2024 Hazard Mitigation and Floodplain Management Plan Update

Town of Foster, Rhode Island

Adopted: date

Dates Active: date 2024 – date 2029

Prepared for:

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FAIRWEATHERSCIENCE

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Acronyms/Abbreviations	
BF	Brushfire
BRIC	Building Resilient Infrastructure and Communities
CC	Climate Change
CFR	Code of Federal Regulations
CMI	Crop Moisture Index
CRS	Community Rating System
DF	Dam Failure
DMA 2000	Disaster Mitigation Act Of 2000
DT	Drought
EC4	Rhode Island Executive Climate Change Coordinating Council
EF Scale	Enhanced Fujita Scale
EQ	Earthquake
EXT	Extreme Temperatures
FEMA	Federal Emergency Management Agency
FL	Flooding
FMA	Flood Mitigation Assistance Program
FPS	Foster Preservation Society
g	gravity
HAZUS-MH	HAZUS-Multi Hazard GIS tool from FEMA
HHPD	High Hazard Potential Dam
HL	Hail
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HM&FMP	Hazard Mitigation and Floodplain Management Plan
HMPC	Hazard Mitigation Planning Committee
HW	High Winds
IS	Ice Storm
LT/TS	Lightning/Thunderstorms
MAP	Mitigation Action Plan
MMI	Modified Mercalli Intensity Scale
mph	miles per hour
MRP	Municipal Resiliency Workshop
NCEI	National Centers for Environmental Information
NE	Nor'easter

Acronyms/Abbreviations	
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Park Service's National Register of Historic Places
NSSL	National Severe Storms Laboratory
NWS	National Weather Service
PDI	Palmer Drought Index
PGA	Peak ground acceleration
RIDEM	Rhode Island Department of Environmental Management
RIEMA	Rhode Island Emergency Management Agency
RIHPHC	Rhode Island Historical Preservation & Heritage Commission
RIIB	Rhode Island Infrastructure Banks
SS	Snow Storm
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act
TC	Hurricane/Tropical Cyclone
TO	Tornado
Town	Town of Foster, Rhode Island
USGS	United States Geologic Survey

EXECUTIVE SUMMARY

The 2024 Town of Foster Hazard Mitigation and Floodplain Management Plan (HM&FMP) is a product of the Town of Foster Hazard Mitigation Planning Committee (HMPC). It has been approved by the Foster Town Council, the Rhode Island Emergency Management Agency (RIEMA), and the Federal Emergency Management Agency (FEMA) in accordance with the Disaster Mitigation Act of 2000.

The purpose of hazard mitigation planning is to reduce or eliminate long-term risk to people and property from natural hazards. This plan was prepared following the requirements of the Disaster Mitigation Act of 2000 so that the Town would be eligible for FEMA's Hazard Mitigation Assistance (HMA) grant programs and other federal programs.

The HMPC's overview of past natural hazard events verifies that the Town is still vulnerable to diverse natural hazards including flooding, high winds, snow storms, and ice. This Plan provides a description of the hazard, historical events, vulnerable locations, the extent (magnitude and severity) of the hazard, past and potential impacts of events, probability of future occurrence, and future conditions due to climate change.

In recognition of the Town's current and projected future vulnerability to flooding, the Town opted to intensify their focus on flooding within this HMP Update. Further, as the Town is in the process of participating in FEMA's Community Rating System (CRS) program, it was advantageous to integrate CRS Activity 510 - Floodplain Management Planning in the HMP Update.

As such, this document was developed according to the FEMA's updated Local Mitigation Planning Guidance and the CRS Activity 510 Planning Process (Floodplain Management Plan) into a single plan that meets the goals, intent, and requirements of each program.

The risk assessment portion of the Plan confirms that the Town has may assets vulnerable to natural hazard events. Some vulnerable assets include roads prone to washout, communication equipment, critical municipal hazard response facilities, dams, and historic resources.

The HMPC established the following goals for the 2024 HM&FMP Update:

1. Implement actions which protect the lives and property of Foster's residents.
2. Implement actions which protect Foster's critical facilities and infrastructure
3. Implement actions which protect Foster's cultural, historical, natural, and economic resources.

The 2024 HM&FMP Update establishes a series of specific mitigation strategies that were developed collaboratively with the intent to meet the identified mitigation goals. These strategies provide a basis for continued planning to develop specific action plans. These actions will be implemented over time and can provide a means to measure progress towards hazard reduction. The Plan also describes future update and maintenance procedures.

Participating Jurisdiction(s): Town of Foster, Rhode Island

Year HM&FMP Completed: 2024

Executive Summary Snapshot

	Estimated Losses								
	# of CF	**$ of CF**	**# of People**	**# of Residences**	**$ of Residences**	**Extent**	**Probability**	**Level of Concern**	**Priority Mitigation Actions:**
High Winds	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Highly Likely	High	
Nor'easter	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Likely	High	
Hurricane	1	unknown	12	5	$2,400,000	Limited	Possible	High	
Snow Storm	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Highly Likely	High	
Ice Storm	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Likely	High	
Drought	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Likely	Medium	
Brushfire	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Likely	Medium	
Extreme Temperatures	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Likely	Medium	
Lightning/ Thunderstorms	107^	$58,479,634	4,469	1,836	$858,188,628	Limited	Highly Likely	Medium	
Hail	107^	$58,479,634	4,469	1,836	$858,188,628	Negligible	Possible	Low	
Tornadoes	107^	$58,479,634	4,469	1,836	$858,188,628	Negligible	Possible	Low	
Earthquake	107^	$58,479,634	4,469	1,836	$858,188,628	Negligible	Possible	Low	
Flooding	1^	$12,650,725	112	46	$21,501,458	Limited	Likely	Medium/ High	

Executive Summary Snapshot

	Estimated Losses								
	# of CF	$ of CF	# of People	# of Residences	$ of Residences	Extent	Probability	Level of Concern	Priority Mitigation Actions:
Dam Failure	7^	$4,949,746	25	10	$5,141,653	Significant	Possible	Low	

^ number does not include number of roads in Foster

FEMA APPROVAL LETTER

PLAN DISTRIBUTION LIST

The Town of Foster's 2024 Hazard Mitigation and Floodplain Management Plan Update is distributed to:

- Town of Foster
- Rhode Island Emergency Management Agency (RIEMA)
- Federal Emergency Management Agency (FEMA)

RECORD OF CHANGES

Hazard Mitigation Plans should be continually updated as circumstances change, new data becomes available, hazards are mitigated, etc. This Record of Changes Table is included to summarize and document changes to this document as they are made throughout time.

Change ID	Description of Changes	Date
01	Updated August 2018 Town of Foster HMP Update to include a Floodplain Management Plan	XX

1. PLAN INTRODUCTION AND BACKGROUND

Hazard mitigation planning is required under the Disaster Mitigation Act of 2000 (DMA 2000) which identified the need for Tribal, Local, and State jurisdictions to coordinate mitigation planning and implement mitigation efforts. It also provided the legal basis for the Federal Emergency Management Agency's (FEMA) mitigation plan requirements for mitigation grant assistance.

1.1 Plan Purpose

The purpose of the Hazard Mitigation and Floodplain Management Plan (HM&FMP) is to set forth guidelines of short-term and long-term actions, which will reduce the actual or potential loss of life and/or property from hazardous events such as high winds, hurricanes and nor'easters, ice storms, snow storms, lightning, brushfires, drought, and extreme temperatures. This Plan was constructed using input from a variety of municipal and private stakeholders and the general public involved in the planning process. This Plan serves as guidance to help the Town reduce their losses and vulnerabilities relating to natural hazards.

The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).

In CRS communities, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community's efforts that address the three goals of the program:

1. Reduce and avoid flood damage to insurable property
2. Strengthen and support the insurance aspects of the National Flood Insurance Program
3. Foster comprehensive floodplain management

1.2 Hazard Mitigation and Benefits

Hazard mitigation planning consists of a series of actions taken to identify specific areas that are vulnerable to natural and human-caused hazards within a town and seek to permanently reduce or eliminate the long-term risk to human life and property. It coordinates available resources and identifies community policies, actions, and tools for implementation that will reduce risk and the potential for future losses town wide. The process of natural hazard mitigation planning sets clear goals, identifies appropriate actions, and produces an effective mitigation strategy that can be updated and revised to keep the plan current. In short, 'it's where we were, where we are and where we're going' in terms of hazard mitigation.

States and communities across the country are slowly, but increasingly, realizing that simply responding to natural disasters, without addressing ways to minimize their potential effect, is no longer an adequate role for government. Striving to prevent unnecessary damage from natural disasters through proactive planning that characterizes the hazard, assesses the community's vulnerability, and designs appropriate land-use policies and building code requirements is a more effective and fiscally sound approach to achieving public safety goals related to natural hazards.

With an approved HMP, local governments are eligible to apply for FEMA Hazard Mitigation Assistance (HMA) grants, of which some do not require a disaster declaration to distribute funds.

The purpose of this Plan is to recommend actions and policies for the Town of Foster to minimize social and economic loss and hardships resulting from natural hazards. These hardships include the loss of life, destruction of property, damage to critical infrastructure and critical facilities, loss/interruption of jobs,

loss/damage to businesses, and loss/damage to significant historical structures. Natural hazard events that affect Foster include high winds, crippling snow storms, and heavy rain. To protect present and future structures, infrastructure, and assets and to minimize social and economic hardships, the Town of Foster implements the following general actions and policies:

- Revisions to the Town's Comprehensive Plan.
- Incorporation of hazard mitigation into the site plan review process.
- State and local building code review.
- Public education/outreach.
- Post-disaster recovery opportunities/strategies.

The Town of Foster also recognizes the important benefits associated with hazard mitigation, its interaction with municipal land use and infrastructure planning, and the need for a comprehensive planning approach, which accommodates these interdependencies. Foster's Comprehensive Plan (2022) addresses natural and cultural resources, land use, housing, services and facilities, traffic circulation, open space, economic development, and future development trends. While the entire Hazard Mitigation Plan will not be formally incorporated into the Comprehensive Plan updates, certain, applicable mitigation actions will be incorporated during the update process. The Town recognizes coordination between the Hazard Mitigation Plan and the Comprehensive Plan to be of benefit because it will ensure a unified planning approach into the future and ensure that risk reduction remains a critical element of municipal planning. This is also in alignment with current goals of Rhode Island Statewide Planning which requires a natural hazards component to be included in the Comprehensive Plan.

A second benefit of hazard mitigation allows for a careful selection of risk reduction actions through an enhanced collaborative network of stakeholders whose interests might be affected by hazard losses. Working side by side with this broad range of stakeholders can forge partnerships that pool skills, expertise, and experience to achieve a common goal. Proceeding in this manner will help the Town ensure that the most appropriate and equitable mitigation projects are undertaken.

A third benefit of hazard mitigation would be endorsing a proactive planning approach focused on sustainability, whereby the Town of Foster could minimize the social and economic hardships that have resulted from the occurrence of previous natural disasters. These social and economic hardships include: the loss of life, destruction of property, interruption of jobs, damage to businesses, and the loss of historically significant structures and facilities. This proactive planning approach would look for ways to combine policies, programs, and design solutions to bring about multiple objectives and seek to address and integrate social and environmental concerns. Linking sustainability and loss reduction to other goals can provide a framework within the state and local governments that will bring the comprehensive planning process full circle.

Lastly, participation in a hazard mitigation planning process will establish funding priorities. The formal adoption and implementation of this HM&FMP will allow the Town of Foster and its residents to become more involved in several programs offered by FEMA including: the Community Rating System Program (CRS); the Building Resilient Infrastructure and Communities (BRIC); the Flood Mitigation Assistance Program (FMA); and the Hazard Mitigation Grant Program (HMGP). Money spent today on preventative measures can significantly reduce the cost of post-disaster cleanup tomorrow.

1.3 Hazard Mitigation & Floodplain Management Plan Layout Description

The Town of Foster's 2024 HM&FMP Update consists of the following sections and appendices:

- **Section 1- Plan Introduction and Background**

  Defines what a HM&FMP is and its benefits. Provides Foster's general history and background, including historical trends for population, the demographic and economic conditions that have shaped the area, as well as the government and leadership within the Town.

- **Section 2- Planning Process**

  Describes the planning process for the HM&FMP update, identifies the Hazard Mitigation Planning Committee (HMPC) members, lists the meetings held as part of the planning process, and lists the key stakeholders within the surrounding area. This section documents public outreach activities performed by the Town of Foster (support documents are in Appendix E); including document reviews and relevant plans, reports, and other appropriate information data utilized for HM&FMP update development.

- **Section 3- Risk Assessment**

  Describes the process through which the HMPC identified, screened, and selected the hazards for profiling in this version of the HM&FMP Update. The hazard analysis includes the nature of the hazard, previous occurrences (history), location, extent, and impact of past events, and future event recurrence probability for each hazard. The influence of climate change is also discussed within each hazard profile.

  Identifies the Town's potentially vulnerable assets—people, critical facilities, critical infrastructure, and residential and non-residential buildings. The resulting information identifies the full range of hazards that the Town could face and the potential damages, economic losses, and social impacts. Land use and development trends are also discussed.

- **Section 4- Programmatic Capabilities**

  This section lists the Town's policies, programs, available resources, and governmental authorities. State programs, National Flood Insurance Program (NFIP), and zoning ordinances are discussed.

- **Section 5- Mitigation Strategy**

  Defines the Town of Foster's mitigation strategy which provides a blueprint for reducing the potential losses identified in the vulnerability analysis.

  The HMPC developed a list of specific mitigation goals and potential actions to address the risks in Foster. Mitigation actions include structural projects, emergency services, natural resource protection strategies, property protection techniques, preventive initiatives, and public information and awareness activities. The status of mitigation actions identified in the 2018 HMP are provided.

