mitigation Committee discussed past and potential hazards during a public meeting and also extracted data from the 2018 State Plan and other state and federal databases. Past and potential hazards were mapped where spatial data was available.

Natural Hazards

Inland Flooding

Risk Assessment: Medium
Average Impact: Medium
Future Probability: High

Definition:
Inland flooding is generally defined as a high flow, overflow, or inundation by water, which causes or threatens damage. Flooding results from the overflow of rivers, their tributaries, and streams throughout the State, primarily from high precipitation events. Flash flooding is defined as a flow with a rapid rise in water level and extreme velocities in a river or stream, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Because of New Hampshire's steep terrain in the headwaters of watersheds, particularly outside of the coastal plain, flash floods also lead to riverbank and bed erosion. Extreme precipitation events in recent years, such as Tropical Storm Irene, have led to buildings on the edges of streambanks becoming at risk to river erosion, or culvert failures.

Location:
The risk from inland flooding is Town-wide, especially near rivers, streams, and brooks within special flood hazard areas and other localized areas identified by the Hazard Mitigation Committee.

Riverine flooding is the most common natural disaster to impact New Hampshire and are most likely to occur in the spring due to the increase in rainfall and the melting of snow;

however, floods can occur at any time of the year because of heavy rains, hurricane, or a Nor'easter.

New Hampshire's climate ranges from moderate coastal to severe continental, with annual precipitation ranging from about 35 inches in the Connecticut and Merrimack River valleys, to about 90 inches on top of Mount Washington. Localized street flooding occasionally results from severe thundershowers, or over larger areas, from more general rain such as tropical cyclones and coastal "nor'easters." More general and disastrous floods are rare, but some occur in the spring from large rainfall quantities combined with warm, humid winds that rapidly release water from the snowpack.

Causes of flooding that could potentially affect Middleton include:

- 100-year rainstorm
- severe tropical storm (hurricane or tropical storm) that can bring torrential rainfall more than that from a 500-year storm
- rapid snowpack melt given the northern, relatively cold location and climate of Middleton
- river ice jams
- erosion and mudslide in steep slope areas or riverbanks resulting from heavy rainfall that can alter topology
- structural failure of a dam or water tank

Extent:
Flooding can occur in any area of the Town but is more likely to occur within the 100-year floodplain, downstream of dams, along river and stream banks, near wetlands and road crossings, and other low-lying areas. Middleton has approximately 5% (652 acres) of its land in 100-yr. floodplain.

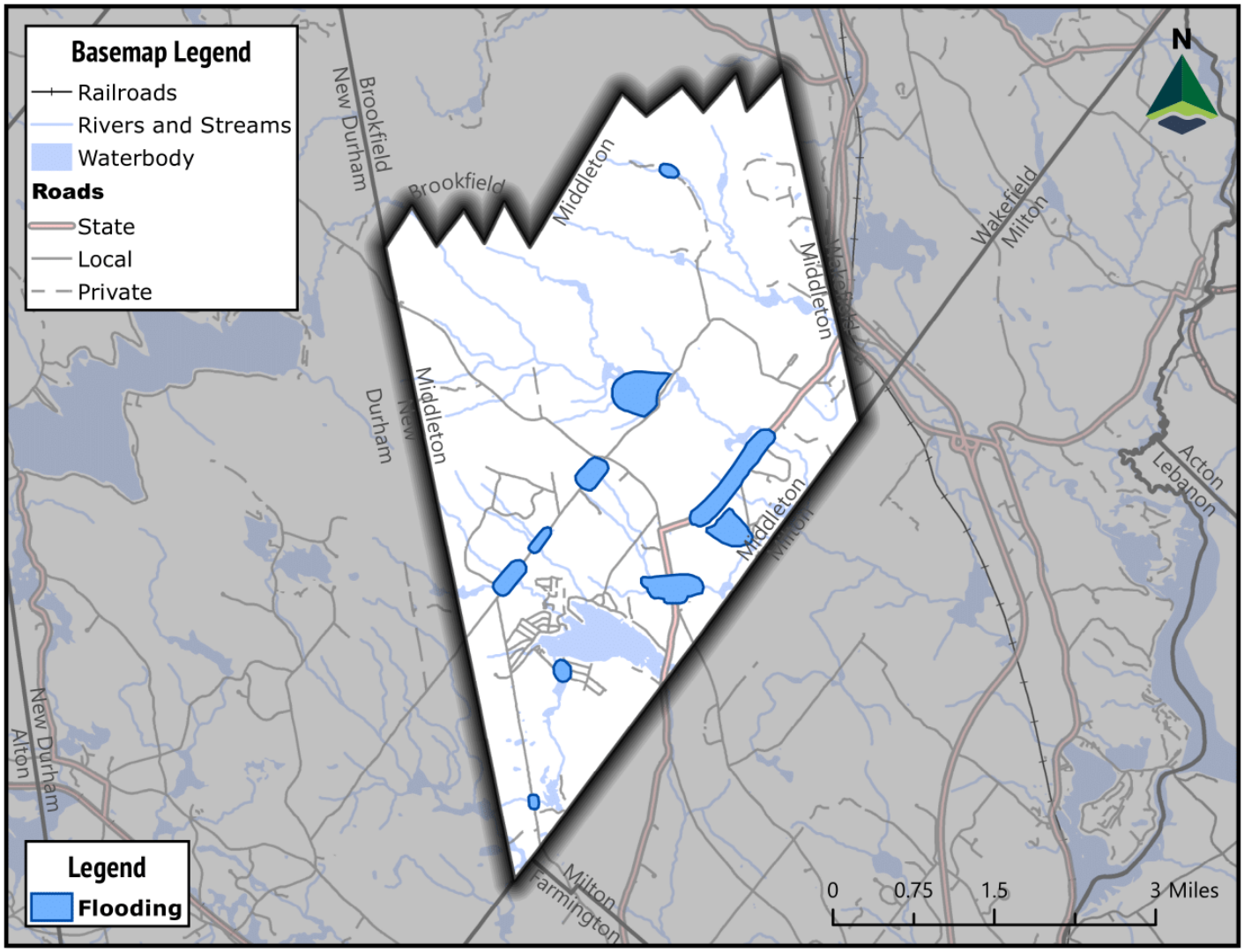
The "100-year flood" Term:

The "100-year flood" is a term often used to describe a flood that has a 1% chance of occurring in any year. But the phrase is misleading, and often causes people to believe these floods happen every 100 years on average. The truth is, these floods can happen quite close together, or not for long stretches of time, but the risk of such a flood remains constant from year to year. The 100-year-flood term was originated to delineate areas on a map to determine what properties are subject to the National Flood Insurance Program. Properties within the 100-year-floodplain, as defined by the Federal Emergency Management Agency, have special requirements and mortgage holders will require owners to carry flood insurance on these properties.

[Source: The Nurture Nature Center: Focus on Floods]

Although flooding of the full extent of this floodplain by definition would require a 100-year storm, smaller storms with a higher annual probability of occurrence could still flood significant portions of that floodplain. Structures that could be impacted by a 100-year storm could also be affected by smaller, more frequent flooding; however, Middleton has few structures within the floodplain. It is likely that the 100-year floodplain will expand in area when flood maps are updated due to better mapping technology and current precipitation data.

Map 1. Past Inland Flooding



Previous Hazard Events:

Although the storm could not be classified, a 1936 event was described at the time as causing "the greatest damage in New Hampshire's history" (Fahey 1936). Two other consequential flooding events took place in 2006 and 2007, both of which were considered 100-year events. During those events, there were several areas where Middleton experienced severe impacts, including: along Jones Brook in the vicinity of Ridge Road and Hollow Road, North of the intersection of Kings Highway and Governors Road, the southern end of Pleasant Valley Road, and areas along the shorelines of Sunrise Lake.

There are a few areas in town that have been impacted by more recent heavy storm events. The following list includes areas identified by the committee and also from comments in the public survey.

- Drew Road: This area gets stormwater runoff from Jesse Mountain, which also includes Partridge Drive and Pheasant Drive.
- New Durham Road: This area gets stormwater runoff from Jesse Mountain,
- Pinkham Road
- Jones Brook
- Nicola Road and NH 153 near Nicola Road
- NH 153: bridge near 252 NH 153; near Nicola Road; Stateside
- Lake District
- Middleton Road
- Lake shore area of Sunrise Lake Village District

Probability of Future Events:
With the increase in storm intensity and frequency, there are concerns that the areas mentioned already will be challenged even more. As funding becomes available, Middleton will continue to monitor these areas and make stormwater management improvements when possible.

Drought

Risk Assessment: Medium
Average Impact: Low
Future Probability: High

Definition:
A drought is defined as a long period of abnormally low precipitation, especially one that adversely affects growing or living conditions. The impacts of droughts are indicated through measurements of soil moisture, groundwater levels, and stream flow. The effect of drought on these indicators is variable during any event. For example, frequent minor rainstorms can replenish the soil moisture without raising groundwater levels or increasing streamflow. Low streamflow also correlates with low ground-water levels because ground water discharge to streams and rivers maintains streamflow during extended dry periods. Low streamflow and low ground-water levels commonly cause diminished water supply.

Location:
The risk from drought is Town-wide. The State has been divided up into five drought management areas to effectively monitor for and respond to drought conditions.

Extent:
The National Drought Monitor classifies the duration and severity of the drought using precipitation, stream flow, and soil moisture data coupled with information provided on a weekly basis from local officials. There are five magnitudes of drought outlined in the New

Hampshire State Drought Management Plan: Exceptional, Extreme, Severe, Moderate, and Abnormally Dry.

Drought is a regional hazard and can impact the entire jurisdiction. Agricultural land and residents who use dug shallower wells may be more vulnerable to the effects of drought.

Table 18: National Drought Monitor

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: • short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • some lingering water deficits • pastures or crops not fully recovered
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies

Previous Hazard Events:
While the impacts of drought are typically not as damaging and disruptive as floods or storm events, the impacts of long-term drought or near drought conditions can impact crops and the water supply.

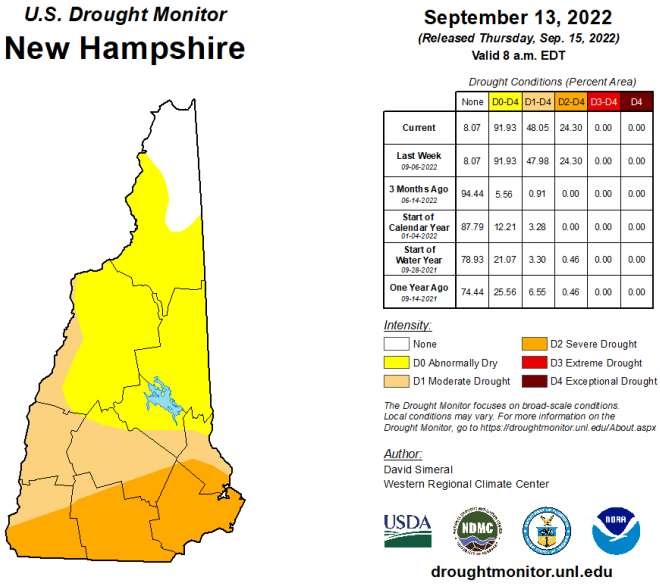
Normal precipitation for the state averages 40 inches per year. As a result, extended droughts are not as common as they are in other parts of the country; however, periods of drought have occurred historically in New Hampshire. Seven droughts of significant extent and duration were evident over the course of the last century as noted in the table below.

Table 19: Period of Drought in NH				
Date	Description	Impacts	Location	Additional Information
1929-1936	Regional Drought	No specific impacts available	Statewide	10 to > 25yr recurrence interval
1939-1944	Regional Drought	No specific impacts available	Statewide	10 to >25yr recurrence interval, severe in southeast and moderate elsewhere.
1947-1950	Moderate Drought	No specific impacts available	Statewide	10-25yr recurrence interval
1960-1969	Severe Regional Drought	High Pollen Count, High Fire Danger, and high prices for produce, wells dried up, rivers, ponds and reservoirs became mud holes. Foggy mornings disappeared. Water Emergencies and Restrictions. Wild birds had trouble getting fish.	Statewide	>25yr recurrence interval. Regional longest recorded continuous spell of less than normal precipitation. President Johnson ordered a study to find out what could be done to help New England.
1999	Drought	Water systems and private wells were adversely impacted by the drought. Impacts to agricultural crops also occurred.	Statewide	Water systems in Salem and Hampton/North Hampton were in danger of running out of water.
2001-2002	Severe Drought	Numerous forest fires. Water systems and private wells were adversely impacted by the drought. Impacts to agricultural crops also occurred.	Statewide	Water systems in Salem and Seabrook were in danger of running out of water. Hundreds of private wells failed.
2016-2017	Extreme Drought	Water systems and private wells were adversely impacted by the drought. Impacts to agricultural crops also occurred. Hundreds of private wells failed.	Statewide	Areas of the state between D1-D3. 19 of the State's 120 dairy farms closed. The State had lost 10 farms over the previous four years combined. This was the first time that an Extreme drought had been declared for New Hampshire since the National Drought Monitor became operational in 2000. Conditions in 2016 were like that of droughts observed in 1995, 1978, and 1964.
2020	Extreme Drought	164 community water systems, eight municipalities, and some private well users in New Hampshire had restrictions in place. Since the start of dry conditions this spring, New Hampshire officials estimated at least 1,000 wells have gone dry.	Statewide	The severe drought lasted 2 months for the entirety of October and November of 2020. The hay crop had been reduced by up to 75 percent in New Hampshire

In more recent years, drought has again become a problem in New Hampshire with three significant droughts within the last 20 years. In 1999, a drought warning was issued by the Governor's Office. In March 2002, all counties in New Hampshire except for Coos County were declared in Drought Emergency. This was the first time that low-water conditions had progressed beyond the Level Two, Drought Warning Stage.

During the summer of 2015, most of central and southern New Hampshire experienced a severe drought. Drought conditions continued and intensified into 2016 in New Hampshire and in Southeast New Hampshire in particular. At its peak in October 2016, nearly 20% of the state was categorized as being in extreme drought. One hundred and sixty community water systems reported implementing a water restriction or ban, and 13 towns reported implementing voluntary or mandatory outdoor use bans in the state during the peak drought conditions. Conditions in New Hampshire largely returned to normal in the first half of 2017, with just over 2% of the state still experiencing abnormally dry conditions. This area covers the southern part of Strafford County, including the Town of Middleton, illustrating the extent to which local drought conditions can vary both geographically and over time.

At the time of this update, there are no droughts in the Strafford County area or in the southern part of the State. However, in 2020, Strafford County experienced its most significant drought in over 20 years with nearly the entire county under an Extreme Drought for two consecutive months.



Probability of Future Events:
Advances in dynamic modeling and the use of hybrid methods have improved drought prediction, but challenges remain to improve the accuracy of drought forecasting.

Historically, droughts in New Hampshire have had limited effect because of the plentiful water resources and sparse population. Since 1960, the population has more than doubled, which has increased demand for the State's water resources. Further droughts may have considerable effect on the State's densely populated areas along the seacoast and in the south-central area.

Currently, drought possibility seems moderate; however, with extreme variation in environmental conditions due to climate change, drought probability may grow in the future. The large amount of water resources and relatively sparse population in New Hampshire have tended to minimize the impacts of drought events in the region, but this regional protection may be endangered in the future with increases in drought frequency or severity.

Earthquake

Risk Assessment: Low
Average Impact: Low
Future Probability: Medium

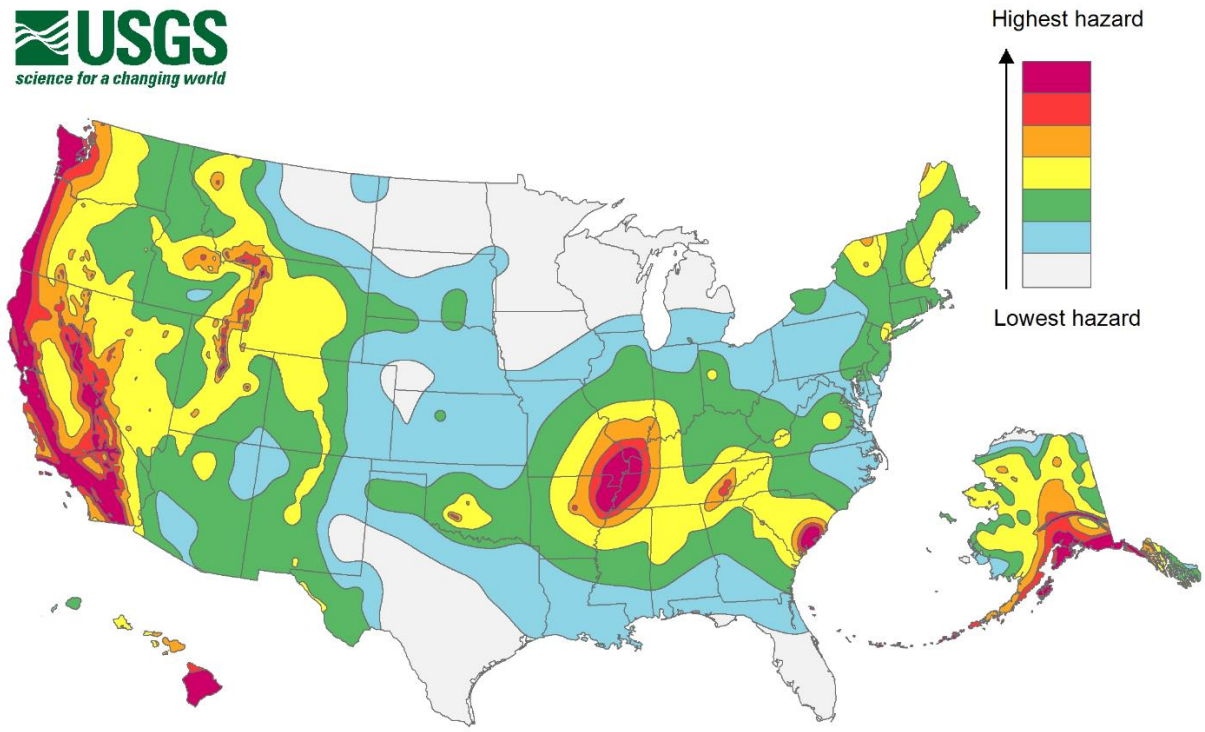
Definition:
The USGS defines an earthquake as a term used to describe both sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, avalanches, and tsunamis. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks and are followed by vibrations of gradually diminishing force called aftershocks. Earthquakes in the Northeast are not associated with specific known faults.

Due to the geology of the region, the area impacted by an earthquake in the Northeast can be up to 40 times greater than the same magnitude event occurring on the West coast. Earthquakes can occur at any time without warning.

An earthquake can impact all areas of Town. People at greatest risk are those who live in unreinforced masonry buildings built on filled land or unstable soil.

Location:
The risk from earthquakes is Town-wide. There is no typical season for earthquakes, they can occur at any time. Due to the state's location in an area of moderate seismic activity earthquakes are a common event, but significantly damaging earthquakes are not.

