

Atkinson, New Hampshire

Natural Hazards Profile

KEY FINDINGS:

- The most pressing natural hazards that Atkinson is facing are extreme temperatures, drought, wildfires, and isolated flooding.
- The flood zones in Atkinson are isolated and distributed throughout town. This includes areas surrounding Island Pond in the northwest part of town, along Hog Hill Brook, an area just south of NH111 between Main Street and East Road, and in the southeastern part of town along the Haverhill, MA, state line and the Plaistow, NH, town line.
- Average temperatures in New Hampshire have risen more than 3°F since the beginning of the 20th century.
- In 2021, there were 22 fires reported in Atkinson. This included illegal burns, miscellaneous calls, and number of grass/woods fire. However, this is an increase in the number of the fires reported in previous years.
- Only 4% of Atkinson, or 287 acres, is in the 100-year floodplain and an additional 0.03% or 2 acres are in the 500-year floodplain.
- 0.3% of the town's roads, 0.21 miles, are within the 100-year floodplain and none of Atkinson's roads are within the 500-year floodplain.

DATA SOURCES:

- 2020 Hazard Mitigation Plan
- 2022 Land Conservation Plan
- 2018 State of New Hampshire Hazard Mitigation Plan
- 2022 Town of Atkinson Zoning Ordinance
- NH GRANIT Data
- United States Geological Survey (USGS)
- NH Division of Forests and Land
- Rockingham Planning Commission (RPC)
- 2015 RPC Regional Master Plan – Natural Hazards and Climate Change Chapters
- 2017-2022 National Integrated Drought Information System
- 2022 NOAA New Hampshire Climate Summary
- 2021 National Interagency Fire Center

INTRODUCTION

With the impacts of climate change becoming more of a reality for communities in the region, it is important for the Town of Atkinson to identify and address potential natural hazards that can occur in the community and any vulnerable infrastructure that may be affected. The frequency and intensity of natural hazard events in the region is increasing. It is essential that communities like Atkinson identify any weaknesses in infrastructure and develop mitigation strategies to ensure the resilience of the community. Atkinson has identified Hazard Mitigation goals in the 2020 Hazard Mitigation Plan, and they are listed below:

- Reduce or avoid long-term vulnerabilities posed by natural hazards impacting Atkinson, including the impacts from flooding, hurricanes and high wind events, severe winter weather, wildfire and conflagration, earthquakes, drought, and extreme temperatures.
- Improve upon the protection of the Town of Atkinson's general population, the citizens of the State and guests, from all natural and man-made hazards.
- Reduce the potential impact of natural and man-made disasters on Atkinson and the State's Critical Support Services.
- Reduce the potential impact of natural and man-made disasters on Atkinson's Critical Facilities in the State.
- Reduce the potential impact of natural and man-made disaster on Atkinson's and the State's infrastructure.
- Improve Atkinson's Emergency Preparedness.
- Improve Atkinson's Disaster Response and Recovery Capability.
- Reduce the potential impact of natural and man-made disasters on private property in Atkinson.
- Reduce the potential impact of natural and man-made disasters on Atkinson's and the State's economy.
- Reduce the potential impact of natural and man-made disasters on Atkinson's and the State's natural environment.
- Reduce Atkinson's and the State's liability with respect to natural and man-made hazards generally.
- Reduce the potential impact of natural and man-made disasters on Atkinson's and the State's specific historic treasures and interests as well as other tangible and intangible characteristics that add to the quality of life to the citizens and guests of the State and the Town.
- Identify, introduce and implement cost effective Hazard Mitigation measures so as to accomplish Atkinson's and the States' goals and objectives in order to raise the awareness and acceptance of hazard mitigation planning.

Listed below are the natural hazards that need to be understood and addressed in Atkinson:

Extreme Temperatures

As identified in the 2018 State of New Hampshire Multi-Hazard Mitigation Plan, extreme temperatures can be defined as, *“a period of prolonged and/or excessive hot or cold that presents a danger to human health and life”*.