- **Section 6- Plan Maintenance**

  Describes the formal Plan maintenance process to ensure that the HM&FMP remains an active and applicable document. This section includes an explanation of how the HMPC intends to organize their efforts to ensure that updates and revisions to the HM&FMP occur in an efficient, well-managed, and coordinated manner.

- **Section 7- Plan Update**

  This section describes hazard events that have occurred and changes in development since 2018;

changes in mitigation priorities; and describes how the mitigation plan was integrated into other planning mechanisms.

- **Section 8- Plan Adoption**

  Describes the Town of Foster's adoption process of the HM&FMP Update. Supporting documentation can be found in Appendix D.

- **Section 9- References**

  Lists reference materials and resources used to update this HM&FMP.

- **Section 10- Appendices**

  Appendix A: Delineates federal, state, and other potential mitigation funding sources. This section will aid the Town of Foster with researching and applying for funds to implement their mitigation strategy.

  Appendix B: Provides the FEMA Local Mitigation Plan Review Tool, which documents compliance with FEMA guidelines.

  Appendix C: Provides the FEMA CRS Activity 510- Floodplain Management Planning Checklist, which documents compliance with FEMA guidelines for CRS credit.

  Appendix D: Provides the Town's adoption resolution.

  Appendix E: Provides public outreach information, including survey results.

  Appendix F: FEMA National Risk Index- Community Report for Census tract 44007013300 (Foster), Providence County, Rhode Island.

1.4 Planning Area

1.4.1 Background

The Town of Foster is comprised of 52 square miles which includes the villages of Hopkins Mills, Clayville, Moosup Valley, North Foster, and Mount Vernon in western Rhode Island. Foster is surrounded by the rural communities of Glocester, Scituate, and Coventry as well as the Town of Killingly, Connecticut, to the west.

The unique cultural landscape retains the image and feel of an earlier time of rural tranquility. The Town has many historic features including houses, farmsteads, stone walls, roads, and mill ruins. Originally covered in hardwood forests, Foster, by the early 19th century, was almost totally cleared, a result of both agricultural endeavors and forest processing industries. Today much of the land has reverted to forest, transected by both paved and unpaved roads. Most of these roads are lined with old stone walls, open fields, and woods.

1.4.2 History

From the 2022 Draft Comprehensive Plan:

"The recorded history of present-day Foster stretches back to the Archaic period (6,000 to 500 BCE) and it is

likely the land was used for game hunting and temporary camping as early as 8,300 BCE. Changes in climate and advances in technology through succeeding centuries allowed the Native American population to grow and transition from small hunter-gatherer groups to largely permanently settled tribes.

The Narragansett tribe was the dominant power in the area before the chartering of Rhode Island (1663) and continued to be so until its defeat in King Philip's War (1675- 1676). The conflict culminated with the spreading of European-originated diseases which significantly decreased the Narragansett population and the size of other local tribes, such as the Nipmuc who controlled the western half of present-day Foster.

Colonial settlement west from Providence's town center occurred steadily through the seventeenth century and the first building in Foster was constructed in the early 1700s. The continued growth in the outlands population was responded to in 1731 with the establishment of three towns from Providence's original land – Glocester, Scituate and Smithfield. The Town of Foster was incorporated out of Scituate half a century later, during the Revolutionary period. Local development continued into the nineteenth century and peaked in 1820, at which time the country's industrialization and territorial expansions west stunted Foster's economy and population until the 1960s.

It is not hard to view the entire town as an important and unique cultural landscape which retains the image and feel of an earlier time of rural tranquility and quietness. Although prosaic, this description is meaningful as these qualities are highly valued by Foster residents and often cited as a main reason for relocating to the community."

1.4.3 Demographics

The Town of Foster had slight decrease in population since the 2010 U.S. Census. The estimated population for the Town in 2020 is 4,469, which is a 3% decrease since 2010. Figure 1-1 shows the Town's historical population (1790-2020).

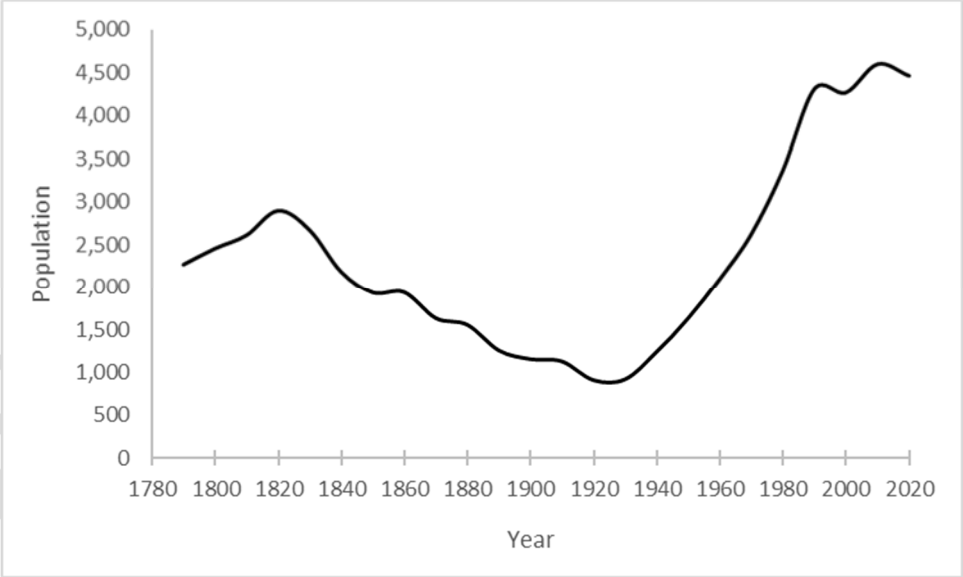


Figure 1-1 Town of Foster Historical Population (1790-2020)

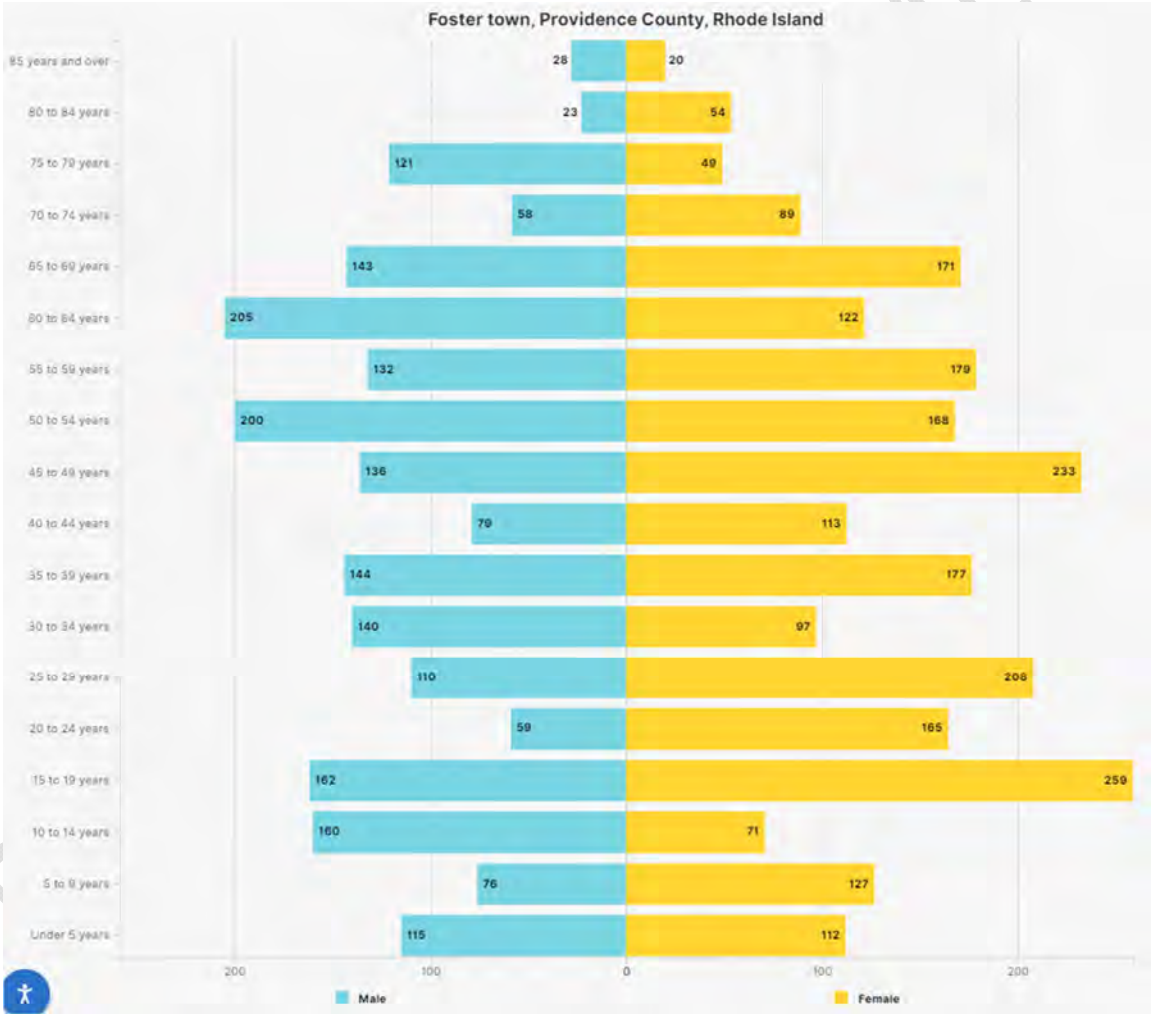
Table 1-1 provides demographic information based on the 2020 Decennial Census and the 2022 American Community Survey 5-year Estimates.

Table 1-1: Town of Foster Demographics

Total Population (2020)	4,469
Median Age	45
Employment Rate	68.7%
Total Housing Units	1,836
Total Households	1,427
Average Family Size	3.52
Median Household Income	$109,614
Bachelor's Degree or Higher	37.2%
Has Healthcare Coverage	97.1%

Source: US Census 2023

Figure 1-2 provides a detailed breakdown of the age and sex of Foster's residents.



Source: US Census 2023

Figure 1-2 2021 Town of Foster Population by Age and Sex

Generally, Foster residents have proven themselves as self-reliant and community oriented. Being largely rural, most households have back-up generators and wood burning stoves or fireplaces to make life more comfortable when the power goes out for days. According to members of the HMPC, residents often rely

on each other and neighbors before seeking assistance from local officials.

1.4.4 Government

The Town of Foster, as part of the Town of Providence, was founded in 1636 and incorporated as its own municipality on August 24, 1781. The Town operates under a Home Rule Charter adopted in 1976 that provides for a Town Council form of government with a five-member Council. Each Town Council member is elected at-large for a term of two years. The Council is led by a Town Council President, who is elected by the Town Council members. Per the Town Charter, the Town Council President "shall be recognized as the head of the Town government." The Town Council President works closely with the Town Clerk, who is also an elected official. The Town Clerk is the Director of the Department of Administration and oversees administration of the Town Hall.

1.4.5 Public Safety

Law enforcement and protection of persons and property is provided by the Police Department's nine sworn officers supported by six full-time and part-time professional employees. The Police Department operates a twenty-four-hour patrol. Average response time to an emergency dispatched call is approximately six to eight minutes throughout the Town. The police station and Emergency Operations Center is located in the historic Aylsworth House in Foster Center. In January 2020, the Town appointed a new Emergency Management Director. The Director is supported by the Assistant Emergency Management Director.

The three (3) Foster fire districts/companies (Foster Center, Moosup Valley, and South Foster) provide first response to major disasters. Fire fighters are trained in various matters which include search and rescue, EMT services, and firefighting.

The Paine School serves as the local emergency shelter but is not Red Cross certified.

1.4.6 Roads and Bridges

The transportation network in Foster grew out of Providence merchants' commercial interests and the most common modes of travel at the time – by foot, horse or drawn carriage. Foster's transportation network today still consists of major highways running east-west through the Town connected by local north/south roads. The major highways continue to provide access through the town to destinations such as Providence and the State of Connecticut while the local roads provide access to the farms, villages, and neighborhoods.