Map 2: Earthquake Risk Areas

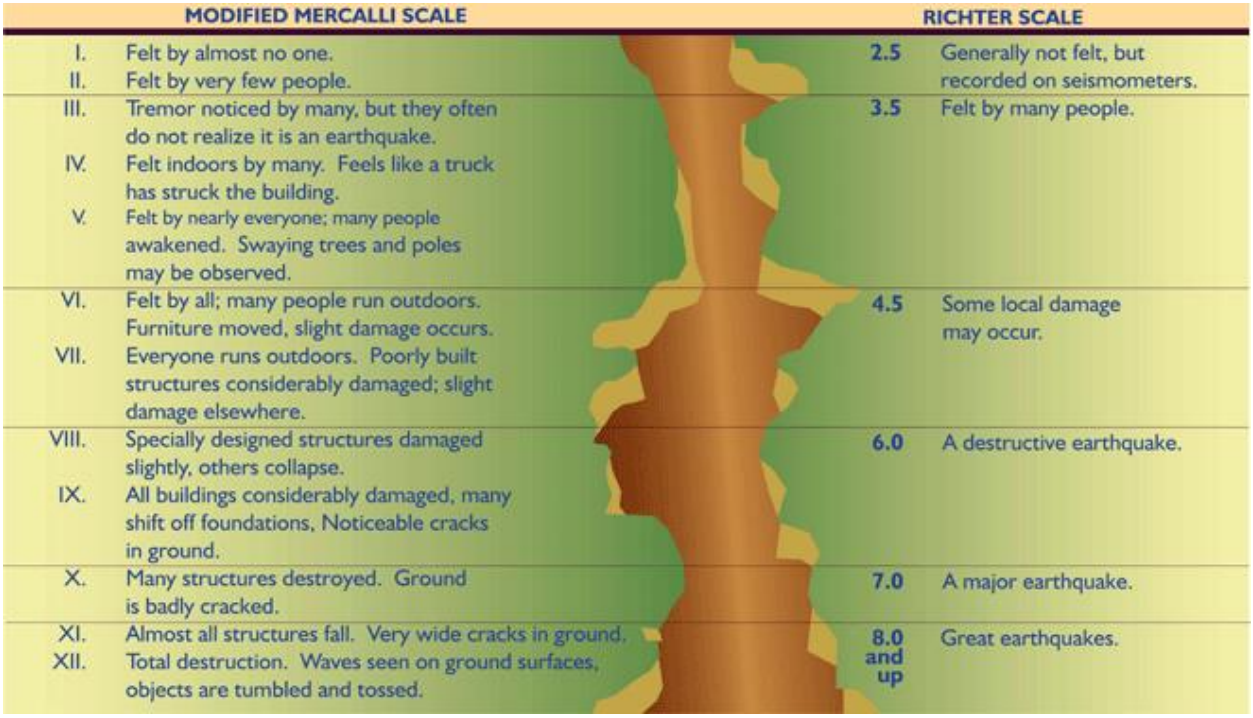


Extent:

The magnitude and intensity of an earthquake is measured by the Richter scale and the Modified Mercalli Intensity (MMI) scale, respectively. The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes.

The Modified Mercalli Intensity (MMI) scale was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead, it is an arbitrary ranking based on observed effects experienced at a given place and therefore has a more meaningful measure of severity.

Figure 3: Earthquake Scales- Modified Mercalli and Richter



Previous Hazard Events:

According to maps produced by the USGS, there have been 211 earthquakes felt in NH since 1925 (twenty-one so far in 2022 and 2023 at the time of this update). Of those 211, only six registered a 4.0 magnitude or above on the Richter Scale. During the last five-year update period, there have been no impacts from earthquakes in Middleton.

Table 20: Notable Earthquakes in NH - 1925-2022 (Magnitude 4.0 or Greater)

Location	Date	Magnitude (Richter Scale)
5km North Northeast of Tamworth, NH	December 24, 1940	5.6
8km West of Tamworth, NH	December 20, 1940	5.3
29km South of Lac-Megantic, Canada	June 15, 1973	4.8
5km West of Hollis Center, Maine	October 16, 2012	4.7
1km of Sanbornton, NH	January 19, 1982	4.5
2km Northeast of Ossipee, NH	October 9, 1925	4.0

Probability of Future Events:

Earthquakes are on average an annual occurrence, but significant quakes have an annual probability of occurrence (based on the 1925-2022 period) of about 6.2%.

Extreme Temperatures

Risk Assessment: Medium

Average Impact: Low
Future Probability: High

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

Extreme Heat events occur because of above normal temperatures, which often coincide with high relative humidity, that increase the likelihood of heat disorders with prolonged exposure or strenuous activity. This risk comes from the heat and humidity preventing the human body from adequately cooling itself using natural methods; this can result in heat disorders and, if untreated, unconsciousness and eventually death. Heat related disorders include heat cramps, heat exhaustion, and heat stroke. Populations at risk, such as the young and elderly, are more likely to experience a heat related disorder during a heat event. Humidity exacerbates how the human body experiences heat when hazy, damp air is trapped near the ground. Certain relative humidity percentages can render the body's natural ability to cool itself by sweating ineffective. These meteorological conditions can lead to heat stroke, which is an immediate medical emergency. Extreme heat can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.

Extreme Cold events occur during meteorological cold waves, also known as cold snaps, that are caused by the southern transport of arctic airmasses into the Northeast. These events are most common in winter months and increase the likelihood of cold disorders in humans and animals that have prolonged exposure to low ambient temperatures. This effect is exacerbated when there are winds present that effectively lower the temperature that is perceived by the human body, known as the wind chill. The risk comes from when the body is losing heat faster than it can produce it. Wind acts to carry heat away from the body, therefore amplifying the perceived temperature by the human body and reducing the body's core temperature. Cold disorders can include frostbite and hypothermia. Frostbite occurs when uncovered skin/extremities are exposed to extreme cold and the body tissue is either injured or killed. Hypothermia is when the body is unable to heat itself at the rate it is being cooled and the body's core temperature begins to drop below normal values. A normal core body temperature is 98.6°F: mild hypothermia occurs when core body temperature drops between 90-95°F, and severe hypothermia occurs at core body temperatures of below 90°F. If left untreated, hypothermia can result in unconsciousness and eventually death. Extreme cold can also damage or kill crops and animals (wild, farm, or domesticated), potentially presenting a risk to the economy.

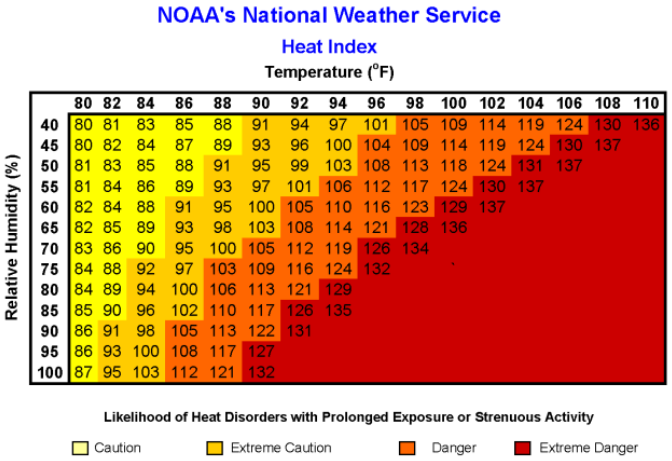
Location:
The risk from extreme temperatures is Town-wide. The hazard is very season dependent: summer months present the greatest hazard for extreme heat events, while winter months present the greatest threat of extreme cold.

Extent:

Since temperatures, humidity, and wind are all based upon existing scientific scales (Fahrenheit, Relative Humidity % [comparison of ambient temperature and dew point], and miles per hour [or knots], respectively), the data is already comparative to each other. Severity/magnitude of these events relates to how extreme the temperature is, how long it is expected to remain at an extreme, and any exacerbating factors (such as humidity or wind).

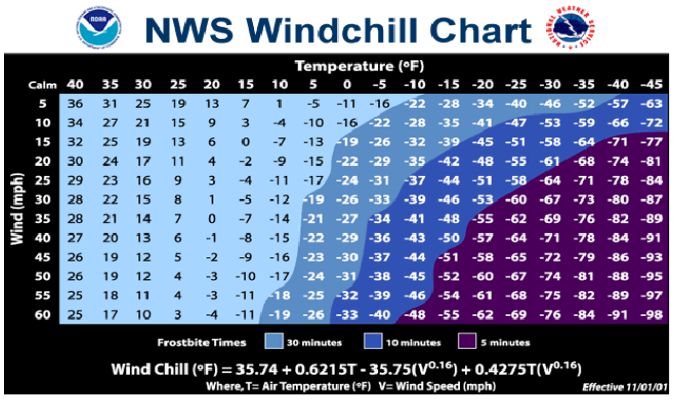
Extreme Heat

Extreme heat events can be described as periods with high temperatures of 90°F or above. The graph to the right displays the likelihood of heat disorders with prolonged exposure or strenuous activity.



Extreme Cold

What constitutes extreme cold varies by region. Characteristics of an extreme cold event in northern states include temperatures at or below zero for an extended period. According to the National Weather Service (NWS), extreme cold is a daily concern during the winter months for northern states. The NWS Windchill Temperature index calculates the dangers from winter winds and freezing temperatures.



Previous Hazard Events:

Extreme Heat

Since the last plan update, there have been several significant heat waves. The Hazard Mitigation Committee did not recall any heat-related losses. The elementary school is considered a location that can serve as a heating or cooling center for residents.

Extreme Cold

Since the last plan update, the Town has experienced challenges with roadways impacted from freeze thaw cycles. This is a result of warmer temperatures in the winter. During extreme cold events, older infrastructure is more apt to fail, such as water main breaks and

necessary replacement schedules are needed. The Hazard Mitigation Committee did not recall any cold-related losses.

Probability of Future Events:
According to the New Hampshire Climate Assessment (June 2022), the warmest daily temperatures are expected to increase throughout this century along with an increase in the frequency of hot temperature extremes. By the end of the century, the increase in days above 90°F projected for the higher concentration pathway (50-60 days) is twice as high as the projected increases for the lower concentration pathway (20-30 days).

As winters warmed, the length of the cold season decreased with fewer days with snow on the ground and fewer cold temperature extremes, especially after 1970. Between 1907-1960, there were an average of 154 days per year under 32°F. More recently, between 1991-2020, Middleton experienced a decrease of about ten days a year, with an average of 144 days per year under 32°F. As such, the severity of cold extremes will likely decrease, along with snowfall and snow cover. Locally, there have been no records of extreme heat-related losses.

High Wind Events

Risk Assessment: Medium
Average Impact: Medium
Future Probability: High

Definition:
For the purposes of this plan, there are two types of high wind events that may result from other severe storms and may occur at any time of the year:

- **Tornadoes**: A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. Because wind is invisible, it is hard to see a tornado unless it forms a condensation funnel made up of water droplets, dust, and debris. Tornadoes are the most violent of all atmospheric storms.
- **Straight-line winds**: This term describes any thunderstorm wind that is not associated with rotation and is usually used to differentiate from tornadic winds. There are several sub-types of straight-line winds"
    - Downdraft - small-scale column of air that rapidly sinks towards the ground
    - Downburst - result of a downdraft, referred to as a macroburst when the area affected is greater than 2.5 miles and microburst when less than 2.5 miles.
    - Gust Front - leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Characterized by wind shift, temperature drop, and gusty winds in front of a thunderstorm

Location:
The risk from high wind events is Town-wide.

Extent:
Tornadoes are measured based on the 3 second gust wind speed of the rotational winds. The Enhanced Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes. The scale measures wind speeds of 65 to greater than 200 miles per hour. The damage path of a tornado can be more than one mile wide and 50 miles long, whereas a downburst is typically less than 2.5 miles. Downbursts can have wind speeds of 150 miles per hour.

Enhanced Fujita Scale	
EF–0	65–85 mph winds
EF–1	86–110 mph
EF–2	111–135 mph
EF–3	136–165 mph
EF–4	166–200 mph
EF–5	>200 mph

Downbursts are primarily based on their size, but consideration is also given to duration and wind speed.

Table 21: Downbursts

	Microbursts	Macrobursts
Size	Less than 2.5 miles	Greater than 2.5 miles
Duration	5-15 minutes	5-30 minutes
Wind speed (3 second gust – mph)	Up to 168 mph	Winds causing widespread damage, possibly as high as 135 mph

Previous Hazard Events:
Tornadoes are rare in New Hampshire. The NCDC Storm Events database (NCDC 2022) lists only 7 tornadoes that have impacted Strafford County since 1950. One was an EF-0 event (65-85 mph); one was an EF1 event (73-112 mph); and five were EF2 events (111-135 mph). Over the course of the past seven decades, there have not been any fatalities, 0 injuries, but approximately $2.9 million in property damages associated with tornados. Most property damage was sustained during an event that took place in 1981. The most recent touchdown was in 2008, in which an F2 tornado and high winds created a path of destruction through five New Hampshire counties that destroyed homes, displaced families, downed trees, and forest lands and closed major state roadways. The impact to residents was extensive, with over 100 homes rendered uninhabitable. Phone and electric service was cut off to over 12,500 customers. One fatality (not in Strafford County) is attributed to a building collapse, and local hospitals reported numerous physical injuries associated with this severe storm. Since the last plan update, there have been no direct impacts from tornados in Middleton.

Downburst activity is very prevalent throughout the State, although most of the downburst activity is mostly unrecognized unless a large amount of damage has occurred. During the

summer months, when several weather systems can merge creating 40-50 mph gusts, resulting storms can cause downed trees and electric wires.

Probability of Future Events:
The average annual probability of recurrence of a tornado impacting Middleton is roughly 10%. The probability may be slightly higher if local reports of tornadoes were considered; however, this 10% probability is for all of Strafford County – not just Middleton. The NCDC identified two tornadoes that touched down relatively close (Strafford and New Durham) to Middleton, which would suggest the average annual probably of recurrence to be less than 3%. While tornados are not common, one would likely cause significant impact. The probability of occurrence of a downburst is likely much higher. A tornado or downburst can impact the entire town but may cause greater damage to areas with higher densities.

Infectious Diseases

Risk Assessment: Medium
Average Impact: Medium
Future Probability: High

Definition:
Infectious diseases are illnesses caused by organisms—such as bacteria, viruses, fungi, or parasites. Many organisms live in and on our bodies. They're normally harmless or even helpful, but under certain conditions, some organisms may cause disease. Some infectious diseases can be passed from person to person, some are transmitted by bites from insects or animals, and others are acquired by ingesting contaminated food or water or being exposed to organisms in the environment. Signs and symptoms vary depending on the organism causing the infection, but often include fever and fatigue. Mild infections get better on their own without treatment, while some life-threatening infections may require hospitalization.

According to the United States Centers for Disease Control and Prevention (CDC), the number of people with a disease that is usually present in a community is referred to as the baseline or endemic level of the disease. This number of infections is not necessarily the desired level, which may in fact be zero, but rather is the typical or normal number of people infected. In the absence of intervention and if the number of infections is not high enough to deplete the pool of susceptible persons, the disease may continue to occur at this level indefinitely. Thus, the baseline level is often regarded as the expected level of the disease. While some diseases are so rare in each population that a single case warrants an epidemiologic investigation (e.g., rabies, plague, polio), there are other diseases that occur more commonly so that only deviations from the norm (i.e. seeing more cases than expected) warrants investigation.

Epidemics occur when an agent (the organism) and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible people. More specifically, an epidemic may result from:

- A recent increase in amount or virulence of the agent,
- The recent introduction of the agent into a setting where it has not been before,
- An enhanced mode of transmission so that more susceptible persons are exposed,
- A change in the susceptibility of people's response to the agent, and/or
- Factors that increase exposure or involve introduction through new portals of entry.

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

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

An epidemic may also result from a bioterrorist event in which an infectious agent is released into a susceptible population, often through an enhanced mode of transmission, such as aerosolizing (inhalation of small infectious disease particles). Regarding foodborne and waterborne outbreaks, the epidemic hazard involves the safety of the food supply. This food safety may be jeopardized because of a fire, flood, hurricane, earthquake, or other natural, technological, or human-caused disaster.

Location:
The risk from infectious diseases is Town-wide. The prevalent diseases can change based on the time of year, such as the influenza virus in the winter and foodborne disease in the summer.

Extent:
The magnitude and severity of infectious diseases is described by its speed of onset (how quickly people become sick, or cases are reported) and how widespread the infection is. Some infectious diseases are inherently more dangerous and deadly than others, but the best way to describe the extent of infectious diseases relates to the disease occurrence:

- **Endemic** – Constant presence and/or usual prevalence of a disease or infection agent in a population within a geographic area
- **Hyperendemic** – The persistent, high levels of disease occurrence
- **Cluster** – Aggregation of cases grouped in place and time that are suspected to be greater than the number expected even though the expected number may not be known
- **Epidemic** – An increase, usually sudden, in the number of cases of a disease above what is normally expected
- **Outbreak** – The same as epidemic, but over a much smaller geographical area
- **Pandemic** – Epidemic that has spread over several countries or continents, usually affecting many people

Previous Hazard Events:
During March of 2020, the COVID-19 virus spread to the United States and effected Middleton in various ways, including economic impacts to businesses, a transition away from in-person meetings, and impacts to emergency responders.

Mandatory shutdowns had an immediate impact on many local businesses, especially those that are service driven. Several restaurants cut expenses by providing take-out options and were able to thrive during this time.

To keep town officials, staff, and members of the public safe, municipal operations across town were altered. Staff met internally to develop strategies and policies that were based on the latest science and recommendations from the CDC. These included increased cleaning and sanitizing routines for municipal buildings; providing masks and hand sanitizer for all employees; enacting an ordinance that required masks to be worn outside and to maintain a safe distance; offering options for residents to pay bills online or by using a drop off box outside the Town Hall; communicating important updates on the virus and any changes in municipal policy through the town website; and transitioning to online meetings. The transition to a virtual, and eventually a hybrid (virtual and in-person) approach provided a more flexible and accessible option for public participation.

Probability of Future Events:
According to a study from the Global Health Institute from Duke University, the probability of a pandemic with similar impact to COVID-19 is about 2% in any year. Lastly, New Hampshire boasts a four-season climate and maintains a tourism-driven economy that welcomes visitors from all over the country every month of the year which exacerbates the transmission from other locations.

Landslides

Risk Assessment: Low
Average Impact: Low
Future Probability: Low

Definition:
A landslide is the downward or outward movement of earth materials on a slope that is reacting to a combination of the force of gravity and a predisposed weakness in the material that allows the sliding process to initiate. The broad classification of landslides includes mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides and earth flows. Landslides may be formed when a layer of soil atop a slope becomes saturated by significant precipitation and slides along a more cohesive layer of soil or rock. Although gravity becomes the primary reason for a landslide once a slope has become weak through a process such as the one just described, other causes can include:

- Erosion by rivers or the ocean that creates over-steepened slopes through erosion of the slope's base. In the case of rivers, this can occur because of flash flooding
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- Large earthquakes have been known to weaken slopes and trigger landslides
- Wildfires (loss of vegetation)
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore, the formation of waste piles, or building of man-made structures may stress weak slopes to the point of failure

Location:
The risk from landslides can occur any place where steep slopes and unstable soils combine. Slope steepness is a key factor causing the earth surface mass movements. However, there are other factors, including erosion of a slope and soil moisture, among others. A period of heavy rains can saturate slope soils, s that the pressure of the water in the spaces between soil particles pushes the soil apart. This enables gravity to overcome resistance to downward soil movement, and when this occurs, a slide begins. Gravity is constant but the degree of resistance can and does vary within slopes.

Extent:
Potential impacts could include property damage, road closures, and increased erosion if forests were damaged.

Previous Hazard Events:
The USGS classifies landslide incidence regionally as very low (less than 1.5% of land area involved). During the last five-year update period, there have been no impacts from landslides in Middleton.

Probability of Future Events:
Landslides could occur in Middleton in areas with steep slopes, where soils and loose bedrock formations would tend to slough off and move en masse downhill under gravity. Earthquakes could readily cause landslides, as could ground saturation from extended heavy precipitation events. Given seismic or precipitation events that could initiate landslide, landslide hazard is likely in steep slope areas. However, these areas are extremely limited in scale. The local probability in Middleton will depend on specific soil/rock types and upon the probability of initiating events.

Lightning

Risk Assessment: Medium
Average Impact: Medium
Future Probability: High

Definition:
Lightning is a visible electric discharge produced by a thunderstorm. The discharge may occur within or between clouds, between a cloud and the air, between a cloud and the ground, or between the ground and a cloud.

