

## SECTION 4 RISK ASSESSMENT

### Risk Assessment

Requirement: §201.6(c)(2): (The plan must include) a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

It is essential in any hazard mitigation plan to identify the hazards that exist in the town or multi-town region and how vulnerable the community is to the particular hazard. This is known as the hazard identification and vulnerability analysis process.

### Climate

No risk assessment of Aroostook County's natural hazards would be complete without first considering its climate and geography. Factors such as seasonal temperatures, annual precipitation, prevailing wind directions and geographical features can all profoundly affect both the occurrence and severity of these hazards.

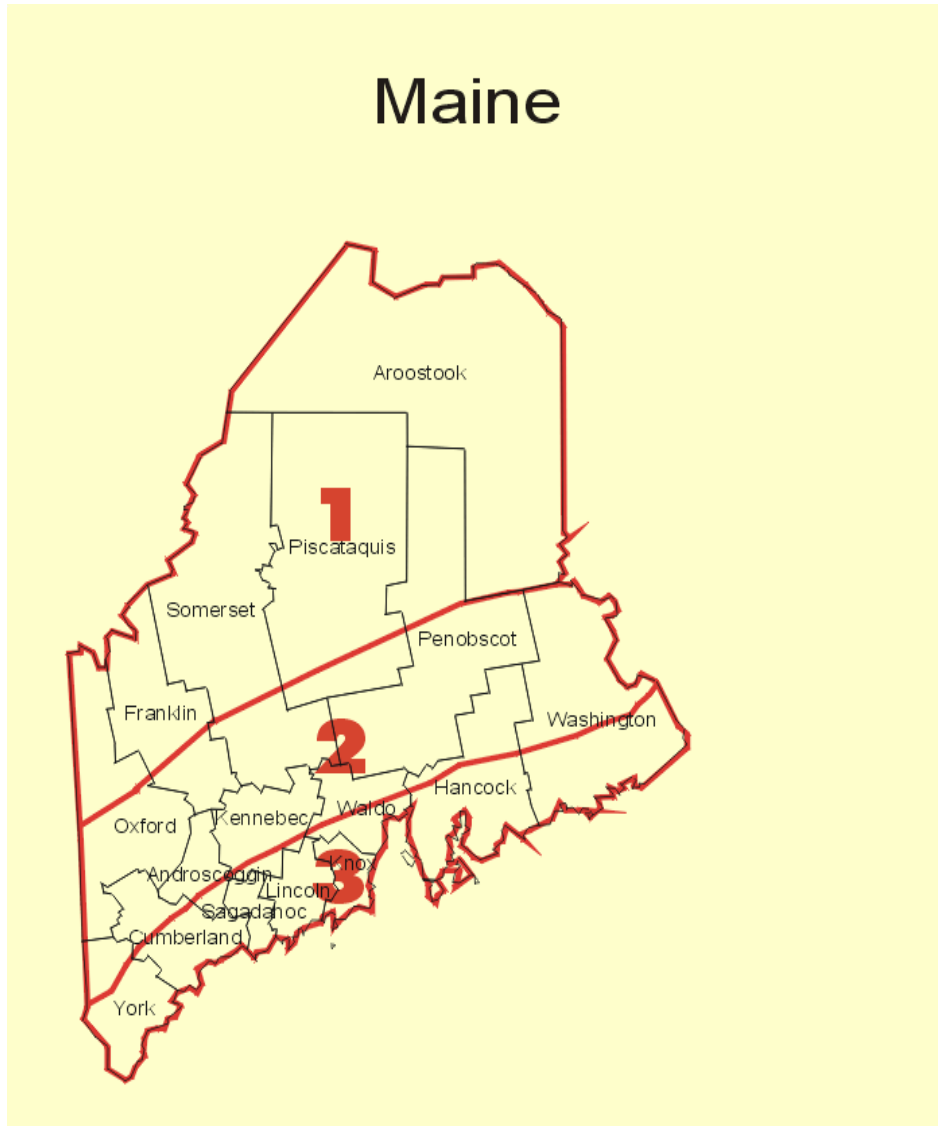
Aroostook County is located entirely in the northernmost of Maine's three climatic divisions. The **northern division (#1 on the map on the next page)** encompasses 17,916 square miles (54%) of the state. This division is least affected by marine influences **and it contains most of the central and western mountainous regions. It includes all of Aroostook County.**

**Temperature:** **According to the Maine State Hazard Mitigation Plan 2019, the mean** annual temperature **in the northern division** is about 38 degrees Fahrenheit. Temperatures average about 64 degrees Fahrenheit in July and August, and about 18 degrees Fahrenheit in January and February.

**Precipitation:** **The northern division's** average **annual** amount of precipitation, based on long-term records dating back to 1895, is **40.9** inches. This includes the conversion of all snowfall to a water-equivalent. Average monthly precipitation is between three and four inches, with November being the wettest month, and February being the driest month.

**Prevailing Winds:** Prevailing wind direction varies with both season and location. Local influences such as orientation of a valley also may play a key role in dictating prevalent wind direction at any one location. Most of the county is under northwest to west-northwest winds throughout much of the year and particularly during the winter. During the summer, southwest to southerly winds may become quite frequent.

Climate Divisions of Maine



**Geography:** Overall, the terrain across much of Aroostook County is hilly. The present-day landscape is a direct result of glacial erosion and deposition from the large ice sheets that completely covered Maine as recently as about 14,000 years ago. A variety of glacial deposits cover the county, providing a rich variety in the overall landscape as well as abundant sand and gravel for construction material. Many of these deposits also are excellent sources of ground water (that is, aquifers) for household and industrial water supplies. In addition, glacial deposits and erosion are directly responsible for the lakes found in Aroostook County.

Extensive wetland areas that provide habitat for many ecosystems are also a result of past glaciations in combination with existing climatic conditions. Maine is the most forested state

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in the United States with 90% of its land area in woodland (about 85% in Aroostook County). Historically, this has supported a considerable lumber and paper products industry. Many logging roads provide the only access into vast unsettled areas. These forests also provide habitat for abundant wildlife, and together with the large number of lakes are a great resource for sports and recreation.

### Climate Change

A detailed evaluation of climate change is beyond the scope of this plan, but suffice it to say that long term global climate trends, which include changes in temperature and precipitation, may affect the State of Maine and Aroostook County. As stated in the Maine State Hazard Mitigation Plan 2019:

“For clarification, the National Aeronautics and Space administration (NASA) uses the following definitions to describe climate and weather:

Climate: The description of the long-term pattern of weather in a particular area.

Weather: The description of the way the atmosphere is behaving in the short term, from minute to minute, hour to hour, day to day, and season to season.

As Mainers are aware, the state has long had a highly variable climate, characterized by abrupt weather variations day-to-day, month-to-month, and year to year (pages 1-8 to 1-9).”

The report “Maine’s Climate Future, 2020 Update,” prepared by the University of Maine, reports that “Rapid warming in the Arctic can affect the weather we experience in Maine and conditions in the Gulf of Maine (Schmitt 2007). As arctic air warms, there is less of a temperature difference between the North Pole and the continental United State, leading to weaker westerly winds. Recent studies have suggested that weakened westerlies may lead to a more wavy Jet Stream, so called “blocking” storm patterns, and Polar Vortex dips that allow Arctic air, still very cold, to plunge into Maine during winter (page 14).”

“Changes in the distribution of winds and sea-surface temperature across the North Atlantic, and Gulf Stream position, are likely amplifying regional warming and precipitation cycles, and have the potential to further affect seasonal shifts in the environment over the coming decades (Saba et.al. 2016, Thomas et.al.2017) (page 14).”

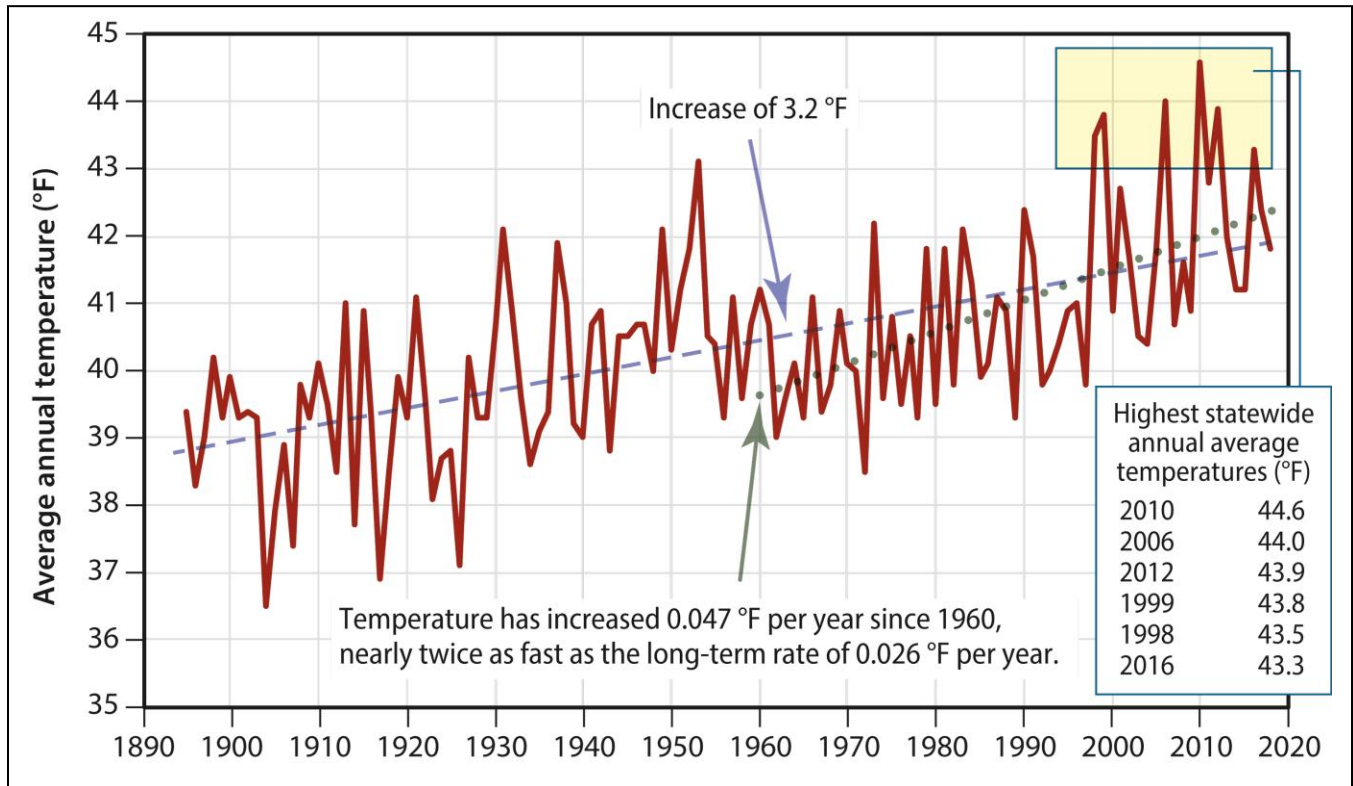
**Temperature Changes in Maine.:** Excerpts from the report “Maine’s Climate Future, 2020 Update,” prepared by the University of Maine, include the following:

“Temperatures are increasing statewide. Average annual temperature has increased 3.2 degrees Fahrenheit in the last 124 years, and the rate of warming has increased most notably since 1960. The six warmest years on record have occurred since 1998. Indeed, the Northeast is warming faster than any other region in the U.S., and is projected to warm 5.4 degrees Fahrenheit when the rest of the world reaches 3.6 degrees Fahrenheit (page 3)...The growing season (the period between the last frost

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and first frost) is more than two weeks longer than it was in 1950, mostly due to later frosts in the fall (page 4).”