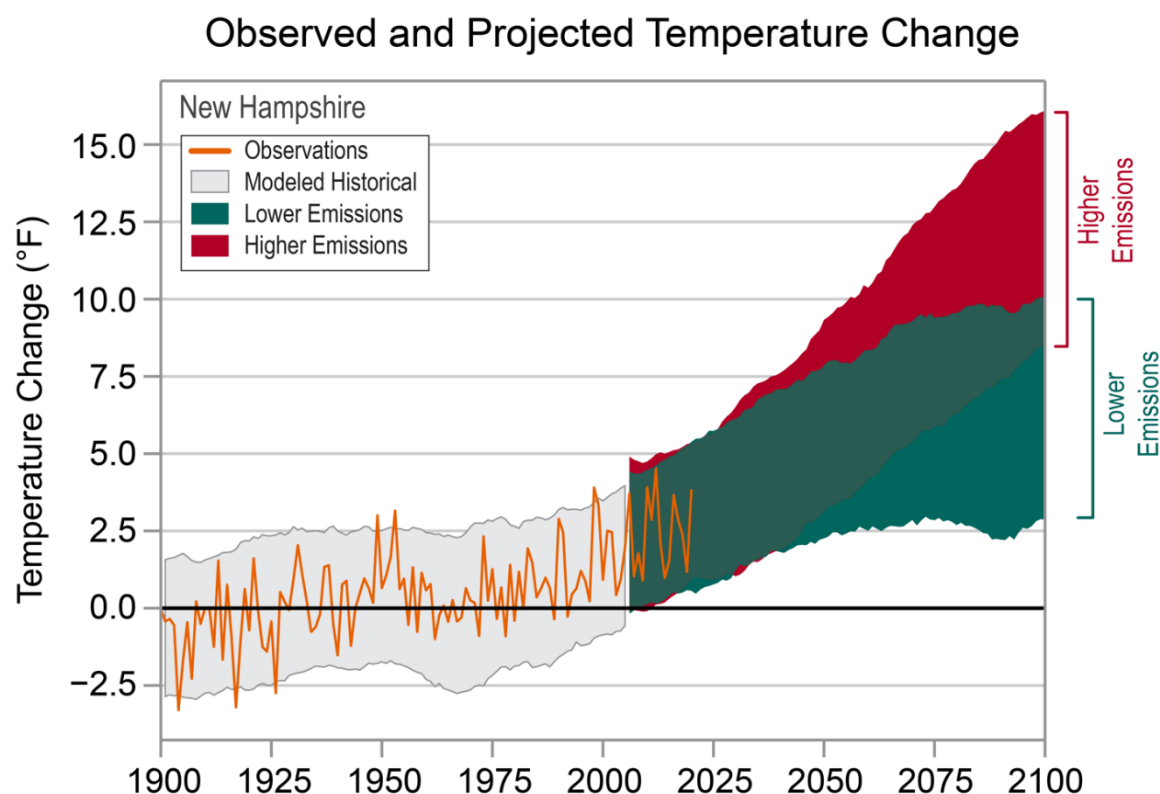
Warmer Temperatures

New Hampshire experiences between two to ten days per year where the heat index reaches 95 degrees. In Rockingham County, the region is predicted to be impacted by more extreme heat events. The increase in temperatures predicted for longer durations of time indicates that Atkinson is expected to be impacted as a result of these warmer temperatures. As identified in the 2020 Hazard Mitigation Plan, *“extreme heat events impact Atkinson for 2-3 days each summer”*, however with more recent data from the 2022 New Hampshire NOAA Climate Summary it appears there have actually been more extreme heat events. The impacts to Atkinson due to warmer temperatures are identified in the next table:

Table 1: Impacts from Warmer Temperatures	
Category	Impacts
Health	Risk of heat related injury or death to humans, pets, and livestock. There is particularly a risk to the elderly and the young.
Transportation	Road damage can result as asphalt can soften in extreme prolonged heat and concrete roads can explode. Vehicles experience increased stress on cooling systems and other components.
Agricultural	Livestock can be severely impacted or killed, crop production can be slowed, damaged, or destroyed. Although warmer temperatures will increase the length of the growing season, this could lead to a greater demand for water to irrigate crops and lawns.
Energy	The increased use of cooling systems such as air conditioners creates an increased demand for energy consumption during extreme heat temperatures. This demand can lead to the heating of power lines causing transmission and distribution lines to sag and sagging

	powerlines can short out causing power outages and brownouts
Water	Water Resources: The demand for water increases to meet animal and human needs in order to prevent illness and water consumption utilized to cool down equipment and structures. Firefighter hose pressure can also be affected. Water Quality: Rises in water temperature can result in lower water quality and can affect fish populations and result in the death of other organisms. Increased temperatures can also lead to more precipitation events in place of snow during winter months, and may result in drought due to increased evaporation.