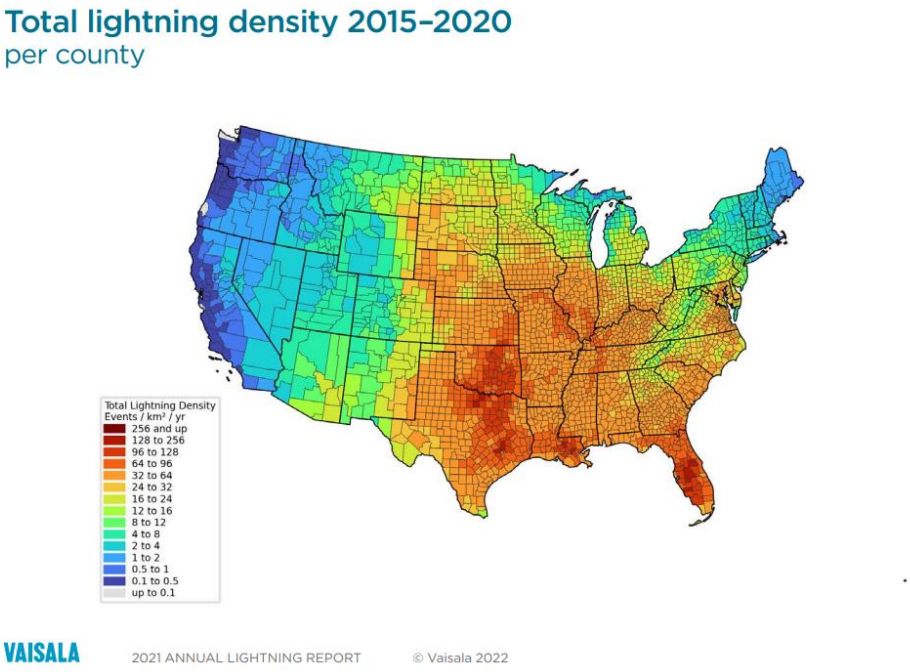
There are roughly 5-10 times as many cloud flashes as there are cloud to ground flashes. There are two types of ground flashes: negative polarity (those that occur because of electrification in the environment) and positive polarity (charge build up on tall structures, airplanes, rockets, and towers on mountains). Negative polarity lighting goes from cloud to ground while positive polarity lightning goes from ground to cloud.

Thunder always accompanies lightning but may not be heard depending on the position of the observer. As lightning passes through the air, it heats the air to a temperature of 18,000-60,000 degrees Fahrenheit. This causes the air to rapidly expand and contract creating a sound wave known as thunder. Thunder can be heard up to 10 miles away from the strike. At longer distances thunder sounds like a low rumble as the higher frequency sounds are absorbed by the environment.

Location:
The risk from lightning is Town-wide; areas at enhanced risk include taller buildings, areas of higher elevation, open bodies of water, large fields, and campgrounds with sparse tree coverage. Negative polarity lightning (cloud to ground) usually occurs in the immediate area of the storm, whereas positive polarity lightning (ground to cloud) can strike long distances around the cell when no immediate signs of a thunderstorm are present. Some lightning strikes occur far outside of the parent thunderstorm—these are called "bolts from the blue", as they appear to come from a clear sky. These strikes are much more dangerous because

they can strike up to 25 miles outside of the storm, catching people off guard in what appears to be clear conditions.

Figure 4: Total Lightning Density



Extent: While weather forecasters can and do forecast the likelihood of intense lightening activity, it is impossible to forecast individual strikes as lightning is so widespread, frequent, and random during a storm. There is also still not a full scientific understanding of the cloud electrification processes.

Lightning strikes can be measured against each other through electrical calculations of the voltage and amperage that was discharged (the higher the voltage and amperage, the stronger and more severe the individual strike is). For the purposes of emergency management, all lightning strikes are viewed as equally dangerous regardless of their amps or volts, as any lightning strike is strong enough to cause infrastructure damage, injury, or death.

Research shows that the severity of a storm is roughly correlated to lightning frequency; however, there is significant regional variability and no direct correlation has yet been found. That said, there appears to be a general increase in the frequency of lightning as a thunderstorm becomes more intense (i.e. larger in area and vertical growth, more organized, hail producing, etc.). There is currently not a widely adopted scale for measuring lightning storms in the northeastern United States. Based on information from the National Weather Service that is used in fire weather forecasts, the severity of lightning storms can be measured using the Lightning Activity Level (LAL) which is based on cloud and storm development as well as number of lightning strikes in a 5-minute period.

Table 22: Lightning Activity Level	
Lightning Activity Level (LAL)	Conditions
LAL1	No thunderstorms.
LAL2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five-minute period.
LAL3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five-minute period.
LAL4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five-minute period.
LAL5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five-minute period.
LAL6	Dry lightning (same as LAL3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Previous Hazard Events: There were no reported lightning strike related deaths in New Hampshire. The NCDC database lists two reported lightning events in Strafford Country from January 1, 2008 to February 28, 2017.

Probability of Future Events:
It is highly likely that the Town will continue to experience impacts from lightning. The severity of those impacts is anticipated to be low to moderate depending on the location of lightning strikes, wind, or other factors such as flash flooding or downbursts that may accompany a thunderstorm. The committee did not recall any impact from lightning strikes since the previous plan.

Severe Winter Weather

Risk Assessment: Medium
Average Impact: Medium
Future Probability: High

Definition:
The State of New Hampshire experiences four types of severe weather during the winter months, which usually bring snow, high winds, and/or rain depending on temperatures:

Heavy Snow

The severity of a heavy snowstorm is directly dependent on how much snow is falling and how fast it is falling. This is usually expressed by the National Weather Service in the number of inches that an affected area of the State will receive and the amount of time that they are expected to receive that snowfall in. Also, the amount of snow that falls in an hour is a unit of measurement of severity for a heavy snowstorm. Storms that produce 2 inches of snowfall

in an hour or more begin to tax the ability of snowplows to keep the roadways clear, can produce blizzard like conditions when combined with wind, and can quickly lead to treacherous road conditions. The Winter Storm Warning criteria for the State of New Hampshire are as follows:

- 6" or more of snow expected in a 12-hour period –or
- 9" or more of snow is expected in a 24-hour period –or
- a combination of snow, ice, and/or wind that produces life threatening impacts is expected

Blizzard

A blizzard is a snowstorm with the following conditions that is expected to prevail for a period of 3 hours or longer:

- Sustained wind or frequent gusts to 35mph or greater; AND,
- Considerable falling and/or blowing snow that frequently reduces visibility to less than ¼ mile

Nor'easter

A Nor'easter is a large cyclonic storm that tracks north/northeastward along the East Coast of North America. It is so named due to the northeasterly prevailing wind direction that occurs during the storm. While these storms may occur at any time of the year, they are most frequent and severe during the months of September through April. Nor'easters usually develop off the east coast between Georgia and New Jersey, travel northeastward, and intensify in the New England region. Nor'easters nearly always bring precipitation in the form of heavy rain and/or snow, as well as gale force winds, rough seas, and coastal flooding.

New Hampshire (New England) is especially susceptible to strong Nor'easters during the winter as the polar Jetstream transports cold, artic air southward across the northern central US. This airmass then moves eastward toward the Atlantic Ocean where it meets warm air from the Gulf of Mexico generating a strong low-pressure system. The warm waters of the Gulf Stream help keep the coastal waters off New England relatively mild during the winter, which in turn helps warm the cold winter air over the water. The presence of the relatively warmer, moist air over the Atlantic and cold, dry Arctic air over the land provide the temperature contrast necessary to generate the strong frontal boundaries that help a Nor'easter intensify.

Ice Storm

Ice storms typically occur with warm frontal boundaries, where warm air rises up and over a shallow mass of cold air near the earth's surface. When snow falls from clouds near just north of the warm frontal boundary, it will fall through the deep warm layer aloft first and melt completely into a liquid water droplet. As it passes through the shallow cold layer near

the surface, the water droplet cools to the point of being supercooled (a liquid raindrop that remains a liquid at the freezing point). When these supercooled water droplets make contact with freezing surfaces on the ground, such as streets and walkways, they freeze on contact forming layers of ice. This process of freezing rain, when persistent over a long period of time, will form layers that may exceed over an inch thick in extreme cases.
Any accumulation of ice can present hazards; however, significant accumulations of ice (1/4" or greater) can pull down trees and utility lines resulting in loss of power and communications. Walking and driving also becomes very dangerous to almost impossible during an ice storm.

Location:
The risk from severe winter weather is Town-wide.

Extent:
Winter weather events are common in New Hampshire. Heavy snow typically brings significant snow removal costs along with delays in transportation schedules. Wet snow can result in major infrastructure damage from heavy snow loads and has been the cause of human harm during long periods of shoveling, including back injuries and in some cases heart attacks. The most severe damage, though, often comes from ice storms and winter nor'easters.

NOAA has developed the Regional Snowfall Index (RSI) which is a snowfall impact scale that uses the area of snowfall, amount of snowfall, and population to attempt to quantify the societal impacts of a snowstorm.

Table 23: Regional Snowfall Index

Category	RSI Value	Description	Approximate % of Storms
0	0-1	N/A	54%
1	1-3	Notable	25%
2	3-6	Significant	13%
3	6-10	Major	5%
4	10-18	Crippling	2%
5	18+	Extreme	1%
The RSI is an evolution of the previous Northeast Snowfall Impact Scale (NESIS).			

Blizzard
As a blizzard has specific scientific conditions that are either met or not met for a storm, the RSI scale referenced above could assist in the severity rating of a blizzard.

Nor'easter
The severity of a Nor'easter is directly dependent on the time of year and the type of weather that the Nor'easter brings. Nor'easters during the winter can cause heavy snowfall, blizzard

conditions, ice, and strong winds. Occasionally these strong coastal low-pressure systems will occur during the summer and can produce significant rainfall, cause flooding, and generate tornadoes or straight-line wind events (micro/macrobursts). The severity of Nor'easters along coastal areas can also be measured by using storm tide and storm surge amounts as described in the coastal flooding section.

Ice Storm

The Ice Storm Warning criteria for New Hampshire is an accumulation of ½" of ice or greater. Although there is currently not a widely adopted scale for measuring ice storms, based on information from the US Forest Service following the 1998 Ice Storm, the severity of ice storms can be viewed in terms of the amount of ice accumulation, the duration of that accumulation, and the resulting damage. The number of variables that need to be taken into consideration to accurately measure the intensity of an ice storm make the process difficult. Some resources, such as weather stations, are not able to measure ice accumulations; therefore, observers must report accumulations to the weather service to get an accurate depiction of the severity of an event. Furthermore, ice accumulation can vary drastically over topography and over short distances, making interpolation of reported values less accurate.

In 2008, the Sperry-Piltz Ice Accumulation Index (SPIA Index) was developed to take into consideration ice thickness, wind speed and direction, and temperatures for the storm period to develop a severity index score across five levels.

Although not widely adopted, National Weather Service offices across the country that receive ice are testing this scale for its viability at being the next Saffir-Simpson style scale for measuring ice storms.

Figure 5: Sperry-Piltz Ice Accumulation Index

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

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

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

Previous Hazard Events:

Three events of those listed in the National Climactic Data Center database are of note for their severity:

- The Ice Storm of 2008 (December 11th–12th) was a major winter storm that brought a mixture of snow, sleet, and freezing rain. The greatest impact in the state was in southern and central New Hampshire where a significant ice storm occurred. Following the ice storm, recovery and restoration efforts were negatively impacted by additional winter weather events that passed through the state. The freezing rain and sleet ranged from 1 to 3 inches, ice accretion to trees and wires in these areas generally ranged from about a half inch to about an inch. The weight of the ice caused branches to snap, and trees to either snap or uproot, and brought down power lines and poles across the region. About 400 thousand utility customers lost power during the event, with some customers without power for two weeks. Property damage across northern, central, and southeastern NH was estimated at over $5 million. Locally, Middleton experienced widespread power outages for upwards of a week.

- The Blizzard of 2013 – NEMO (February 8th-9th) was an area of low pressure developed rapidly off the Carolina coast late on the 7th and early on the 8th. The storm moved very slowly northeast during the 8th and 9th as it continued to intensify. By the morning of the 10th, the storm was located just to the east of Nova Scotia. The storm brought heavy snow, high winds, and blizzard conditions to the southeastern part of

the state. Snowfall amounts were generally 18 inches or more in the southeast where blizzard conditions caused considerable blowing and drifting snow. In western and northern sections, snowfall amounts were in the 4 to 18 inch range. Southeastern New Hampshire had blizzard conditions for about 3 to 10 hours.

According to the NOAA Northeast Snowfall Impact Scale (NESIS), which ranks storms that have large areas of 10 inch snowfall accumulations or greater based on a function of the area affected, the amount of snow, and the number of people living in the path of the storm, Nemo was ranked as a 'major' event (http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis).

The NCDC Regional Snowfall Index for the stations near Middleton reported between 18 and 24 inches of snow (Rochester and Nottingham) and 12 to 18 inches (between Epsom and Northwood) from February 8-February 10, 2013. According to the NH Union Leader, wind gusts of over 30 miles per hour were expected to occur with the storm; however, the NH Electric Co-op reported only minor power outages. Locally, this storm resulted in significant and expensive snow removal effort. There were some branches down, which led to sporadic power outages throughout town.

- **The Blizzard of 2015 – JUNO** (January 26th – 28th) was area of low pressure developed off the Delmarva peninsula on January 26th, and intensified rapidly as it moved slowly northward through the 27th. Snow spread northward across the region Monday night and became heavy on the 27th. Winds became strong during the day leading to blizzard conditions at times along and inland from the coast. The snow persisted into Tuesday night in many areas with blowing and drifting snow. Snowfall amounts ranged from 10 inches to more than 30 inches across much of the southeastern part of the state.

  Juno was ranked on the NESIS as a 'major' event based on the area affected, the amount of snow, and the number of people living in the path of the storm. The Regional Snowfall Index for the station near Middleton reported between 18 and 24 inches from January 25-January 28th, 2015. Locally, this storm resulted in significant and expensive snow removal effort. There were some branches down, which led to sporadic power outages throughout town.

During the last five-year update period, a major disaster was declared due to a winter storm and snowstorm during the period of March 13-14, 2018. The powerful Nor'easter brought high winds and more than two feet of snow in some areas in southeastern New Hampshire. As a result, Strafford County was one of three counties eligible for public assistance funding for emergency work and the repair or replacement of facilities damaged by the storm.

Probability of Future Events:

Middleton will continue to be impacted by severe, regional winter weather events that produce a variety of precipitation, including snow, rain, and sleet. Due to its heavily forested nature, the Town is most highly exposed in terms of damage to forest resources and the secondary impacts of those damages. As a result of more mild temperatures, storm events in recent years have produced more sleet, upwards of 2 inches in some events, causing water content to accumulate and bond to roadways more quickly. This mixture of precipitation is problematic as it exhausts more resources, materials, and staff capacity, to keep the roads safe. The Town's Public Works Department will need to continue exploring new and innovative methods, including pre-treatment and de-icing techniques and equipment purchases, to ensure they are prepared for unpredictable winter weather conditions.

Solar Storms and Space Weather

Risk Assessment: Medium
Average Impact: Low
Future Probability: High

Definition:
The term space weather is relatively new and describes the dynamic conditions in the Earth's outer space environment, similar to how the terms "climate" and "weather" refer to the conditions in the Earth's lower atmosphere. Space weather includes any and all conditions and events on the sun, in the solar wind, in near-Earth space, and in our upper atmosphere that can affect space-borne and ground based technological systems.

Location:
The risk from solar storms and space weather is town-wide.

Impact:
The entire town is at risk for solar storms and space weather. There is a concern for disruption in emergency services communications and businesses that rely on the internet.

The next table shows the level of severity of space weather as it relates to the impact on radio communications. The National Oceanic and Atmospheric Administration (NOAA) uses this chart to alert those who depend on radio communications such as first responders and airlines on days that could create life threatening situations if their radios are impacted.

Table 24: Radio Blackout Chart

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

Source: National Oceanic and Atmospheric Administration (NOAA)

Previous Hazard Events:
This is a hazard that is difficult to detect at the local level and the Work Group was not aware of any specific dates of occurrence. There have been no incidents of damage or interruption of communication services recorded in Middleton.

Probability of Future Events:
The Work Group discussed the increased awareness of these events and ranked it as a high probability that these events will occur during the next ten years.

Hurricane and Tropical Storm

Risk Assessment: High
Average Impact: High
Future Probability: High

Definition:
A tropical cyclone is the generic term for a non-frontal synoptic scale low-pressure system over tropical or sub-tropical waters with organized convection (i.e. thunderstorm activity) and defined cyclonic surface wind circulation. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere. There are several stages throughout the life cycle of a tropical cyclone:

- **Potential Tropical Cyclone**: Term used by the National Hurricane Center (NHC) in advisory products to describe a disturbance that is not yet a tropical cyclone, but which poses the threat of bringing tropical storm or hurricane conditions to land areas within 48 hours. This is a new term introduced by the NHC in the summer of 2017.

- **Tropical Disturbance**: A tropical disturbance is a cluster of showers and thunderstorms that flares up over the tropics. It is typically about 100 to 300 miles in diameter and generally moves westward. Tropical disturbances last for more than 24 hours, so there's a clear distinction between diurnal convection and tropical disturbances. Lacking a closed circulation of winds, tropical disturbances do not qualify as tropical cyclones.

- **Tropical Storm**: Once the maximum sustained winds of a developing tropical cyclone reach 34 knots (39 MPH), the low-pressure system is typically called a tropical storm and is assigned a formal name. The tropical cyclone maintains a tropical-storm status if its maximum sustained winds are above 34 knots and less than 64 knots (74 MPH).

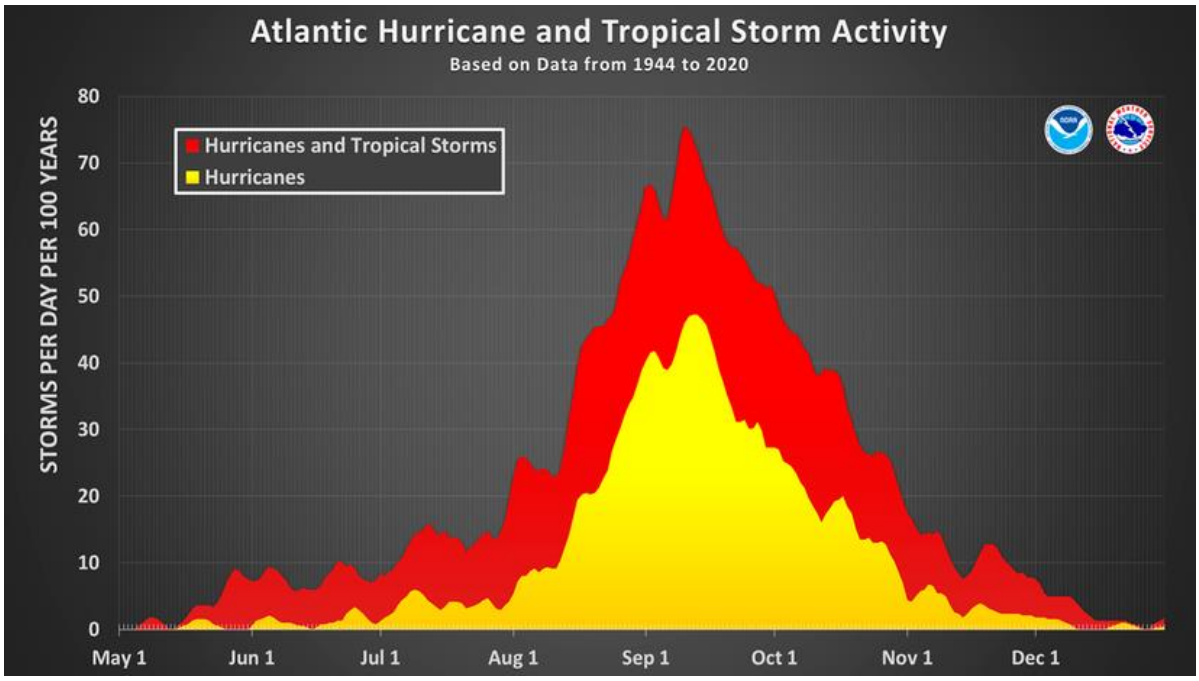
- **Hurricane**: Once a tropical cyclone's maximum sustained winds reach 64 knots (74 MPH), the storm becomes a hurricane (in the North Atlantic and Northeast Pacific Ocean basins).