The following chart, taken from the “Maine’s Climate Future, 2020 Update,” demonstrates significant year-to-year variations in Maine’s average annual temperature with periods of relative cold and relative warmth, but an upward trend in annual average temperatures.



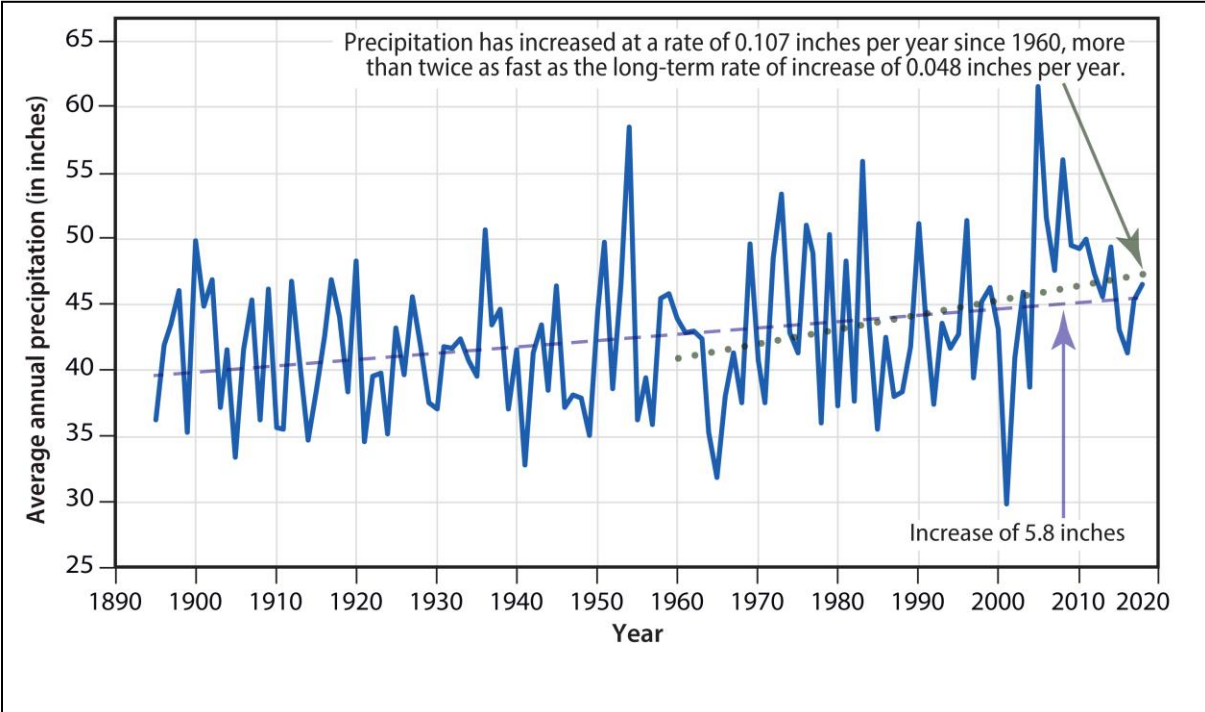
Source: Maine’s Climate Future, 2020 Update, University of Maine, page 3.

**Precipitation Changes in Maine.** Maine’s Climate Future, 2020 Update, reports that:

“Average annual precipitation has increased 15 percent (5.8 inches) since 1895, and the increase has come in the form of more rain and less snow. Since 1895, depth of annual snowfall has decreased 20 percent (2.3 inches). As with temperature, the rate of increase has accelerated in recent decades (page 5).

“Communities across the state are experiencing more heavy or “intense” precipitation events (Fernandez et. al. 2015)...Increased precipitation means increased volume of runoff to local streams, rivers, and ultimately the Gulf of Maine (Vincent et. al. 2015, Huntington et. al. 2016). These higher floods and flows can...damage roads, bridges and properties (page 6).”

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Source: Maine’s Future, 2020 Update, University of Maine, page 5.

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<b>Description of Hazards</b>	
<b>Requirement §201.6(c)(2)(i):</b> (The plan shall include) a description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	
Element	B1. Does the Plan include a description of the type, location and extent of all natural hazards that can affect each jurisdiction?
	B2. Does the plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction?

During meetings throughout the county, participating towns discussed hazards that face their community. The following table notes each hazard, Aroostook County’s vulnerability to that hazard and the probability that each hazard will occur in the future.

The following hazards will be examined in detail in this mitigation plan: Flooding, Severe Summer and Winter Storm, and Wildfire. A determination that these are the most significant hazards in Aroostook County was made through personal communication and by reviewing data, reports, and records. While several hazards have a high likelihood of occurring, the other factors of the hazard/vulnerability analysis relegate them to non-significant/lower priority hazards.

The Aroostook County Hazard Mitigation Planning Team agreed that flooding was the most serious hazard in Aroostook County. There was general agreement that ice jams, combined with spring snow melt and sometimes heavy rains are a leading cause of flooding in Aroostook County. The year 2008 proved to all participants that the focus on flooding was a valid concern and area to elaborate on. The year 2008 was devastating to many communities especially the ones near the St. John River along the St. John Valley corridor. Fort Kent was hit the hardest followed by Van Buren. Other communities that received a great deal of damages included Island Falls, Washburn and the community of Wallagrass, more specifically the Soldier Pond area. Having had to deal with such major flooding, proved to all participants that mitigation should be addressed in greater detail and in some areas expanded. Identifying projects for mitigation is now on every one’s radar and is being addressed.

Flooding and related hazards were identified through an extensive process that utilized input from members of the Hazard Mitigation Planning Team (comprised of representatives from State, County and municipal governments), survey returns from Aroostook County municipalities, a review of the Maine State Hazard Mitigation Plan 2019, hazard mitigation zoom workshops, public input, researching past disaster declarations in the county, and a review of current maps.

The hazards profiled in this Plan, and the basis for their selection, are summarized in the table below.

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<b>Summary of Hazards Profiled in this Plan</b>		
<b>Hazard</b>	<b>How Identified</b>	<b>Why Identified</b>
Flooding	Review of 2020 hazard mitigation survey returns from Aroostook County municipalities, a review of the Maine State Hazard Mitigation Plan 2019, hazard mitigation zoom workshops, FEMA flood studies, flood maps, state data on disaster declarations, committee and local knowledge, Flood of 2008	There is a history of flooding in many parts of the county, particularly along the Aroostook and St. John Rivers. The County also contains twelve high hazard dams and six significant hazard dams that could, in the event of a dam failure, cause loss of life or serious property damage. There have been no major dam failures in the county in recent decades, but In 1954, a hurricane washed out dams in Mars Hill and Easton.
Severe Winter Storms	Review of past disaster declarations, committee and local knowledge, records from 1998 ice storm, Maine State Hazard Mitigation Plan 2019	Maine is frequently hit with blizzards and major “northeaster” storms. In 1998, a major ice storm hit Maine, knocking out power in many locations for days. The impacts of winter storms include wind damage. Summer storms are often accompanied by high winds, road and culvert washouts.
Severe Summer Storms	Review of past disaster declarations, Committee and local knowledge, State Plan	Summer storms are often accompanied by high winds, road and culvert washouts.
Wildfires	Review of Maine Forest Service records, committee and local knowledge, State Hazard Mitigation Plan 2019	Many areas of the county are forested. Wildfires have been numerous but they have generally been small. Wildfires can destroy land cover which, in turn, can cause erosion and sedimentation and exacerbate flooding.

The following table identifies the hazards that were either eliminated from further consideration in the Plan or included in other hazard profiles. Factors for eliminating them from further consideration include a lack of historical evidence, lack of overall county-wide severity, or a low likelihood for the event to occur. Even though these potential hazards are not profiled in the Plan, there is no guarantee that they would not or could not occur and

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cause damage. The Hazard Mitigation Planning Team made the decision to keep this Plan simple by profiling only the top four hazards.

<b>Hazards that were Eliminated from Further Consideration</b>		
<b>Hazard</b>	<b>How Identified</b>	<b>Why Eliminated</b>
Avalanche	Review of USGS Maps	There are no mountains in the county that hold large amounts of snow that would create avalanches.
Blight/Infestation	State Plan, <b>Planning Team</b> , and local knowledge State Plan	Even though the county is heavily dependent on potato farming and timber production, state government, private businesses and the general public have responded to incidents of blight and infestation with spray programs, surveys, and restrictions on plant/aquaculture cultivation and plant importation.
Drought	Drought Advisory Committee <b>Planning Team</b> and local input State Plan	Severe, multi-year droughts occurred in Maine in the 1960's, 1980's and 2000 to 2003, <b>2016, 2018 and 2020</b> . <b>Up until 2020</b> , the effects of drought, such as wells running dry in some areas, have never been sufficient to create disaster conditions in Aroostook County, although they have increased the danger of wildfires.
Earthquake	Maine Geological Survey, historical records, State Plan	Although earthquakes are common in Maine, no significant motion has been shown for any fault since the last ice age about 20,000 years ago. Northwestern Aroostook County is one of three areas in Maine with the most seismic activity, but this area is largely uninhabited, and there has been only one earthquake with a magnitude greater than 3 (3.8) since 1979.
Hurricanes	Review of past disaster declarations, historical data, <b>Planning Team</b> , input State Plan	Maine is hit by a hurricane about every 10-20 years. However, the hurricanes are not very powerful by the time they hit Aroostook County. Strong, localized, and brief gusts approaching hurricane strength are sometimes experienced with winter and summer storms (see profile for summer storms).
Landslides	Review of Maine Geological Survey records, State Plan	Landslides are virtually unknown in Aroostook County. However, sometimes steep embankments can be subject to landslides, as was the case along a small section of Bradbury Road in Fort Kent. Aroostook County does not have any mountains or areas of steep terrain that could potentially be subject to landslides. However, this does not mean that landslides cannot occur.
Subsidence	Review of Maine Geological Survey records	There have been no known cases of land subsidence in Aroostook County.
Tornado, severe winds	Review NWS records, State Plan	On average, 1-2 tornadoes occur in the State of Maine every year, but there has been no loss of life or major damage in many years (but see profiles of winter and summer storms for high wind damages).
Winds	Review NWS records State Plan Local Surveys	Strong winds associated with severe winter and summer storm events are included in those hazard descriptions.



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<b>Hazards that were Eliminated from Further Consideration</b>		
<b>Hazard</b>	<b>How Identified</b>	<b>Why Eliminated</b>
Pandemic	Statewide experience, 2020, news reports, AKEMA monitoring	AKEMA has a separate pandemic plan which is available from AKEMA

The following chart is a compilation of the Hazard Mitigation **Planning** Team’s research efforts to determine what disaster events have occurred in Aroostook County during the last century. The team found few disasters during the first half of the 20<sup>th</sup> century. This is due in part to the poor records that were kept at the time, the fact that there was very little development in the county before 1950; and the fact that the residents mostly lived in homes built in the 19<sup>th</sup> Century which were built to withstand winter storms and were built out of known flood areas. After 1950, people began to build in flood-prone areas and in less hardy structures. In addition, there was very little threat from wildfire before the 1950’s, because most of the land had been cleared for farming. After the 1950s, many farms fell to ruin and the fields grew up into forests.