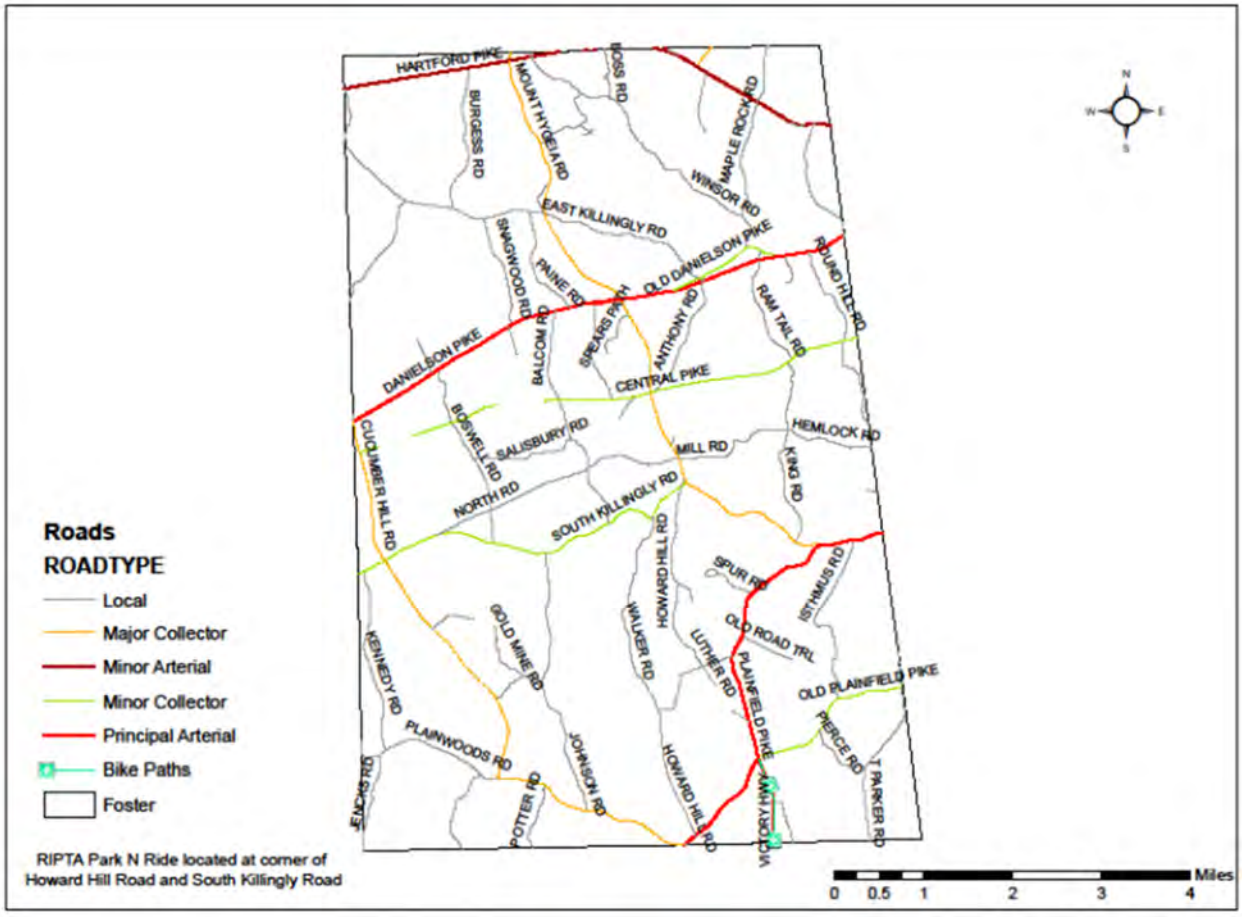
Foster is located approximately 12 miles from Interstate 295 in Rhode Island, and about 4 miles from Interstate 395 in Connecticut. Foster contains five numbered state routes (Figure 1-3).

East-west routes are:

- Route 6 (Danielson Pike): a major connector between Interstate 295 in Rhode Island and Interstate 395 in Connecticut that includes the primary area of commercial development in the community.
- Route 101 (Hartford Pike): branches off Route 6 in Scituate and joins Route 44, a major connector between Providence and Connecticut.
- Route 14 (Plainfield Pike): provides Foster residents with the most direct route to urban centers in Johnston, Cranston, and Providence.
- Route 102 (Victory Highway): provides a north/south route which passes through Scituate to the east and through the rural areas of Foster and West Greenwich to the South, connecting to Route I-95 in West Greenwich.

- Route 94 (Foster Center Road/Mount Hygeia Road): connects Route 102 and Route 6.

Other state roads are Central Pike (east of Foster Center Road Route 94), Cucumber Hill Road and Moosup Valley Road.



Source: 2022 Town of Foster Comprehensive Plan

Figure 1-3 Roadways in Foster

The major municipal roadways are Howard Hill Road, Walker Road, Johnson Road, South Killingly Road, Kennedy Road, and East Killingly Road. These roads are relatively narrow and winding, which helps to keep automobile drivers travelling at safe speeds and helps protect the character of the community. Many minor local roads are unpaved. Unpaved roads require frequent repairs and maintenance of erosion control measures but are an important part of the rural character. Tom Wood Road and portions of Tray Hollow Road, George Washington Highway, Luther Road, Howard Hill Road, Biscuit Hill Road, Weatherbee Road, Goldmine Road, Central Pike, and Rickard Road are all unimproved local public roadways.

Foster contains 17 major bridges, eight of which are maintained by the state. Four bridges (Central Pike, Dolly Cole, Moosup Valley and Spears) are posted with weight limits and three (Hemlock, Hopkins Mill, and Hemlock Road) are closed. The location of the bridges in Foster is shown in Figure 1-4

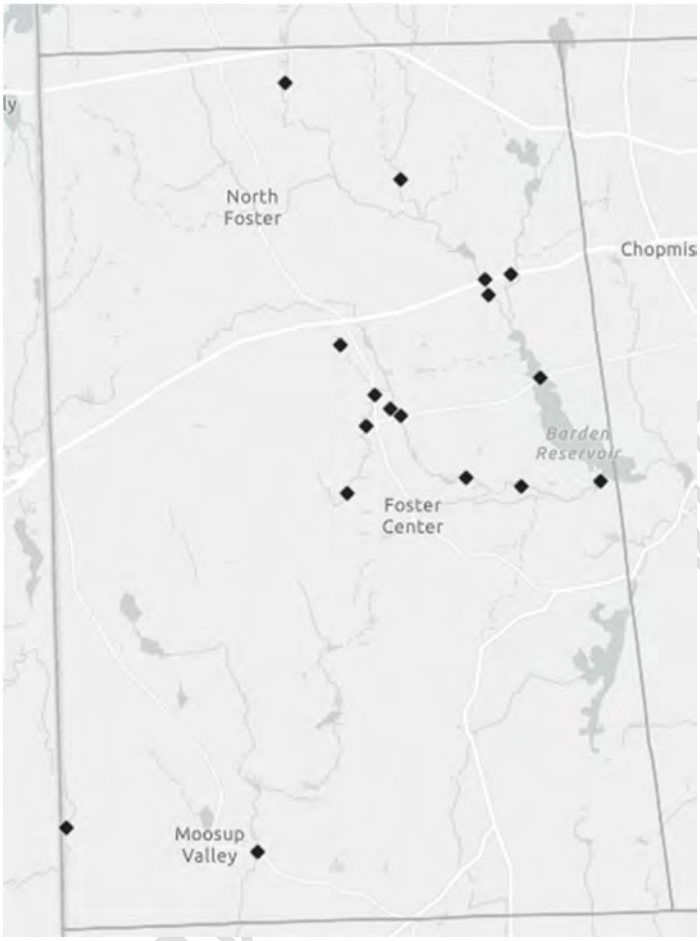


Figure 1-4 Bridges in Foster

1.4.7 Utilities

There are only 2 power lines coming into the Town of Foster. This makes the town much more vulnerable to wind and ice events. Historically when there are widespread power outages, the town is not always a priority for restoration work because of the low population density. The residents of Foster are generally prepared with generators and wood stoves to get them through periods without power.

Foster residents are served by private wells and onsite wastewater treatment systems (OWTS). There are no public water or public sewer facilities.

1.4.8 Water Resources

The Town of Foster is traversed by rivers, brooks, and streams. There are various reservoirs and ponds covering a total of 448 acres. These waters provide essential habitat and many support fishing and swimming criteria. The Town relies on wells for drinking water and does not have any significant groundwater resources. Water bodies of significance include:

- Barden Reservoir
- Westconnaug Reservoir
- Shippee Sawmill Pond
- Hopkins Mill Pond
- Spear Pond
- Clark Pond

- Porter's Pond
- Ponaganset River and tributaries
- Dolly Coke Brook
- Hemlock Brook
- Westconnaug Brook
- Moosup River and tributaries
- Scituate Reservoir Watershed (most of Foster is located in this watershed)

1.4.9 Historic and Cultural Resources

Foster Preservation Society (FPS) is the primary organization involved in historic preservation locally and an active collaborator with both the town and the state. Examples of this include its involvement in supporting Rhode Island Historical Preservation & Heritage Commission's (RIHPHC) nominations of historic places to the National Park Service's National Register of Historic Places (NRHP) and compiling a video related to the Historic Barns survey.

The group also works independently to provide educational lectures at area libraries and schools. FPS also houses a large collection of several hundred historical documents, genealogical records, photographs, postcards, and tax lists at its office in the historic Meeting House. In more recent years, the digital recording of interviews with local residents has also begun as an additional resource for future generations.

The National Register of Historic Places recognizes four historic districts, three buildings, one farm, and a prehistoric archaeological site in Foster (Figure 1-5).

- Foster Center Historic District
- Hopkins Mills Historic District
- Moosup Valley Historic District
- Clayville Historic District
- Captain George Dorrance House
- Mount Vernon Tavern
- Mount Hygia/Solomon Drown House
- Borders Farm
- Breezy Hill Site

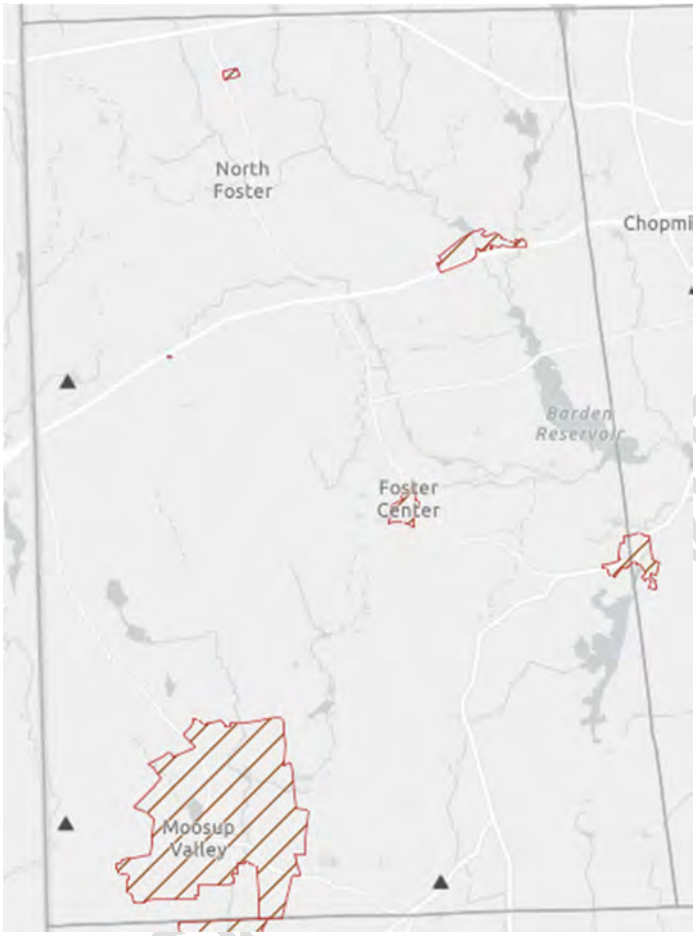


Figure 1-5 National Register of Historic Places and Historic Districts in Foster

Foster's prized heritage is also located in its cemeteries and stone walls. The FPS has surveyed the historic cemeteries and documented nearly half of the inscriptions. The Town has also amended its Zoning Ordinance to ensure that any proposed alterations, relocations, excavations, dismantlings, or demolition of stone walls are identified in planning processes.

Figure 1-6 Swamp Meadow Covered Bridge

Cultural resources in Foster include libraries, the Foster School District (PreK- grade 5), the Foster-Glocester Regional School District (grades 6-12, located in Glocester), Swamp Meadow Community Theatre, and Artist Open Studios.

In late July, residents and neighbors come together for the annual Old Home Days- a tradition that dates back to 1904. Events include a community supper, pie eating contests, crafters, 4-H shows, tractor pulls, and a skillet toss. For paranormal enthusiasts, Foster is a popular visiting spot to witness hauntings throughout the year.

Additionally, the highest point in Rhode Island, Jerimoth Hill (812 feet), is located in Foster.

2. PLANNING PROCESS

This section provides an overview of the planning process; identifies the key stakeholders and HMPC members, documents public outreach efforts, and summarizes the review and incorporation of existing plans, studies, and reports used to update this HM&FMP. Meeting information regarding the HMPC and public outreach efforts are included below, and outreach support documents are provided in Appendix E.

This section addresses Element A of the Local Mitigation Plan regulation checklist.

Regulation Checklist- 44 Code of Federal Regulations (CFR) § 201.6 Local Mitigation Plans
ELEMENT A. Planning Process
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))
A4-a. Does the plan document what existing plans, studies, reports, and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?
Source: FEMA 2022 (Local)

2.1 Overview of the Planning Process

This HM&FMP Update follows the following FEMA Guidance for Planning:

- FEMA 2022/2023 Local Mitigation Planning Policy Guide
- FEMA 2021 Addendum to the 2017 CRS Coordinator's Manual

The Town's first HMP was completed in 2005 and updated in 2018.

The Town of Foster initiated the hazard mitigation planning effort on December 14, 2023. This Hazard Mitigation and Floodplain Management Plan Update is the result of a dedicated group of individuals working on an expedited timeline (~6 months) to identify natural hazards and proposing ways to improve Foster's resiliency.

The Town hired a consultant, Fairweather Science, LLC, to assist with this planning effort. All meetings with

the HMPC and the consultant were held virtually.

The planning process began on December 14, 2023 with a kickoff meeting between the HMPC, Fairweather Science, and Rhode Island Emergency Management Agency (RIEMA). The focus of this meeting was to discuss the plan update process and project schedule. The HMPC also discussed any events/disasters that occurred in the last 5 years and reviewed the hazards identified in the 2018 HMP. Any revisions to the previously identified hazards were discussed. The HMPC then gave initial suggestions for mitigation projects, and reviewed the existing list of critical facilities. The HMPC then discussed community lifelines and vulnerable and underserved populations and ways to engage them during the planning process. Lastly, the HMPC reviewed a draft public survey to engage the public. The purpose of the survey was to capture the local residents' perception of natural hazards and obtain suggestions for mitigation projects.

On January 12, 2024, the draft Risk Assessment was sent to the HMPC, and a meeting date was set for the HMPC to meet to review it and provide comments.