- **Major Hurricane**: A tropical cyclone with maximum stained winds of 96 knots (111 MPH) or higher.

- **Post-tropical Cyclone**: A former tropical cyclone, this term is used to describe a cyclone that no longer possesses the sufficient tropical characteristics to be considered a tropical cyclone. These post-tropical cyclones often undergo an extratropical transition and form frontal boundaries. Post-tropical cyclones can continue carrying heavy rains and high winds and cause storm surge.

Location: The risk from tropical and post-tropical cyclones is Town-wide. This hazard is very seasonally dependent: the Atlantic hurricane season officially runs from June 1st to November 30th each year. These dates were selected as they encompass over 97% of tropical activity; however, hurricanes have occurred outside of the official season dates. The peak of the Atlantic hurricane season falls in mid-September, followed by a lesser secondary peak in activity in mid-October.

Figure 6: Atlantic Hurricane and Tropical Storm Activity



Extent:
The risk from severe tropical and post-tropical cyclones is Town-wide.

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating system 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.

Table 25: Saffir-Simpson Hurricane Wind Scale		
Category	Sustained Winds	Types of Damage due to Hurricane Winds
1	74-95 mph	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Previous Hazard Events:

Over the past decade, Middleton has experienced two significant storms, Tropical Storm Irene and Hurricane Sandy.

Tropical Storm Irene (August 28, 2011) - brought a prolonged period of strong and gusty winds and heavy rain to the state. The high winds snapped or uprooted numerous trees throughout the state causing more than 160,000 customers to lose electrical and/or communication services. The heavy rains caused rivers and streams throughout the state to flood causing damage to bridges, roads, and property. The strongest winds across the state began Sunday morning in southern areas and spread northward during the day. Winds continued to be gusty overnight as the storm moved away from the area. Observed maximum wind gusts included 63 mph at Portsmouth, 52 mph at Concord, and 51 mph at Manchester. On the top of Mt. Washington, winds gusted to 104 mph as the storm approached and 120 mph as it moved away. The combination of wet soil and the prolonged period of strong and gusty winds brought down numerous trees throughout the state. One person was killed and three people were injured across the state due to falling trees or branches. Rainfall amounts across the state ranged from 1.5 to 3 inches across southeastern New Hampshire. Local

impacts included wind, downed trees, and moderate flooding in low-lying areas. Downed tree limbs and flooding caused minor infrastructure damage.

Hurricane Sandy (October 26 to November 8, 2012) was the last hurricane to hit the region. Middleton experienced minimal impacts associated with rain and wind. Presidential Declaration FEMA-4095 requested funds for debris removal and emergency protective measures. Strafford County was not included in the public assistance or direct federal assistance declaration. Strafford County did receive Emergency Declaration funds for Emergency Protective Measures.

During the last five-year update period, there have been no significant impacts from tropical storms and hurricanes.

Probability of Future Events:
Middleton is vulnerable to hurricane hazards including wind, tornadoes, heavy rainfall, and inland flooding due to its location.

Based on a 30-year climate period from 1991 to 2020, an average Atlantic hurricane season has 14 named storms, 7 hurricanes, and 3 major hurricanes (Category 3, 4, or 5 on the Saffir-Simpson Hurricane Wind Scale). With variability in sea-level pressure and sea-surface temperatures in the Atlantic Ocean, it is difficult to predict with certainty the number of storms in any given year. It is even more difficult to determine which of those storms will make landfall.

Hurricanes and tropical storms will continue to affect Middleton and recurrence potential of hurricane and tropical storm hazards is, therefore, moderate. It is likely that the region will be impacted by a significant storm of tropical origin within the foreseeable future.

Wildfire

Risk Assessment: High
Average Impact: High
Future Probability: High

Definition:
A wildfire is any non-structural fire, other than prescribed fire, that occurs in the Wildland. Wildland here is defined as consisting of vegetation or natural fuels. Wildfires can be referred to as brushfires, wildland fires, or grass fires depending on the location and what is burning.

Location:
Middleton is a rural town with a predominantly forested landscape. The risk from wildfire is Town-wide with increased risk in heavily wooded areas. Exposure to natural factors such

as lightning that can cause wildfires is consequently high and can occur throughout Town.

Extent:
Currently, there is not a universally adopted scale for measuring wildfires within the State of New Hampshire. There are numerous factors that can be used to describe the severity and complexity of a wildfire:

- Acreage of the fire (size)
- Topography and landscape
- Amount of time required to extinguish the fire
- Environmental factors (drought or wind)
- Damages to urban infrastructure along the WUI, damages to utility infrastructure, or other severe environmental damages
- Amount and types of resources required to extinguish the fire (expressed in number of alarms)

Generally, fire personnel most commonly use the acreage of the fire and the number of alarms to describe the magnitude of the wildfire, as these descriptions are relatable to the size of the fire and number of resources required to extinguish. While this is not an exact science, these two factors alone are easily understood and allow a straightforward comparison of the magnitude of wildfire events. Some wildfire events that may not easily be described using these factors, including:

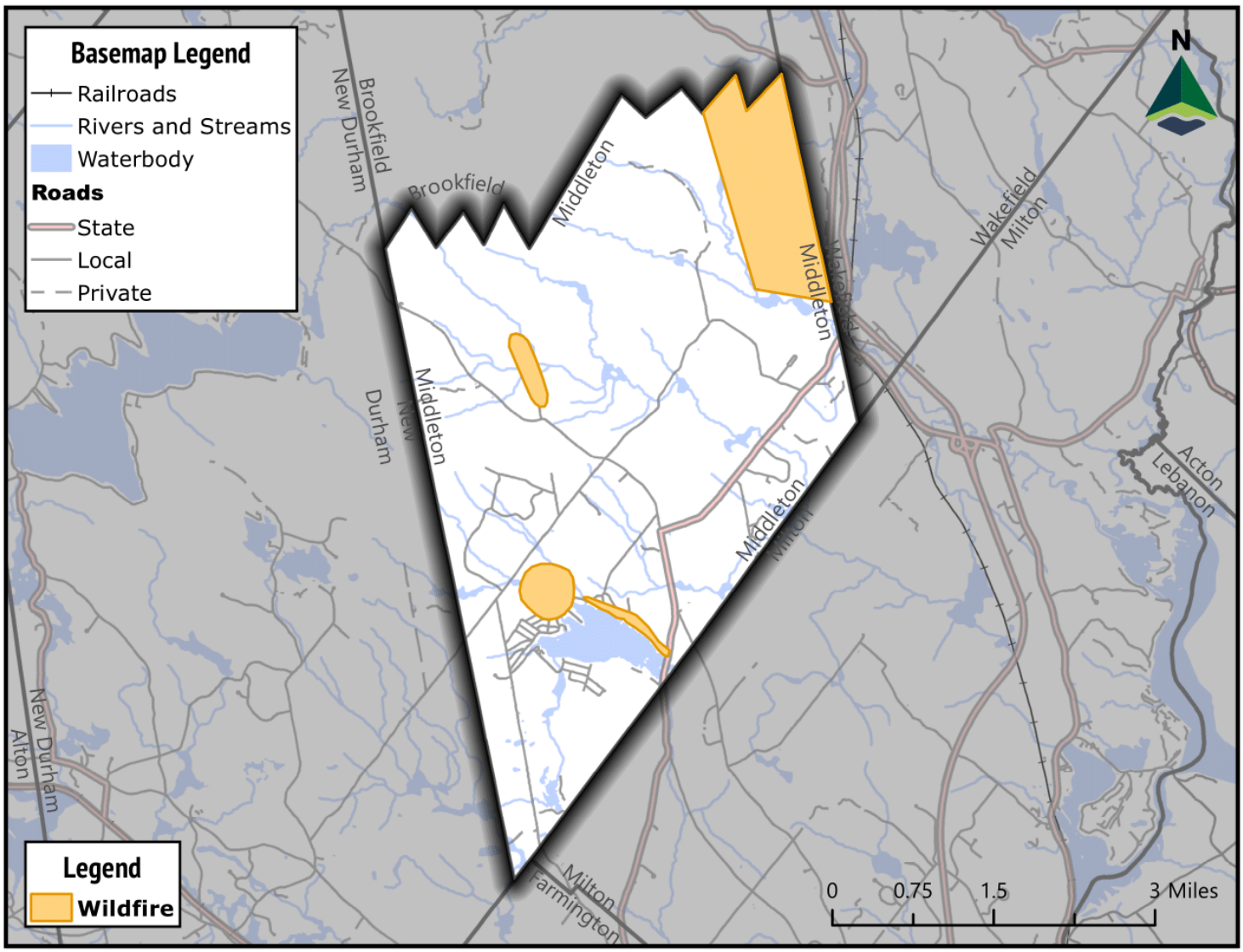
- Significant acreage fires that are isolated to a large, flat field which require few resources to extinguish (greater area covered, less alarms needed)
- Small acreage fires that occur in a remote, difficult landscape burning deep into the ground, which often requires a more diversified and coordinated response

The National Wildfire Coordinating Group (NWCG) has developed a fire size classification chart to describe a wildfire by the areal extent in acres:

Table 26: Fire Size Classification Chart

Size Class of Fire	Size of Fire in Acres
Class A	One-fourth acre or less
Class B	More than one-fourth acres, but less than 10 acres
Class C	10 acres or more, but less than 100 acres
Class D	100 acres or more, but less than 300 acres
Class E	300 acres or more, but less than 1,000 acres
Class F	1,000 acres or more, but less than 5,000 acres
Class G	5,000 acres or more

Map 3: Wildfire Events



Previous Hazard Events:

Wildfires in New Hampshire historically have tended to run in 50-yr cycles, which can be observed starting from the 1800s. This 50-year cycle is partially based upon human activities and, therefore, may not prove to be accurate into the future. The peak in wildfires in the late 1940's and early 1950's is thought to be related to the increased fuel load from trees downed in the 1938 hurricane. Here, 70 years later, New Hampshire officials are again concerned about the high fuel load created by the 1998 and 2008 ice storms that hit New Hampshire.

During the last five-year update period, there have been no impacts from wildfire.

Probability of Future Events:
The probability of occurrence of wildfires in the future is difficult to predict due to the dependence of wildfire on the occurrence of the causal hazards and the variability of numerous factors that affect the severity of a wildland fire. As indicated above, loading of dead brush and other fuels in forested areas can be cyclical, indicating that the risk of wildfire can grow over time if potential sources of fuel are not regularly removed. In general, if a wildfire occurred in one of the large, unfragmented woodland areas, the cost of the timber loss would likely be in the range of several million dollars.

Technological Hazards

Dam Failure

Risk Assessment: Medium
Average Impact: High
Future Probability: Medium

Definition:
Dam Failure is defined as the sudden, rapid, and uncontrolled release of impounded water.

Location:
There are two high hazard dams in Middleton: Sunrise Lake Dam and Ellis Hatch Dam. Both dams are in good condition and are inspected every two years. In 2009, the entire Sunrise Dam was rebuilt and upgraded, which included the removal of trees and root systems for all areas within 15 feet of dam embankment; removal of unsuitable soil, for the placement of upstream concrete cutoff walls; the construction of a new apron and cutoff wall; the re-construction of the disturbed embankment to proper final elevation; and the installation of a new drain system. There is also a low hazard dam- Currier Pond Dam- which is inspected every six years. Based on the condition and frequent inspections of the high hazard dams, the committee did not identify this to be a high risk potential, however, they ranked it as a medium potential because of the inundation area if a breach happened to occur.

Extent:
Within the State of New Hampshire dams are categorized into one of four classifications, which are differentiated by the degree of potential damages that a failure of the dam is expected to cause. The classifications are designated as Non-Menace, Low Hazard, Significant Hazard, and High Hazard.

Non-Menace Structure
A non-menace structure is a dam that is not a menace because it is in a location and of a size that failure or misoperation of the dam would not result in probable loss of life or loss to property, provided the dam is:

- Less than six feet in height if it has a storage capacity greater than 50 acre-feet; or
- Less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.

Low Hazard Structure

A low hazard structure is a dam that has a low hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following:

- No possible loss of life.
- Low economic loss to structures or property.
- Structural damage to a town or city road or private road accessing property other than the dam owner's that could render the road impassable or otherwise interrupts public safety services.
- The release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than two-acre-feet and is located more than 250 feet from a water body or water course.
- Reversible environmental losses to environmentally sensitive sites.

Significant Hazard Structure

A significant hazard structure is a dam that has a significant hazard potential because it is in a location and of a size that failure or misoperation of the dam would result in any of the following:

- No probable loss of lives.
- Major economic loss to structures or property.
- Structural damage to a Class I or Class II road that could render the road impassable or otherwise interrupt public safety services.
- Major environmental or public health losses, including one or more of the following:
    - Damage to a public water system, as defined by RSA 485:1-a, XV, which will take longer than 48 hours to repair.
    - The release of liquid industrial, agricultural, or commercial wastes, septage, sewage, or contaminated sediments if the storage capacity is 2 acre-feet or more.
    - Damage to an environmentally sensitive site that does not meet the definition of reversible environmental losses.

High Hazard Structure

A high hazard structure is a dam that has a high hazard potential because it is in a location and of a size that failure or misoperation of the dam would cause probable loss of human life as a result of:

- Water levels and velocities causing the structural failure of a foundation of a habitable residential structure or commercial or industrial structure, which is occupied under normal conditions.
- Water levels rising above the first floor elevation of a habitable residential structure or a commercial or industrial structure, which is occupied under normal conditions when the rise due to dam failure is greater than one foot.
- Structural damage to an interstate highway, which could render the roadway impassable or otherwise interrupt public safety services.
- The release of a quantity and concentration of material, which qualify as "hazardous waste" as defined by RSA 147-A:2 VII.
- Any other circumstance that would more likely than not cause one or more deaths.

Table 27: Dams

Hazard Class	Name	River or Stream	Inspection Interval
H	Sunrise Lake Dam	Tributary to Cocheco River	2 years
H	Ellis Hatch Dam	Jones Brook	2 years
L	Currier Pond Dam	Branch/Cocheco River	6 years

Previous Hazard Events:
During the last five-year update period, there have been no impacts from dam failure.

Probability of Future Events:
The potential for catastrophic flooding from dam breach or failure exists in Middleton. The dam inundation areas for the Sunrise Lake Dam and Ellis Hatch Dam have been delineated and digitized (breach during 100-yr. storm). In both cases, the inundation area is not extensive. Inundation information for the other dam was not available. All three dams, however, have never breached, have been continually inspected, and are in excellent condition. The probability of this particular flooding hazard occurring is small.

Hazardous Materials

Risk Assessment: Medium
Average Impact: Medium
Future Probability: High

Definition:
A hazardous material is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, property, and the environment. Many products containing hazardous chemicals are used and stored in homes routinely and are also shipped daily on the nation's highways, railroads, waterways, and pipelines. Chemical manufacturers are one source of hazardous materials,

but there are many others, including service stations, hospitals, and hazardous materials waste sites. Hazardous materials continue to evolve as new chemical formulas are created.

Location:
The risk from hazardous materials is Town-wide.

Extent:
Incidents involving hazardous materials could potentially occur at any residence or business or along any road; however, it is more likely that a large-scale incident would occur in the form of a spill along Kings Highway, Ridge Road, and NH 153. The extent of such an incident can be difficult to predict and would depend upon the type and volume of materials involved.

Previous Hazard Events:
During the last five-year update period, there have been no significant impacts from hazardous materials or incidents that would activate the Hazmat team.

Probability of Future Events:
As mentioned above, it is difficult to predict where and when a hazardous spill or incident will occur. The committee felt that with the increase in traffic volume on Kings Highway, Ridge Road, and NH 153, the probability is likely that an incident will occur within the next 10 years.

Long-Term Utility Outage (1 week)

Risk Assessment: Medium
Average Impact: Low
Future Probability: High

Definition:
A long-term utility outage is defined as a prolonged absence of any type of public utility that is caused by infrastructure failure, cyber-attack, supply depletion, distribution disruption, water source contamination, or a natural, human caused or technological disaster. When discussing extended power failure in this plan, it is referring to power failure that can last for a period of up to one week. Many things can cause power failure: downed power lines (due to storm, wind, accident, etc.); failure of public utilities to operate or failure of the national grid.

Location:
The risk from long-term utility outage is Town-wide. Extended power failure can negatively impact lighting, heating, water supply, and emergency services. Extended power failure is particularly hazardous for remote areas. Elderly populations and other populations to protect

could also be particularly vulnerable if the extended power outage occurred in conjunction with extreme heat or severe winter weather.

Extent:
There is no universal method for measuring the extent of utility outages; however, proxy data can be used to determine the extent or area impacted during an outage. These factors include, but are not limited to:

- Number of customers without power, services, fuel, cable/internet, etc.
- Size of the area experiencing an outage
- How long customers have been without a utility and how long they can expect to be without that resource
- Whether resources were completely expended, requiring state or federal assistance
- Extent of cascading impacts

An event is typically referred to after the fact as the greatest extent experienced. For example, the greatest number of customers without power throughout the incident.

Previous Hazard Events:
Historically, power outages have coincided with storm and wind events due to impacts upon power lines. While power outages lasting multiple days in some areas have occurred, no significant impacts beyond repair of damaged lines have been reported during the last five-year update period.

Probability of Future Events:
The likelihood of future power outage events can be difficult to predict, though the historic record indicates that they will be highly correlated with high wind events such as thunderstorms and severe winter weather.

Human-Caused Hazards

Cyber Threats

Risk Assessment: Medium
Average Impact: Medium
Future Probability: Medium

Definition:
The field of cyber security is primarily concerned with protecting against damage and disruption to or theft of hardware, software, or information. Due to the variety of services they provide, local government organizations collect, store, and work with large amounts of personal data and other sensitive information. While the security of this information has

always been important, increasing use of digital networks to store and transmit that information makes the security of those networks a priority. Furthermore, local governments provide critical services such as police, fire, utilities, and other services, and disruption to these services could be devastating for residents. Types of cyber threat include:

- **Malware**: Malicious software that can damage computer systems, including monitoring system activity, transferring information, or even taking control of computers or accounts. This includes a wide variety of viruses, Trojans, ransomware, and other programs that are usually installed by clicking on infected links, files, or email attachments.
- **Phishing**: These attacks come in the form of emails, often disguised as a trusted or legitimate source, that attempt to extract personal data.
- **Denial of Service**: This is a large-scale attack designed to disrupt network service by overloading the system with connection requests. These attacks are more likely to impact large, high-profile organizations, but such attacks can occasionally have residual impacts on other organizations in the same network.
- **Man in the Middle**: By imitating an end user (e.g. an online bank), an attacker can extract information from a user. The attacker can then input that information to the end user to access additional information, including sensitive data such as personal or account information.
- **Drive-by Downloads**: Malware installed on a legitimate website causes a system to download a program simply by visiting that website. This program then downloads malware or other files directly to the user's system.
- **Malvertising**: This attack type downloads malware or other files to your computer when you click on an infected advertisement.
- **Rogue Software**: Attackers use pop-up windows to mimic legitimate anti-virus or other security software to trick users into clicking on links to download malware or other files.
- **Sponsored Attacks**: These threats, which could be perpetrated by state or non-state actors, include specific attacks to damage or disrupt infrastructure such as utilities or wastewater facilities.

Location:
The risk from cyber-threats is Town-wide that have the potential to impact any location if critical services are disrupted, or any resident, business, contractor, or employee whose information is stored in town records in the event of a data breach. The severity of any impact depends upon the type of incident – targeted phishing attacks may be focused upon a single employee or account, while malware attacks could impact an entire department or gain access to an entire database of personal information.