<b>Historical Summary of Hazard Events in Aroostook County</b>					
<b>Year</b>	<b>Month</b>	<b>Day</b>	<b>Estimated Damage</b>	<b>Type of Damage</b>	<b>Declaration</b>
1934	June	3-5	\$300,000 Multi-County	Fire	n/a
1951	April	12		Flood	n/a
1973	May	6		Flood	SBA
1973	July	1		Flood	SBA
1973	Dec		\$3,000,000 Multi-County	Flood	n/a
1974	May	26	\$3,000,000 Aroostook	Flood	n/a
1976	April	2	\$200,000 Aroostook	Flood	n/a
1976	August			Crop Damage	SBA
1976	Aug	9-19	“Belle” Aroostook	Flooding, Agricultural (potato) loss	SBA
1977	Aug	10	\$4,000,000 Aroostook	Hurricane	SBA
1978	Jan	10	Unknown	Winter storm	Presidential
1979	April	30	\$648,500 Multi-County	Flood	SBA
1991	April	10-12	\$14,400,000 Aroostook	Severe ice jams & Flooding	Presidential
1992	May	19	Aroostook - Allagash	1,150 acre Fire	no
1993	Mar	13-14	unknown	Winter storm	EM-3164
1994	April	15	\$5,700,000 Aroostook, Fort Fairfield	Flooding, ice jams, damage to 71 homes and businesses	Presidential
1998	Jan	5-25	\$1,496,635	Ice storm, power outages, loss of heat, refrigeration, sanitary services, forestry	DR-1198

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<b>Historical Summary of Hazard Events in Aroostook County</b>					
<b>Year</b>	<b>Month</b>	<b>Day</b>	<b>Estimated Damage</b>	<b>Type of Damage</b>	<b>Declaration</b>
				damages	
2000	Mar-Apr		\$448,690	Flood	DR-1326
2003	Jan-Mar		\$312,475	Severe winter conditions: frozen pipes	DR-1468
2003	Feb	2-4	\$345,182	Severe Winter Storm	EM-3174
2003	Dec	6-15	\$202,126	Severe Winter Storm	EM-3190
2003	Dec	14-15	Unknown	Severe winter storms and severe cold	EM 3194
2005	Feb	10-11	\$334,405	Severe Winter Storm	EM-3206
2005	March	9	\$498,000	Severe Winter Storm	EM-3209
2005	March-May	28-3	\$262,989	Flood	DR-1591
2005	Dec	25-27	\$512,603	Severe Winter Storm	EM-3265
2008	Apr-May	30-3	\$TBD	Flood	DR-1755
2009	July		\$200,000 (Insured) T17-R3 & Fort Kent	Micro-burst – NWS Caribou	No
2010	Dec	12-19	TBD	Severe winter storms, widespread flooding	DR-1953
2017	Feb	13	Unknown	Statewide blizzard, winter storm	n/a
2017	Mar	14	Unknown	Statewide blizzard	n/a
2020	Jan	Ongoing	TBD	Covid-19 pandemic	DR-4522



Fort Kent-May 2008

Photo courtesy of Maine Forest Service

## Flooding

**“St. John River Basin.** The St. John River Basin includes portions of Aroostook, Somerset, Piscataquis, and Penobscot Counties. The river basin drains 1,650 square miles from a vast area in both Canada and northern Maine. The St. John River runs 420 miles and has a considerable drop in elevation in the upper section followed by generally flat topography with rolling hills. The state’s only National Scenic Waterway, the Allagash, which forms the headwaters of the St. John basin, is world renowned for its wilderness canoeing. The St. John forms Maine’s northernmost border. Because of the wide channel and steep banks, the main stem of the St. John River has relatively moderate flooding. Some tributaries of the St. John, such as the Aroostook River, are prone to flooding. There is, however, very little development at risk in the St. John Basin. Maine’s two most significant levees, Fort Kent and Fort Fairfield, are in this basin. The Fort Kent levee was built in the late 1980’s, and has since seen numerous updates. The Fort Fairfield levee was built in 2001. In 2008, a flood on the Saint John River came within three inches of the top of the levee but did not overtop it. Despite the height of the water, the levee withstood the flood (Maine State Hazard Mitigation Plan, 2019, page 1-5).”

Flooding in Aroostook County **has many causes**. Ice jams from the spring thaw, severe storms and saturated farm fields are just some examples of the causes. The Aroostook County Emergency Management Agency (AKEMA) has copies of flood maps for the towns that participate in the National Flood Insurance Program.

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In the springtime, AKEMA monitors the following rivers at the following points:

1. **Aroostook River:** Masardis, Washburn
2. **St. John River:** 9 Mile Bridge, Dickey, Fort Kent
3. **St. Francis River:** Connors
4. **Big Black River:** Depot Mountain
5. **Fish River:** Fort Kent
6. **Allagash River:** Allagash

AKEMA has also conducted a survey of all Aroostook County dams. This was done by visiting each dam, getting pictures and creating site maps. Once that was complete, the information was placed in a resource guide, divided by town, which also includes dam owners, ID numbers and emergency contact information.

**Types of Flooding in Aroostook County:** Flooding is a temporary inundation of normally dry land as a result of: 1) the overflow of inland waters; and/or 2) the unusual and rapid accumulation or runoff of surface waters from any source. Note: the nature of Aroostook County's geology and hydrology is such that flooding is usually fast rising but of short duration. There are several different types of potential flooding in Aroostook County:

- **Dam failure:** The sudden release of water resulting from structural collapse or improper operation of the impounding structure. Dam failure can cause rapid downstream flooding, loss of life, damage to property, and the forced evacuation of people.
- **Flash flood:** A flood event occurring with little or no warning where water levels rise rapidly due to heavy rains, ice jam release, or rapid snow melt.
- **Ice jam:** An accumulation of floating ice fragments that blocks the normal flow of a river. During a thaw or rainstorm, the rapid increase in discharge from snow melt and/or rainfall can rapidly lift and break up a thick ice cover and carry it downstream as an ice run. Ice runs can jam in river bends or against the sheet ice covering flatter reaches. The resulting ice jams can block flow so thoroughly that serious flooding may result within an hour of their formation. Failure of an ice jam suddenly releases water downstream. Damages from ice jam flooding usually exceed those of clear water flooding because of higher than predicted flood elevations, rapid increase in water levels upstream and downstream, and physical damage caused by ice chunks. Moving ice masses can shear off trees and destroy buildings and bridges above the level of the flood waters.
- **Lacustrine:** (Lake Flooding) occurs when the outlet for the lake cannot discharge the flood waters fast enough to maintain the normal pool elevation of the lake. During a base flood event, normal increases in water surface elevations on most Maine lakes and ponds range from 1 to 5 feet. However, in Maine there are some examples where the base flood event will reverse the flow of the outlet stream. In such instances, river and base flood elevations can rise more than 15 feet above normal pool. While this can impact individual sport camps built near the water's edge, there are no records of major damages so this type of flood will not be further addressed in the Plan.

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- **Riverine/riparian:** Periodic overbank flow of rivers and streams, usually the result of spring run-off, but can also be caused by major rain storms. This is the major type of flooding in Aroostook County.
- **Urban:** Overflow of storm sewer systems, usually due to poor drainage, following heavy rain or rapid snow melt. The combined sanitary and storm water systems that some urban areas installed years ago cause flooding of sanitary sewerage when riparian floods occur. Runoff is increased due to a large amount of impervious surfaces such as roof tops, sidewalks and paved streets.
- **Beaver Dam Flooding:** Flooding resulting from back-up and overflow of water resulting from beaver dams.

**Nature of the Hazard from Dam Failure:** Maine dams were constructed incrementally over a period of 300 years. Businesses harnessed the abundant fast flowing rivers and rocky rapids for the development of energy and transportation. Many dams throughout the country are now aged, and in Maine the majority of these structures are nearly 100 years old and beyond the normal design life of civil engineering works. Many are low head dams constructed using local materials of stone, timber and earth. Based on anecdotal information obtained at a September 19, 2006 meeting in Caribou, a 1954 hurricane resulted in a deluge that washed out the Mars Hill and Easton dams, as well as several roads. Dam failure is not a frequent occurrence, but it can and does occur.

Maine law, consistent with federal law, classifies the hazard potential of dams as High, Significant or Low. If they failed, High Hazard dams could cause loss of life; Significant Hazard dams could cause significant property damage and Low Hazard dams would generally cause damage only to the owner's property. Therefore, it's possible that a small (low head) dam located above a large community could be rated High Hazard while a structurally larger dam sited in an unpopulated area could be a Low Hazard potential.

In Aroostook County, there are 12 High Hazard dams and six Significant Hazard dams, as shown in the table below. Only one of the dams shown in the table, Sco Pan Plant, is regulated by the Federal Energy Regulatory Commission (FERC). The rest are regulated by the Maine Emergency Management Agency. The County also has 38 low hazard dams that are not included in the table.

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<b>Aroostook County High Hazard and Significant Hazard Dams</b>					
<b>MEMA ID</b>	<b>Dam Name</b>	<b>Other Name</b>	<b>Dam Owner</b>	<b>Town</b>	<b>River</b>
<b>High Hazard Dams</b>					
134	Josephine	Lake Josephine	McCain Foods	Easton	Unnamed
135	Christina	Lake Christina	McCain Foods	Easton	Prestile Stream
136	Bryant Pond	n/a	Fort Fairfield	Fort Fairfield	Libby Brook
138	Libby Brook	n/a	Fort Fairfield	Fort Fairfield	Libby Brook
141	Durepo Brook	n/a	Limestone	Limestone	Durepo Brook
142	Trafton Lake	Webster Brook	Limestone	Limestone	Limestone Stream
143	Noyes Mill	n/a	Limestone	Limestone	Noyes
144	Community Pond	Limestone Community	Limestone	Limestone	Limestone
148	Mantle Lake	Mantle Lake Outlet	Presque Isle	Presque Isle	Mantle Brook
151	Hanson Brook	n/a	Presque Isle	Mapleton	Hanson Brook
154	Violette Brook	n/a	Van Buren Water District	Cyr Plantation	Violette Brook
414	Scopan Plant	Squa Pan	Algonquin Northern Maine GenCo Liberty Power.	Masardis/Ashland	Squa Pan Stream
<b>Significant Hazard Dams</b>					
150	Arnold Lake	n/a	Presque Isle	Presque Isle	Arnold Brook
152	Hunnewell Lake	n/a	IFW/State of Maine	St. John Plantation	Thibeault Stream
653	Smith Farm	n/a	H.Smith Farm Family Limited Partnership	Westfield	Smith Brook
823	McCrum's Pond	n/a	Neil Grass	Westfield	Rideout Brook
999	Jack's Pond	n/a	Laurice Grass-Bell & Michael Foster	Monticello	?
1006	Schools Farm Dam	Littleton Irrigation Pond	Schools Real Estate Holdings, LLC	Littleton	?

Source: MEMA and AKEMA

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**Nature of Flood Hazard other than Dam Failure.** Severe flooding can cause loss of life, property damage, disruption of communications, transportation, electric service and community services, crop and livestock damage, health issues from contaminated water supplies, and loss and interruption of business. Ironically, firefighting efforts can be compromised if fire fighters and equipment are responding to a flood emergency.

Generous precipitation (about 41 inches a year) contributes to the flood potential. The low pressure system over the eastern seaboard and the tendency of some storms to follow one another in rapid succession provide heavy, combined moisture. Water abundance is one of Aroostook County's most valuable natural resources and its primary hazard.

**Location of Flooding Hazard:** Aroostook County's susceptibility to flooding is further exacerbated by the wide-ranging weather variables as discussed in the climate section. Due to seasonal (and regional) factors such as heavy rains, rapidly melting snow pack and/or ice jams, major flooding most frequently occurs between December and May. Based on MEMA data, the most flood prone months are April, January and March respectively. Floods can also be caused by hurricanes.

**Location of Municipal Flood-Prone Areas.** The following is a summary of areas that are subject to flooding and/or that have had repeated flood damages in specific jurisdictions, as identified in the Aroostook County Hazard Mitigation Planning Municipal Survey 2015 and subsequently modified in 2020 and 2021.