On January 24, 2024 the HMPC met with Fairweather Science to review the draft Risk Assessment. The HMPC provided comments and answered remaining questions to finalize the Risk Assessment. The meeting notice and agenda were published on the Town of Foster's website and Facebook page and encouraged members of the public to attend virtually. Six members of public attended this meeting and provided input on past hazard events. RIEMA Mitigation Planning Supervisor and State Planning Branch Chief were invited to the meeting, but due to scheduling conflicts, they were unable to attend.

XX

Table 2-1 provides a summary of the Committee's meeting dates and the activities that they conducted.

Table 2-1 Hazard Mitigation Planning Committee Meetings

Date	Agenda	Attendees	
12/14/2023	Project Kickoff Meeting with the HMPC HM&FMP overview; project schedule; discuss any events/disasters that occurred in the last 5 years; review hazards identified in the 2018 HMP; initial suggestions for mitigation projects; review existing list of critical facilities; discussion about community input via an online survey; community lifelines and vulnerable and underserved populations and ways to engage them during the planning process.	Town of Foster HMPC	• Grant McGregor • Kelli Russ • Denise DiFranco • Tyler Domingos • Michael Barnes
		RIEMA	• Rae-Anne Culp (RIEMA)
		Members of the public	• Linda Tibbetts • James Bennett • Julia Parmentier • John Kent
		Fairweather Science (consultant)	• Laura Young • Olivia Kavanaugh
01/24/2024	Review of Draft Risk Assessment Address any comments or concerns on the draft RA; review public survey responses received; review list of stakeholders and stakeholder engagement letter; discuss pursuing Community Rating System and updating HMP to be a joint Hazard Mitigation and Floodplain Management Plan	Town of Foster HMPC	• Grant McGregor • Kelli Russ • Denise DiFranco • Tyler Domingos • Michael Barnes • Jayme Prizynski
		Members of the public	• Linda Tibbetts • Amy Pearson • Angela Cambio

Date	Agenda	Attendees	
	(HM&FMP).		• Guenter Bay • Ruby Bolduc • Jim Waterman
		Fairweather Science (consultant)	• Laura Young • Olivia Kavanaugh

2.2 Foster Hazard Mitigation Plan Committee

This Hazard Mitigation and Floodplain Management Plan Update is a product of the Foster HMPC. The HMPC was led by the Town Planner, Grant McGregor. Committee members include:

Table 2-2 Town of Foster Hazard Mitigation Plan Committee

Name	Title	Key Input
Grant McGregor	Town Planner	HMPC lead, project management, data input, and HM&FMP review.
Kelli Russ	Finance Director	HMPC member, data input, and HM&FMP review.
Denise DiFranco	Town Council President	HMPC member, data input, and HM&FMP review.
Jayme Pirzynski	EMA Director	HMPC member, data input, and HM&FMP review.
James Waterman	Foster EMS	HMPC member, data input, and HM&FMP review.
George Dumont	Building Official/ Floodplain	HMPC member, data input, and HM&FMP review.
Gina-Marie Lindell	Police Chief	HMPC member, data input, and HM&FMP review.
Tyler Domingos	Police Captain	HMPC member, data input, and HM&FMP review.
Michael Barnes	Citizen & Prior Superintendent	HMPC member, data input, and HM&FMP review.
Harry Shippee	DPW Foreman	HMPC member, data input, and HM&FMP review.
Cheryl Hawes	Town Council	HMPC member, data input, and HM&FMP review.
Laura Young (consultant)	Project Manager- Fairweather Science	Responsible for project management/coordination, subject matter expertise in plan development, and HM&FMP review.
Olivia Kavanaugh	Staff Scientist/	Responsible for HM&FMP development, writer, research, and

Name	Title	Key Input
(consultant)	Mitigation Planner- Fairweather Science	analysis.

2.3 Opportunities for Stakeholders and Other Interested Parties to Participate

The HMPC extended an invitation to all individuals and entities identified on the project mailing list in which they described the planning process and announced the upcoming planning activities. The announcement was emailed to relevant academia, nonprofits, and local, state, and federal agencies on date.

The following agencies, neighboring communities, and community stakeholders were invited to participate in and review the HM&FMP Update:

- American Red Cross, RI Region
- BLM- Northeastern States
- Captain Isaac Paine School
- Division of Statewide Planning
- EPA- Rhode Island
- FEMA Region I
- Foster Conservation Commission
- Foster Country Club
- Foster Department of Social Services
- Foster Land Trust
- Hemlock Village Retirement Home
- HUD- Rhode Island
- Libraries of Foster
- Northern RI Chamber of Commerce
- NWS Boston Office
- Providence Water Supply Board
- Rhode Island National Guard
- RI Coastal Resources Management Council
- RI Department of Commerce
- RI Department of Education
- RI Department of Environmental Management
- RI Department of Health
- RI Department of Human Services
- RI Department of Public Safety
- RI Department of Public Utilities
- RI Department of Transportation (RIDOT)
- RI Housing
- RI Rehabilitation Code Board
- RI Water Resources Board
- RIDEM- Department of Parks and Recreation
- State Fire Marshal's Office
- State Floodplain Coordinator
- State Mitigation Planning Supervisor
- State Planning Branch Chief
- University of Rhode Island
- USACE- New England District
- USDA- Natural Resource Conservation Service
- USGS- Rhode Island

Neighboring Communities

The Town of Foster heavily relies on neighboring communities during hazard events or disasters. Foster Fire Department, Police, and EMS all have mutual agreements with all of the surrounding communities, including those across the Connecticut state line, to aid one another as necessary.

The following neighboring communities were invited to participate in the planning process as stakeholders:

- Glocester, RI
- Burrillville, RI
- Scituate, RI

- Coventry, RI
- Killingly, CT
- Sterling, CT

2.4 Public Input

This HM&FMP benefits from various distinct types of public input strategies that were utilized by the HMPC during the drafting process and prior to its adoption by the Town Council. Public input for the 2024 HM&FMP was collected primarily through a public survey, public meetings, and an invitation to comment on the draft risk assessment and draft HM&FMP.

The online public survey was shared on the Town of Foster's website on December 28, 2023 and on the Town's official Facebook page on January 9, 2024. Residents also shared the survey in various private Facebook groups. Additionally, email blasts were sent out to the Town's mailing list subscribers on December 6, 2023 and January 22, 2024 with a link to the survey and a request for photo submissions.

On January 11, 2024 the Town of Foster also posted a request on the Town website and Town Facebook page for the public to provide images of hazard impacts to be included in the HM&FMP. A total of XX images were shared with the HMPC for inclusion in the HM&FMP.

Underserved populations (the elderly) were engaged in the planning process by being provided paper copies of the survey to provide input. After XX weeks, the paper surveys were collected by a Town representative and were filled out digitally to be included with the final results. XX.

A total of XX survey responses were collected.

Feedback received from the public was used in confirming natural hazards that impact the Town, level of concern of each hazard, and critical facilities that the public relies on. Additionally, the HMPC reviewed the list of mitigation projects that the public suggested. XX

Outreach support documents and survey results are provided in Appendix E.

2.5 Review and Incorporation of Existing Plans, Studies, And Reports

During this HM&FMP update, the HMPC reviewed and incorporated pertinent information from available resources since the 2018 HMP was completed. Newly collected data included available plans, studies, reports, and technical research listed in Table 2-3. The new data was reviewed and referenced throughout the document.

Table 2-3 Documents Reviewed

Plans, studies, reports, ordinances, etc.	Contents Summary (How will this information improve mitigation planning?)	Data Used (How was this information incorporated into this HM&FMP?)
2005 and 2018 Town of Foster Hazard Mitigation Plans	Review past hazard events, mitigation activities, and planning processes.	Compared hazard profiles, history, and impacts of events for the hazard profiles.
2024 State of Rhode Island Hazard Mitigation Plan (SHMP)	Defines statewide hazards and their potential impacts.	Compared hazard profiles, history, and impacts of events for hazard profiles. Source of most current statewide hazard information.
Rhode Island 2022 Climate	Provides current climate change trends in	Used information in hazard profiles to discuss

Plans, studies, reports, ordinances, etc.	Contents Summary (How will this information improve mitigation planning?)	Data Used (How was this information incorporated into this HM&FMP?)
Update Report	Rhode Island.	the influence of climate change on the hazard.
2018 Resilient Rhody- An Actionable Vision for Addressing the Impacts of Climate Change in Rhode Island	A comprehensive report outlining the State's climate resilience action strategy.	Used information in hazard profiles to discuss the influence of climate change on the hazard.
2016 EC4 STAB Current State of Climate Science in Rhode Island report	Provides an overview of statewide climate change impacts.	Used information in hazard profiles to discuss the influence of climate change on the hazard.
Town of Foster 2022 Comprehensive Plan	Sets forth a vision and goals for the Town's future and provides the overall foundation for all land use regulation in Foster.	Cited information from the Plan throughout the HM&FMP such as community background information, land use information, future goals of the Town, and various figures and maps.

A complete list of references is provided in Section 8.

3. RISK ASSESSMENT

This section identifies and profiles the hazards that could affect Foster.

This section addresses a portion of Element B of the Local Mitigation Plans regulation checklist.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT B. Risk Assessment
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?
B1-b. Does the plan include information on the location of each identified hazard?
B1-c. Does the plan describe the extent for each identified hazard?
B1-d. Does the plan include the history of previous hazard events for each identified hazard?
B1-e. Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature, and sea levels), on the type, location, and range of anticipated intensities of identified hazards?
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? (Requirement 44 CFR § 201.6(c)(2)(ii))
B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?
Source: FEMA 2022 (Local)

3.1 Overview

Hazard identification is the process of recognizing any natural events that may threaten an area. Natural hazards result from uncontrollable or unexpected natural events of sufficient magnitude. This plan does not include any man-made, technological, or terrorism related hazards. Historical hazards are noted, but all natural hazards that have the potential to affect the study area must be considered.

A hazard analysis includes the identification, screening, and profiling of each hazard.

Hazard profiling entails describing hazards in terms of their nature, history, location, magnitude, frequency, extent, and probability. Hazards are identified through historical and anecdotal information collected by members of the community, previous mitigation plans, studies, and study area hazard map preparations/reviews, when appropriate. Hazard maps are then used to define the geographic extent of a hazard, as well as define the approximate boundaries of the risk area.

3.2 Hazard Identification and Screening

The 2018 Foster Hazard Mitigation Plan and the 2024 State of Rhode Island Hazard Mitigation Plan were used as a starting point for identifying hazards that pose a threat to the Town of Foster. The following table summarizes the hazards identified by the Foster HMPC. This HM&FMP will focus primarily on the natural

hazards.

Table 3-1 Hazards Identified by the Foster Hazard Mitigation Plan Committee

Natural Hazard	Updated from the 2018 HMP or New Hazard?
Climate Change	Updated- influence incorporated into each hazard
High Winds	Updated
Nor'easter	Updated
Hurricanes (Tropical Cyclones)	Updated
Snow Storm	Updated
Ice Storm	Updated
Drought	Updated
Brushfire	Updated
Extreme Temperatures	Updated
Lightning/Thunderstorms	Updated
Hail	Updated
Tornadoes	Updated
Earthquake	Updated
Flooding (Riverine and Urban/Street)	Updated
Dam Failure	Updated

3.2.1 Hazards Not Profiled in this HM&FMP Update

- Coastal Flooding: Coastal flooding/storm surge is not included in this HM&FMP due to Foster's inland location- over 18 miles from the Providence River at the upper part of Narragansett Bay.

3.3 Hazard Profiles

The natural hazards selected by the HMPC for profiling have been examined based on the following factors:

- Description of the hazard
- History (previous occurrences)
- Location (hazard areas)
- Extent (includes magnitude and severity)
- Impact (provides general impacts associated with each hazard)
- Probability of Future Occurrence (annual likelihood of hazard occurring)
- Future Conditions Including Climate Change (how climate change is influencing the hazard)

Each hazard is assigned a rating based on the following criteria for magnitude/severity (Table 3-2) and probability of future events (Table 3-3). Estimating magnitude and severity are determined based on historic events using the criteria identified in the following tables, which are consistent with the State of Rhode Island 2024 HMP Update.

Table 3-2 Hazard Magnitude/Severity Criteria

Magnitude/ Severity	Criteria
Significant	• Multiple deaths and severe injuries • Medium shutdown of some critical infrastructure and facilities • 20% to 50% of residential and 10-25% of commercial structures are severely damaged • Large impacts to local operations for long amounts of time
Limited	• Some injuries • Short shutdown of some critical infrastructure and facilities • Fewer than 10% of residential and commercial structures damaged • Small number of local operations impacted for short amounts of time
Negligible	• Minor injuries • No shutdown of critical infrastructure and facilities • Scattered incidental residential and commercial structure damages • Few or no operations impacted for short amounts of time

Table 3-3 Hazard Probability of Future Events Criteria

Probability	Criteria
Highly Likely	• Greater than 90% annual probability of occurring.
Likely	• Between 50-89.9% annual probability of occurring.
Possible	• Between 1-49.9% annual probability of occurring.
Unlikely	• Less than 1% annual probability of occurring.

The hazards profiled for the Town of Foster are presented throughout the remainder of this section. The presentation order does not signify their importance or risk level.

3.3.0 Climate Change

To meet updated FEMA guidelines, the HMPC decided to incorporate the influence of climate change into each individual hazard rather than profile it as standalone hazard. General background information regarding climate change in Rhode Island is described below.