Extent:
The National Cybersecurity and Communications Integration Center (NCCIC) uses the Cyber Incident Scoring System to measure the magnitude of a cyber incident. The NCCIC Cyber Incident Scoring System (NCISS) uses the following weighted arithmetic mean to arrive at a score between zero and 100:

Each category has a weight, and the response to each category has an associated score. The categories are:

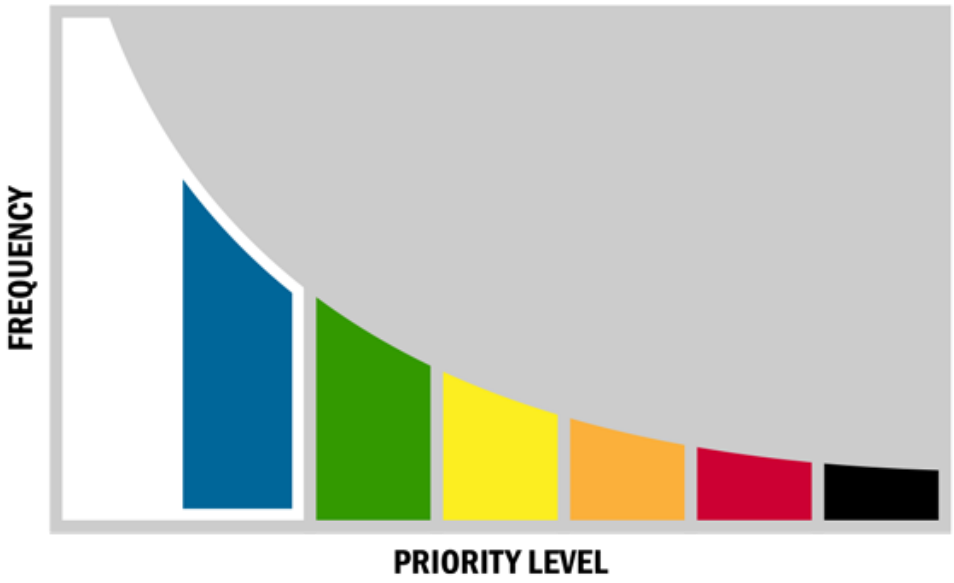
- Functional Impact
- Observed Activity
- Location of Observed Activity
- Actor Characterization
- Information Impact
- Recoverability
- Cross-Sector Dependency
- Potential Impact

Each response score is multiplied by the category weight, and the weighted scores are summed.

Calculate the minimum possible weighted score sum and subtract this number from the previously calculated sum of the weighted scores. Divide the result by the range: the difference between the maximum possible weighted score sums and the minimum possible weighted score sum. Finally, multiply the resulting fraction by 100 to produce the result.

Weights and values are specific to an individual organization's risk assessment process. Accompanying this document is a representative tool that demonstrates a reference implementation of the concepts outlined in this system. Once scored, the incident is assigned a priority level.

Figure 7: Cyber Threat Risk Level



■ Emergency (Black)
An Emergency priority incident poses an imminent threat to the provision of wide-scale critical infrastructure services, national government stability, or the lives of U.S. persons.

■ Severe (Red)
A Severe priority incident is likely to result in a significant impact to public health or safety, national security, economic security, foreign relations, or civil liberties.

■ High (Orange)
A High priority incident is likely to result in a demonstrable impact to public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.

■ Medium (Yellow)
A Medium priority incident may affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.

■ Low (Green)
A Medium priority incident may affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.

Baseline
A baseline priority incident is highly unlikely to affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence. The bulk of incidents will likely fall into the baseline priority level with many of them being routine data

losses or incidents that may be immediately resolved. However, some incidents may require closer scrutiny as they may have the potential to escalate after additional research is completed. To differentiate between these two types of baseline incidents, and seamlessly integrate with the CISS, the NCISS separates baseline incidents into Baseline–Minor (Blue) and Baseline–Negligible (White).

■ Minor (Blue)
A Baseline–Minor priority incident is an incident that is highly unlikely to affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence. The potential for impact, however, exists and warrants additional scrutiny.

■ Negligible (White)
A Baseline–Negligible priority incident is an incident that is highly unlikely to affect public health or safety, national security, economic security, foreign relations, civil liberties, or public confidence.

Previous Hazard Events:
During the last five-year update period, there have not been any major incidents; however, the Town recognizes this to be a constant threat and has taken necessary steps to reduce their risk including filtering potential threats and spam; adding anti-virus for programs on all machines; and providing education to municipal employees.

Probability of Future Events:
A town of Middleton's size is most likely to be at risk from malware, phishing, and other methods of acquiring personal information. These threats may be targeted, as in the case of phishing emails sent to employee accounts, or threats that individuals encounter during their regular computer usage. Cyber threats are also constantly evolving to find new weaknesses in anti-virus software and other network defenses. As noted above, ransomware has become an increasingly prevalent form of malware in recent years and is likely to continue to be a threat in years to come.

Mass Casualty

Risk Assessment: Medium
Average Impact: Medium
Future Probability: High

Definition:
The definition of a mass casualty event is any incident that results in a large number of casualties from a single incident such as a multi-car automobile accident, aircraft accident, hurricane, flood, or armed assault that exceeds the capacity of local emergency and support services.

Location:
This hazard can occur anywhere in town.

Extent:
The extent of this type of hazard exceeds the capacity of the local emergency services and would require assistance from mutual aid of nearby towns and State services.

Previous Hazard Events:
During the last five-year update period, there have not been any major accidents; however, the Town recognizes this to be a threat since there is very limited full-time emergency staff in Middleton.

Probability of Future Events:
The Middleton Hazard Mitigation Committee ranked this as a high probability that will likely happen within the next 10 years due to the need for mutual aid annually.

CHAPTER 6: CLIMATE CHANGE

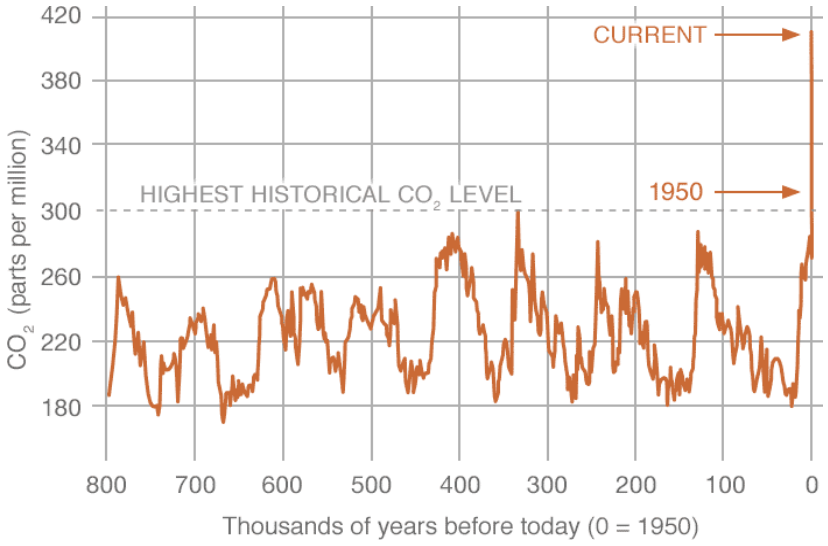
Increase in Intensity and Frequency of Severe Weather Events

Introduction

According to the National Aeronautics and Space Administration's (NASA) Global Climate Change, there have been seven cycles of glacial advance and retreat over the last 650,000 years, with most of these changes driven by fluctuations in the Earth's orbit that alter the amount of solar energy the planet receives, especially in the northern hemisphere, combined with the powerful **ice-albedo feedback loop** (ice is more reflective than land or water surfaces). Other influences on Earth's climate on shorter timeframes (annual to century scales) include variations in solar output and volcanic eruptions that generate particles that reflect sunlight, which can brighten the planet and cool the climate. These processes are natural and will continue to affect the planet's climate; however, an extensive and ever-growing body of scientific evidence—the IPCC's Fifth Assessment and the Fourth National Climate Assessment for example— point to human activities, and especially the burning of fossil fuels, as being responsible for the warming of the planet over the past 50 years.

As of November 2020, concentrations of carbon dioxide (CO_2) in the Earth's atmosphere have reached 415 parts per million (ppm). For context, according to ice core samples, CO_2 concentrations never exceeded roughly 300 ppm over the last 400,000 years and studies have shown that human activities have raised atmospheric concentrations of CO_2 by 47% since pre-industrial levels in 1850.

Figure 8: Proxy Measurements of CO_2 taken from Reconstruction of Ice Cores



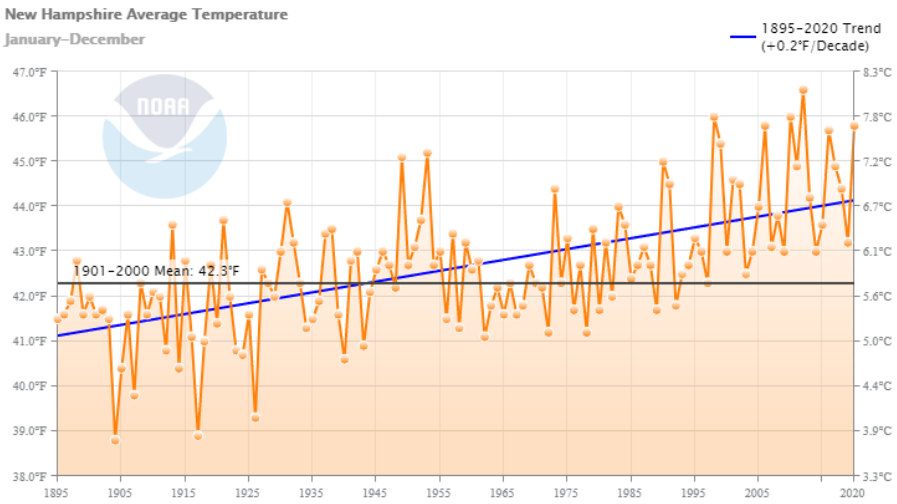
Atmospheric levels of other greenhouse gases, including methane, nitrous oxide, and CFC have also risen over the past several decades as well. This increase in atmospheric greenhouse gases is primarily responsible for the rise in the planet's average surface temperature of about 1.6°F since the late 1800s, with most of the warming occurring in the last 50 years. Nineteen of the twenty warmest years on record have happened since 2001. This warming trend is considered extremely likely to continue. These increases in temperature have affected the Earth's climate in many ways. Ocean temperatures have warmed, the Greenland and Antarctic ice sheets are rapidly losing mass, glaciers are retreating all over the world, global sea-level is rising, snow cover has decreased, and the number of record high temperatures and intense rainfall events has been increasing since the 1950s.

Climate Change in New Hampshire

Increased Temperature on Land

Temperature, of course, is one of the most used indicators for climate change. Historically, New Hampshire has been characterized by cold, snowy winters and mild summers but there has been significant evidence this seasonal definition is changing. According to data from the NOAA National Centers for Environmental Information, since the early 20th century, the average annual temperature in the state has increased by approximately 3°F, and state's maximum temperatures have increased between 0.5°F and 2.6°F. The state's temperature change has been continuously recorded at three meteorological stations in southern New Hampshire (Keene, Durham, and Hanover) for the last century and all three weather stations show consistent long-term minimum and maximum temperature increases. Overall, more than half of the state's warmest years on records have occurred since 1990.

Figure 9: NH Average Temperature Change (1895-2020)

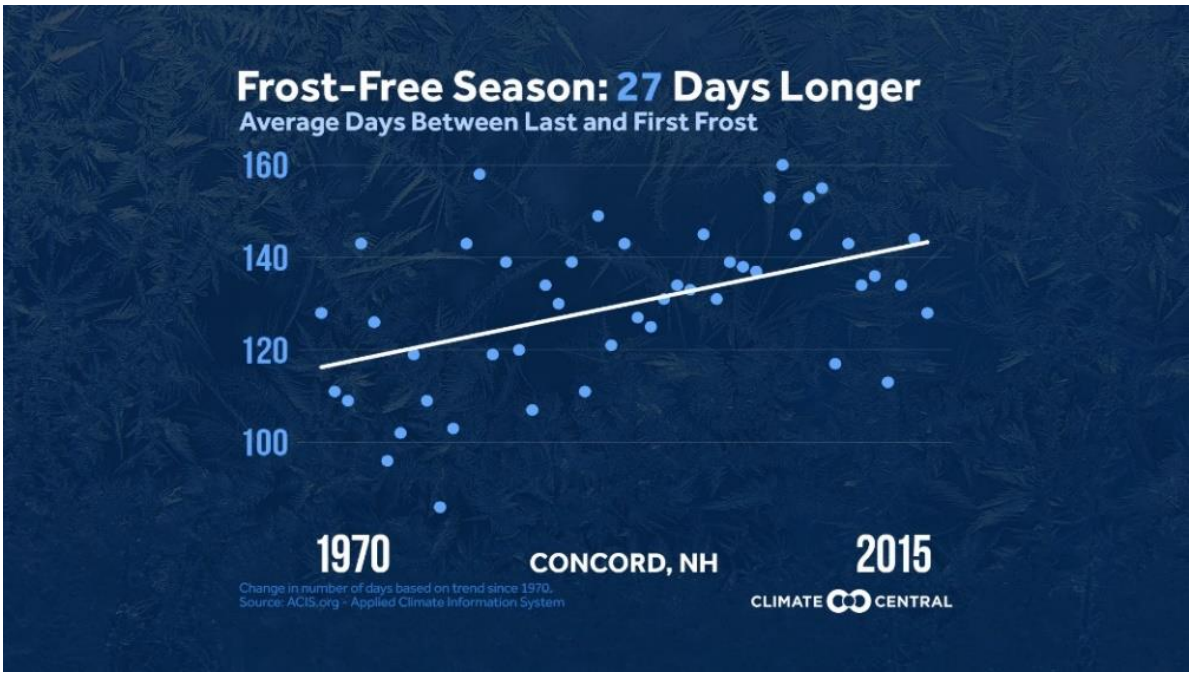


According to Wake et al. 2014, while the number of hot days has increased slightly across southern New Hampshire, there has been a dramatic increase in the rate of winter warming over the last four decades at all three stations, which may be linked to decreases in snow cover through changes in surface albedo, or reflectivity. In Southern New Hampshire, the number of hot days has increased slightly over the last five decades (+0.8 days per decade) and the number of cold days has reduced significantly. (-5.0 days per decade).

Changes in the distribution of hot and cold extreme temperatures can lead to the increased frequency, duration, and intensity of heat waves, increased nighttime warming, longer growing seasons, drought length and intensity, crop failure, and the expansion of suitable habitat for both Lyme disease-bearing ticks and invasive species such as the emerald ash borer.

According to the EPA, accompanying the rising temperatures is a steady lengthening of the United States' **growing season**. The average growing season has lengthened by two to five weeks across the U.S since the beginning of the 20th century, with a particularly large increase over the last 30 years. Since 1970, data collected in Concord, NH shows an increase of 27 days between the first and last frost of the year. In Southern New Hampshire, the growing season has increased by 10 days per decade since 1960.

Figure 10: Length of Frost-Free Season in Concord, NH, 1970-2015



As the Northeast is known for its long, cold winters, and warm to hot summers, this seasonality is an important cultural and economic driver of regional economies such as agriculture, commercial fishing, forest products, and tourism. Cold, snowy winters help

support regional tourism such as fishing, hunting, and winter sports. Timber harvesting on wet sites often occurs in the winter when soils are frozen, or snow covered, and maple sugaring depends on sufficient cold winters for adequate sap quantities. Milder winters and early springs are adversely impacting the region's tourism, farming, and forestry activities.

The growing season determines what crops can be grown in a region and changes can have both positive and negative effects. While a longer season can allow farmers to diversify their crops or have multiple harvests from the same plot, it can also limit the types of crops grown, increase the heat stress on crops, encourage invasive species or weed growth, and increase pests and irrigation demands. Farmers will need to combat the northward expansion of the European corn borer and the Western corn root worm on their crops, and the warmer temperatures will likely allow the codling moth—an apple tree pest—to complete a third generation requiring additional insecticide applications.

More Rainfall and Less Snow

As winter warms in New Hampshire, snowfall and snow cover will continue to decrease (See Increased Temperature on Land). Although snowfall amounts in recent winters have varied, overall snowfall has been decreasing at most monitoring stations and the number of snow-covered days is decreasing throughout the state. This is because as cold seasons warm, more precipitation falls as rain instead of snow. Precipitation across the region has increased in the last century, with the highest number of extreme precipitation events happening in the last decade. Between 1958 and 2010, the northeastern United States experienced a 70% increase in precipitation during heavy rain events. The statewide average for annual precipitation is 44.2 inches, with higher amounts in the southern and eastern parts of the state due to proximity to the Atlantic Ocean. This average in southeastern New Hampshire is projected to increase by 5-10% by mid-century and 7-15% by 2100—with a subsequent increase in flooding. The increase is expected to be greatest in the winter and spring, intermediate in the summer, and lowest in the fall.

These observations in total and seasonal precipitation are due to an increase in the intensity and frequency of individual precipitation events, with the Great Bay watershed showing a 15-38% magnitude increase of extreme daily precipitation since the 1950s. These large precipitation events have contributed to significant springtime flood events in coastal New Hampshire and are projected to increase the risk of future flooding. Extreme precipitation events also cause non-coastal flooding of rivers, streams, roadways, and active agricultural fields which can result in contamination of farmland soils by floodwaters as well as crop failure.

Drought

Drought is yet another prominent extreme weather event that is increasing due to climate change. In the 21st century, droughts have been characterized by hotter temperatures, longer

durations, and greater spatial extent with recent years being punctuated by periods of moderate to extreme drought development. Droughts are also exacerbated by growing human demands on water resources. Drought conditions have historically been driven by sea surface temperatures, internal atmospheric variability, and land-atmosphere feedback, but human-caused climate change is increasingly affecting the frequency, intensity, and extent of droughts. While it is projected there will be increased precipitation in New Hampshire, the intensity of naturally occurring droughts is projected to increase as well. This is because higher summer temperatures will increase the rate of depletion of soil moisture during dry spells and the projected increases in average annual precipitation will take place primarily during the winter and spring. Practically, this could look like rainier winters and springs with more extreme precipitation events and longer periods without precipitation more prone to drought in the summer and fall.

For example, over the past two decades, the state has experienced several significant periods of drought including in 2001-2002; 2015-2016, 2020; and most recently 2021. The most recent drought period only ended due to extreme precipitation in the month of July 2021. The NH Drought Management Program determined that the drought that impacted the state in the early 2000s was the third worst on record, and that recent droughts were due to a combination of a below average snowpack in the spring, little precipitation to recharge the groundwater, and the inability of watersheds to store large volumes of water due to their geology. With extreme variation in environmental conditions due to climate change, drought probability may grow in the future.

The large amount of water resources and relatively sparse population in New Hampshire have tended to minimize the impacts of drought events in the region, but this protection may be endangered in the future with increases in drought frequency or severity combined with population growth and increased development. Increased development means more impervious surfaces, and more impervious surfaces will contribute to additional precipitation runoff and less groundwater recharge during rain and flooding events. Impacts from climate change may cause a 10% increase in annual groundwater recharge rates in the New Hampshire coastal region over the next century; however, increases in impervious surfaces may reduce this recharge 5 to 10%. Land development associated with increases in demand due to population growth will also increase groundwater withdrawals for drinking water and will contribute to intensified groundwater depletion during droughts.

Increased Temperature in the Ocean

Worldwide, ocean temperatures are also increasing. The Gulf of Maine is warming at an accelerating rate, three times as fast as the average global rate in the last three decades and seven times as fast in the last 15 years. In 2012, during the most intense ocean heat wave in the last three decades, sea surface temperatures in the Gulf of Maine were a record-breaking 69.98°F. These warming temperatures are having cascading effects on environmental and

ecological patterns such as marine species migrating northward in search of colder waters, and are already impacting NH fishing grounds with the closure of the Gulf of Maine Shrimp Fishery based on depleted shrimp populations. These changes also lead to higher levels of evaporation and greater moisture in the air, which contributes to more precipitation and extreme weather events.