According to the 2022 NOAA New Hampshire Climate Summary, since the beginning of the 20th century, New Hampshire's temperatures have risen more than 3°F. The greatest warming has occurred in the winter, with an increase of more than 4°F since 1900. NOAA's Observed and Projected Temperature Change Graph below shows the state's historical data in comparison to the projected change in temperatures over time based on high versus low emissions.



Colder Temperatures

Although the earth's climate is warming, it is still probable that other extreme temperature events such as extreme cold temperatures will continue to occur during the winter season as well. As defined in the state of New Hampshire Multi-Hazard Mitigation Plan, extreme cold during winter months, also known as cold snaps, are caused due to the southern transport of arctic airmasses into the northeast. Atkinson experienced severe impacts from the 2008 ice storm that left residents out of power for at least a week, if not more, and significantly damaged electrical and road infrastructure. At the time, the Town utilized the Fire Station to provide water to residents. The Community Center acted as a shelter and provided food and internet access to residents. The Timberlane Regional High School acted as a safe place. Reflections on incidents such as the 2008 ice storm help shed some light on the importance of preparedness in anticipation of these extreme temperature events before they occur. The impacts to Atkinson due to colder temperatures are identified in the table below:

Table 2: Impacts from Colder Temperatures	
Category	Impacts
Health	Risk of cold related injury such as hypothermia and frostbite, or death to humans (elderly especially at risk), pets, and livestock.
Transportation	Vehicles, batteries, etc. damaged due to freezing or wind.
Agricultural	A freeze or frost early or late in the growing season can cause increases in the cost of products, loss of products, and impacts to livestock.
Energy	Increases in energy use due to heating systems during extreme cold temperatures.
Water Resources	Frozen water resources, pipes, and systems can lead to infrastructure damage, and create a disconnect preventing people and animals from getting water.

Drought

The state of New Hampshire's Department of Homeland Security and Emergency Management defines a drought as *"the absence of water in a region that occurs slowly due to below average precipitation over an extended period, resulting in low stream flows, low surface water, and low groundwater levels"*. In recent years, the State of New Hampshire has experienced increases in drought levels occurring for longer durations of time that have caused significant impacts which require community adaptation and implementation measures. For the state to successfully

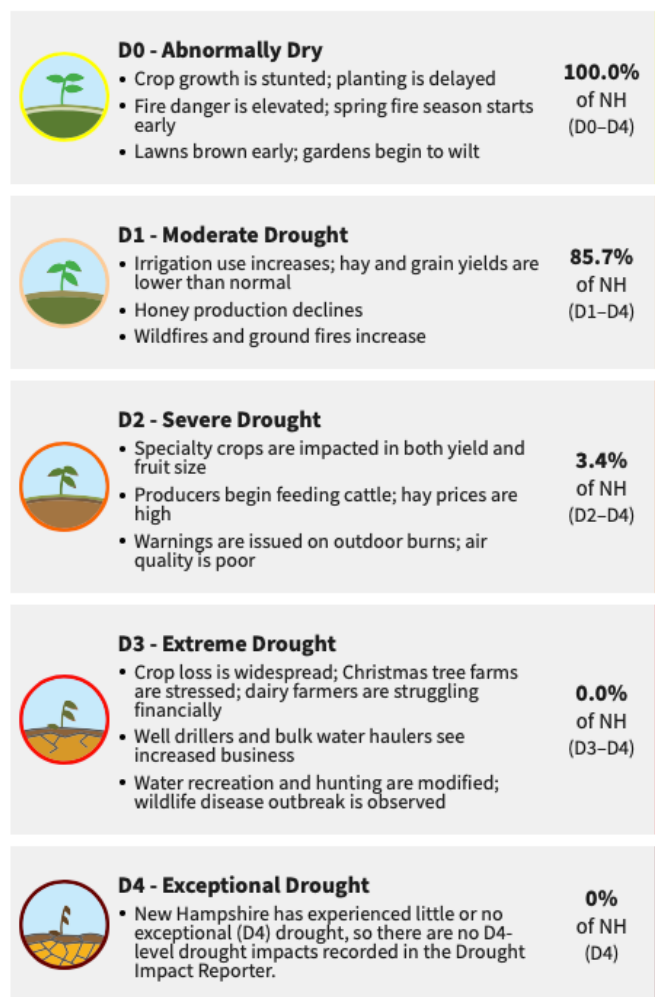
monitor and respond to drought conditions, the state has been divided up into 5 drought management areas in which Rockingham County is identified as the “Coastal Drainage” drought management area. The threats to Atkinson due to drought are identified in the next table with the following categories of impact:

Table 3: Impacts from Droughts	
Category	Impact
Water	Lack of water causes productivity of natural vegetation and agriculture to decrease; risk to summertime drinking water supply, lack of water for public safety, the amount of impervious surface area reduces infiltration and contributes to drought impacts.
Environmental	Loss or destruction of fish and wildlife habitat; lack of food and drinking water for wildlife; increased stress on and possible extinction of endangered species; lower water levels in reservoirs, lakes, and ponds; loss of wetlands; more frequent wildfires; wind and water erosion of soils; poor soil quality.
Economic	Destruction of crops causing higher food costs, cost of irrigation and drilling more wells, timber industry workers may be affected if wildfires are exacerbated by drought destroying timber, water companies having to spend money on new or additional water supplies.
Social	Anxiety or depression about economic losses caused by drought; health problems related to poor water quality, dust and pollen; threat to public safety from an increased number of wildfires, reduced incomes, fewer recreational activities.

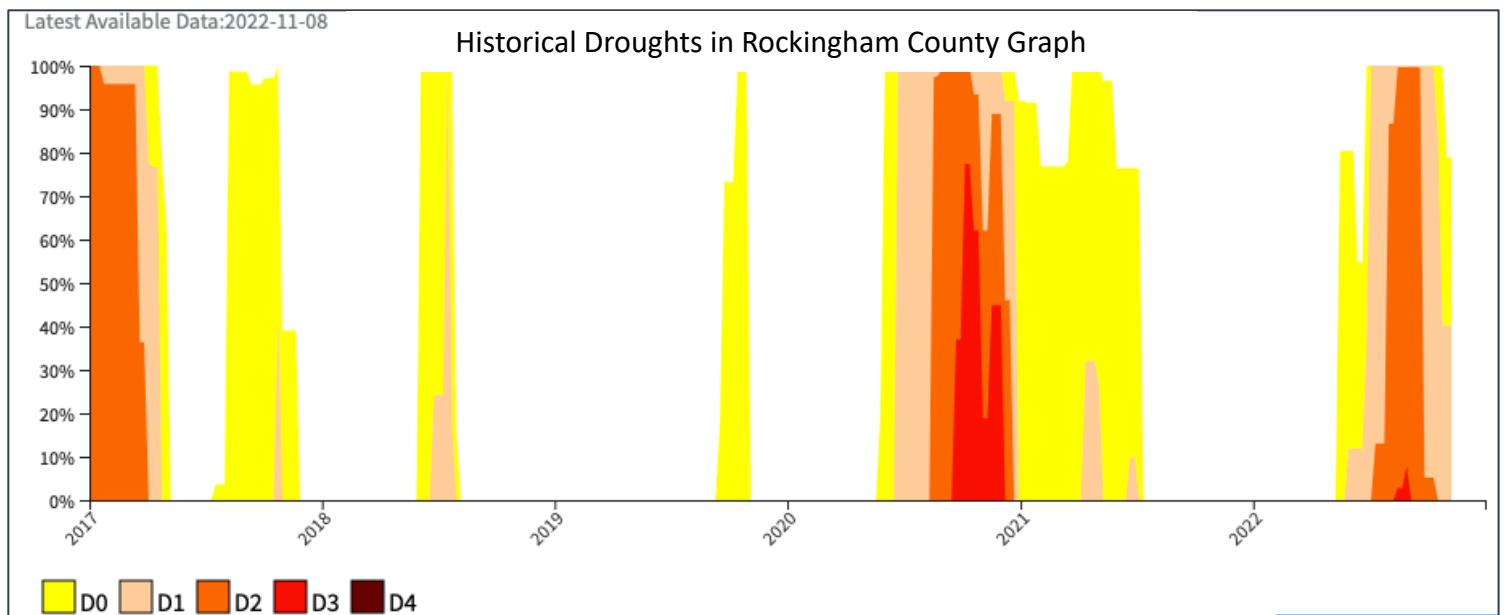
Recent data from the U.S. Drought Monitor (USDM) shows that Rockingham County has experienced extreme drought in 2021 and 2022. The USDM relies on drought experts to synthesize the best available data and work with local observers to interpret the information. The USDM also incorporates information about how drought is affecting people, with its network of over 450 observers across the country, including state climatologists, National Weather Service staff, Extension agents, and hydrologists. Droughts are classified as D0-D4 which can be described in the image to the right. The Historical Droughts in Rockingham County Graph depicts this data on the following page.