The NOAA National Centers For Environmental Information State Climate Summaries 2022 for Rhode Island (NCEI 2022) states:

Rhode Island's geographic position in the mid-latitudes often places it near the jet stream, particularly in the late fall, winter, and spring. The state's frequently changing weather is a result of the regular passing of low-pressure storms associated with the jet stream. In addition, Rhode Island's location on the East Coast of North

America exposes it to the cold winter and warm summer air masses of the continental interior and the moderate and moist air masses of the western Atlantic Ocean. In winter, the contrast between the frigid air masses of the continental interior and the relatively warm Atlantic Ocean provides the energy for occasional intense storms known as nor'easters. In Providence, average temperatures in July are around 74°F and in January about 29°F. Statewide annual average precipitation is about 46 inches. The driest year on record (28 inches of precipitation) was 1965, while the wettest year on record (63 inches of precipitation) was 1972. Average accumulated snowfall ranges from 20 inches on Block Island and along the southeastern shores of Narragansett Bay to between 40 and 55 inches in the western portion of the state.

Temperatures in Rhode Island have risen almost 4°F since the beginning of the 20th century. The number of hot days has been above the long-term average since the 1990s with the greatest number occurring during the most recent 6-year period of 2015–2020. The greatest number of warm nights also occurred during the 2015–2020 period. Very cold nights have been mostly below average since the mid-1980s, and the most recent 6-year period (2015–2020) was about average.

Total annual precipitation for Rhode Island has generally been above average in recent decades. The driest multiyear periods were the 1940s and the latter half of the 1960s and the wettest period was the 2000s, although precipitation has been predominantly above average since the 1970s. The driest consecutive 5 years was the 1962–1966 interval, and the wettest 5-year period was 2005–2009, with an annual average of 54 inches of precipitation, which was about 8 inches more than the long-term average. Since 2000, summer precipitation was above average until the most recent 6-year period (2015–2020), which was below average. Rhode Island experienced the largest number of 2-inch extreme precipitation events in the 10-year period of 2005–2014. In 2010, major rainfall from a nor'easter in late March caused the worst flooding in the state's history. This event set an all-time monthly precipitation record in Providence of 16.34 inches, superseding the previous record of 15.38 inches, which was recorded in October 2005. The flooding of 2010 resulted in an estimated $43 million in national flood insurance claims in the state. Rhode Island experienced severe drought in 2016 and extreme drought in 2020, straining water supplies.

Extreme weather events common to Rhode Island include severe storms (coastal, winter, and thunderstorms), often accompanied by flooding, and on occasion, tropical storms, and hurricanes. The state's coastline is highly vulnerable to flood damage from winter and hurricane events. FEMA disaster declarations were sought 4 out of the last 10 years. Landfalling hurricanes produced hurricane-force winds in Rhode Island 6 times from 1900 to 2019. The Great New England Hurricane (Category 3) of 1938 was one of the most destructive and powerful storms ever to impact southern New England. Storm tides of 12 to 15 feet were recorded for Narragansett Bay, and downtown Providence was submerged under a storm tide of 20 feet. In October 2012, Superstorm Sandy (a post-tropical storm) caused a storm surge 9.4 feet above normal high tide in Providence, resulting in extensive coastal flooding. One year earlier, Hurricane Irene brought heavy rainfall and strong southeast winds of up to 70 mph, knocking down power lines and leaving half of Rhode Island's one million residents without power. Both hurricanes demonstrated the region's vulnerability to extreme weather events. (NCEI 2022)

How rapidly these changes will be felt is debatable but there is certainty within the state that municipalities need to be prepared. One approach is to become more adaptable/resilient to the changing conditions. A second approach is to mitigate the impacts by being more energy efficient and reducing air pollution- a contributor to global warming.

Through the exercise of creating this plan, the Town of Foster is exploring ways to reduce their long and short-term risks to a variety of hazards. Fortunately, being an inland community, Foster does not have to be concerned about storm surge and erosion but being in a coastal state, any storm that comes up the eastern seaboard will likely impact the Town, which is located about 17 miles from the shore. As climate conditions intensify, the HMPC is prepared to update this plan accordingly.

3.3.1 High Winds

3.3.1.1 Description

Wind is the movement of air caused by a difference in pressure from one place to another. Local wind systems are created by the immediate geographic features in a given area such as mountains, valleys, or large bodies of water. National climatic events such as high gale winds, tropical storms, thunderstorms, Nor'easters, hurricanes, and low-pressure systems produce wind events in Rhode Island. Wind effects can include blowing debris, interruptions in elevated power and communications utilities, and intensification of the effects of other hazards related to winter weather and severe storms.

3.3.1.2 History

Table 3-4 describes historical high wind events in Foster. Since the 2018 HMP, there have been 4 high wind events in Foster.

Table 3-4 Historical High Wind Events in Foster

Date	Event Description
01/28/1996	Ahead of an approaching sharp cold front, south winds gusting to 50 to 60 mph, heavy rainfall of 1 to 2 inches, and very mild temperatures rising into the 50s occurred. Two large trees and two power poles were reported blown down in Foster. Scattered power outages were reported throughout the state as some trees and tree limbs were blown down by the high winds.
12/24/1996	Strong south to southwest winds ahead of an approaching cold front reached sustained speeds of 25 to 35 mph with gusts of 40 to 50 mph. A peak gust to 50 mph was reported from North Foster.
11/2/1999	Strong winds buffeted Rhode Island, as deepening low pressure moved across southern Canada. High winds in Providence and western Kent Counties resulted in several large trees, limbs, and power lines down in Coventry, Scituate, and Burrillville. In Foster, about 30 to 35 trees were downed by high winds, and some electric customers lost power for about four hours. Wind gusts were estimated to be near 60 mph, and primarily affected the higher elevations.
04/02/2005	Low pressure moving through the mid-Atlantic states brought strong southeast winds to parts of southern New England, including the higher elevations of northern Rhode Island where a gust to 58 mph was reported by an amateur radio operator. Several trees were blown down in Foster and Burrillville. There were no reports of injuries.
01/18/2006	An intensifying low-pressure system moved across the Great Lakes and into Quebec, producing strong damaging winds across Rhode Island on 18 January 2006. In addition, winds gusted to as high as 59 MPH at 11:45 AM in North Foster.
1/21/2006	An intensifying low-pressure system moved east across Quebec, swinging a cold front across southern New England during the mid to late afternoon of 21 January 2006. This cold frontal passage produced strong gusty winds that knocked down trees, limbs, and wires across Rhode Island. In Foster, a tree was blown down onto a car, causing two minor injuries to the people inside.
12/01/2006	Low pressure strengthened rapidly as it tracked from the southern Plains to central New England, bringing a period of damaging south to southwest winds to central and northern Rhode Island. One person was injured in Foster when a tree fell on Barlow Trail.
03/08/2008	A cooperative observer in North Foster recorded a wind gust of 59 mph at a home weather station. No damage was reported.

Date	Event Description
12/27/2011	A strong low-pressure system moved up the east coast bringing heavy rain and strong to damaging winds to Southern New England. A cooperative observer recorded a 54-mph wind gust at their home weather station in North Foster. Numerous small trees were downed throughout Scituate.
10/29/2012	Superstorm Sandy, a hybrid storm with both tropical and extra-tropical characteristics, brought high winds and coastal flooding to southern New England. The NWS Cooperative Weather Observer in North Foster reported wind gusts to 51 mph.
11/27/2013	An anomalously strong low-level jet coupled with strong pressure falls associated with a low-pressure region approaching southern New England resulted in strong to damaging winds across southern New England. Damage was largely to trees. A tree was downed onto Howard Hill Road in Foster.
04/04/2015	Low pressure and a cold front moved across Southern New England. This drew strong gusty northwest winds across the region during the late morning and afternoon. A tree fell on wires on North Road in Foster.
03/17/2016	An upper-level disturbance coupled with cold air aloft and moving into southern New England set off a complicated mix of showers and thunderstorms and non-convective winds. All efforts were made to separate out the non-convective winds from the thunderstorm winds. A tree and wires were downed, snapping a utility pole in half in Foster.
03/31/2016	Strong southwesterly winds mixed to the surface ahead of a strong cold front. This resulted in some damage across southeastern Massachusetts and Rhode Island. A tree and wires on Windsor Road were downed in Foster.
01/24/2017	Low pressure that developed over the Gulf States moved up the East Coast on January 23 and 24, passing off Cape Cod on January 24. The storm moved off through the Martimes on January 25. A telephone pole and wires were down in Foster.
10/24/2017	Low pressure moved north through the Great Lakes. This swung a cold front slowly east into Southern New England on October 25. The front stalled over the region during the 25th before moving off to the east on the 26th. Strong low-level winds brought a flow of tropical moisture ahead of the front. The strong winds aloft were brought to the surface in damaging wind gusts, with speeds reaching 45 to 55 mph. The tropical moisture was converted to heavy downpours, with storm rainfall totals ranging from 2 inches to 6 1/2 inches. This brought widespread urban and poor drainage flooding. Tree down on Luther Road in Foster. Tree down on wires on Isthmus Road.
04/16/2018	Low pressure organized over the Ohio Valley on April 14th, swept to the Mid Atlantic coast on the 15th, and moved along the New England coast on the 16th. This brought rain and some heavy downpours to the coastal plain on the 16th, while inland areas had a mixture of snow, freezing rain, and rain. Strong gusty southeast winds also affected Rhode Island on the 16th. The storm moved off through the Canadian Maritimes the night of the 16th. At 3:52 PM EST a tree was reported down on Howard Hill Road in Foster.
04/13/2020	A powerful low-pressure system tracked across the Great Lakes and brought strong and damaging winds to Rhode Island Monday late morning through the evening. A very strong and highly anomalous low-level jet brought southerly wind gusts of 60-70 mph ahead of a cold front that moved through Monday evening. In Foster at 1:20 PM EST a tree was down blocking South Killingly Rd.

Date	Event Description
03/01/2021	An arctic cold front moved through southern New England on the afternoon of March 1st. It was followed by very strong/damaging west-northwest winds, which continued through much of the night and into the early morning hours on March 2nd. There were several reports of downed trees in northern Rhode Island. In Foster at 10:29 PM EST on March 1st, a tree was down on Danielson Pike.
12/11/2021	Gusty southwest winds occurred in the afternoon out ahead of an approaching cold front. Then, a fine line of showers along a cold front caused locally damaging wind gusts during the evening. The strong westerly gusts continued for a couple of hours behind the front. In Foster at 9:20 PM EST, a tree was down on Cucumber Hill Road.
02/03/2023	A major Arctic cold front blasted through southern New England on the morning of February 3rd. It was followed by a few rounds of strong and locally damaging wind gusts. Temperatures plunged to 10 to 20 below zero on the morning of March 4th. The -10F reading at Boston's Logan Airport was the coldest there since 1957. There were numerous instances of burst pipes due to the cold across the region, but it is impossible to quantify dollar damage. Wind chill indices reached 30 to 40 below zero across southern New England. Winds generally were gusting to 45 to 55 mph. In Foster at 530 PM EST, a tree was down on wires, causing a utility pole to break on Pine Tree Lane and Winsor Road.

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a)

3.3.1.3 Location

All of Foster is susceptible to high wind events.

3.3.1.4 Extent

The Beaufort Wind Scale is a 13-level scale used to describe wind speed and observed wind conditions at sea and on land. A wind classification of 0 has wind speeds of less than 1 mile per hour (mph) and winds are considered calm. On the other end, a classification of 10 with wind speeds reaching 63 mph can blow down trees and cause considerable damage.

Table 3-5 Beaufort Wind Scale

Force	Speed (mph)	Description	Impacts on land
0	0-1	Calm	Calm: smoke rises vertically.
1	1-3	Light Air	Direction of wind shown by smoke drift, but not by wind vanes.
2	4-7	Light Breeze	Wind felt on face; leaves rustle; ordinary vanes moved by wind.
3	8-12	Gentle Breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	Moderate Breeze	Raises dust and loose paper; small branches are moved.
5	19-24	Fresh Breeze	Small trees in leaf begin to sway; crested wavelets form on inland waters.

Force	Speed (mph)	Description	Impacts on land
6	25-31	Strong Breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	32-38	Near Gale	Whole trees in motion; inconvenience felt when walking against the wind.
8	39-46	Gale	Breaks twigs off trees; generally impedes progress.
9	47-54	Severe Gale	Slight structural damage occurs (chimneypots and slates removed)
10	55-63	Storm	Seldom experienced inland; trees uprooted; considerable structural damage occurs.
11	64-72	Violent Storm	Very rarely experienced; accompanied by wide-spread damage.
12	72-83	Hurricane	Equivalent to a Category 1 Hurricane

Source: NWS 2023b

Foster does not have a weather station in the Town, but wind speeds in nearby Providence are indicative of conditions Foster. With an average wind speed of 9.3 mph, Providence is a windy city, 1.0 mph higher than the national average. The average wind speed in Providence is about the same as the State average. The windiest season in Providence is spring, with spring wind speeds reaching 10.27 mph on average, 1.17 mph higher than in the rest of the U.S.

Based on the extent of past events and the criteria identified in Table 3-2, the extent of high winds in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.1.5 Impact

Strong wind gusts of 40 mph (Beaufort Scale of 8) can blow twigs and small branches from trees. Occasional gusts and sustained winds at this speed (and above) are of concern to the Town. Damages from wind events range from power outages, property damage to vehicles and buildings and fallen trees/limbs. Wind events in Foster have resulted primarily in power outages and downed tree limbs on local and State roads with minimal property damage. It is important that the Town of Foster maintain their public tree trimming program that will reduce the likelihood of fallen trees/limbs from disrupting transportation routes and/or taking down power lines.

Past high wind events in Foster have caused downed trees, downed power lines, loss of electricity, and injuries from falling trees.

Photo Credit: Betsy Puckett

Figure 3-1 Downed Power Lines (December 18, 2023)

3.3.1.6 Probability of Future Occurrence

Foster experiences high wind events annually.

Based on previous occurrences and the criteria identified in Table 3-3, it is Highly Likely that Foster will experience a high wind event within the calendar year; there is a greater than 90% annual probability of occurring.