Greenhouse Gas Emissions

The New Hampshire Department of Environmental Services (NHDES) conducts an annual greenhouse gas (GHG) emissions inventory that tracks the six main GHG's, including carbon dioxide, methane, nitrous oxide, and three industrial process gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). According to 2017 data, carbon dioxide makes up the majority of NH's GHG emissions (92%), primarily due to burning fossil fuels for heat, electricity, and to power motor vehicles. GHG sources are usually categorized into the following sectors: transportation, electricity generation, residential, commercial, industry, waste and wastewater, and agriculture. Transportation is the predominant sector, producing an estimated 47% of the state's GHGs.

Fortunately, a large majority of NH is forested, with these areas acting as a carbon sink. This process, called **carbon sequestration**, could be responsible for absorbing and storing nearly 25% of CO_2 emissions from the burning of fossil fuels in the state. Intact forested ecosystems are also a major factor in **climate resiliency** for New Hampshire. It is estimated that a 40-acre forest in northern New Hampshire holds the same amount of carbon as 53,000 automobile tanks of gasoline. Large undeveloped and unfragmented forested blocks are also very important for wildlife and biodiversity conservation and as of 2019, 47% of large forest blocks in the state are permanently conserved. **Climate corridors,** identified by the Nature Conservancy as part of their Resilient and Connected Landscapes project, facilitate tree and wildlife species range shifts as temperatures and habitat continue to change. Intentionally keeping areas forested and protected is a natural safeguard for fresh drinking water and clean air for local communities and offers numerous benefits for the state overall, both now and in the future.

Air Pollution

New Hampshire has a network of 13 air quality monitoring stations that continuously monitor air pollutants. NHDES staff track progress in reducing air pollution and inform the public about air quality in their communities and any necessary health precautions. New Hampshire's regulated air pollutant levels have generally dropped since the 1970s, but air quality in many parts of the country still fails to meet health-based air quality standards. While the impact of climate change on the production of fine particulate matter pollution has been inconclusive, warmer temperatures associated with climate change will increase ozone production and ozone concentrations in urban areas. This is likely to lead to more pollution-related cardiorespiratory illness and death in the state.

Species Migration and Invasive Species

The timing of biological events (bird migration, wildlife breeding, plant flowering and fruiting) is determined by variables such as seasonal temperature, food availability, and pollination. In the Northeast, flowering dates are occurring one week earlier than the mid-1800s and migratory birds are arriving and breeding earlier, revealing a shift in migratory patterns. Forests are a defining feature of New Hampshire and climate change has the potential to alter the forest species composition, distribution, abundance, and productivity (as well as their associated species) in several ways. While not uniform and depending on the suitable habitat characteristics for species (such as soils, elevation, latitude, and other factors), some tree species will experience decreases in suitable habitat, while others will see expansion of suitable habitat as the climate changes. Decreases in suitable habitat are projected to be greatest in Southern and Coastal New England.

While already a major threat to native New Hampshire ecosystems, nonnative plant and animal species are becoming more of a concern because of their increased potential to outcompete native species. Some nonnative species can establish themselves faster than native species because they lack competitors and are better able to respond to climate change-induced changes such as warmer temperatures, earlier springs, and reduced snowpack. Additionally, the warmer temperatures are likely to expand the ranges of certain invasive species that were previously limited by colder northern temperatures. Fewer days below freezing is leading to increases in rates of pest outbreaks and vector-borne diseases (disease that results from an infection transmitted to humans and other animals by blood-feeding arthropods, such as mosquitos, ticks, and fleas) such as Dengue fever, West Nile Virus, Lyme disease, and malaria. All these factors can lead to a decline of natural species, increases in nonnative or invasive species, and a reduction in biodiversity.

CHAPTER 7: ACTION PLAN

Mitigation Goals

The Middleton Hazard Mitigation Committee developed overarching goals and objectives, which are adapted from the 2023 NH State Hazard Mitigation Plan.

Overarching Goals

The following are the five overarching goals of this Plan:

- Minimize loss and disruption of human life, property, the environment, and the economy due to natural, technological, and human-caused hazards through a coordinated and collaborative effort between Federal, State, and Local authorities to implement appropriate hazard mitigation measures.
- Enhance protection of the general population, citizens, and guests of Middleton before, during, and after a hazard event through public education about disaster preparedness and resilience and expanded awareness of the threats and hazards which face the Town.
- Promote continued comprehensive hazard mitigation planning to identify, introduce, and implement cost effective hazard mitigation measures.
- Address the challenges posed by climate change as they pertain to increasing the risk and impacts of the hazards identified within this plan.
- Strengthen Continuity of Operations and Continuity of Government to ensure continuation of essential services.

Natural Hazard Objectives

The following are the natural hazard objectives of this Plan:

- Reduce long-term flood risks through assessment, identification, and strategic mitigation of at risk/vulnerable infrastructure (dams, stream crossings, roadways).
- Minimize illnesses and deaths related to events that present a threat to human and animal health.
- Implement plan development, outreach, and public education to reduce the impact from natural disasters.
- Ensure mitigation strategies consider the protection and resiliency of natural, historical, and cultural resources.

Technological Hazard Objectives

The following are the technological hazard objectives of this Plan:

- Ensure technological hazards are responded to appropriately and to mitigate the effect on citizens.
- Identify and respond to emerging contaminates.
- Enhance public education of technological hazards to assist in the prevention and mitigation of hazard impacts on the population.

- Ensure emergency responders are properly equipped and trained to respond, contain, and mitigate incidents involving technological hazards.
- Reduce the possibility of long-term utility outages by implementing mitigation reduction measures such as line clearing and removal of nuisance trees, as well as ensuring back-up power is in place and tested.
- Lessen the effects of technological hazards on communications infrastructure.

Human-Caused Hazard Objectives

The following are the human-caused hazard objectives of this Plan:

- Identify Critical Infrastructure and Key Resources (CIKR) risks or vulnerabilities and protect or strengthen infrastructure against hazards.
- Improve the ability to respond and mitigate Cyber Events through increased training, exercising, improved equipment, and utilizing accepted technologies.
- Foster collaboration between Federal, State, and Local agencies on training, exercising, and preparing for mass casualty incidents and terrorism. Ensure local assets (e.g., non-profits, schools, senior housing facilities, and other facilities and populations to protect) are prepared for all phases of emergency management including training and exercising on reunification.

Development of Action Items

The Hazard Mitigation Committee determined that any strategy designed to reduce personal injury or damage to property that could be done prior to an actual disaster would be listed as a potential mitigation strategy.

The committee determined that this Plan was in large part a management document designed to assist town officials in all aspects of managing and tracking potential emergency planning strategies. For instance, the committee was aware that some of these strategies are more properly identified as readiness issues; however, did not want to "lose" any of the ideas discussed during these planning sessions and thought this method was the best way to achieve that objective.

The committee identified twenty-seven (27) new strategies to implement during the life of this Plan. These strategies are intended to supplement existing programs and the ongoing and not yet completed mitigation strategies identified in previous plan updates. When identifying new strategies, the committee balanced several factors including capacity to implement strategies, priority projects, existing strategies, policies, and programs, the hazard ranking, and whether a strategy will reduce risk associated with multiple hazards.

Prioritization of Action Items

A technique known as a STAPLEE evaluation, which was developed by FEMA, was used to evaluate new mitigation strategies based on a set of criteria (see below). The STAPLEE method is commonly used by public administration officials and planners.

Table 28: Prioritization "STAPLEE" Method		
S	Social	Is the proposed strategy socially acceptable to the community? Is there an equity issue involved that would result in one segment of the community being treated unfairly?
T	Technical	Will the proposed strategy work? Will it create more problems than it solves?
A	Administrative	Can the community implement the strategy? Is there someone to coordinate and lead the effort?
P	Political	Is the strategy politically acceptable? Is there public support both to implement and to maintain the project?
L	Legal	Is the community authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?
E	Economic	What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits?
E	Environmental	How will the strategy impact the environment? Will it need environmental regulatory approvals?

The Hazard Mitigation Committee evaluated each mitigation strategy using the STAPLEE and ranked each of the criteria as poor, average, or good. These rankings were assigned the following scores: Poor=1; Average=2; Good=3.

The following questions were used to guide further prioritization and action:

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

The prioritization exercise helped the Hazard Mitigation Committee evaluate the new hazard mitigation strategies that they had brainstormed throughout the multi-hazard mitigation planning process. While all actions would help improve the Town's multi-hazard and responsiveness capability, funding availability will be a driving factor in determining what and when new mitigation strategies are implemented.

Table 29: Mitigation Actions								
New Mitigation Projects	S	T	A	P	L	E	E	Total
Update the Local Emergency Operations Plan (LEOP) and include information about the new school.	3	3	3	3	3	3	3	21
Work with Community Emergency Response Teams (CERT) in Rochester to assist in transporting residents to the Community Center during an emergency event.	3	3	3	3	3	3	3	21
Conduct a fieldwork analysis to identify which existing dry hydrants are operational and which ones need to be repaired. This analysis should also develop an operations and maintenance plan to ensure a schedule is kept avoiding any dry hydrants falling in disarray.	3	3	3	3	3	3	3	21
Provide educational brochure about drinking water, including well maintenance and testing, impacts of drought, and additional resources.	3	3	3	3	3	3	3	21
Determine specific locations for road surface markings, such as fog line, and investigate the cost.	3	3	3	3	3	3	3	21
Partner with the Conservation Commission to conduct a water consumption and leak detection education and outreach campaign. Investigate funding options through NHDES, which offers leak detection grants.	3	3	3	3	3	3	3	21
Work with the Town of New Durham to make improvements and upgrades to New Durham/Middleton Road to decrease emergency response times for mutual aid.	3	3	3	3	3	3	3	21
Provide residents with educational material on urban interface, and the importance of firebreaks in order to contain fires within the boundary of the burn unit and avoid the start of a wildfire.	3	3	3	3	3	3	3	21
Add CODE RED, Reverse 911, or other notification system to alert residents of incoming storms.	3	3	3	3	3	3	3	21
Identify alternatives for an additional access (emergency) to Nicola Road and other dead-end roads.	3	3	3	3	3	3	3	21
Provide information regarding NFIP to residents by posting on the town website.	3	3	3	3	3	3	3	21
Coordinate with the School Board to investigate options to address pedestrian safety issues, including insufficient parking, lack of sidewalks, and lightning problems that are exasperated during winter weather.	3	3	3	3	3	3	3	21
Provide information on emergency preparedness, hazard mitigation, and emergency operations on the website. Include links to the NH HSEM and FEMA websites for a range of information for all hazards.	3	3	3	3	3	3	3	21
Continue to provide outreach assistance to elderly and special needs populations by organizing staff and coordinating within town departments. Develop a list of	3	3	3	3	3	3	3	21

Table 29: Mitigation Actions								
New Mitigation Projects	S	T	A	P	L	E	E	Total
elderly residents and residents with special needs for welfare checks during a hazardous storm event.								
Establish potential cistern locations for existing and new development.	3	3	3	3	3	3	3	21
Create a plan to host people in the Middleton Elementary school for emergency shelter.	3	3	3	3	3	3	3	21
Determine costs and obtain backup power generators at Town facilities.	3	3	3	3	3	3	3	21
Add the Middleton Hazard Mitigation Plan Update 2023 to the Town website.	3	3	3	3	3	3	3	21
Determine a central and safe location to store all emergency plans including, but not limited to: Hazard Mitigation Plan, EOP, Dam Emergency Action Plans, etc.	3	3	3	3	3	3	3	21
Provide local updates and warnings about current drought conditions and make recommendations on use.	3	3	3	3	3	3	3	21
Determine locations for improved fire truck access around waterbodies.	3	3	3	3	3	3	3	21
Develop solutions to improve access for the area between Bowser Pond and NH16.	3	3	3	3	3	3	3	21
Include some mitigation actions from this plan into the Capital Improvement Plan.	3	3	3	3	3	3	3	21
Enforce the State and local regulations on affected waterbodies (Cocheco River, Currier Pond, Jones Brook/Pond, and Sunrise Lake).	3	3	2	3	3	3	3	20
Revise criteria for new residential and non-residential structures or substantial improvements located within the special flood hazard areas to require an additional two (2) feet of freeboard to the base flood elevation as recommended by the New Hampshire Coastal Risk and Hazards Commission's Final Report and Recommendation (November, 2016). *This strategy will not be completed until new FEMA maps are completed.	2	3	3	2	3	3	3	19
Determine the feasibility to purchase a fire rescue boat for Sunrise Lake.	2	3	3	2	3	3	3	19
Obtain a new rescue pumper.	2	3	3	2	3	2	3	18

Implementation of Action Items

After reviewing the finalized STAPLEE numerical ratings, the Hazard Mitigation Committee prepared to develop the Implementation Plan (Table 31). To do this, the Hazard Mitigation Committee developed an implementation plan that outlined the following:

∴ Type of hazard
∴ Affected location
∴ Type of Activity
∴ Responsibility
∴ Funding
∴ Cost Effectiveness; and
∴ Timeframe

The following questions were asked to develop an implementation schedule for the identified priority mitigation strategies.

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

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

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

In addition to the prioritized mitigation projects, Table 30, Implementation Plan, includes the responsible party (WHO), how the project will be supported (HOW), and what the timeframe is for implementation of the project (WHEN)

New Mitigation Projects	Type of Hazard	Local Responsible Agent	Potential Funding Source	Cost Effectiveness	Timeframe
				Low: < $10K	6 months – 1 year
				Medium: $10K-$50K	2-3 years
				High: > $50K	4-5 years
Update the Local Emergency Operations Plan (LEOP) and include information about the new school.	All	EMD	FEMA grant	Low	4-5 years
Work with Community Emergency Response Teams (CERT) in Rochester to assist in transporting residents to the Community Center during an emergency event.	All	EMD	Town budget	Low	6 months - 1 year
Conduct a fieldwork analysis to identify which existing dry hydrants are operational and which ones need to be repaired. This analysis should also develop an operations and maintenance plan to ensure a schedule is kept avoiding any dry hydrants falling in disarray.	Fire	FC	Town budget	Low	6 months - 1 year
Provide educational brochure about drinking water, including well maintenance and testing, impacts of drought, and additional resources.	Existing & Emerging Contaminants	HO	Town budget	Low	6 months - 1 year
Determine specific locations for road surface markings, such as fog line, and investigate the cost.	Transport Accident	RA	Town budget	Low	6 months - 1 year
Partner with the Conservation Commission to conduct a water consumption and leak detection education and	Water Quality	CC	Town budget, NHDES grants & assistance	Low	2-3 years

New Mitigation Projects	Type of Hazard	Local Responsible Agent	Potential Funding Source	Cost Effectiveness Low: < $10K Medium: $10K-$50K High: > $50K	Timeframe 6 months – 1 year 2-3 years 4-5 years
outreach campaign. Investigate funding options through NHDES, which offers leak detection grants.					
Work with the Town of New Durham to make improvements and upgrades to New Durham/Middleton Road to decrease emergency response times for mutual aid.	All	BOS	Town budget, grants	High	4-5 years
Provide residents with educational material on urban interface, and the importance of firebreaks in order to contain fires within the boundary of the burn unit and avoid the start of a wildfire.	Fire	FC	Town budget, FEMA, grants	Low	6 months - 1 year
Add CODE RED, Reverse 911, or other notification system to alert residents of incoming storms.	All	EMD	Town budget, grants	Low	2-3 years
Identify alternatives for an additional access (emergency) to Nicola Road and other dead-end roads.	All	EMD, PB, RA	Town budget	Low	2-3 years
Provide information regarding NFIP to residents by posting on the town website.	All	BOS	Town budget	Low	6 months - 1 year
Coordinate with the School Board to investigation options to address pedestrian safety issues, including insufficient	All	BOS	Town budget	Low	2-3 years

New Mitigation Projects	Type of Hazard	Local Responsible Agent	Potential Funding Source	Cost Effectiveness	Timeframe
				Low: < $10K	6 months – 1 year
				Medium: $10K-$50K	2-3 years
				High: > $50K	4-5 years
parking, lack of sidewalks, and lightning problems that are exasperated during winter weather.					
Provide information on emergency preparedness, hazard mitigation, and emergency operations on the website. Include links to the NH HSEM and FEMA websites for a range of information for all hazards.	All	EMD, BOS	Town budget	Low	6 months - 1 year
Continue to provide outreach assistance to elderly and special needs populations by organizing staff and coordinating within town departments. Develop a list of elderly residents and residents with special needs for welfare checks during a hazardous storm event.	All	BOS	Town budget	Low	4-5 years
Establish potential cistern locations for existing and new development.	Fire	PB, FC	Town budget, grants	Low	4-5 years
Create a plan to host people in the Middleton Elementary school for emergency shelter.	All	EMD, SB	Town budget	Low	4-5 years
Determine costs and obtain backup power generators at Town facilities.	All	BO	Town budget, grants	High	4-5 years
Add the Middleton Hazard Mitigation Plan Update 2023 to the Town website.	All	BOS	Town budget	Low	6 months - 1 year
Determine a central and safe location to store all	All	BOS	Town budget	Low	6 months - 1 year

New Mitigation Projects	Type of Hazard	Local Responsible Agent	Potential Funding Source	Cost Effectiveness	Timeframe
				Low: < $10K	6 months – 1 year
				Medium: $10K-$50K	2-3 years
				High: > $50K	4-5 years
emergency plans including, but not limited to: Hazard Mitigation Plan, EOP, Dam Emergency Action Plans, etc.					
Provide local updates and warnings about current drought conditions and make recommendations on use.	Drought	BOS	Town budget	Low	6 months - 1 year
Determine locations for improved fire truck access around waterbodies.	Fire	FC	Town budget	Low	6 months - 1 year
Develop solutions to improve access for the area between Bowser Pond and NH 16.	All	BOS, FC, RA	Town budget	Low	2-3 years
Include some mitigation actions from this plan into the Capital Improvement Plan.	All	BOS, BC	Town budget	Low	4-5 years
Enforce the State and local regulations on affected waterbodies (Cocheco River, Currier Pond, Jones Brook/Pond, and Sunrise Lake).	Water Quality	CC, RA	Town budget, Federal & State grants	Low	4-5 years
Revise criteria for new residential and non-residential structures or substantial improvements located within the special flood hazard areas to require an additional two (2) feet of freeboard to the base flood elevation as recommended by the New Hampshire Coastal Risk and Hazards	Flood	PB	Town budget	Low	4-5 years

New Mitigation Projects	Type of Hazard	Local Responsible Agent	Potential Funding Source	Cost Effectiveness	Timeframe
				Low: < $10K	6 months – 1 year
				Medium: $10K-$50K	2-3 years
				High: > $50K	4-5 years
Commission's Final Report and Recommendation (November, 2016). *This strategy will not be completed until new FEMA maps are completed.					
Determine the feasibility to purchase a fire rescue boat for Sunrise Lake.	Fire	FC	Town budget, grants	Medium	2-3 years
Obtain a new rescue pumper.	Fire	FC, BOS	Town budget, grants	High	2-3 years

CHAPTER 8: MONITORING, EVALUATION, AND UPDATING THE PLAN

Introduction

A good mitigation plan must allow for updates where and when necessary, particularly since communities may suffer budget cuts or experience personnel turnover during both the planning and implementation states. A good plan will incorporate periodic monitoring and evaluation mechanisms to allow for review of successes and failures or even just simple updates.