The 2022 Atkinson Land Conservation Plan identified town approaches to limit the impacts from drought and they are listed below:

- Town wide water conservation program aimed at public outreach and education, and phased reduction of water usage during drought such as limiting use of groundwater during drought for lawn watering and non-food production activities.
- Encourage and facilitate the capture and reuse of rainwater and clean household water for indoor plant watering, outdoor landscaping and household cleaning.
- Create public announcements on social media, in newsletters, and through email about drought conditions and how to best manage water use during these periods.
- Distribute lawn signs with messaging about water use and conservation.



Source(s): [NDMC](#), [NOAA](#), [USDA](#)



Wildfires

The State of New Hampshire’s Department of Homeland Security and Emergency Management defines wildfires as *“any non-structural fire, other than a prescribed fire, that occurs in the Wildland. Wildlands consist of vegetation or natural fuels”*. Drought conditions create high probability of wildfire due to the lack of water and dry vegetation that act as fuel. As identified in the NH Multi-Hazard Mitigation Plan, the number of woodland fires in the state increased by over 200% during the 2016-2017 drought. Some factors to consider that can lead to a potential increase in woodland fires are:

- The average length of snowpack has decreased by 12 days over the last 50 years, causing bare ground exposed longer and forests to be more susceptible to fires during a drought.
- Temperatures are allowing disease and insects to move north, killing trees which provides more fuel for fires.
- Other extreme weather events, such as windstorms or ice storms, are downing more trees adding fuel to fires during a drought.

In order to mitigate the impacts from wildfires, the Town of Atkinson has its own Forest Fire Warden who educates the public on safe fires and wildfire prevention as well as the distribution of fire permits. Atkinson follows NH State Law (RSA 227-L:17) which requires fire permits for all outside burning unless there is still snow ground cover. According to statistics from the National Interagency Fire Center, in the state of New Hampshire in 2021, there was a total of 280 fires which burned 96 acres. Table 4 shows data retrieved from 2017-2021 from the Fire Department statistics in the Town of Atkinson Annual Reports.

In recent years, there has been a slight increase in the number of illegal burns reported by the Atkinson Fire Department, and a minor increase in the number of grass/woods fires. This could coincide with the increase and longevity of droughts in the area creating dryer vegetation that acts as fuel for these fires. Wildfires are a threat to the forests and neighborhoods of Atkinson. Though Atkinson has managed to maintain much of its rural character in a quickly developing portion of New Hampshire, much of the Rockingham County region has seen rapid commercial and residential development. Due to Atkinson's land use balance of development and woodlands/open space, the Town should examine its Wildland-Urban Interface (WUI) with the remaining natural lands. The Wildland-Urban Interface (WUI) are areas of development that abut and are near wildlands. A WUI area can also be described as a zone where structures and other human developments meet or intermingle with undeveloped wildlands, or any point where the fuel feeding a wildfire change from natural (wildland/vegetation) fuel to man-made (urban) fuel.