3.3.1.7 Future Conditions Including Climate Change

It is difficult to quantify and predict how climate change will influence future high wind events in Foster. There are contradictory studies that analyze changes in high wind events in New England.

Oceanographers at the University of Rhode Island have analyzed long-term data from several anemometers in southern New England and found that average wind speeds have declined by about 15% at inland sites while speeds have remained steady at an offshore site (URI 2012). The researchers found that average wind speeds at T.F. Green Airport in Warwick, R.I. (24 miles SE of Foster), declined from about 9 knots to 7.7 knots from 1975 to 2011 (URI 2012).

Another study states that New England has seen a number of mid-autumn (October–November) wind storms—high-wind events associated with extratropical cyclones—in recent years that have produced extensive infrastructure damage, raising concerns that these events may become more common in a changing climate (Simonson et al. 2020).

However, there are multiple hazards that generate high winds (severe winter weather, Nor'easter, hurricanes, thunderstorms, and tornadoes) that are influenced by climate change. Depending on the hazard type, the Town of Foster may experience increased impacts associated with high winds.

3.3.2 Nor'easter

3.3.2.1 Description

A Nor'easter is a strong area of low pressure along the East Coast of the United States that typically features winds from the northeast off the Atlantic Ocean. Nor'easters are most often associated with strong winter storms moving up the Northeast coast, but snow isn't a requirement for such a storm. These storms are most frequent and strongest between September and April but can occur any time of the year.

The storm radius is often as large as 1,000 miles, and the horizontal storm speed is about 25 mph, traveling up the eastern United States coast. Sustained wind speeds of 10-40 mph are common during a nor'easter, with short term wind speeds gusting up to 70 mph. Typically a winter weather event, Nor'easters are known to produce heavy snow, rain, and heavy waves along the coast. Unlike hurricanes and tropical storms, Nor'easters can sit offshore, wreaking damage for days.

Also called East Coast Winter Storms, Nor'easters are characterized by:

- A closed circulation.
- Located within the quadrilateral bounded at 45^0N by 65^0W and 70^0W, and at 30^0N by 85^0W and 75^0W.
- Show a general movement from the south-southwest to the north-northeast.
- Contain winds greater than 23 mph.
- The above conditions must persist for at least a 12-hour period.

3.3.2.2 History

On average, Foster experiences or is threatened by a Nor'easter every few years.

Table 3-6 describes historical Nor'easters that have impacted the entire State of Rhode Island, including Foster. Since the 2018 HMP, there have been 0 Nor'easters that impacted Foster.

Table 3-6 Historical Nor'easters in Rhode Island

Date	Comments
02/10/1969	Up to 20 inches of snow in parts of Rhode Island.
02/07/1978	27 inches of snow in Providence. State of emergency declared in RI and in surrounding MA and CT.
2/23/1998	The second powerful Nor'easter to affect the region in less than a week brought heavy rainfall and strong northeast winds to much of Rhode Island. An extremely intense low-pressure system moving to the northeast and passing just to the southeast of Nantucket had a central barometric pressure just under 29 inches of mercury. Rainfall totals for this storm exceeded 2 inches over the eastern and northern part of the state. A total of 2.03 inches of rain was reported in Foster.
02/14/2003	In February 2003, a powerful Nor'easter, often referred to as the Presidents' Day Storm, impacted the northeastern United States, including Rhode Island. This storm brought heavy snowfall, with some areas in Rhode Island receiving over 20 inches of snow. Strong winds contributed to drifting snow and power outages. The storm disrupted travel and daily life for several days.
05/25/2005	Late season Nor'easter brought strong winds and heavy rains, some gusts as high as 60 mph.
02/12/2006	Heavy snow (9.4 inches at T.F. Green) and windy conditions.

Date	Comments
04/13/2007	A late-season Nor'easter brought heavy snowfall to Rhode Island and other parts of the northeast. The storm was notable for its unusual timing, as it occurred in the spring. Some areas received more than a foot of snow, causing travel disruptions and power outages.
10/29/2011	A rare and historic October Nor'easter brought very heavy snow to portions of southern New England on Saturday October 29. Low pressure tracked northeast from the North Carolina coast Saturday morning, rapidly strengthening as it passed well south of Nantucket Saturday evening. As the storm intensified, colder air from aloft was drawn into New England resulting in heavy snow in the interior. 3-6 inches of snow fell across northwestern Providence County.
02/08/2015	Long duration snow storm that dumped 6-16 inches of snow in northwestern Providence County.
03/14/2017	Heavy wet snow followed by plunging temps hampered roads. 11.5 inches of snow reported in North Foster.
03/01/2018	A powerful Nor'easter struck the eastern United States, affecting Rhode Island. This storm brought heavy snowfall, coastal flooding, and strong winds to the region. Some parts of Rhode Island received more than a foot of snow, and coastal areas experienced inundation and erosion.

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a), RIEMA 2024

3.3.2.3 Location

The Town's proximity to the Atlantic Ocean renders it susceptible to Nor'easters and the resulting loss of human life and property. All of Foster is susceptible to the impacts of a Nor'easter.

3.3.2.4 Extent

The magnitude or severity of a severe winter storm or Nor'easter depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (e.g., weekday versus weekend) and time of season.

The extent of a severe winter storm (including Nor'easters that produce snow) can be classified by meteorological measurements and by evaluating its combined impacts. For measuring wind effects, the Beaufort Wind Scale is a system that relates wind speed to observed conditions at sea or on land (See Table 3-5). The snow impact of a Nor'easter can be measured using NOAA's Regional Snowfall Index (See Section 3.3.4- Snow Storm).

Based on the extent of past events and the criteria identified in Table 3-2, the extent of Nor'easters in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.2.5 Impact

Foster is an inland community; most damage would be from downed power lines, downed trees, and damage to mobile homes or older structures. The Blizzard of 1978 was the largest Nor'easter on record. Many people were without heat, food, and electricity for over a week.

3.3.2.6 Probability of Future Occurrence

Based on previous occurrences and the criteria identified in Table 3-3, it is Likely that Foster will experience

a Nor'easter event in the next five years; there is a between 50-89.9% annual probability of occurring.

3.3.2.7 Future Conditions Including Climate Change

Similar to hurricanes, changes in air and water temperatures will lead to stronger Nor'easters along the Atlantic Ocean. Foster should expect stronger Nor'easters, but not necessarily more frequent storms.

The 2024 State of Rhode Island HMP states:

For extratropical storms, particularly Nor'easters, the increase in intensity is caused by changes in atmospheric conditions, including temperature gradients, which can affect the strength and track of these storms.

Both tropical and extratropical storms are expected to produce heavier rainfall in a warmer climate. This can lead to more significant inland flooding and exacerbate the risk of river and urban flooding (RIEMA 2024).

3.3.3 Hurricanes (Tropical Cyclones)

3.3.3.1 Description

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics. These storms are referred to as "cyclones" due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage.

There are three categories of tropical cyclones:

- Tropical Depression: maximum sustained surface wind speed is less than 39 mph
- Tropical Storm: maximum sustained surface wind speed from 39-73 mph
- Hurricane: maximum sustained surface wind speed exceeds 73 mph

Once a tropical cyclone no longer has tropical characteristics it is classified as an extratropical system.

Most Atlantic tropical cyclones begin as atmospheric "easterly waves" that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the north, it begins to leave the area where the easterly trade winds prevail and enters the temperate latitudes where the westerly winds dominate. This situation produces the eastward curving pattern of most tropical storms that pass through the Mid-Atlantic region. When the westerly steering winds are strong, it is easier to predict where a hurricane will go. When the steering winds become weak, the storm follows an erratic path that makes forecasting very difficult.

Storm surge is the abnormal rise in water level caused by the wind and pressure forces of a hurricane or Nor'easter. Nationally, storm surge flooding has caused billions of dollars in damage and hundreds of deaths. Given today's ever-increasing population densities in coastal states, the need for information about the potential for flooding from storm surge has become even more important. Further discussion on storm surge is not included in this plan, due to Foster's inland location over 18 miles from the Providence River at the upper part of Narragansett Bay.

The Saffir-Simpson scale below is based primarily on wind speeds and is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall.

Table 3-7: Saffir/Simpson Hurricane Wind Scale

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

3.3.3.2 History

Table 3-8 lists the historical hurricanes that have come within 20 miles of Foster.

Since the 2018 HMP, there have been 2 hurricanes that came within 20 miles of Foster (Elsa and Henri, both in 2021).

Table 3-8 Historical Hurricanes within 20 miles of Foster

Storm Name	Max Category	Max Wind Speed (mph)	Impacts
Unnamed 1851	Tropical Storm	60	No record of damages in Foster.
Unnamed 1858	Category 2	90	No record of damages in Foster.
Unnamed 1861	Category 1	70	No record of damages in Foster.
Unnamed 1869	Category 3	100	No record of damages in Foster.

Storm Name	Max Category	Max Wind Speed (mph)	Impacts
Unnamed 1872	Category 1	70	No record of damages in Foster.
Unnamed 1888	Category 3	110	No record of damages in Foster.
Unnamed 1888	Tropical Storm	50	No record of damages in Foster.
Unnamed 1894	Category 3	105	No record of damages in Foster.
Unnamed 1897	Tropical Storm	60	No record of damages in Foster.
Unnamed 1902	Tropical Storm	50	No record of damages in Foster.
Unnamed 1908	Category 1	65	No record of damages in Foster.
Unnamed 1915	Category 1	65	No record of damages in Foster.
Unnamed 1916	Tropical Storm	40	No record of damages in Foster.
Great New England Hurricane of 1938	Category 3	120	The unforeseen Great New England Hurricane of 1938 is the most catastrophic weather event in Rhode Island and history. The event occurred slightly before high tide and brought with it winds upward of 120 mph. A tidal surge inundated the City of Providence with over 10' of water. Foster was not severely impacted by this storm.
Carol 1954	Category 3	100	The hurricane resulted in house and tree damage around Foster.
Donna 1960	Category 4	125	No record of damages in Foster.
Bob 1991	Category 2	115	The hurricane damaged business and homes as well as taking down numerous trees and utility lines in Foster. The highest amount of rainfall was 7.01 inches in Foster.
Beryl 1994	Tropical Storm	50	No record of damages in Foster.
Bertha 1996	3	115	No record of damages in Foster.
Gordon 2000	Category 1	70	No record of damages in Foster.
Hanna 2008	Category 1	75	No record of damages in Foster.
Irene 2011	Tropical Storm	121	Collective effects throughout Massachusetts and Rhode Island resulted in 1 fatality, no injuries, and $127.3 million in property damage. Local damage after Hurricane Irene in August 2011 mainly

Storm Name	Max Category	Max Wind Speed (mph)	Impacts
			included down trees and power lines.
Sandy 2012	Tropical Storm	69	Peak wind speeds in Foster were 65-69 mph. Being inland, Foster was spared the storm surge but suffered minor damage throughout the town due to high winds and rain. There were widespread power outages and a backlog of requests for downed tree removal which restricted access to roads and private property.
Andrea 2013	Tropical Storm	55	No record of damages in Foster.
Elsa 2021	Category 1	75	No record of damages in Foster.
Henri 2021	Category 1	65	Henri is the strongest tropical cyclone to pass over New England since Tropical Storm Bertha in July of 1996. No damages were reported in Foster

Source: NOAA 2023a

Rhode Island has experienced six Presidential Disaster Declarations related to hurricanes or tropical storms (Table 3-9). Foster was not severely impacted by any of these disasters. Since the 2018 HMP, there have been no Rhode Island Presidential Disaster Declarations relating to hurricanes or tropical storms.

Table 3-9 State of Rhode Island Presidentially Declared Disasters Relating to Hurricanes

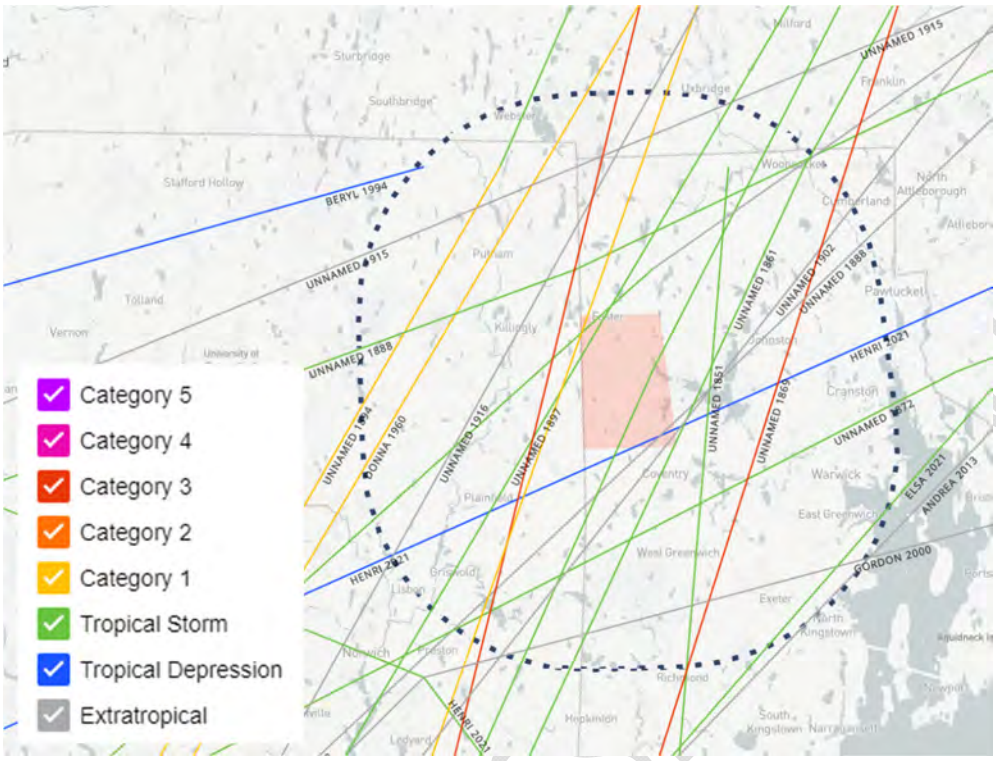
Designation	Declaration Date	Incident Type
DR-23-RI	09/02/1954	Hurricane
DR-39-RI	08/20/1955	Hurricane and Flood
DR-748-RI	10/15/1985	Hurricane Gloria
DR-913-RI	08/26/1991	Hurricane Bob
DR-4027-RI	09/03/2011	Tropical Storm Irene
DR-4089-RI	11/03/2012	Hurricane Sandy

Source: FEMA 2024

3.3.3.3 Location

The Town's relative proximity to the Atlantic Ocean renders it particularly susceptible to hurricanes and the resulting loss of human life and property.