Multi-Hazard Plan Monitoring, Evaluation, and Updates

To track programs and update the mitigation strategies identified through this process, the Plan shall be reviewed and evaluated following each declared/non-declared event, or at a minimum on an annual basis. The Plan will be updated formally every five years. The review will detail any adjustments that need to be made to the Plan to illustrate changes from across the State, such as updated maps or changes in priorities from within the State's mitigation strategy. The Emergency Management Director is responsible for initiating the review and will consult with members of the hazard mitigation planning team identified in this plan. The public will be encouraged to participate in any updates and will be given the opportunity to be engaged and provide feedback through such means as periodic presentations on the plan at town functions, surveys, and posting on websites. Public announcements will be made through postings on the Town website and disseminated using the Friday Updates. A formal public meeting will be held before reviews and updates are official.

Changes will be made to the Plan to accommodate projects that have failed or are not considered feasible after a review for their consistency with STAPLEE, the timeframe, the community's priorities, or funding resources. Priorities that were not ranked high, but identified as potential mitigation strategies, will be reviewed as well during the monitoring and update of the plan to determine feasibility of future implementation. In keeping with the process of adopting this hazard mitigation plan, a public meeting to receive public comment on plan maintenance and updating will be held during the annual review period and before the final product is adopted by the Board of Selectmen.

CHAPTER 9: PLAN ADOPTION

Signed Certificate of Adoption

Town of Middleton, New Hampshire
Board of Selectmen
A Resolution Adopting the 2024 Multi-Hazard Mitigation Plan Update, Town of Middleton, NH

WHEREAS, the Town of Middleton authorizes responsible departments and/or agencies to execute their responsibilities demonstrated in the plan, and received funding from the NH Office of Homeland Security and Emergency Management under a Flood Mitigation Assistance Project Grant and assistance from Strafford Regional Planning Commission in the preparation of the 2024 Multi-Hazard Mitigation Plan Update, Town of Middleton, NH; and

WHEREAS, several public planning meetings were held between August 14, 2023 and November 1, 2023 regarding the development and review of the 2024 Multi-Hazard Mitigation Plan Update, Town of Middleton, NH; and

WHEREAS, the 2024 Multi-Hazard Mitigation Plan Update, Town of Middleton, NH contains several potential future projects to mitigate hazard damage in the Town of Middleton; and

WHEREAS, a duly-noticed public meeting was held by the Middleton Board of Selectmen on _____ to formally approve and adopt the 2024 Multi-Hazard Mitigation Plan Update, Town of Middleton, NH.

NOW, THEREFORE BE IT RESOLVED that the Middleton Board of Selectmen adopts the 2024 Multi-Hazard Mitigation Plan Update, Town of Middleton, NH
ADOPTED AND SIGNED this day of _____, 2024

_____

Middleton Board of Selectmen, Chair

_____
Town Seal or Notary

Date_____

Final Approval Letter from FEMA

(Add approval letter)

APPENDICES

Appendix A: Bibliography

Appendix B: Planning Process Documentation

Appendix C: Summary of Possible All-Hazard Mitigation Strategies

Appendix D: Technical and Financial Assistance for All-Hazard Mitigation
- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Repetitive Flood Claims (RFC)
- Severe Repetitive Loss (SRL)

Appendix E: Successful Outreach Campaigns

Appendix F: Maps
- Emergency Response Facilities
- Non-Emergency Response Facilities
- Facilities and Populations to Protect
- Potential Resources
- Water Resources

Appendix A: Bibliography

Documents used to develop this Plan:

- Local Mitigation Planning Policy Guide, FEMA, released April 19, 2022
- Local Multi-Hazard Mitigation Plans
    - Town of Rollinsford, adopted 2021
    - Town of Durham Update 2023
- 2023 NH State Hazard Mitigation Plan
- National Climatic Data Center, storm events between 2017-2023

Appendix B: Planning Process Documentation

The Hazard Mitigation Committee met five times over a three-month period, between August 14, 2023 and November 1, 2023, to discuss the range of hazards included in this plan as well as brainstorm mitigation needs and strategies to address these hazards and their impacts on people, business, and infrastructure in the Town. All meetings were geared to accommodate brainstorming, open discussion, and an increased awareness of potential threats to the Town. This process results in significant cross talk regarding all types of natural, technological, and man-made hazards. All feedback from participants of the planning committee was incorporated into the Plan.

List of Meetings with Hazard Mitigation Steering Committee

Meeting	Date	Agenda Items
Meeting #1	8/14/23	Update Process: Timeframe, Committee Responsibilities, In-kind Match Status update of 2017 Action Plan and risk assessment and review existing programs and policies.
Meeting #2	9/13/23	Updated hazard descriptions.
Meeting #3	9/27/23	Reviewed asset inventory.
Meeting #4	10/11/23	Prioritize new actions/strategies and develop Action Plan.
Meeting #5	11/1/23	Reviewed Climate Change Chapter and Action Plan.

Hazard Mitigation Committee Meeting #1

August 14, 2023
8:30 AM

Middleton Town Hall
182 Kings Highway, Middleton, NH

MEETING AGENDA

1. Introductions
2. Update Process: Timeframe, Committee Responsibilities, In-kind Match
3. Status of 2017 Action Plan
4. Risk Assessment
5. Review Existing Programs and Policies
6. Potential Dates for Future Meetings
    a. Meeting #2 - September 11
    b. Meeting #3 - September 25

Middleton meeting #1 8/14/23

Name	Title	email
Dan Phillips	road agent.	roadagent@middletonnh.gov
KATE Buzard	Conservation Commission	kbuzard@outlook.com
Kathryn Toussaint on behalf of PdChief Greg Cooper		Pdchief@MiddletonNH.gov Pdsec " " " "
Carol Long	BOS Secretary	ssbk@middletonnh.gov
JEFFREY ELDRIDGE	DEPUTY FIRE CHIEF	ELDRIDGE_MFR@YAHOO.com
Christine Maynard	Planning Board	Christine Maynard 32@live.com

Hazard Mitigation Committee Meeting #2

September 13, 2023
8:30 AM

Middleton Town Hall
182 Kings Highway, Middleton, NH

MEETING AGENDA

1. Review Existing Programs and Policies

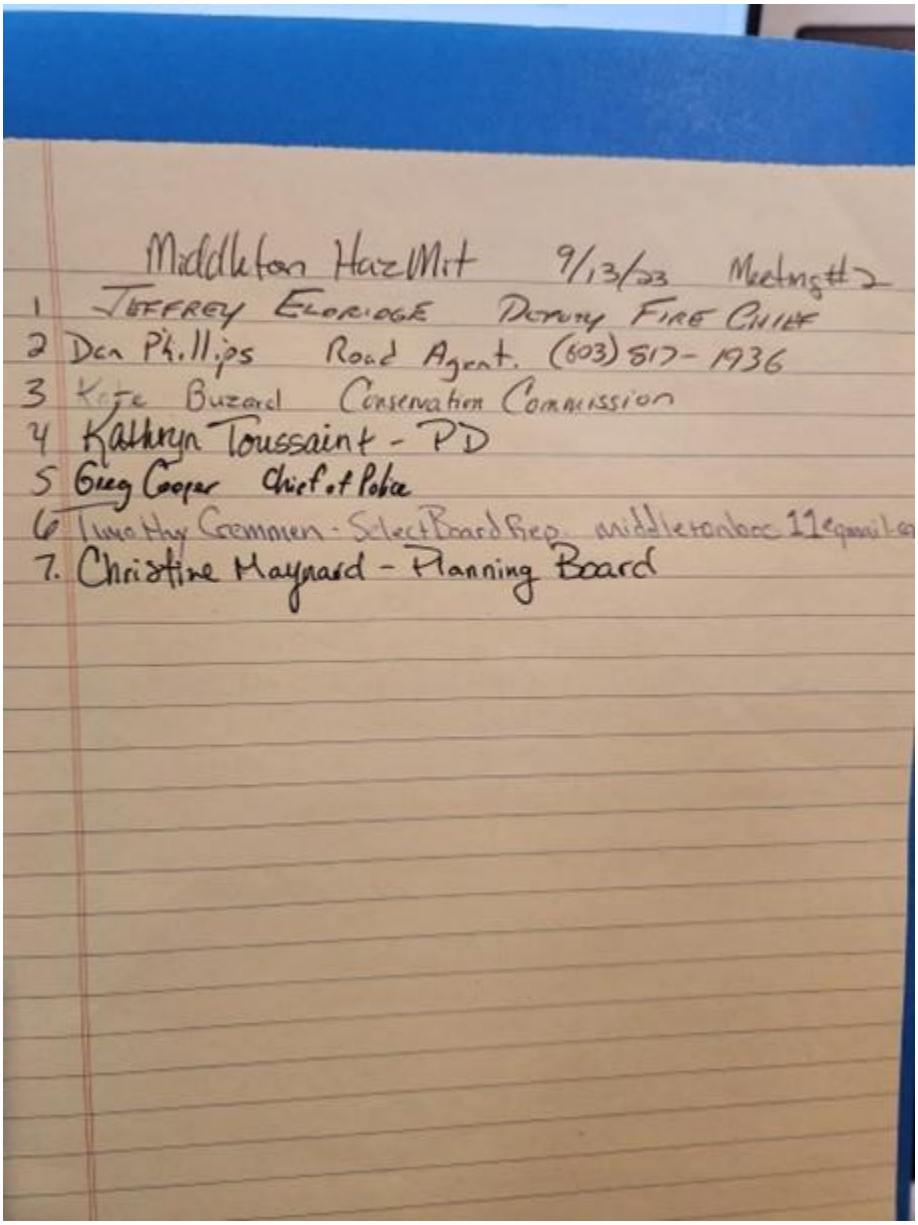
2. Past and Potential Hazards

    a. List the past hazard events that have occurred since 2017
    b. List areas of concern for potential future weather events

3. Potential Dates for Future Meetings

    a. Meeting #3 - September 27
    b. Meeting #4 - October 11

Meeting #2: September 13, 2023



Hazard Mitigation Committee Meeting #3

September 27, 2023
8:30 AM

Middleton Town Hall
182 Kings Highway, Middleton, NH

MEETING AGENDA

1. Critical Facilities
    a. Mapping exercise to update locations of critical facilities
    b. Locate any areas of concern for potential future hazard events

2. Gaps in Coverage
    a. Review a list of potential mitigation actions for each hazard and determine actions that fit for the Town

3. Potential New Strategies
    a. Begin to develop the strategies to include in the action plan

4. Potential Dates for Future Meetings

    a. Meeting #4 - October 11, 2023 at 8:30 a.m.

Middleton Hazard Mitigation Committee

September 27, 2023

Meeting #3

8:30AM – 10:30AM

Name	Title/Town Affiliation	Email	Prep time
1. Jeff Eldridge	Fire Deputy Chief		
2. Kathryn Toussaint	Police Admin		4 hours
3. John Mullen	Planning Board		
4. Kate Buzard	Conservation Comm.		1 hour
5. Dan Phillips	Highway Dept / Road Agent		
6. Tim Crowell	Board of Selectmen		3 hours
7.			
8.			
9.			
10.			

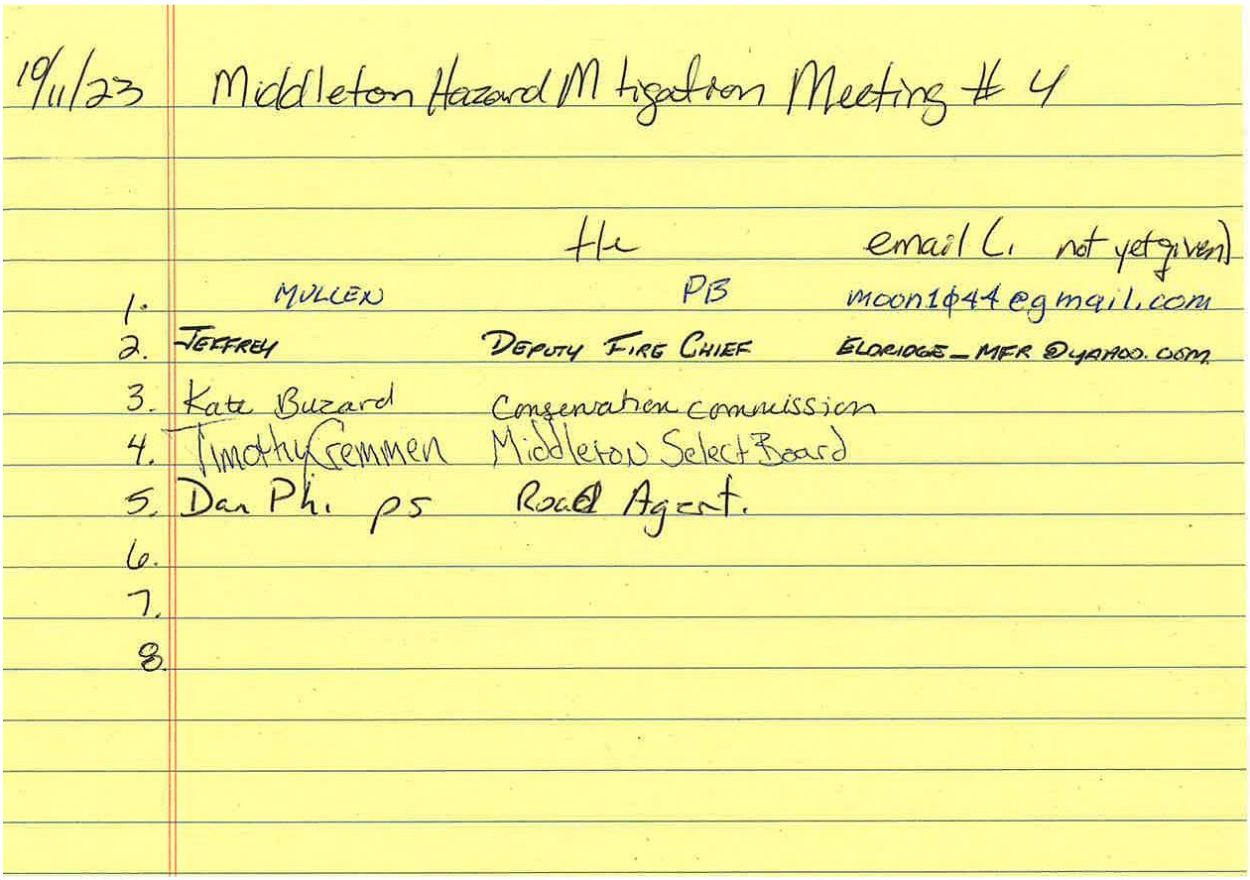
Hazard Mitigation Committee Meeting #4

October 11, 2023
8:30 AM

*Old Town Hall
200 Kings Highway, Middleton, NH

MEETING AGENDA

1. Rank strategies/actions for the new action plan
2. Create the new Action Plan
3. Date for final meeting
    a. Meeting #5 - November 1, 2023 at 8:30 a.m.



Hazard Mitigation Committee Meeting #5

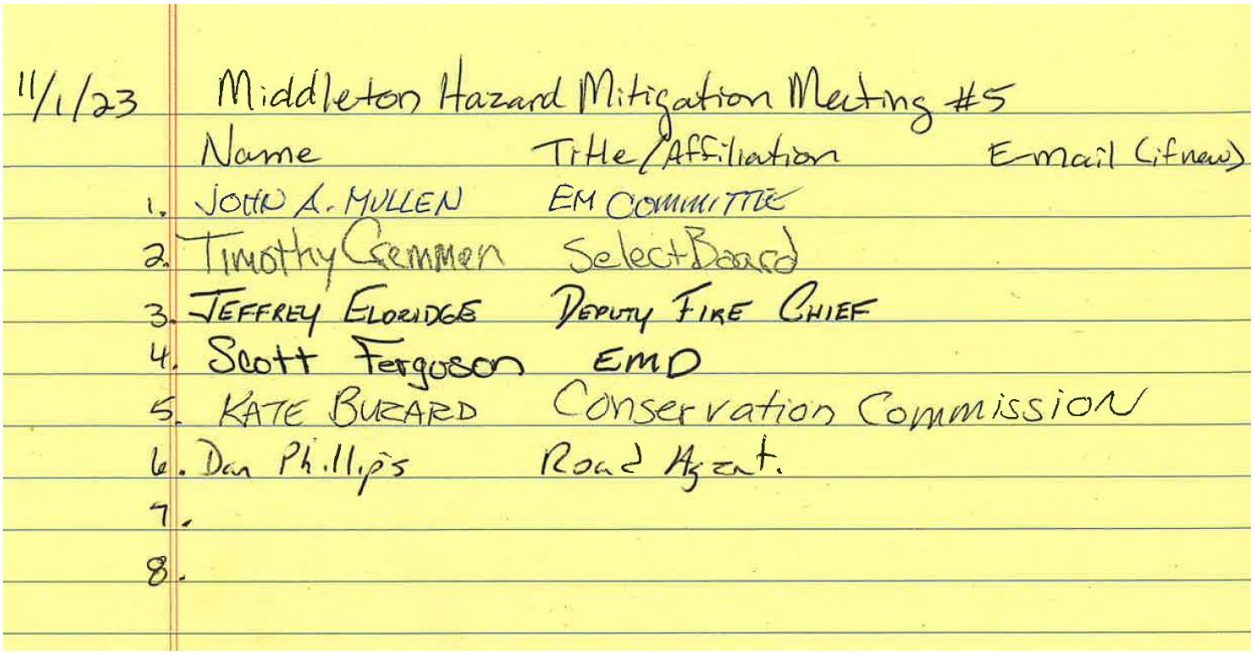
November 1, 2023
8:30 AM

*Old Town Hall
200 Kings Highway, Middleton, NH

MEETING AGENDA

1. Review Sections of the Final Draft
    a. Review Chapter 6, Climate Change
    b. Review Chapter 7, Action Plan
    c. Other chapters as needed

2. Discuss Next Steps



11/1/23 Middleton Hazard Mitigation Meeting #5

	Name	Title/Affiliation	E-mail (if new)
1.	JOHN A. MULLEN	EM COMMITTEE	
2.	Timothy Gemmen	Select Board	
3.	JEFFREY ELDRIDGE	DEPUTY FIRE CHIEF	
4.	Scott Ferguson	EMD	
5.	KATE BURARD	Conservation Commission	
6.	Dan Phillips	Road Agent.	
7.			
8.			

Appendix C: Summary of Possible All-Hazard Mitigation Strategies

I. RIVERINE MITIGATION

A. Prevention

Prevention measures are intended to keep the problem from occurring in the first place, and/or keep it from getting worse. Future development should not increase flood damage. Building, zoning, planning, and/or code enforcement personnel usually administer preventative measures.

1. **Planning and Zoning**- Land use plans are put in place to guide future development, recommending where - and where not - development should occur and where it should not. Sensitive and vulnerable lands can be designated for uses that would not be incompatible with occasional flood events - such as parks or wildlife refugees. A Capital Improvements Program (CIP) can recommend the setting aside of funds for public acquisition of these designated lands. The zoning ordinance can regulate development in these sensitive areas by limiting or preventing some or all development - for example, by designating floodplain overlay, conservation, or agricultural districts. All zoning should be carefully reviewed on a consistent basis by municipal officials to make sure guidelines are up-to-date and towns are acting in accordance with best management practices.

2. **Open Space Preservation -** Preserving open space is the best way to prevent flooding and flood damage. Open space preservation should not, however, be limited to the floodplain, since other areas within the watershed may contribute to controlling the runoff that exacerbates flooding. Land Use and Capital Improvement Plans should identify areas to be preserved by acquisition and other means, such as purchasing easements. Aside from outright purchase, open space can also be protected through maintenance agreements with the landowners, or by requiring developers to dedicate land for flood flow, drainage and storage.

3. **Floodplain Development Regulations -** Floodplain development regulations typically do not prohibit development in the special flood hazard area, but they do impose construction standards on what is built there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential. Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and floodplain ordinances.
    a. **Subdivision Regulations:** These regulations govern how land will be divided into separate lots or sites. They should require that any flood hazard areas be

shown on the plat, and that every lot has a buildable area that is above the base flood elevation.

b. **Building Codes**: Standards can be incorporated into building codes that address flood proofing for all new and improved or repaired buildings.
c. **Floodplain Ordinances:** Communities that participate in the National Flood Insurance Program are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

4. **Stormwater Management** - Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increases storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Generally, there is a prohibition against storm water leaving the site at a rate higher than it did before the development. One technique is to use wet basins as part of the landscaping plan of a development. It might even be possible to site these basins based on a watershed analysis. Since detention only controls the runoff rates and not volumes, other measures must be employed for storm water infiltration - for example, swales, infiltration trenches, vegetative filter strips, and permeable paving blocks.