Table 4: History of Illegal Burns & Misc. Fire Department Calls

Year	# of Illegal Burns & Misc Calls	# of Grass/Woods Fire	Total
2021	17	5	22
2020	15	2	17
2019	11	3	14
2018	10	1	11
2017	9	2	11

Inland Flooding

The state of New Hampshire's Department of Emergency Management's Multi-Hazard Mitigation Plan defines inland flooding as, *"a high flow, overflow, or inundation by water, which causes or threatens damage from the overflow of rivers, their tributaries, and streams throughout the State, primarily from high precipitation events"*. Atkinson's 2020 Hazard Mitigation Plan identifies that inland floods are most likely to occur in the spring due to the increase in rainfall and melting of snow. However, flooding can occur at any time of the year. For example, a sudden thaw in the winter or a major downpour in the summer can cause flooding because there is suddenly a lot of water in one place with nowhere to go.

Increased Precipitation

The effects of climate change can also cause more severe weather events and may result in an increase in precipitation resulting in flash flooding and extreme precipitation events. Flash flooding is defined as, *"a rapid rise in water level and extreme velocities in a river or stream, beginning within six hours of the causative event"*. In New Hampshire, flash flooding also includes ice dams and rapid snow melt. An extreme precipitation event can be identified as one where more than one inch of rain falls within 24 hours, or more than 2-4 inches falls in 48 hours. The threats to Atkinson due to increased precipitation are identified below:

- Damage to infrastructure such as buildings, roads, bridges, culverts, increased erosion and degraded water quality.
- Road closures due to flooding and/or culvert and bridge failure.

- Increased rainfall intensity during storms resulting in greater flood damage because flood zones are underestimated on current flood maps.
- Loss of homes and business due to flooding.
- Possible release of toxic materials.
- Loss of critical facilities due to flooding.

Riverine erosion, scouring, and flooding

Increased precipitation and flash flood events along with increased impervious surfaces contribute to riverine erosion. The rivers and streams that are most affected by erosion are those within watersheds that have steep terrain, where rivers have been historically straightened and modified, and those that have development adjacent to them. Scouring typically occurs downstream of bridges and culverts and other structures within rivers such as retaining walls and riprap revetments. The threats to Atkinson due to flooding are identified in the next table with the following categories of impact:

Table 5: Impacts from Flooding	
Category	Impact
During Flood	Risk of drowning, becoming trapped, or emergency services not being able to rescue people in distress.
After Flood	If properties are not properly cleaned, mold and rot can occur in areas that were flooded causing health problems for people and pets. Damage to personal properties, businesses, industrial complexes, housing units, roads, stormwater infrastructure, bridges, culverts, power and utility lines.
Overtime	Damage to structures causing rot and degradation.
Environmental	Release of hazardous chemicals, pesticides, and other materials into flood waters will contaminate those waters; downstream water quality issues due to overwhelmed storm drainage systems in developed areas being overwhelmed and inundated; disrupts the balance of the existing ecosystem, kills animals/plants/insects; contaminated floodwaters introduced to the ecosystem create impacts.
Economic	Damage to structures, loss of commerce due to business closure or inaccessibility, and rebuilding and mitigating related costs.

Additional causes that contribute to inland flooding as identified in Atkinson's Hazard Mitigation Plan are described below:

- **Erosion and mudslides** - *Erosion is the process of wind and water wearing away soil. Typically, in New Hampshire, the land along rivers is relatively heavily developed. Mudslides 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. Erosion and mudslides become significant threats to development during floods. Floods speed up the process of erosion and increase the risk of mudslides.*
- **Rapid snowpack melt** - *Warm temperatures and heavy rains cause rapid snowmelt. Quickly melting snow coupled with moderate to heavy rains are prime conditions for flooding.*
- **River ice jams** - *Rising waters in early spring often breaks ice into chunks, which float downstream and often pile up, causing flooding. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice in riverbeds and against structures presents significant flooding threats to bridges, roads, and the surrounding lands.*
- **Dam breach and failure** - *Dam failure results in rapid loss of water that is normally held by the dam. These kinds of floods are extremely dangerous and pose a significant threat to both life and property. There are five man-made dams in Atkinson:*
 - Lagoon at Atkinson Country Club (if breached water would flow towards Haverhill, MA),
 - Dam at the Killam property on Westside Drive (if breached would put homes in Salem, NH at risk),
 - Dam at Island Pond Road (if breached would cause road flooding),
 - Dam on Hodge Mill Pond (privately owned and if breached would impact Oak Ridge and Mill Street), and
 - Dam adjacent to Community Center.