### *To Be Updated*

- **Allagash:** Allagash-St. Francis town line; Dickey Road; Ferry Road; Frank Mack Road; Walker Brook Road.
- **Amity:** At times we have flooding on all our town roads. Where there is a culvert, it is usually caused by freezing or beavers plugging them: Monument Road, Estabrook Road, Tracy Road and Lycette Road.
- **Blaine:** Dam at Robinson Pond, low areas of the Kinney Road, E Plantation Road and East Blaine Road.
- **Bridgewater:** Route 1 corridor around Fire Station; Dead Brook area of Packard Road; Whitney Brook Bridge on Tannery Street; and Boundary Line Road.
- **Caribou:** Collins Street-brook culvert; Roosevelt Street-brook culvert and ditch; River Road-cross culvert and ditching; Cross Road-cross culvert and ditching; Grimes Mill Road, Bog Road, Harvest Road, Rose Street.
- **Castle Hill:** The Wadell Road has an issue with flooding and the Dudley Road swamp.
- **Chapman:** The area of Littlefield Road in the swamp has been an issue in the past; Grendell Road has flooding in the swamp.
- **Crystal:** Fish Stream at Crystal Road near Patten/Crystal Town Line; Fish Stream at Crystal Road near 75 Crystal Road; Fish Stream at Shur Road; Retreat Road – large swamp drainage usually floods over road; Crystal Brook Bridge at Crystal Road.
- **Cyr Plantation:** Madore Road.
- **Dyer Brook:** Temporary flooding of Town Line Road during spring thaw has occurred once or twice.

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- **Eagle Lake:** There are certain areas of the community that are susceptible to flooding due to the local lake and area streams and rivers. These areas include Lakeside Lane, Sly Brook Road, Mills Lane, Willard Lane, Pinkham Lane, Pinette Lane, South Brook Lane, Warden Lane, Boyles Lane, Browns Lane, Meadow Lane, Spruce Tree Lane, Ken’s Lane, Old Main Street.
- **Fort Kent:** Cross culvert and driveway culvert on North Perley Brook Road near Black Lake Road (Fort Kent has been awarded a Hazard Nitigation Grant to remediate the issue); Bradberry Road along Fish River to old Fish River bridge site; Riverside Park; most of East Main Street.
- **Grand Isle:** Since Grand Isle is located close to the St John River, many areas face a great deal of flooding, roads are always in the process of flooding during the spring ice jams and river flooding areas of concern. As the roads are flooded so are many of the homes that are close to the river areas. During the spring floods many areas monitor the river levels and ice jams and how those will affect the community roads, homes, and some businesses.
- **Hamlin:** Hammond Brook area; Martin Brook area.
- **Hodgdon:** Jackins Settlement Road; Little Road; Hillview Avenue.
- **Houlton:** Bangor Road/Porter Settlement Road intersection; Riverfront Park Trail; Smyrna Street/Moose River Bridge.
- **Island Falls:** Mattawamkeag River at Old Patten Road/Sewall Street and at Houlton Road; Fish Stream at Old Patten Road; Dyer Brook at Houlton Road; Sly Brook at Sherman Street Bridge Crossing.
- **Limestone:** The Town of Limestone currently has four man-made flood control dams: 1) Durepo; 2) Noyes; 3) Community Pond; 4) Trafton. These dams could cause extensive flood damage if they should become breached. These dams hold back large watersheds, and are covered under an EAP on file with MEMA. Residents at the end of Tardy Road could possible become trapped if Durepo Dam is breached.
- **Linneus:** Beaver Brook-South Oakfield Road; Bither Brook- Burton Road and Folsom Road; Storm erosion- Drews Mills Road, Burton Road, and South Oakfield Road.
- **Littleton:** Foster Road; Shaw Road; Framingham Road.
- **Ludlow:** Lamb Brook at Ludlow Road.
- **Mapleton:** Tea Kettle Brook runs under Boone Road and Pulcifer Road and has been a flood issue in past years; The Griffen Ridge Road on the Pease Road end has issues in the spring as well.
- **Mars Hill:** The area from the Prestile Stream dam south along the Prestile Stream has in the past been susceptible to high water, particularly during the spring runoff period.
- **Nashville:** None.
- **New Sweden:** Rista Road, Jepson Road, School Land Road, Thomas Road.
- **Orient:** Properties near East Grand Lake.
- **Portage Lake:** All low land around the lake, especially the south end and east side.
- **Presque Isle:** Presque Isle Stream that runs along Main Street – most flooding would occur from State Street north to the Aroostook River. The Aroostook River is another area of concern along the Washburn Road; do have some areas of flooding in other areas but it is more from water run off during the spring.
- **Reed Plantation:** All areas around Mattawamkeag River.



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- **St. Agatha:** The shores of Long Lake; the cove near the Town Office; with the spring melt and rain we had a washout from a beaver pond up behind a road that damaged a culvert (Morneault Rd).
- **St. Francis:** ice jam flooding at Kelly Crossing west to 337 Main Street; Thibodeau Brook west to 985 Main Street; Narrow Gauge west to St. Francis/Allagash town line.
- **St. John Plantation:** Route 161 – St. John River along Jalbert’s Boat Landing; the Berube flats, and the town line between St. John and St. Francis.
- **Sherman:** Molunkus Stream – downtown area; Cold Brook Road – Beaver Brook; Golden Ridge Road – Boot Swamp Brook.
- **Unorganized Territory:** E-Township - E-Plantation Road (Three Brooks Crossing); Sinclair (T17R4) - Sinclair Road; Benedicta (TIR5) - Aroostook Road.
- **Wade:** Gardner Creek always has a problem due to the river. Also New Duntown does as well but that is only if we have a quick thaw and runoff from a very large field. We have tried several different ideas, so far noting has worked.
- **Wallagrass:** Soldier Pond Village in Wallagrass; Wallagrass Stream; Michaud Stream in Soldier Pond; and Clark Brook.
- **Washburn:** Route 164 between Washburn and Presque Isle; Parsons Road. Both have had severe river flooding.
- **Westfield:** Young Lake; Westfield Lake; Prestile Stream; Beaver Brook; Burnt Land Brook; Clark Brook; Dockendorf Brook; Johnson Brook; North Branch of Three Brooks; Pretty Brook; Rideout Brook; Youngs Brook; Easton Viner Road; Elliot Road.
- **Westmanland:** Little Madawaska Lake Bridge/McCluskey Brook/Little Madawaska Lake.
- **Weston:** Lakefront properties within the FEMA floodplain.

**Extent.** The majority of the flood damage in the county is caused by winter runoff in the springtime, which undercuts or overtops local roads. When Maine has an above average snowfall for the winter and then warmer temperatures and rainfall suddenly arrive in the spring, the snow pack melts off more quickly than the watersheds can handle. This can cause local water bodies to overflow their boundaries and flood nearby road surfaces. Typically, the road damage is not major, although it can absorb the municipal road budget for an entire year and does happen in several towns every year.

The St. John River Basin drains a vast area in Canada and Northern Maine and has a considerable drop in elevation in the upper section. Because of the wide channel and steep banks, the main stem of the St. John River has relatively moderate flooding. Some tributaries of the St. John, such as the Aroostook River, are prone to flooding.

The following is a summary of the extent of flooding, based on data obtained from the National Weather Service in Caribou:

### St. John River at Fort Kent:

#### Flood Crests

- Flood Stage: 22 feet
- Moderate Flood Stage: 24 feet
- Major Flood Stage: 26 feet

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### Recent Crests

- 23.39 feet on 4/23/2019
- 22.60 feet on 5/1/2018
- **27.74 feet on 4/30/2008**
- 19.19 feet on 4/20/2008
- 18.09 feet on 4/25/2007

The flood flow **at this location** is greater than 56,800 cfs (exact flow not available).

### Aroostook River at Washburn

#### Flood Crests

- Flood Stage: 14 feet
- Moderate Flood Stage: 17 feet
- Major Flood Stage: 20 feet

#### Recent Crests

- 19.66 feet on 4/20/2019
- 14.99 feet on 4/21/2018
- **21.14 feet on 4/18/2015**
- 16.43 feet on 4/7/2009
- 14.40 feet on 4/18/2008
- 14.10 feet on 4/09/2005

The flood flow **at this location** is greater than 35,700 cfs (exact flow not available).

### Fish River at Fort Kent

#### Flood Crests

- Flood Stage: 11 feet
- Moderate Flood Stage: 12 feet
- Major Flood Stage: 13 feet

#### Recent Crests

- 11.20 feet on 4/28/2019
- 12.02 feet on 5/3/2018
- **13.93 feet on 4/30/2008**
- 10.88 feet on 5/01/2005
- 10.01 feet on 4/28/1996

The flood flow **at this location** is greater than 8,800 cfs (exact flow not available).

**Previous Occurrences.** Some flooding occurs every year, but some of the most significant and widespread flooding events are shown in the table below. Some of these flooding events resulted in disaster declarations.

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<b>Historical Summary of Flooding in Aroostook County</b>				
<b>Year</b>	<b>Month/Day</b>	<b>Estimated Damage</b>	<b>Type of Damage</b>	<b>Declaration</b>
1951	Apr 12	Unknown	Flood	n/a
1973	Apr 24	Unknown	Flood	Declaration denied
1973	May 6	\$908,404	Flood	SBA
1973	Jul 1	Unknown	Flood	SBA
1973	Dec ?	\$3,000,000 Multi-County	Flood	Declaration denied
1974	May 26	\$3,000,000 Aroostook	Flood	n/a
1976	Apr 2	\$200,000 Aroostook	Flood	n/a
1976	Aug ?	Unknown	Crop Damage	SBA
1979	Apr 30	\$648,500 Multi-County	Flood	SBA
1991	Apr 10-12	\$1,899,139	Severe ice jams & Flooding	DR-901
1993	Apr ?	\$240,396	Flooding	DR-988
1994	Apr 15	\$5,700,000 Aroostook, Fort Fairfield	Flooding, ice jams, damage to 71 homes and businesses	DR-1029
2000	Mar 28- Apr 26	\$448,690	Flood	DR-1326
2005	Mar 29- May 8	\$262,989	Flood	DR-1591
2008	Apr 28- May 14	\$TBD	Flood	DR-1755
2010	Dec 12-19	TBD	Severe winter storms, widespread flooding	DR-1953

**Fort Fairfield – 1994 Flood.** On Saturday night, April 16, 1994, Fort Fairfield was deluged by a massive flood of historic proportions. The following is an excerpt from a New York Times article dated April 18, 1994:

“Spring arrived with a vengeance over the weekend in this town in northeastern Maine when an ice jam clogging the Aroostook River burst, sending large blocks of ice into town on a wave of frigid waters.”

“Like outsized pieces of some frozen jigsaw puzzle, the ice slammed into buildings and cars on Saturday night, forcing 60 people to evacuate their homes. Ten feet of water flooded Main Street, damaging more than a score of businesses....”

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Two Canadian Customs officers from nearby Perth-Andover, New Brunswick, were drowned when the ice jam broke and the flood trapped them in their car at the border five miles east of here.”

The information contained in the paragraphs below was obtained from Fort Fairfield’s Community Development Director/Floodplain Coordinator, Tony Levesque. This brief overview focuses on major outcomes and does not describe the challenges, setbacks, unanticipated expenses or the many complications that were encountered.

The deluge of 1994 affected approximately 130 single family homes and apartment units, and 43 businesses. Six of the homes were rendered uninhabitable. Most of the businesses and homes were located in and around the downtown on the south side of the river. Approximately 35 dwellings, two mobile home parks and an apartment building were located on the north side.

The Town teamed up with a number of federal, state and local agencies, as well as the Maine Congressional Delegation, to respond to the devastation. All parties worked hard and cooperatively on desired outcomes. The town hired a relocation coordinator and administrative assistant to help with the workload.