5. **Drainage System Maintenance -** Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering water courses or storage basins; regrading and filling should also be regulated. Any maintenance program should include a public education component, so that the public becomes aware of the reasons for the regulations. Many people do not realize the consequences of filling in a ditch or wetland, or regrading.

B. Property Protection

Property protection measures are used to modify buildings subject to flood damage, rather than to keep floodwaters away. These may be less expensive to implement, as they are often carried out on a cost-sharing basis. In addition, many of these measures do not affect a building's appearance or use, which makes them particularly suitable for historical sites and landmarks.

1. **Relocation -** Moving structures out of the floodplain is the surest and safest way to protect against damage. Relocation is expensive, however, so this approach will probably not be used except in extreme circumstances. Communities that have areas

subject to severe storm surges, ice jams, etc. might want to consider establishing a relocation program, incorporating available assistance.

2. **Acquisition -** Acquisition by a governmental entity of land in a floodplain serves two main purposes: 1) it ensures that the problem of structures in the floodplain will be addressed; and 2) it has the potential to convert problem areas into community assets, with accompanying environmental benefits. Acquisition is more cost effective than relocation in those areas that are subject to storm surges, ice jams, or flash flooding. Acquisition, followed by demolition, is the most appropriate strategy for those buildings that are simply too expensive to move, as well as for dilapidated structures that are not worth saving or protecting. Acquisition and subsequent relocation can be expensive, however, there are government grants and loans that can be applied toward such efforts.

3. **Building Elevation -** Elevating a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could be brought in to elevate the site on which the building sits. This approach is cheaper than relocation and tends to be less disruptive to a neighborhood. Elevation is required by law for new and substantially improved residences in a floodplain and is commonly practiced in flood hazard areas nationwide.

4. **Floodproofing -** If a building cannot be relocated or elevated, it may be floodproofed. This approach works well in areas of low flood threat. Floodproofing can be accomplished through barriers to flooding, or by treatment to the structure itself.
    a. **Barriers:** Levees, floodwalls and berms can keep floodwaters from reaching a building. These are useful, however, only in areas subject to shallow flooding.
    b. **Dry Floodproofing:** This method seals a building against the water by coating the walls with waterproofing compounds or plastic sheeting. Openings, such as doors, windows, etc. are closed either permanently with removable shields or with sandbags.
    c. **Wet Floodproofing:** This technique is usually considered a last resort measure, since water is intentionally allowed into the building in order to minimize pressure on the structure. Approaches range from moving valuable items to higher floors to rebuilding the floodable area. An advantage over other approaches is that simply by moving household goods out of the range of floodwaters, thousands of dollars can be saved in damages.

5. **Sewer Backup Protection -** Storm water overloads can cause backup into basements through sanitary sewer lines. Houses that have any kind of connection to a sanitary sewer system - whether it is downspouts, footing drain tile, and/or sump pumps, can be flooded during a heavy rain event. To prevent this, there should be no such

connections to the system, and all rain and ground water should be directed onto the ground, away from the building. Other protections include:

a. Floor drain plugs and floor drain standpipe, which keep water from flowing out of the lowest opening in the house.
b. Overhead sewer - keeps water in the sewer line during a backup.
c. Backup valve - allows sewage to flow out while preventing backups from flowing into the house.

6. **Insurance** - Above and beyond standard homeowner insurance, there is other coverage a homeowner can purchase to protect against flood hazard. Two of the most common are National Flood Insurance and basement backup insurance.
    a. ***National Flood Insurance:*** When a community participates in the National Flood Insurance Program, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.
    b. ***Basement Backup Insurance:*** National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet. Most exclude damage from surface flooding that would be covered by the NFIP.

C. Natural Resource Protection

Preserving or restoring natural areas or the natural functions of floodplain and watershed areas provide the benefits of eliminating or minimizing losses from floods, as well as improving water quality and wildlife habitats. Parks, recreation, or conservation agencies usually implement such activities. Protection can also be provided through various zoning measures that are specifically designed to protect natural resources.

1. **Wetlands Protection** - Wetlands are capable of storing large amounts of floodwaters, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies. Depending on the location, the project might fall under the jurisdiction of the U.S. Army Corps of Engineers, which in turn, calls upon several other agencies to review the proposal. In New Hampshire, the N.H. Wetlands Board must approve any project that impacts a wetland. Many communities in New Hampshire also have local wetland ordinances.

    Generally, the goal is to protect wetlands by preventing development that would adversely affect them. Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice since it takes many years for a new wetland to achieve the same level of quality as an existing one, if it can at all.

2. **Erosion and Sedimentation Control -** Controlling erosion and sediment runoff during construction and on farmland is important, since eroding soil will typically end up in downstream waterways. Because sediment tends to settle where the water flow is slower, it will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters.

3. **Best Management Practices -** Best Management Practices (BMPs) are measures that reduce non-point source pollutants that enter waterways. Non-point source pollutants are carried by storm water to waterways, and include such things as lawn fertilizers, pesticides, farm chemicals, and oils from street surfaces and industrial sites. BMPs can be incorporated into many aspects of new developments and ongoing land use practices. In New Hampshire, the Department of Environmental Services has developed Best Management Practices for a range of activities, from farming to earth excavations.

D. Emergency Services

Emergency services protect people during and after a flood. Many communities in New Hampshire have emergency management programs in place, administered by an emergency management director (very often the local police or fire chief).

1. **Flood Warning -** On large rivers, the National Weather Service handles early recognition. Communities on smaller rivers must develop their own warning systems. Warnings may be disseminated in a variety of ways, such as sirens, radio, television, mobile public address systems, or door-to-door contact. It seems that multiple or redundant systems are the most effective, giving people more than one opportunity to be warned.

2. **Flood Response -** Flood response refers to actions that are designed to prevent or reduce damage or injury, once a flood threat is recognized. Such actions and the appropriate parties include:
    a. Activating the emergency operations center (emergency director)
    b. Sandbagging designated areas (Highway Department)
    c. Closing streets and bridges (police department)
    d. Shutting off power to threatened areas (public service)
    e. Releasing children from school (school district)
    f. Ordering an evacuation (Board of Selectmen/emergency director)
    g. Opening evacuation shelters (churches, schools, Red Cross, municipal facilities)

    These actions should be part of a flood response plan, which should be developed in coordination with the persons and agencies that share the responsibilities. Drills and

exercises should be conducted so that the key participants know what they are supposed to do.

3. **Critical Facilities Protection -** Protecting critical facilities is vital, since expending efforts on these facilities can draw workers and resources away from protecting other parts of town. Critical facilities fall into two categories:
    a. **Buildings or locations vital to the flood response effort:**
        i. Emergency operations centers
        ii. Police and fire stations
        iii. Highway garages
        iv. Selected roads and bridges
        v. Evacuation routes
    b. **Buildings or locations that, if flooded, would create disasters:**
    c. Hazardous materials facilities
    d. Schools

    All such facilities should have their own flood response plan that is coordinated with the community's plan. Schools will typically be required by the state to have emergency response plans in place.

4. **Health and Safety Maintenance -** The flood response plan should identify appropriate measures to prevent danger to health and safety. Such measures include:
    a. Patrolling evacuated areas to prevent looting
    b. Vaccinating residents for tetanus
    c. Clearing streets
    d. Cleaning up debris

    The Plan should also identify which agencies will be responsible for carrying out the identified measures. A public information program can be helpful to educate residents on the benefits of taking health and safety precautions.

E. Structural Projects

Structural projects are used to prevent floodwaters from reaching properties. These are all man-made structures, and can be grouped into the six types discussed below. The shortcomings of structural approaches are:

- Can be very expensive
- Disturb the land, disrupt natural water flows, & destroy natural habitats.
- Are built to an anticipated flood event, and may be exceeded by a greater-than expected flood
- Can create a false sense of security.

1. **Diversions -** A diversion is simply a new channel that sends floodwater to a different location, thereby reducing flooding along an existing watercourse. Diversions can be

surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During flood flows, the stream spills over the diversion channel or tunnel, which carries the excess water to the receiving lake or river. Diversions are limited by topography; they won't work everywhere. Unless the receiving water body is relatively close to the flood prone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive. Where topography and land use are not favorable, a more expensive tunnel is needed. In either case, care must be taken to ensure that the diversion does not create a flooding problem somewhere else.

2. **Levees/Floodwalls -** Probably the best known structural flood control measure is either a levee (a barrier of earth) or a floodwall made of steel or concrete erected between the watercourse and the land. If space is a consideration, floodwalls are typically used, since levees need more space. Levees and floodwalls should be set back out of the floodway, so that they will not divert floodwater onto other properties.

3. **Reservoirs -** Reservoirs control flooding by holding water behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate the river downstream can handle. Reservoirs are suitable for protecting existing development, and they may be the only flood control measure that can protect development close to a watercourse. They are most efficient in deeper valleys or on smaller rivers where there is less water to store. Reservoirs might consist of man-made holes dug to hold the approximate amount of floodwaters, or even abandoned quarries. As with other structural projects, reservoirs:
    a. are expensive
    b. occupy a lot of land
    c. require periodic maintenance
    d. may fail to prevent damage from floods that exceed their design levels
    e. may eliminate the natural and beneficial functions of the floodplain.

4. **Channel Modifications -** Channel modifications include making a channel wider, deeper, smoother, or straighter. These techniques will result in more water being carried away, but, as with other techniques mentioned, it is important to ensure that the modifications do not create or increase a flooding problem downstream.

5. **Dredging:** Dredging is often cost-prohibitive because the dredged material must be disposed of in another location; the stream will usually fill back in with sediment. Dredging is usually undertaken only on larger rivers, and then only to maintain a navigation channel.

6. **Drainage Modifications:** These include man-made ditches and storm sewers that help drain areas where the surface drainage system is inadequate or where underground

drainage ways may be safer or more attractive. These approaches are usually designed to carry the runoff from smaller, more frequent storms.

7. **Storm Sewers -** Mitigation techniques for storm sewers include installing new sewers, enlarging small pipes, street improvements, and preventing back flow. Because drainage ditches and storm sewers convey water faster to other locations, improvements are only recommended for small local problems where the receiving body of water can absorb the increased flows without increased flooding. In many developments, streets are used as part of the drainage system, to carry or hold water from larger, less frequent storms. The streets collect runoff and convey it to a receiving sewer, ditch, or stream. Allowing water to stand in the streets and then draining it slowly can be a more effective and less expensive measure than enlarging sewers and ditches.

F. Public Information

Public information activities are intended to advise property owners, potential property owners, and visitors about the particular hazards associated with a property, ways to protect people and property from these hazards, and the natural and beneficial functions of a floodplain.

1. **Map Information -** Flood maps developed by FEMA outline the boundaries of the flood hazard areas. These maps can be used by anyone interested in a particular property to determine if it is flood-prone. These maps are available from FEMA, the NH Homeland Security and Emergency Management (HSEM), the NH Office of Energy and Planning (OEP), or your regional planning commission.

2. **Outreach Projects -** Outreach projects are proactive; they give the public information even if they have not asked for it. Outreach projects are designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples of outreach activities include:
    a. Presentations at meetings of neighborhood groups
    b. Mass mailings or newsletters to all residents
    c. Notices directed to floodplain residents
    d. Displays in public buildings, malls, etc.
    e. Newspaper articles and special sections
    f. Radio and TV news releases and interview shows
    g. A local flood proofing video for cable TV programs and to loan to organizations
    h. A detailed property owner handbook tailored for local conditions. Research has shown that outreach programs work, although awareness is not enough. People need to know what they can do about the hazards, so projects should

include information on protection measures. Research also shows that locally designed and run programs are much more effective than national advertising.

3. **Real Estate Disclosure -** Disclosure of information regarding flood-prone properties is important if potential buyers are to be in a position to mitigate damage. Federally regulated lending institutions are required to advise applicants that a property is in the floodplain. However, this requirement needs to be met only five days prior to closing, and by that time, the applicant is typically committed to the purchase. State laws and local real estate practice can help by making this information available to prospective buyers early in the process.

4. **Library -** Your local library can serve as a repository for pertinent information on flooding and flood protection. Some libraries also maintain their own public information campaigns, augmenting the activities of the various governmental agencies involved in flood mitigation.

5. **Technical Assistance -** Certain types of technical assistance are available from the NFIP Coordinator, FEMA, and the Natural Resources Conservation District. Community officials can also set up a service delivery program to provide one-on-one sessions with property owners.

   An example of technical assistance is the *flood audit*, in which a specialist visits a property. Following the visit, the owner is provided with a written report detailing the past and potential flood depths and recommending alternative protection measures.

6. **Environmental Education -** Education can be a great mitigating tool if people can learn what not to do before damage occurs. The sooner the education begins the better. Environmental education programs for children can be taught in the schools, park and recreation departments, conservation associations, or youth organizations. An activity can be as involved as course curriculum development or as simple as an explanatory sign near a river.

   Education programs do not have to be limited to children. Adults can benefit from knowledge of flooding and mitigation measures; decision makers, armed with this knowledge, can make a difference in their communities.

II. EARTHQUAKES

A. Preventive

1. Planning/zoning to keep critical facilities away from fault lines
2. Planning, zoning and building codes to avoid areas below steep slopes or soils subject to liquefaction

3. Building codes to prohibit loose masonry overhangs, etc.

B. Property Protection

1. Acquire and clear hazard areas
2. Retrofitting to add braces, remove overhangs
3. Apply Mylar to windows and glass surfaces to protect from shattering glass
4. Tie down major appliances, provide flexible utility connections
5. Earthquake insurance riders

C. Emergency Services

Earthquake response plans to account for secondary problems, such as fires and hazardous material spills

D. Structural Projects

Slope stabilization

III. DAM FAILURE

A. Preventive

1. Dam failure inundation maps
2. Planning/zoning/open space preservation to keep area clear
3. Building codes with flood elevation based on dam failure
4. Dam safety inspections
5. Draining the reservoir when conditions appear unsafe

B. Property Protection

1. Acquisition of buildings in the path of a dam breach flood
2. Flood insurance

C. Emergency Services

1. Dam condition monitoring
2. Warning and evacuation plans based on dam failure

D. Structural Projects

1. Dam improvements, spillway enlargements
2. Remove unsafe dams

IV. WILDFIRES

A. Preventive

1. Zoning districts to reflect fire risk zones
2. Planning and zoning to restrict development in areas near fire protection and water resources

3. Requiring new subdivisions to space buildings, provide firebreaks, on-site water storage, wide roads, multiple accesses
4. Building code standards for roof materials and spark arrestors
5. Maintenance programs to clear dead and dry brush, trees
6. Regulation on open fires

B. **Property Protection**
1. Retrofitting of roofs and adding spark arrestors
2. Landscaping to keep bushes and trees away from structures
3. Insurance rates based on distance from fire protection

C. **Natural Resource Protection**
Prohibit development in high-risk areas

D. **Emergency Services**
Fire Fighting

V. WINTER STORMS

A. Prevention
Building code standards for light frame construction, especially for wind-resistant roofs

B. Property Protection
1. Storm shutters and windows
2. Hurricane straps on roofs and overhangs
3. Seal outside and inside of storm windows and check seals in spring and fall
4. Family and/or company severe weather action plan & drills:
    a. include a **NOAA** Weather Radio
    b. designate a shelter area or location
    c. keep a disaster supply kit, including stored food and water
    d. keep snow removal equipment in good repair; have extra shovels, sand, rock, salt and gas
    e. know how to turn off water, gas, and electricity at home or work

C. Natural Resource Protection
Maintenance program for trimming trees and shrubs

D. Emergency Services
1. Early warning systems/NOAA Weather Radio
2. Evacuation plans

Appendix D: Technical and Financial Assistance for All-Hazard Mitigation

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

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

FEMA's HMA grants are provided to eligible Applicants (States/Tribes/Territories) that, in turn, provide sub-grants to local governments and communities. The Applicant selects and prioritizes sub-applications developed and submitted to them by sub-applicants. These sub applications are submitted to FEMA for consideration of funding. Prospective sub-applicants should consult the office designated as their Applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers is available on the FEMA website, www.fema.gov.

HMA Grant Programs

The HMA grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to Natural Hazards. Brief descriptions of the HMA grant programs can be found below. For more information on the individual programs, or to see information related to a specific Fiscal Year, please click on one of the program links.

A. Hazard Mitigation Grant Program (HMGP)

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

What is the Hazard Mitigation Grant Program?

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

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

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

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

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

The State prioritizes and selects project applications developed and submitted by local jurisdictions. The State forwards applications consistent with State mitigation planning objectives to FEMA for eligibility review. Funding for this grant program is limited and States and local communities must make difficult decisions for the most effective use of grant funds. For more information on the **Hazard Mitigation Grant Program (HMGP),** go to:
http://www.fema.gov/government/grant/hmgp/index.shtm

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

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

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

C. Flood Mitigation Assistance (FMA)

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

Program Overview

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

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

Types of FMA Grants

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

- Planning Grants to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants
- Project Grants to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least $1,000 within any ten-year period since 1978.
- Technical Assistance Grants for the State to help administer the FMA program and activities. Up to ten percent (10%) of Project grants may be awarded to States for Technical Assistance Grants

D. Repetitive Flood Claims (RFC)

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

Program Overview

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

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

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

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

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

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

a) That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

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

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

Appendix E: Successful Outreach Campaigns

1. Tool for outreach material w/ search function: https://cfpub.epa.gov/npstbx/index.cfm

2. NH DES "Scoop the Poop" media kit:
https://www.des.nh.gov/resource-center/publications?keys=scoopthepoop+media&purpose=Guidance+&subcategory=Watershed+Management

3. Cumberland County Interlocal Stormwater Working Group, Education Plan per permit year, EXTENSIVE statistics on outreach campaigns & methods, specifically deals with MS4:
https://static1.squarespace.com/static/5e4af21b92caed7f481a25b7/t/5f21788798148a15d80e1258/1596029063333/Stormwater_Awareness_Approved_7.2020.pdf

    a. Annual Reports found here: https://www.cumberlandswcd.org/iswg
    b. Comprehensive lesson catalog for outreach/engagement with kids, lesson materials can also be rented from the Cumberland County Soil and Water Conservation District:
https://static1.squarespace.com/static/5e4af21b92caed7f481a25b7/t/5ffdcaba6ab8611c9d82eebb/1610468027536/Education+Lessons+Catalog.pdf

4. Messages about flood safety on city benches, outreach about flooding at CSU's housing fair for student renters/property owners: https://successwithcrs.us/fort-colins-colorado/

5. Pages 61-62 case study on using open houses for floodproofing outreach:
https://www.floodsciencecenter.org/koha?id=980

6. Tool for outreach: enviroscapes hands on models, watershed/nonpoint source and wetland/floodplain, mentioned in case study from link above (p 67-68)
https://www.enviroscapes.com/category/hands-on-models

7. Newspaper article on pet waste campaign:
https://www.ajc.com/neighborhoods/north-fulton/roswell-launches-dog-waste-education-and-outreach-campaign/KDA2H34NVJFN3KRSE3L3OB4IK4/

8. One-month social media campaign plan with materials on pet waste education:
https://www.dupagerivers.org/seasonal-campaigns/pet-waste/

9. "Write as rain" stormwater outreach campaign, won first place for best education and outreach in the bay (Chesapeake stormwater network)
https://askhrgreen.org/rainyday/

Appendix F: Maps

Emergency Response Facilities
Non-Emergency Response Facilities
Facilities and Populations to Protect
Potential Resources
Water Resources