Figure 3-2 shows historical hurricane tracks within 20 miles of Foster. Foster is highlighted in red below.



Source: NOAA 2023a

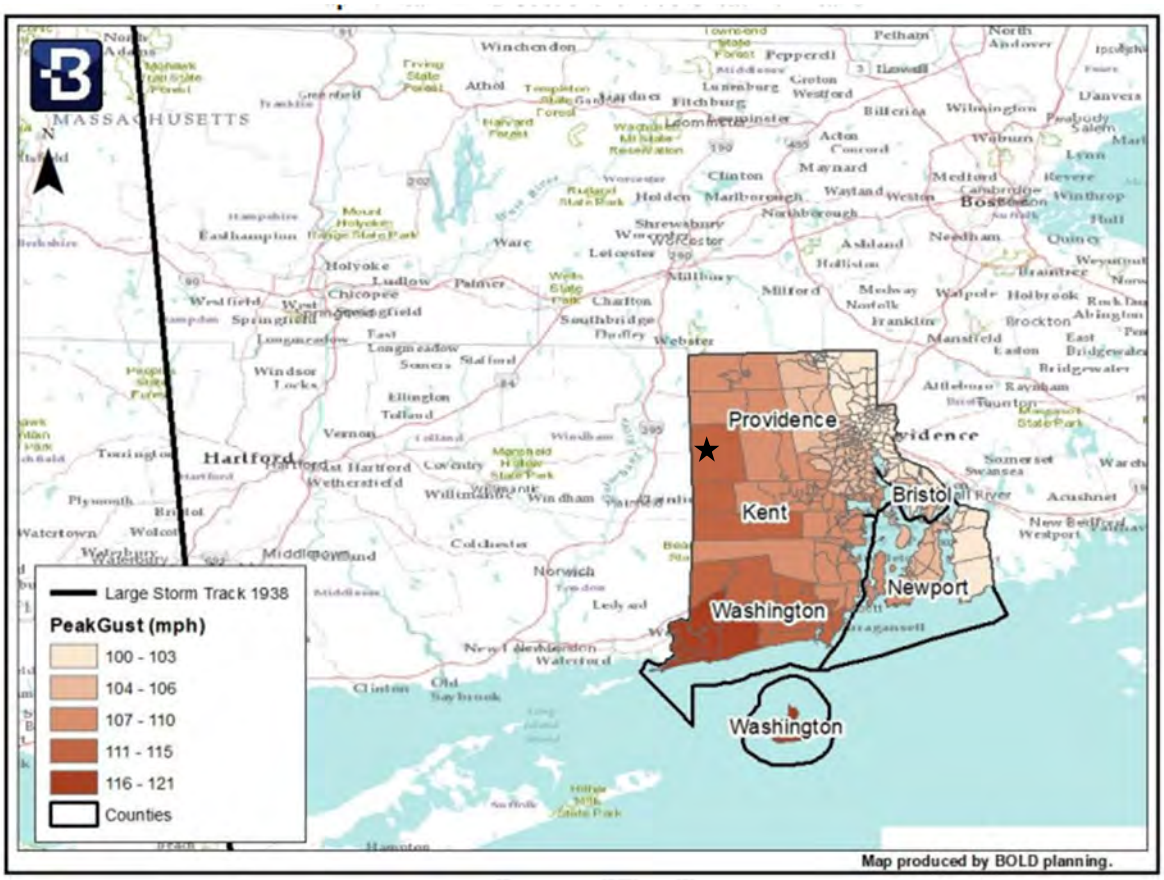
Figure 3-2 Historical Hurricane Tracks within 20 miles of Foster

3.3.3.4 Extent

Hurricanes that likely make it up to Rhode Island are usually weak (Category 1) or downgraded tropical systems. The wind speeds may be less, but the storms can still bring a lot of rain.

Hurricanes are categorized according to the Saffir/Simpson scale (Table 3-7) with ratings determined by wind speed and central barometric pressure. Hurricane categories range from one (1) through five (5), with Category 5 being the strongest (winds greater than 155 mph). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 24 hours or sooner.

Figure 3-3 shows the statewide peak wind gust of the 1938 Great Hurricane. Foster experienced a peak wind gust of 111-115 mph.



Source: RIEMA 2024

Figure 3-3 Peak Wind Gust of the 1938 Great Hurricane

Based on the extent of past events and the criteria identified in Table 3-2, the extent of hurricanes/tropical cyclones in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

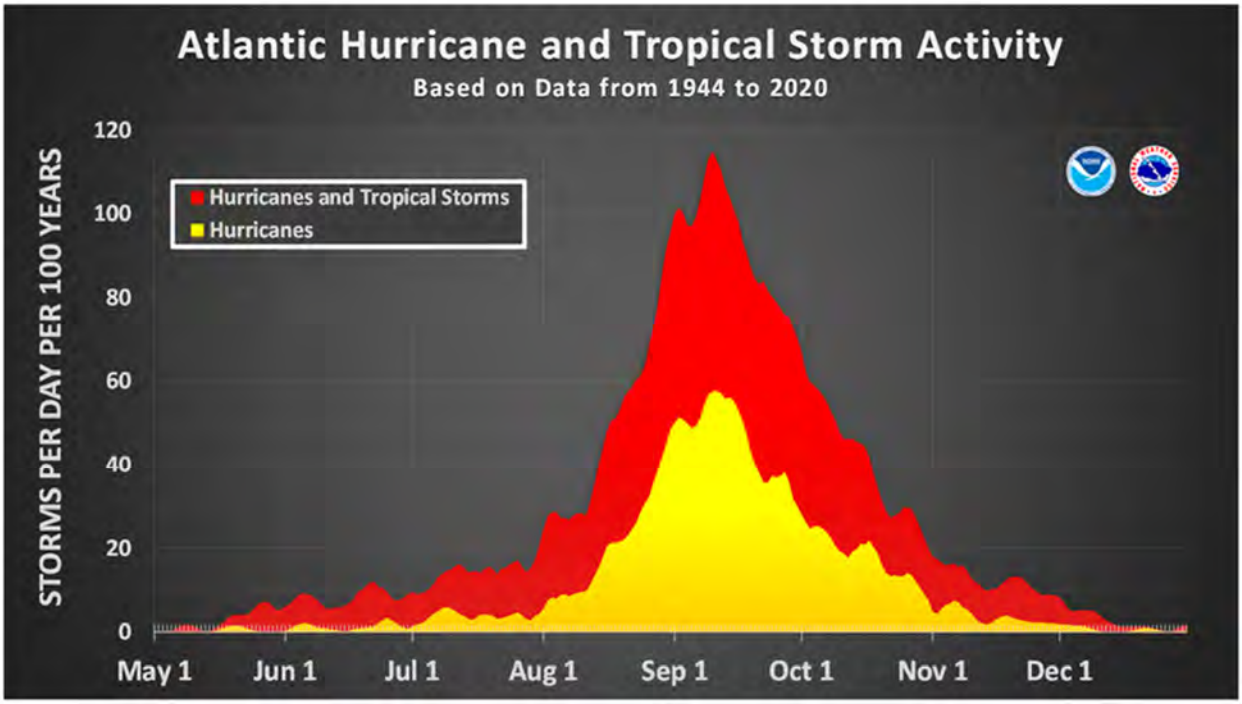
3.3.3.5 Impact

The wind and rain that precedes a hurricane can cause severe damage even to those communities that are further inland, such as Foster. As Foster is an inland community, most damage from a hurricane would be from downed power lines, downed trees, and damage to mobile homes or older structures.

3.3.3.6 Probability of Future Occurrence

The official hurricane season for the Atlantic basin is from June 1 to November 30, but tropical cyclone activity sometimes occurs before and after these dates. The peak of the Atlantic hurricane season is September 10, with most activity occurring between mid-August and mid-October.

Figure 3-4 shows the seasonal distribution of Atlantic hurricane and tropical storm activity from 1944-2020.



Source: NOAA NHC 2021

Figure 3-4 Atlantic Hurricane and Tropical Storm Activity (1944-2020)

Hurricanes occur annually in the Atlantic Ocean, but based on previous occurrences and the criteria identified in Table 3-3, it is Possible a hurricane will impact Foster in the next five years; there is a between 1-49.9% annual probability of occurring.

3.3.3.7 Future Conditions Including Climate Change

The physics driving the global climate are complicated thus it is hard to be certain how climate change will influence the intensity, frequency, and geographical distribution of hurricanes. Some effects of climate change, like rising sea surface temperatures, are thought to favor hurricane development and intensification. Other meteorological effects (such as increasing upper troposphere temperature and vertical wind shear) of climate change are believed to be unfavorable for hurricane formation (EC4 STAB 2016).

In the Atlantic basin, modeling studies predict a substantial reduction in the number of tropical storms and hurricanes, but the frequency of intense storms (Category 4 and 5) is likely to increase and possible double by the end of the 21st century (EC4 STAB 2016).

While the impact of climate change on the frequency of storms in the Atlantic Basin remains uncertain, the predicted changes in storm activity could change the frequency and intensity of associated storm surges, high winds, and precipitation events, causing serious implications for both coastal and inland communities and infrastructure systems in Rhode Island (Resilient Rhody 2018).

3.3.4 Snow Storm

3.3.4.1 Description

A winter storm is a combination of heavy snow, blowing snow, and/or dangerous wind chills. A winter storm is life-threatening.

A snowstorm is an example of a winter storm. A snow storm occurs when a mass of very cold air moves away from the polar region and collides with a warm air mass. The warm air rises quickly and the cold air cuts underneath it, causing huge cloud banks to form. As the ice crystals within the cloud collide, snow is formed. However, snow will only fall from the cloud if the temperature of the air between the bottom of the cloud and the ground is below 40 degrees Fahrenheit. A higher temperature will cause the snowflakes to melt as they fall through the air, turning them into rain or sleet. Similar to ice storms, the effects from a snow storm can disturb a community for a prolonged period of time. Buildings and trees can collapse under the weight of heavy snow.

Winter storms vary in size and strength and can be accompanied by strong winds that create blizzard conditions and dangerous wind chills. A blizzard as a specific type of snowstorm that consist of large amounts of snow or blowing snow, winds greater than 35 mph, and visibility of less than ¼ mile for at least three hours.

3.3.4.2 History

Table 3-10 provides details on historical heavy snow and winter storm events in Foster.

Since the 2018 HMP, there have been 3 heavy snow or winter storm events in Foster, but no damages were reported.

Table 3-10: History of Heavy Snow and Winter Storm Events in Foster

Date	Event Details
02/16/1996	A rapidly intensifying low pressure system moved northeast from off the Virginia Capes passing southeast of Cape Cod. It brought still another in a long series of major snowstorms this winter season. 5.2 inches of snow was recorded in North Foster. The seasonal snowfall total reached 79.9 inches at North Foster. Highway travel was seriously disrupted for the Friday afternoon rush hour and many motorists were delayed several hours before arriving home.
03/07/1996	A low-pressure system moved from North Carolina northeastward to just southeast of New England and brought yet another heavy snowstorm to northern and central Rhode Island. Only a few inches accumulated across the south, where the precipitation was mostly rain and sleet. Light freezing rain and drizzle occurred on March 6th and early on March 7th before significant snow accumulation began. A thin coating of glaze resulted in very icy roads. Numerous minor skidding accidents occurred. 7.6 inches of snow was recorded in North Foster.
04/07/1996	A low-pressure system developed off the North Carolina coast and a nor'easter accompanied by heavy, wet snow began during the late afternoon on Easter Sunday. The greatest reported totals included 8.0 inches in North Foster. Snow melted to only slushy accumulations on pavements but stuck to trees and wires. No significant travel problems were reported.
04/09/1996	A low-pressure system developed along the mid-Atlantic coast and intensified to 984 mb (29.06 in.) as its center passed right over Nantucket Island, MA at 10 AM on April 10th. The storm brought a record late-season snowfall to much of the state and especially to the higher elevations of northern Rhode Island. North Foster had the highest snowfall total of 21.5 inches. New snowfall records were established for a single April storm and for a 24-hour period during the month of April. At North Foster, 129.1 total inches.
12/06/1996	An intensifying storm system moving eastward from the southeast tip of Long Island caused heavy, wet snow across much of the state. The storm caused scattered power outages and poor road conditions. The greatest amounts were reported from the higher elevations of western and northwestern Rhode Island. In North Foster, 11.3 inches.