Actions included using a patchwork quilt of grant funds to develop a plan of action, move people out of the floodplain on the north side of the river, and build a dike to protect the downtown. By 1997, the Town had completed all of its prioritized purchases as outlined in the plan of action. On the north side of the river, several structures were elevated out of the floodplain. A number of people were relocated to one of two town-created subdivisions as well as other available properties in Fort Fairfield. A park and a boat ramp were established on the now-vacant floodplain properties. Acquisition and relocation costs totaled about \$2.95 million.

On the south side of the river, grant funds were used to construct a 2,100 foot dike in the year 2000 to protect the downtown. This involved purchasing property for the dike, establishing interceptors, gates and pump stations to manage sanitary waste, storm water, streams and ground water flowing from terrain above the downtown. During flooding events, gates are closed on storm drains that normally flow by gravity through the dike to the river so that water is diverted to the interceptor and discharged by high pressure pumps through the dike and into the river.

The dike has subsequently protected the town from a number of floods, including several that potentially would have been worse than the flood of 1994. Fort Fairfield’s efforts have resulted in the elimination of all 17 repetitive loss structures.

**Fort Kent Flood of 2008.** As reported in various newspaper and other accounts, between April 30 and May 1, 2008, heavy rains combined with snowmelt to create record flooding of the St. John and Fish Rivers. In Fort Kent, flood waters caused the evacuation of over 600 people and flooded many homes and businesses, an elderly apartment complex, and many roads including Routes 1 and 161.

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Five feet of water entered Fort Kent Housing, an apartment complex for senior and disabled residents. The century-old St. Louis Catholic Church, caught between the rushing waters of the two rivers, suffered extensive damage when three feet of water entered the church, ruining pews, carpeting, a new organ, furniture and electronics and filling the 10-foot basement. A 31-foot levee protecting a portion of the downtown was almost overtopped when flood waters reaching an elevation of 30.14 feet. Flood waters also came within a foot of the International Bridge connecting Fort Kent with New Brunswick, Canada. The sanitary sewer system stopped working when sewer collection pumps went offline.

The response to the disaster was immediate. The Red Cross, Border Patrol, State Police, Game and Fire Wardens, and Fire Department were on the scene to assist in the evacuation and provide support. Approximately 70 National Guard personnel assisted homeowners in the St. John Valley in cleaning out their homes and property and piling trash at the roadside to be picked up by town crews. Residents who did not suffer damage helped others to clean out their homes and cellars. Volunteer firefighters pumped water from the church (one cellar wall crumbled from the pressure of the water). Firefighters also used huge pump trucks to wash the mud and debris from East Main Street. Public Works Department employees removed a temporary gravel berm that had been created to stop the waters of Fish River from flooding the west side business district. Volunteers from outside the community came to help. Following initial cleanup efforts, five private homes and the senior housing complex were acquired and demolished through a combination of HMGP grant funds and private money.

**Probability of Occurrence:** Floods are described in local flood hazard studies in terms of their extent, including the horizontal area affected, and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different extents of flooding. The most widely adopted design and regulatory standard for floods in the United States is the 1-percent annual chance flood and this is the standard formally adopted by FEMA. The 1-percent annual flood, also known as the base flood, has a 1 percent chance of happening in any particular year. It is also referred to as the “100-year flood.” The probability of flooding of homes, commercial and governmental buildings and critical facilities located in flood-prone areas is 1% in any given year.

### Severe Winter Storms

Aroostook County has had severe frost and freeze-ups, extreme snowfall amounts, and ice jams. Maintaining heavy equipment, properly insulating pipes and mitigating water runoff issues are just a few of the things that are being done to reduce the effects of some of these storms.

Severe winter storms do not ordinarily have an immediate impact on flooding. They add to the snow pack, which in the January thaw or springtime can lead to rapid snowmelt, runoff and flooding. Ice jams can exacerbate flooding by temporarily blocking, then releasing, large volumes of water, often with disastrous downstream impacts.

Severe winter weather conditions are characterized by low temperatures, strong winds, and often large quantities of snow.

**Types of Severe Winter Storms in Maine.** A single winter storm may include one or more of the following:

- **Blizzard:** Sustained winds of 40 mph (miles per hour) or more or gusting up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening travel conditions.
- **Ice storms:** Rain which freezes upon contact. Ice coatings of at least one-fourth inch in thickness are heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages.
- **Northeasters:** Northeasters (or nor'easters) are extra-tropical coastal storms that can produce tremendous amounts of precipitation and strong winds. When the precipitation is in the form of snow, sleet or freezing rain, it can damage overhead utility lines and become a highway driving hazard.
- **Sleet storm:** Frozen rain drops (ice pellets) which bounce when hitting the ground or other objects, but in accumulated depths of two inches or more, produces hazardous driving conditions.
- **Heavy snow storm:** A snowfall of fifteen inches or more within 12 to 24 hours, which disrupts or slows transportation systems and the response time of public safety departments.

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Caribou - Jan. 2008

Photo courtesy of Vern Ouellette

Aroostook County is subject to severe winter storm events in the form of ice storms and blizzards, accompanied by high winds and flooding. Winter storms can threaten Aroostook County any time from November through April. The Gulf Stream follows a path up the eastern seaboard, bringing major storms with it to the Gulf of Maine. Air streams containing much colder air flow down from Canada and collide with the Gulf Stream over the New England region. Nor'easters, the most severe storms in Aroostook County, occur during the winter, spring and fall. They rarely develop during the summer.

Precipitation amounts can exceed several inches of water equivalent (20-30 inches of snow or more). Loss of electrical power and communication services can impede the response of ambulance, fire, police and other emergency services, especially to remote or isolated residents. Roads can become impassable as the result of snow accumulation and drifting. Business closings can occur due to road conditions and loss of power. Structural failures are possible as the result of snow loads on roofs. This is of particular concern with respect to older structures built prior to the advent of snow-load design standards. Heavy snow loads can also result in the formulation of ice dams on roofs, leakage and damage to building interiors.

**Location of Hazard.** The entire county is subject to severe storms every winter, but there have been a number of storms that have been worse than others.

**Location of Severe Winter Storm Impact areas.** The following is a summary of areas that are susceptible to severe winter storms, as identified in the Aroostook County Hazard Mitigation Planning Municipal Survey 2015 and subsequently modified in 2020 and 2021.

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### *To Be Updated*

**Allagash:** Due to warm ups ,we currently have early ice jams from the Allagash Bridge to the town line.

**Amity:** We don't have any ice jams, except frozen culverts. The power is out quite frequently.

**Aroostook Band of Micmacs:** Elders Housing in Littelton; Doyle Road Housing in Caribou; Spruce Haven in Caribou.

**Blaine:** Ice jam, dam at Robinson Pond.

**Bridgewater:** Route 1 Bridge by Fire Station-Ice Jam; Wicklow Place Senior Housing Complex; drifting Snow on many side roads and Route 1.

**Caribou:** All areas are susceptible to this type of event - , all areas of the Aroostook River.

**Castle Hill:** All the north/south roads are problems for blowing and drifting snow.

**Chapman:** West Chapman Road is a north/south road and is a problem for drifting and blowing snow.

**Crystal:** Severe winter storms are usually not an issue, except for power loss. Most major roads are state maintained, and Crystal has a local plow contractor to plow town roads. Residents are spread out over a large area in Crystal.

**Cyr Plantation:** Omer Dumond Road; Madore Road.

**Dyer Brook:** Town line road has many fields causing an enormous amount of drifting. However, we have road contracts for plowing. Therefore, we don't incur any extra expense for this drifting problem. We may however, have power outages.

**Eagle Lake:** Severe winter storms would affect those residents that reside on private roads around the lakes more than those on town or state roads.

**Fort Kent:** Ice jams occur on the St. John River at the mouth of the Fish River; also up river from the St. John River bridge.

**Grand Isle:** All areas in our community are subject to winter storms, flooding and power outages on a regular basis. Grand Isle has at many times been affected by winter storms, flooding and power outages. The Town continues on a regular basis to monitor for any potential weather events that may affect lives, homes, roads and power outages.

**Hamlin:** Hammond Brook and Martin Brook areas.

**Hodgdon:** Not had an issue with ice jams or power outages.

**Houlton:** Smyrna Street/Meduxnekeag Bridge for ice jams.

**Island Falls:** The downtown area is probably the most susceptible to severe winter storms, due to limited snow storage and narrow town street. The whole town is susceptible to power outages. The town has many elderly citizens with single source heating and no generators.

**Limestone:** A severe winter storm with power outages could potentially cause issues, as we are not equipped in our community with a large generator to set up a temporary shelter. Residents at the ends of dead end roads could be trapped due to heavy drifting of snow as we have a lot of open fields.

**Linneus:** Wind damage to buildings and power lines causing power outages.

**Littleton:** Any roads blocked have been handled within hours. We have not been plagued with ice for many years.

**Ludlow:** The western side of town has issues with power failures. The east is served by Houlton Water Company and seems fine.have severe drifting along the open fields. All the roads running north and south can experience problems from blowing and drifting snow and possible blockages. The entire town could be at risk for a power outage.



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**Mars Hill:** We have several roads that run in a north/south orientation that are susceptible to drifting snow during and immediately after severe winter weather. These roads include, but are not limited to West Ridge Road; East Blaine Road; Westfield Road East Ridge Road; Boyd Road and Kearney Road.

**Nashville:** None.

**New Sweden:** None, unless severe wind storm taking down trees

**Orient:** The town has had a number of power outages this year. We are small so this affects the whole town.

**Portage Lake:** We are part of the Fish River chain and experience fluctuations in water levels due to flowage into St. Froid lake.

**Presque Isle:** Severe winter storms affect the entire City of Presque Isle - power outages; ice jams on Presque Isle stream and Aroostook River.

**Reed Plantation:** The entire town is susceptible to power outages.

**Sherman:** Molunkus Stream - downtown area, Extract Road; North Street; Kilkenny Place (senior housing).

**St Agatha:** The entire town and especially the back settlements where there are farm fields with open space along the road.

**St. Francis:** The town has not had any issues with severe winter storms.

**St. John Plantation:** Route 161 - St. John River along Jalbert's Boat Landing; Berube flats, and the town line between St. John and St. Francis.

**Unorganized Territory:** Unorganized Territory to the west and south of Allagash - St. John; Big Black; Little Black, and Allagash Rivers (Ice Jams); E-Township - E-plantation Road (Power Outages).

**Wade:** Gardiner Creek is susceptible to ice jamming and flooding. Severe winter weather is a real hazard on the North Wade and Howe Roads as both are wide open and higher ground. So much drifting we have a very hard time keeping those two roads open in a severe storm.

**Wallagrass:** Strip Road and Sly Brook Road are susceptible to road closures with heavy wind drifts; Wallagrass stream with ice jams.

**Westfield:** All roads.

**Westmanland:** McCluskey Brook; Little Madawaska Rive. Power outages would impact entire town of Westmanland

**Weston:** The entire community is susceptible to power outages.

**Extent.** Total snowfall in Aroostook County typically ranges between 90 to 110 plus inches. The county's largest average seasonal snowfall totals from lengthy records are 116 inches per winter season in Caribou. January is usually the snowiest month throughout, with many stations averaging over 20 inches of snow during that month. December usually averages out to be the second snowiest month.