There are also four large beaver dams that could cause flooding if breeched: Two of these dams are on Hovey Meadow Pond off Merrill Drive, one Dam is on Stewart Farm Pond, and the other Dam is on Sawmill Swamp. While flooding due to beaver dams does have potential negative impacts to infrastructure, it is also important to note that beavers and their habitat are important elements of wetland ecology.

Flood Zones

Designated flood zones are areas described by the Federal Emergency Management Agency (FEMA) as being prone to varying levels of flood risk. These flood zone areas are identified on the FEMA Flood Insurance Rate Map (FIRM) in terms of a designated 1% (also referred to as Base Flood or 100-year flood) and 0.2% (500-year) annual flood zones. FEMA identifies Special Flood Zone Hazard areas as *"areas that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year"*. The FIRM also shows moderate flood hazard areas between the limits of the base flood and the 0.2% annual chance flood. Existing

floodplains in Atkinson include areas surrounding Island Pond in the northwest part of town, along Hog Hill Brook, an area just south of NH111 between Main Street and East Road, and in the southeastern part of town along the Haverhill, MA, state line and Plaistow, NH, town line. These FEMA identified Flood Hazard Areas in Atkinson is shown visually on Map 5 of the Land Conservation Plan – Surface Water, Watersheds, and FEMA Flood Hazard Areas – also found at the end of this profile. There are three primary flood zone types in Atkinson including:

- Zone A: – 1% annual chance flood (also known as the 100-year floodplain)
- Zone AE – 1% annual chance flood (100-year floodplain)
- Zone X – 0.2% annual chance flood (also known as the 500-year floodplain)

In Atkinson, only 4% of the town or 287 acres is in the 100-year annual floodplain and an additional 0.03% of the town or 2 acres are in the 500-year floodplain. In terms of roadways, Atkinson fortunately has only 0.21 miles or 0.3% of the town's roads in the 100-year floodplain, and none of Atkinson's roads lie within the 500-year floodplain. The small amount of Atkinson roadways that do lie in the 100-year floodplain are mostly located in the northwest part of town surrounding Island Pond and along Hog Hill Brook. As identified in the 2020 Atkinson Hazard Mitigation Plan, *"the Highway Department indicates that flooding can result from long-term beaver dams, impacting the following roads: Brushwood Drive, Bryant Woods Road, and Maple Avenue"*.

In order to mitigate losses due to flooding, the Town of Atkinson joined the regular program of the National Flood Insurance Program (NFIP) in March of 2009. The current Flood Insurance Rate Map and Flood Insurance Study was completed May 17, 2005. The National Flood Insurance Program involves providing full insurance coverage based on risk shown on the FIRM map for Atkinson. Participating communities in the NFIP must agree to adopt a Floodplain Development Ordinance and enforce regulations in order to protect the floodplain from future development impacts. As a result, Atkinson adopted a Floodplain Development Ordinance and the details of this regulatory tool are briefly described below.

Atkinson Floodplain Management Ordinance

This ordinance identifies certain areas of the Town of Atkinson, New Hampshire that are subject to periodic flooding, causing serious damages to properties within these areas. Relief is available in the form of flood insurance as authorized by the National Flood Insurance Act of 1968. The regulations in the Atkinson Floodplain Management Ordinance apply to all lands designated as special flood hazard areas by the Federal Emergency Agency (FEMA) in its "Flood Insurance Study for the County of Rockingham, N.H.", with the associated Flood Insurance Rate Maps. These areas are designated as Zone A and AE on the Flood Insurance Rate Map. For more information on Atkinson's Floodplain Management Ordinance, visit the Atkinson Zoning Ordinance, Planning and Land Use Regulations.

Map 5 - Surface Water, Watersheds, FEMA Flood Hazard Area

Land Conservation Plan
Atkinson, NH
2022

2022

FEMA Flood Hazard Zone

1% Annual Risk (100 Year Flood)

0.2% Annual Risk (500 Year Flood)

Watersheds

HUC 12 Name

Arlington Mill Reservoir

Little River

Lower Merrimack River

Lower Spickett River

Stream

Intermittent Stream