**Previous Occurrences.** Some of the most significant storms over the past 30 years are summarized in the table below.

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<b>Historical Summary of Major Winter Storms in Aroostook County</b>					
<b>Year</b>	<b>Month</b>	<b>Day</b>	<b>Estimated Damage</b>	<b>Type of Damage</b>	<b>Declaration</b>
1978	Jan	10	Unknown	Winter storm –snow, rain , ice	n/a
1993	Mar	13-14	Unknown	Winter storm	EM-3099
1998	Jan	5-25	\$1,496,635	Ice storm, power outages, loss of heat, refrigeration, sanitary services, forestry damages	DR-1198
2001	Mar	5-31	\$139,226	Severe winter storm	EM-3164
2003	Dec 02 –Jan 03	17 1	\$312,475	Severe winter conditions: frozen pipes	DR-1468
2003	Feb	2-4	\$345,182	Severe winter storm	EM-3174
2003	Dec	6-7	\$202,126	Severe winter storm	EM-3190
2003	Dec	14-15	Unknown	Severe winter storms and severe cold	EM 3194
2005	Feb	10-11	\$334,405	Severe winter storm	EM-3206
2005	Mar	9	\$498,000	Severe winter storm	EM-3209
2005	Dec	25-27	\$512,603	Severe winter storm	EM-3265
2010	Dec		TBD	Severe winter storms, widespread flooding	DR-1953
2017	Feb	13	Unknown	Statewide blizzard, winter storm	n/a
2017	Mar	14	Unknown	Statewide blizzard	n/a

**Probability of Occurrence.** No probability studies have been done, but Aroostook County’s location in the Northeast, and its long experience with winter storms, indicate that between November and April of every year, such storms will occur. The locations where such storms are the most intense will vary from year to year. Climate models suggest that Maine is likely to get more ice storms in the future because of warmer temperatures, but it is not known whether the severity of ice storms will be affected by warmer temperatures. If colder temperatures prevail, the precipitation will be in the form of snow.

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### Severe Summer Storms

Severe summer storms and hurricanes can have an immediate impact on flooding, primarily as a result of heavy downpours.

**Types of Severe Summer Weather Events in Aroostook County:** A severe summer weather event is a violent weather phenomenon producing winds, heavy rains, lightning, and hail that can cause injuries and destruction of property, crops and livestock. There are several different types of summer weather events in Aroostook County:

- **Hurricane:** An intense, tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center called the “eye.”
- **Lightning:** An electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lighting appears as a “bolt.” This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling causes thunder.
- **Thunderstorm:** A storm formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm or cold front. All thunderstorms have lightning and can occur singly, in clusters or in lines.
- **Tornado:** A violently rotating column of air extending downward from a thunderstorm to the ground. The distinctive, slender, funnel shaped cloud, with wind velocities up to 300 miles per hour at the central core, destroys everything along its narrow ground path.
- **Microburst.** A small, extremely intense downdraft which descends to the ground creating strong wind divergence. Microbursts are typically limited to areas less than 2.5 miles across. This weather phenomenon is capable of producing damaging surface winds in excess of 100 mph. Generally, a microburst event will last no longer than 15 minutes.



Microburst in Fort Kent – 2008



Photos courtesy of John Bannen

Aroostook County is subject to summer storms. During summer months, southwest to southerly winds become quite prevalent. When severe summer storms arrive, high winds

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can fell trees and branches onto power lines, causing power and communication outages. Heavy rains that often accompany thunderstorms can result in flash flooding or erosion. Lightning strikes can start fires. Any of these weather events can cause personal injury or property damage.

The impact of summer storms in Aroostook County is usually restricted to flooding and erosion caused by the large amounts of moisture these storms can carry, as well as downed power lines and tree branches.

**Location of Hazard.** All of Aroostook County is vulnerable to one or more severe summer storms each year, usually in the form of thunderstorms. The following is a summary of areas that are susceptible to severe summer storms, as identified in the Aroostook County Hazard Mitigation Planning Municipal Survey 2015 and subsequently modified in 2020 and 2021.

### *To Be Updated*

**Amity:** All of the above town roads, have debris that has to be cleared after severe storms.

**Allagash:** Walker Brook Road and Inn Road.

**Aroostook Band of Micmacs:** Spruce Haven in Caribou; Doyle Road in Caribou; housing in Connor.

**Blaine:** All major areas on E Plantation Road and Kinney Road.

**Bridgewater:** Route 1 Bridge by Fire Station; Wicklow Place Senior Housing Complex.

**Caribou:** All areas are susceptible to this type of event, both rural and urban.

**Castle Hill:** Portions of MacDonald Road and Richardson Road are heavily wooded areas that are problems during summer storms.

**Chapman:** The area of Littlefield Road is a hazard in summer storms.

**Crystal:** Residents are spread out over a large area so most storms will affect only a small amount of people.

**Cyr Plantation:** Madore Road.

**Dyer Brook:** Tree removal is a necessary expense to the taxpayers of Dyer Brook

**Eagle Lake:** All areas listed in the flooding section are susceptible to severe summer storms and power outages.

**Fort Kent:** In the event of spring flooding, Quigley's Lumberyard; the Blockhouse picnic area and Riverside Park are areas that may need debris removal.

**Grand Isle:** Homes, businesses and roads are subject to storms and power outages that may affect the residences and businesses. Grand Isle is so close to the St. John River that those effects may involve many of the community residents and businesses. Road safety is also a concern.

**Hodgdon:** Areas susceptible to downed trees and debris removal: Summer roads located on Westford Hill; Horseback Road; South McIntyre Road.

**Hamlin:** Albert Cyr Road; Fournier Road; Leon Cyr Road; Jovin Road.

**Island Falls:** Intown area due to concentrated housing and narrow streets.

**Limestone:** Severe summer storms could cause flooding within our community. Many of our roads are rural with timber on both sides that could fall in the roadway. Culverts and ditches can become blocked with debris. Power outages could also cause issues for citizens in our community. Some specific areas:

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- 1) Bog Road: wooded area approximately 3.5 miles from Route 1A: possible flooding concerns
- 2) Tardy Road: flooding concern, culvert crossing roadway
- 3) Long Road, approximately 1 mile east of Route 1A has flooded many times, as culvert is not large enough to handle water flow
- 4) Blake Road: Approximately 1/2 miles from Grand Falls Road (Rt. 227), Cross-road culvert in poor condition threatening road washout.

**Linneus:** Areas around Meduxnekeag and Nickerson Lakes.

**Littleton:** Debris removal has been handled satisfactorily by the town highway department. Local power outages depend on direction of storm

**Ludlow:** Western side of town.

**Mapleton:** The same areas that have problems in the winter are problems in the summer as well.

**Mars Hill:** Mountain Road has in the past been susceptible to downed trees.

**Nashville:** None.

**New Sweden:** Bondeson Road and Hedmen Road.

**Orient:** Most of the town. We are very rural and wooded.

**Portage Lake:** All of our municipality is supplied by power coming in from Ashland and when we have large scale storms the power is often lost.

**Presque Isle:** Summer storms can cause power outages, high winds have caused travel issues with downed trees in the roadway or getting hung up in power lines. For the most part power outages are localized and can affect the entire town with power outages. We have had trees come down on Mill Road.

**Sherman:** North Street; Gallison Road; Nason Road; Patterson Road.

**St. Agatha:** Properties along the lake, back settlements where culverts could wash out and limit access to the rest of town and delay emergency services.

**St. Francis:** On occasion, summer storms affect an area known as Sunset Drive due to its hilly terrain. Occasionally, flash flooding occurs on a few intermittent streams which connect to one brook that crosses Sunset Drive. Debris sometimes clogs three-foot culverts.

**St. John Plantation:** Route 161 - St. John River along Jalbert's Boat Landing, Berube flats, and the town line between St. John and St. Francis are areas that may need debris removal as a result of summer storms.

**Unorganized Territory:** Same as Flooding question.

**Wade:** Nothing major really for summer storms. Just the normal problems that would go along with power outages.

**Wallagrass:** Clark Brook Road; Sly Brook Road; Carter Brook Tote Road; Hillside Street; Michaud Road; Pond View Road; St, Antoine Road; Buggy Brook Road.

**Washburn:** Route 164 from Caribou to Presque Isle has had severe undercutting and ditch erosion from field runoff. Main Street has been flooded by field runoff.

**Westfield:** Young Lake Road; Miller Road; Egypt Road; Simpson Road.

**Westmanland:** With regard to power outages, would impact entire town of Westmanland.

**Weston:** There have been some recent damage from trees being blown down due to severe summer storms town wide.

**Extent.** The most damaging types of summer storms in Aroostook County are F1 tornados and microbursts with winds in excess of 100 miles per hour, and thunderstorms of more than an inch of rain per hour that can wash out roads and result in flash flooding. The table below provides information on various categories of tornados.

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### The Fujita Tornado Scale (abbreviated)

Maximum Wind Speeds	Tornado Category	Equivalent Saffir-Simpson Scale (for hurricanes)	Typical Effects
40-72 mph	F0	NA	Gale tornado; light damage to chimneys; breaks twigs and branches off trees; pushes over shallow-rooted trees; damages signboards; some windows broken.
73-112 mph	F1	Cat 1/2/3	Moderate tornado. Moderate damage: peels surfaces off roofs; mobile homes pushed off foundations or overturned; outbuildings demolished; moving autos pushed off roads; trees snapped or broken.
113-157 mph	F2	Cat 3/4/5	Significant tornado; considerable damage: roofs torn off frame houses; mobile homes demolished; frame houses with weak foundations lifted and moved; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
158-206 mph	F3	Cat 5	Severe tornado; severe damage: roofs and some walls torn off well-constructed houses; trains overturned; most trees in forests uprooted; heavy cars lifted off the ground and thrown; weak pavement blown off roads.
207-260 mph	F4	NA	Devastating tornado; devastating damage: well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and disintegrated; large missiles generated; trees in forest uprooted and carried some distance away.

**Previous Occurrences.** The following table summarizes the occurrences and estimated damages of hurricanes in Aroostook County going back to 1938. Historically, of all Maine’s natural hazards, hurricanes are the most likely to cause deaths. The impact will vary widely, depending on whether it strikes a rural or urban population.

Historical Summary of Hurricanes in Aroostook County					
Year	Month	Day	Statewide Estimated Damage	Type of Damage	Declaration
1976	Aug	9-19	“Belle” Aroostook	Flooding, Agricultural (potato) loss	SBA

**Probability of Occurrence.** There have been no probability studies to indicate the frequency of summer storms. However, Aroostook County’s location in the northeast, and its long experience with summer storms, indicate that each summer, summer storms will occur. The locations where such storms are the most intense will vary from year to year. The most severe forms of summer storms, hurricanes and tornadoes, occur very infrequently in Aroostook County.

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### Wildfire

Wildfire can have an impact on flooding, primarily by denuding the landscape which, in turn can lead to erosion and sedimentation. Sedimentation of streams and rivers can block the natural flow of water, resulting in flooding. In 2006, erosion and sedimentation from a logging operation caused minor flooding in Frenchville.

**Types of Wildfires in Aroostook County:** A wildfire is a fire that burns vegetative cover such as grass, timber, or slash. A wildfire is a natural phenomenon initially finding its origin in lightning. However, humans have become the greatest cause of wildfires in Maine. There are two types of wildfires:

- Wildland fires burn vegetative cover or forest fuel.
- Wildland Urban Interface fires are created where homes meet with highly volatile forest fuels.

Aroostook County is subject to wildfires. A wildfire in October, 1825, burned 3,000,000 acres in Maine and New Brunswick, Canada. A severe wildland fire occurred in October of 1947. This fire burned 205,678 acres statewide and caused 16 deaths.

Several demographic factors make Aroostook County's rural areas vulnerable to the threat of wildfires. Out-migration from rural areas often leaves an older, more vulnerable population and shrinking tax bases to fund local, usually volunteer fire departments. In Aroostook County, as in all of New England, the housing stock is also aging. When old farm homes and wood frame buildings are located in remote areas, it can be very challenging for volunteer fire fighters to respond before the structures are destroyed.

**Location of Hazard.** The Maine Department of Conservation, Forest Service Forest Protection Division tracks all reported fire occurrences in the State on an annual basis. These are coded by cause: campfire; children; debris burning – which can include backyard burning, incendiary (includes arson lightning, machinery, miscellaneous, railroad and smoking).

**Location of Wildfire Impact areas.** The following is a summary of areas that could be susceptible to wildfires, as identified in the Aroostook County Hazard Mitigation Planning Municipal Survey 2015 and subsequently modified in 2020 and 2021.

### *To Be Updated*

**Allagash:** We have many camps on the Walker Brook and Old School House Roads.

**Amity:** The Cone Road and Williams Road are private roads but there are several year round residents living there. These two roads are in the woods. We have camps and residents living on Monument and Suckertown Roads, both wooded areas. These are way back where the road is not maintained by the town.

**Aroostook Band of Micmacs.** Spruce Haven in Caribou.

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**Blaine:** All roads have homes that would be vulnerable.

**Bridgewater:** Properties located on Bell's Crossing, Packard Road, Kinney Road, Snow Road, to name a few.

**Caribou:** Powers Road; West Presque Isle Road; Bog Road; Bowles Road; Albair Road, most of our rural area is in wildfire area.

**Castle Hill:** Several Properties are located in the wildland urban interface.

**Chapman:** There are several homes built in the woods in Chapman.

**Crystal:** The whole town is susceptible to wildfire/forest fire. The town is rural and most homes are located on old farm land and forest land. There is limited access to water supplies in the event of fires.

**Cyr Plantation:** Omer Dumond Road.

**Dyer Brook:** We have 10 leased camp properties scattered around the wooded area.

**Fort Kent:** Some homes built in north/south Perley Brook and the top of Belon Hill are located within the forest that would be considered susceptible to wildfires.

**Grand Isle:** Many of the homes located close to the St. John river are susceptible to flooding and fires.

**Hodgdon:** Camps located on lower end of South Town Line Road by the State of Maine game reserve. Subdivision located off Skedgll Road.

**Houlton:** n.a.

**Island Falls:** Island Falls has Mattawamkeag Lake and Pleasant Pond. All of those areas are susceptible to wildfires. Cottages are close together, ground is kind of duffy making fire spread easily, access to some are limited to small hilly and winding roads not built for larger fire apparatus. Most of Island Falls population is a rural setting, some located on old farm land, others located in dense forest area. Some Homes are year round and some are seasonal.

**Limestone:** Much of our community is forest and agricultural land. Given the right conditions of the season could potentially cause wildfire. Our current water system for fire protection (hydrants) is only available within the MaineDOT compact zone. In the rural areas water has to be pumped from ponds, lakes, dry hydrants, or brought in by tanker truck.

**Linneus:** Areas around Meduxnekeag and Nickerson Lake; area in the southwest corner of the town. Access provided by private roads built for forest harvesting, now being used as access for recreation and seasonal homes (camps).

**Littleton:** Very few.

**Ludlow:** North edge of town.

**Mapleton:** The town had a Wildland Urban Interface assessment by the Maine Forest Service in 2005 and it is available for review.

**Mars Hill:** There are several homes located on the eastern slopes of Big Rock that could be susceptible to wildfire damage.

**Nashville:** None.

**New Sweden:** None.

**Orient:** Most of the town. We are very rural and wooded.

**Portage Lake:** Portage residents are surrounded by forest.

**Presque Isle:** We have year round and summer homes located around Echo Lake. A lot of these home are built within heavy wooded areas around the lake. We have other homes in the outlying areas that are built back off the roads and located in heavily wooded areas as well. These numbers are significantly less than the area around Echo Lake.

**Reed Plantation:** The entire town is rural in nature and thus susceptible to wildfire and forest fires.



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**St. Agatha:** We have a couple camps off of Plien Road with season camps in the woods.

**St. Francis:** 90% of the structures on the south side of Route 161 are built close to the tree line which is mostly softwood stands of either mature or natural softwood regeneration. Some properties may have hayfields or tall grass between the structure and the tree line which are susceptible to wildfire in the forest in the high risk months.

**St. John Plantation:** There are a few camps built in the woods that may be susceptible to wild fires.

**Sherman:** Town-wide - rural & heavily wooded. Thorne Road; Gardiner Street; Prairie Road; Station Road.

**Unorganized Territory:** Northern Maine Woods. Remote areas with structures throughout the Unorganized Territory.

**Wade:** We do have quite a few camps on Gardner Creek that are surrounded by woods that would have a problem if a wildfire would occur.

**Wallagrass:** 1st Wallagrass Lake region with camps as well as a few homes built out in the woods throughout the Town of Wallagrass.

**Washburn:** Not a major problem.

**Westfield:** Simpson Road; Miller Road; Egypt Road.

**Westmanland:** Little Madawaska Lake has only one access road.

**Weston:** The municipality has seasonal and year round homes on all four lakes in the area, most all of which could be susceptible to wildfire/forest fires. There are also a number of homes that are on non-waterfront private roads that are susceptible.

**Extent.** Aroostook County could be subject to wildfires. There was a major wildfire in Aroostook County in May 1992 that burned 1,150 acres. There were six separate wildfires in Aroostook County in October of 1994 which burned a total of 225 acres, but there have been no major wildfires (over 1,000 acres) since then. The most severe forest fire in the State of Maine’s recent history was in October, 1947, devastating 205,687 acres and causing 16 deaths. However, most of the damages were confined to Cumberland, Hancock, Oxford and York Counties.

**Previous Occurrences.** Historically, forest fires were one of the State’s most significant hazards. Maine averages about 700 low acreage forest fires annually. **However, in 2020, the Maine Forest Service responded to 800 fires, affecting close to 900 acres, as of July 25, 2020. The increase in the number of fires is due to widespread drought conditions.** Today, about 90% of all forest fires are caused by human activity, while 10% are caused by lightning. During dry periods, fire danger increases rapidly. The following table summarizes the most significant wildfires that have occurred in Aroostook County.

<b>Historical Summary of Major Wildfires in Aroostook County</b>					
<b>Year</b>	<b>Month</b>	<b>Day</b>	<b>Estimated Damage</b>	<b>Acreage</b>	<b>Declaration</b>
1992	May	19	Aroostook - Allagash	1,150	no

Based on information obtained from the Maine Forest Service, there have been no major fires in Aroostook County in recent years. All of the wildfires known to have occurred were confined to relatively small land areas.

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**Probability of Occurrence.** While probability studies have not been done, based on historical records of fires, the Maine Department of Conservation, Maine Forest Service, Forest Protection Division, anticipates that there will be between 600 and 700 low acreage fires (from all causes) each year. However, using the last three years of fire records, the probability of a major wildfire statewide is once a decade.

<b>Assessing Vulnerability: Overview</b>	
<b>Requirement §201.6(c)(2)(ii):</b> (The risk assessment shall include a) description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions	
<b>Elements</b>	B3. Is there a description of each identified hazard’s impact on the community as well as an overall summary of the community’s vulnerability for each jurisdiction?
	B4. Does the Plan address NFIP insured structures within each jurisdiction that have been repetitively damaged by floods?
	D1. Was the plan revised to reflect changes in development?

### A. Vulnerability of Aroostook County to each hazard

- **Flooding.** Some of the county’s most serious flooding has been in areas where there are residential and/or commercial structures including along the Aroostook River and St. John River. With the exception of the aforementioned areas, most of the developed areas in Aroostook County are located outside of designated flood plains, and are thus not very vulnerable to flooding. On the other hand, much of the county is very rural in nature, and is served by a network of rural roads that do not have proper storm drainage systems. These roads are very vulnerable to flooding caused by heavy downpours and/or the blockage of drainage systems by ice or debris, even though these roads may not be in an identified flood plain.
- **Severe Winter storms.** Aroostook County’s location in Northern New England places it in a high-risk area for winter storms. While the majority of winter storms in Aroostook County occur during the winter season of December through March, there are occasional winter storms in the late fall (November and early December) and in the spring (March – April). However, the severity of storms is typically most serious in

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January and February, with storms in the earlier and later parts of the seasons usually being of lesser magnitudes.

The time of day at which storms occur is also important, as overnight storms allow for the closure of schools, and businesses, whereas storms during the day force people to travel home during storm conditions. Based on past experience, storms are most likely to occur overnight or during the morning, but afternoon storms are still somewhat likely.

A major blizzard of the severity that occurred in 1998 would impact nearly all of Aroostook County and threaten the overhead electric and telephone lines. Roads may be closed due to washouts and debris in roads from trees and utility lines.

As noted earlier in this Assessment, Aroostook County has been included in a number of Presidential Disaster Declarations for winter storms. Aroostook County contains at-risk populations that could be impacted by a major winter storm.

- **Severe Summer Storms.** The entire county is vulnerable to thunderstorms, microbursts, and high winds. During the summer months, southwest to southerly winds are prevalent in the county. Severe high winds generally fell trees and branches onto power lines, causing power and communication outages. Heavy rains usually result in flash flooding or erosion. As previously noted, there have been more occurrences of severe summer storms in recent years.
- **Wildfires.** The western part of Aroostook County is heavily forested, and could be vulnerable to forest fires. However, all of the organized municipalities in Aroostook County are served by capable fire departments. The Maine Forest Service has been very active in forest fire prevention activities, and, through meetings convened by the Aroostook County Emergency Management Agency, meets periodically with municipal fire chiefs on matters related to wildfire prevention and response activities.

The western part of Aroostook County consists of large forests with no homes. Well-distributed rainfall normally reduces forest fire risks, but seasonal variations, rapidly draining soils and unusually dry periods can induce major blazes. In addition, insect damage (such as the hemlock woolly adelgid and spruce budworm) diseases, severe weather, and residential and commercial developments in wooded areas can greatly increase the potential for catastrophic fires. Over time, a considerable fuel supply can accumulate from the ignitable slash of some logging operations and/or from dead trees left standing on the forest floor after insect infestations.

### B. Impacts of each hazard on Aroostook County

- **Flooding.** In addition to damages to residential and commercial structures in some locations, the typical damages resulting from flooding in Aroostook County include damages to roads and their respective drainage systems. Historically, flood damages have included partial or complete road washouts, as well as severe erosion of roadside ditches, resulting in hazards to motorists if their vehicles go off the road. In

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some cases, entire communities have been partly or completely isolated because the only road serving the town has been damaged by floods.

- **Severe Winter Storms.** The impacts of severe winter storms include road closures (and the subsequent inability of emergency vehicles to provide help), the loss of power for extended periods of time, high costs to local governments for snow removal efforts, and loss of income to businesses and individuals due to business closures. Roof collapses, both residential and commercial, are rare but they can occur when snow loads become extreme.

The snow pack makes an important contribution to both surface and groundwater supplies, and years with a low snow pack can lead to water shortages by late summer. Melting of the snow pack in March and April is usually gradual enough to prevent serious flooding. However, in Aroostook County, when melting snows combine with rainstorms, the volume of water can overwhelm watersheds, ditches and culverts, leading to road and property damages. Such was the case in 2008, when major flooding resulted in Disaster Declaration DR-1755.

- **Severe Summer Storms.** The damages from summer storms typically involve the washout of roads, downed utility lines and debris clearance. If severe enough, this could result in the loss of income to businesses and individuals due to business closures.
- **Wildfires.** The primary impacts include damages to homes located in the wildland-urban interface and loss of valuable timberland. A larger percentage of homes in rural towns are located in the wildland-urban interface than homes in village areas. The western part of the county includes vast tracts of forestland that could be damaged by wildfires.

**Repetitive Loss Properties.** The following table represents repetitive loss properties in Aroostook County. Privacy laws prohibit reporting any more information than is shown below. The NFIP definition of a repetitive loss property is any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling 10-year period since 1978.

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<b>Repetitive Loss Properties</b>				
<b>Town/City</b>	<b>Residential Structures</b>		<b>Non-Residential Structures</b>	
	<b># Properties</b>	<b># Losses</b>	<b># Properties</b>	<b># Losses</b>
Eagle Lake	3	6		
Easton	1	2		
Fort Kent	3	7	1*	7
Island Falls	1	2		
Oakfield	1	2		
Sherman	1	2		
Wallagrass	1	2		

\*This property is a Severe Repetitive Loss (SRL)

Source: NFIP Program 10/23/2020

Mitigated repetitive loss properties include Fort Fairfield (11 residential and 5 non-residential properties) and Fort Kent (1 residential and 3 non-residential properties).

Aroostook County Flood Insurance Information as of 10/22/2020, according to information obtained from the State NFIP Coordinator, includes:

- Number of policies: 165
- Total coverage: \$27,967,200
- Total premium: \$148,084
- Claims since 1978: 378
- Total claims: \$4,713,169
- CRS: Fort Fairfield is a class 7, saving policy holders 15% on all policies in the SFHA.:

### Assessing Vulnerability: Identifying Structures

The Hazard Mitigation **Planning** Team identified existing buildings, infrastructure and critical facilities located within the County and the hazards to which these facilities are susceptible.

A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in Aroostook County, or fulfills important public safety, emergency response, and/or disaster recovery functions. The critical facilities in Aroostook County are municipal offices, fire, police stations, town garages, hospitals and clinics, water and waste water treatment facilities, and hazardous material sites.

#### A. Vulnerability of existing buildings, infrastructure, and critical facilities

##### Flooding

- **Buildings.** Some of the county's most serious flooding has been in areas where there are residential and/or commercial structures.
- **Infrastructure.** Roads and their associated storm drainage systems are the most vulnerable category of infrastructure. Much of the county is very rural in nature, and is served by a network of rural roads that do not have proper storm drainage systems. These roads are very vulnerable to flooding caused by heavy downpours and/or the blockage of drainage systems by ice or debris.
- **Critical facilities.** Due to the varied topography within the county and the availability of higher elevation sites within all municipalities, nearly all critical facility structures are located outside of floodplains. Possible exceptions include some wastewater treatment plants, due to the need to locate these facilities at lower elevations.

##### Severe Winter Storms.

- **Buildings.** All buildings in Aroostook County are vulnerable to winter storms. Damages can include burst water pipes during power outages, interior water damages due to ice dams forming on roofs, and occasionally, roof collapses due to heavy snow loads.
- **Infrastructure.** Roads and their associated storm drainage systems are the most vulnerable category of infrastructure. They can become temporarily blocked due to heavy snow falling over a short period of time, or ice which can build on their surfaces. Water main breaks due to cold weather can also occur. Roads and their storm drainage systems can become blocked due to heavy snow and ice and debris such as tree limbs.
- **Critical facilities.** All critical facilities in Aroostook County are vulnerable to winter storms in the same manner that individual buildings are vulnerable. However, some of the critical facilities throughout the county have back-up generator systems which allow heating systems to continue operating during a power outage.

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### Severe Summer Storms.

- **Buildings.** All buildings in Aroostook County are vulnerable to summer storms. Damages can include debris like tree limbs; and from high winds, interior water damages due to wind- driven heavy rain.
- **Infrastructure.** Roads and their associated storm drainage systems are the most vulnerable category of infrastructure. They can become temporarily blocked due to heavy rain and debris over a short period.
- **Critical facilities.** All critical facilities in Aroostook County are vulnerable to summer storms in the same manner that individual buildings are vulnerable. However, some of the critical facilities throughout the County have back-up generator systems, which allow building systems to continue operating during a power outage.

### Wildfires

- **Buildings.** Buildings located in the wildland/urban interface are vulnerable to wildfires. Damages can include fire, smoke and water from fire-fighting efforts.
- **Infrastructure.** Power, phone and cable lines can be damaged during a wildfire. Roads and their storm drainage systems are much less vulnerable, although road access to certain areas can be blocked by fires and by emergency fire-fighting vehicles.
- **Critical facilities.** Wildfires in Aroostook County have tended to be relatively small, and have not been a threat to critical facilities. In the event of a very large wildfire, some critical facilities could be damaged by fire and smoke.

### B. Vulnerability of future buildings, infrastructure and critical facilities

There has been very little growth in Aroostook County in the last 10 years, and very little growth is expected during the next 10 years. Between 2010 and 2019, Aroostook County's population declined from 71,870 to 67,055, a loss of 4,815 people or 7%. There will be very few if any future buildings, infrastructure or critical facilities that will be vulnerable to the identified hazards.

### Flooding:

- **Buildings.** The municipalities in Aroostook County that are in the flood insurance program all have municipal shoreland zoning ordinances that generally prohibit the construction of residential, commercial and industrial structures in floodplains. Unlike other parts of the country, Maine does not experience the cycle of widespread flooding devastation in its floodplains, followed by intensive development pressures and subsequent rebuilding. Very little, if any growth is expected. Therefore, flooding of future buildings is not likely to be a serious issue in Aroostook County.
- **Infrastructure.** Future roads and their associated storm drainage systems would seem to be the most likely category of infrastructure that would be vulnerable to flooding. However, State and local road construction standards generally ensure that new roads are properly constructed with adequate storm

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drainage systems. Most if not all roads in the public domain must be designed by a registered professional engineer. Therefore, flooding of future roads is not likely to be a serious issue in Aroostook County.

- **Critical facilities.** Because of the requirements of the Flood Insurance Program, as well as shoreland zoning requirements and a greater awareness of flooding in all communities, future critical facilities will continue to be located outside floodplain areas. The exception may be wastewater treatment plants, due to the need to locate these facilities at lower elevations.

### Severe Winter storms

- **Buildings.** New buildings in Aroostook County will be less vulnerable to winter storms. Damages may include burst water pipes, but many newer buildings will be better insulated than older ones, thus being better able to retain heat during longer periods of time when there is a power outage. There will be less interior water damage due to ice dams forming on roofs because the roofs of newer buildings generally are properly vented, which allows the roofs to remain cold. Roof collapses due to heavy snow loads will be very rare because newer roofs are designed to withstand heavy snow loads.
- **Infrastructure.** Roads will continue to be the most vulnerable category of infrastructure. New roads can be just as easily blocked on a temporary basis due to heavy snowfall, ice building up on the road surface, and debris such as tree limbs accumulating on the road surface during a storm event. However, it is unlikely that Aroostook County will experience much new road construction, with the possible exception of small road segments serving subdivisions.
- **Critical facilities.** Future critical facilities in Aroostook County will be vulnerable to winter storms in the same manner that individual buildings will be vulnerable. However, some of them will have back-up generator systems which will allow heating systems to continue operating during a power outage.

### Severe Summer Storms

- **Buildings.** New buildings in Aroostook County will be less vulnerable to summer storms. There may be damage to roofs, windows, and electrical during a severe summer storm. However, new roofs are designed to withstand high winds and heavy rain.
- **Infrastructure.** Roads will continue to be the most vulnerable category of infrastructure. New roads can be just as easily blocked on a temporary basis due to heavy rainfall, water building up on the road surface, and debris such as tree limbs accumulating on the road surface during a summer storm event. However, it is unlikely that Aroostook County will experience much new road construction, with the possible exception of small road segments serving subdivisions.
- **Critical facilities.** Future critical facilities in Aroostook County will be vulnerable to summer storms in the same manner that individual buildings will be vulnerable.



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### Wildfires

- **Buildings.** Future buildings located in the wildland/urban interface may be vulnerable to wildfires. Damages can include fire, smoke and water from fire-fighting efforts. However, given the very low growth rate projected for Aroostook County, there will not be many new buildings located in the wildland/urban interface.
- **Infrastructure.** Future power, phone and cable lines can be damaged during a wildfire, although the level of future **development** is expected to be minimal, primarily because of the very low growth rate projected for the county.
- **Critical facilities.** Future critical facilities may be vulnerable to a very large wildfire. However, the expectation is that there will be very few new critical facilities constructed during the life of this plan.

The Maine Forest Service's (MFS) Forest Protection Division provides forest fire protection services for all of Maine's forest lands. MFS' goals are to keep the number of forest fire starts to less than 1,000 and annual acreage loss to less than 3,500. Since 2002, MFS has met those goals because of:

- Quick and effective initial attack on all fires;
- Effective air detection and aerial suppression;
- Modern forest fire-fighting equipment;
- Strong emphasis on fire prevention, including state control of statewide burning permits;
- Aggressive training and preparation;
- Improved access to remote areas of the state;
- Northeast Forest Fire Compact membership, providing resources during periods of high fire danger;
- Proactive public information campaigns;
- Law enforcement; and
- Extensive automated weather stations providing accurate daily information used to assist in planning fire operations.

In 2001, the MFS developed a Wildland Urban Interface Committee. This committee was assigned the responsibility of assessing the risk of wildfire to homes within and near forested areas. MFS has printed and distributed brochures and has developed public service announcements alerting homeowners to the potential threat of wildfire in interface areas and what they can do to limit their exposure to the threat of wildfires. MFS has also partnered with the National Park Service to deliver software that can determine risk in Maine communities.

MFS has also launched a community assessment program aimed at focusing its fire prevention efforts on geographical areas of the state with relatively high occurrences of wildfires. The assessment involves working with local officials and the public to identify vulnerable homes in the urban/wildland interface. MFS then prepares a community wildfire protection plan that contains guidelines that

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homeowners can use to protect their homes. The emphasis is on maintaining a 30-foot defensible space around homes.

### County Asset Inventory

The following chart identifies the type and number of critical facilities in each **municipality** in Aroostook County.

### Needs to be updated

	Town Office	Fire/Rescue	Police	Public Works, Salt/Sand	State Highway Maintenance Lots	Hospital/Health	Sewage Treatment	Water Supply	Dams
Allagash	X	X							
Ashland	X	X	X	X	X	X	X	X	X
Bancroft									
Blaine	X			X			X	X	X
Bridgewater	X	X		X		X			
Caribou	X	X	X	X	X	X	X	X	X
Castle Hill									
Caswell	X			X					X
Cyr Plt.				X					X
Dyer Brook	X								
Eagle Lake	X	X		X			X	X	
Easton	X	X		X					X
Fort Fairfield	X	X	X	X	X	X	X	X	X
Fort Kent	X	X	X	X	X	X	X	X	
Frenchville	X	X		X	X				
Grand Isle	X			X			X		
Haynesville	X	X							
Hodgdon	X	X							X
Houlton	X	X	X	X	X	X	X	X	X
Island Falls	X	X						X	X
Limestone	X	X	X	X		X	X	X	X
Littleton	X	X		X					
Madawaska	X	X	X	X	X	X	X	X	
Maliseets, Houlton Band									
Mapleton	X	X		X			X		X
Mars Hill	X	X		X	X	X	X	X	X
Masardis	X	X							X

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	<b>Town Office</b>	<b>Fire/Rescue</b>	<b>Police</b>	<b>Public Works, Salt/Sand</b>	<b>State Highway Maintenance Lots</b>	<b>Hospital/Health</b>	<b>Sewage Treatment</b>	<b>Water Supply</b>	<b>Dams</b>
Monticello	X	X							
New Canada	X								
Oakfield	X	X		X	X				
Oxbow Plt.									
Perham	X			X					
Portage Lake	X	X		X					
Presque Isle	X	X	X	X	X	X	X	X	X
Saint Agatha	X	X		X					
Stockholm	X	X							
Unorganized Territory									
Van Buren	X	X	X	X	X	X		X	
Wade									
Wallagrass	X								
Washburn	X	X	X			X			X
Westfield	X								X
Weston	X								
Winterville Plt.	X								
Woodland	X			X	X				