Date	Event Details
12/07/1996	A low-pressure system centered over Georgia at 7 AM on December 7th moved rapidly northeast across North Carolina. The intensifying system then moved about parallel to the Mid-Atlantic coast with its center reaching Plymouth County in southeast Massachusetts. Heavy, wet snow fell over northwest Rhode Island and a few inches of snow accumulated in the central part of the state. Snowfall totals reached 7 to 10 inches in the higher elevations around Foster and Burrillville. There were no reports of significant damage from this storm.
01/11/1997	A developing low-pressure system south of Long Island spread snow across the entire state. This was a quick-hitting storm system with snowfall rates up to two inches per hour. Most of the snowfall lasted only 6 hours. Since this snow fell on a Saturday morning there were minimal effects on highway travel, but there were the usual spinouts and minor collisions on the highways. In North Foster, 7.4 inches fell.
03/31/1997	A low-pressure system formed off the New Jersey coast during the early morning hours and intensified rapidly as it moved to a position 60 miles south of Newport, Rhode Island by early evening. Pressure falls of 14 millibars occurred during a 12-hour period. The system then retreated to the south during the evening. The weight of the heavy, wet snow began knocking down tree limbs and power lines and widespread power outages began occurring during the late afternoon and evening across much of the state, except the area from Providence south and southwestward where there were only scattered outages. Highway travel was just about impossible during the evening due to the prevailing blizzard conditions. Snowfall totals by midnight exceeded one foot in northern Rhode Island, with 15 inches at North Foster.
04/01/1997	A low-pressure system which formed off the New Jersey coast during the early morning hours of March 31st intensified rapidly as it moved to a position 60 miles south of Newport, Rhode Island. This system retreated to the south during the early morning hours of April 1st, pulling in cold air from the north. The center then moved slowly eastward. Heavy snow and strong winds produced blizzard and near-blizzard conditions across most of Rhode Island during the early morning hours on April 1st. Snowfall accumulations set all-time records for April across most of the state, with amounts ranging from around 4 inches along the south coast to nearly 30 inches along the Massachusetts border in the extreme northern portion of the state. The heavy, wet snow made snow removal extremely difficult and highway travel was just about impossible during the height of the storm. Over a thousand tree limbs and some trees were reported down in Providence and some streets were initially left unplowed due to fallen tree limbs and wires. Schools were closed for two days. Up to 55,000 electric customers were without power at the height of the storm early on April 1st. Most of the estimated dollar damage was due to snow removal and power restoration. In North Foster, 24 inches.
12/23/1997	A low-pressure system developing off the Delaware coast moved to the northeast and intensified rapidly, passing southeast of Cape Cod. This storm brought a surprise heavy snowfall to northern Rhode Island. Heavy snowfall was a surprise to everyone including weather forecasters. Despite some slick driving and early school dismissals, there was little disruption to many local communities. 6 inches in North Foster.
02/25/1999	A strong low-pressure system, which passed about 200 miles southeast of Cape Cod, brought heavy snow to Rhode Island. Over a foot of snow was reported west and north of Providence. The storm closed schools across the state, and created hazardous road conditions. This was the heaviest snowfall of the winter to date. The highest snowfall reported was 14.9 inches in North Foster.
12/30/2000	The season's first winter storm dumped 6 to 9 inches of snow in western Kent and northwest Providence Counties. Since the storm occurred on a Saturday, no major problems with travel were noted. Some of the higher snowfall totals reported include 8 inches in North Foster.

Date	Event Details
01/20/2001	Heavy snow fell across all of Rhode Island. The highest snowfall totals were found in Providence, Bristol, and Newport Counties, where as much as 8 inches of snow were recorded. Since the storm occurred over the weekend, impact on travel was kept to a minimum, but there were still several minor accidents throughout the state. Only a few hundred electric customers were left without power. Some snowfall totals from the storm include 7 inches Foster.
03/05/2001	A major winter storm impacted central and northern Rhode Island with heavy snow and strong winds. The slow-moving storm, which tracked south of New England, dumped more than a foot of snow across Providence and Kent counties and knocked out power to tens of thousands of customers. Schools and businesses were shut down for three days in some communities. As much as 16 inches of snow fell in North Foster.
11/27/2002	A winter storm passing southeast of New England brought heavy snow to northern Rhode Island. The storm occurred on the day before Thanksgiving, but the impact on travel was minimal since most people traveled the day before, in anticipation of the storm. Still, several minor accidents were reported throughout the region, but no injuries were directly attributable to the storm. 6 inches of snow fell in Foster.
12/25/2002	A major winter storm impacted southern New England on Christmas Day, bringing heavy, wet snow and high winds to the Ocean State. The weight of the snow, combined with strong northeast winds, brought down tree limbs and power lines Snowfall totals included 6 inches in North Foster.
01/03/2003	A powerful winter storm tracked south of New England and dumped heavy snow over northwest Rhode Island. Aside from scattered power outages and dozens of minor accidents, little significant impact occurred from the storm since most residents avoided travel. No injuries or damage was directly attributable to the storm. 8 inches in North Foster.
02/07/2003	A winter storm passing southeast of Nantucket brought heavy snow to Rhode Island. No significant storm damage was reported, mainly due to the fluffy, light nature of the snow as temperatures fell into the teens and 20s during the height of the storm. The main impact was to travel, as police and fire departments responded to numerous fender-benders. No injuries were reported. 12 inches in North Foster.
02/17/2003	A major winter storm impacted southern New England with heavy snow and strong winds as it tracked southeast of Nantucket. No significant damage was reported due to the storm, primarily since the snow was fluffy and light with temperatures in the teens and 20s. Impact on travel was minimal since the storm affected the region on Presidents Day and most schools were closed that week. However, there were numerous reports of minor accidents as a result of slippery roads. No injuries were reported. 17 inches in North Foster.
03/06/2003	A fast-moving winter storm passing south of New England brought heavy snow to Rhode Island, where totals of 6 to 10 inches were common. Although dozens of minor accidents were reported as a result of poor visibility and slippery roads, the overall impact of this late season storm was far less on the Ocean State than to areas in adjacent southeast Massachusetts. 8 inches North Foster.
12/05/2003	A major winter storm brought heavy snow and strong winds to southern New England, dumping 1 to 2 feet of snow over a large area as it tracked slowly off the coast. In Rhode Island, snowfall amounts averaged between 10 and 20 inches, and had a major disruption on transportation due to the combination of poor visibility and snow-covered roads. Dozens of minor accidents were reported. Two deaths were indirectly attributed to the storm. One man was killed when the inner tube he was riding in, towed behind a truck, hit a utility pole. Another man was killed when he was hit by a train while crossing the tracks on a

Date	Event Details
	snowmobile in Exeter. 21 inches in North Foster.
12/26/2004	A powerful winter storm brought heavy snow and strong winds to Rhode Island. Snowfall totals of 6 to 10 inches were widely observed throughout the state, along with winds gusting as high as 50 mph along the south coast. There were dozens of reports of accidents due to the combination of slick roads and poor visibility. 7 inches in North Foster.
01/05/2005	Strengthening low pressure tracking southeast of Nantucket brought heavy snow to northern Rhode Island and much of interior southern New England. Snowfall totals of 5 to 7 inches were widely observed throughout Providence County. 7 inches in North Foster.
01/22/2005	A major winter storm brought heavy snow, high winds, and coastal flooding to southern New England. In Rhode Island, snowfall totals of 15 to 25 inches were widely observed. Winds gusting as high as 60 mph at times (mainly around greater Providence) created near blizzard conditions at times, making travel impossible during the height of the storm. 15 inches in North Foster.
02/24/2005	Low pressure over the Mid Atlantic states strengthened rapidly as it passed southeast of Nantucket, and brought heavy snow to much of southeast New England, including Rhode Island. Snowfall totals averaged 5 to 8 inches throughout the Ocean State, with locally as much as 10 inches near the south coast. 7 inches in North Foster.
03/01/2005	Heavy snow and gusty winds affected Rhode Island and all of southern New England, as low pressure reformed off the mid Atlantic coast and tracked southeast of the region. 8 inches in North Foster.
03/12/2005	Low pressure south of Long Island intensified rapidly as it headed to the Canadian Maritimes, and brought heavy snow to northwest Rhode Island and much of interior southern New England. Dozens of minor accidents and spinouts were reported, but no major problems occurred. 7 inches in North Foster.
03/23/2005	Low pressure off the Virginia coast tracked well southeast of New England, but brought pockets of heavy snow to northwest Rhode Island. This late season storm had little impact on travel, although several minor accidents were reported. 9 inches in Foster.
02/14/2007	Low pressure strengthened rapidly as it tracked from the mid Atlantic coast to Cape Cod. Snow began in northern Rhode Island just after midnight on the 14th, before changing to a wintry mix of snow, sleet, and freezing rain during the morning of the 14th. This was the season's first winter storm, and the combination of snow and ice resulted in hazardous travel conditions. Snowfall totals ranged from 2 inches in North Foster. Light icing was also reported from a combination of snow, sleet, and freezing rain. The wintry mix changed to rain for a few hours, before ending as a period of freezing drizzle.
03/16/2007	Low pressure over the Carolinas strengthened as it tracked over southeast Massachusetts and Cape Cod Bay. This winter storm brought heavy snow and sleet to interior sections of Rhode Island with totals of 4 to 7 inches, before an eventual change to sleet, freezing rain, and then rain. 8 inches in North Foster.
03/14/2017	Snow began off and on before daybreak, then became heavy during the morning hours and tapered off in the early afternoon. Up to 2 to 3 inch per hour rates occurred. Strong/damaging winds gusted to 45 to 60 mph across much of Rhode Island.

Date	Event Details
	11.5 inches per a Co-Operative Observer in North Foster.
04/18/2020	An area of light freezing rain moved across Rhode Island during the morning rush hour, causing numerous traffic accidents and a few road closures due to icing. It was enough to cause some tree damage across the region. 5.4 inches per a Co-Operative Observer in North Foster.
10/30/2020	Immediately after winds and rainfall associated with post-tropical cyclone Zeta (which passed well to our southeast) diminished, a new system approached. This was a rapidly moving upper level low and its associated upper jet max, which moved northeastward from the Mississippi Valley and low pressure again passed to the south of New England. Cold air was streaming into the region from the north. The result was some heavy, wet snow across much of the region, with northern RI receiving 3 to 6 inches. The weight of the snow caused scattered tree and power line damage. A Co-op Observer in North Foster recorded 5.7 inches
02/01/2021	A mid-level trough over the Appalachians produced a secondary surface low pressure near the mid-Atlantic coast. High pressure over Hudson Bay allowed low level cold air to stay in place initially. This storm also produced strong winds. 12.5 inches in North Foster.
02/27/2023	A potent mid-level low/shortwave deamplified as it moved east-southeast from the Ohio Valley late on the 27th and early on the 28th. 7 inches in Foster.

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a)

Additionally, Rhode Island has experienced six Presidential Disaster Declarations related to severe winter storms (Table 3-11). Foster was not severely impacted by any of these disasters. Since the 2018 HMP, there has been 1 Rhode Island Presidential Disaster Declaration relating to winter storms.

Table 3-11 State of Rhode Island Presidentially Declared Disasters Relating to Winter Storms

Designation	Declaration Date	Incident Type
DR-548-RI	02/16/1978	Snow and Ice
EM-3058-RI	02/07/1978	Blizzards and Snowstorms
DR-1091-RI	01/24/1996	Blizzard
DR-4107-RI	03/22/2013	Severe Winter Storm and Snowstorm
DR-4212-RI	04/03/2015	Severe Winter Storm and Snowstorm
DR-4653-RI	05/12/2022	Severe Winter Storm and Snowstorm

Source: FEMA 2024

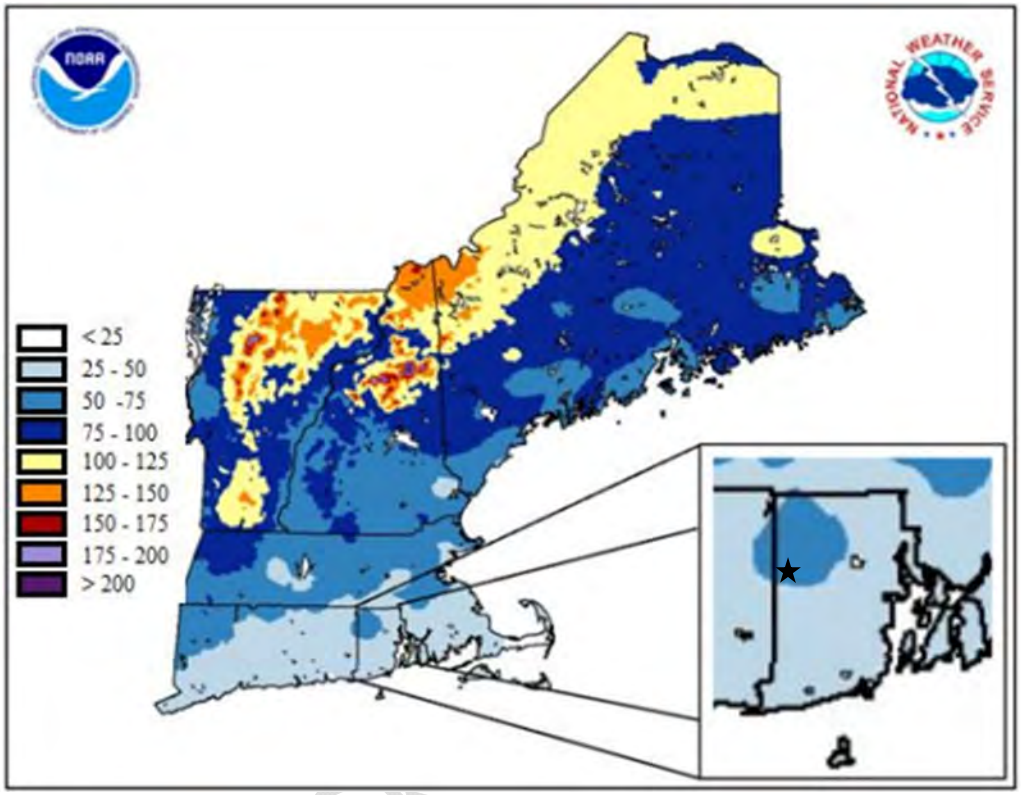
3.3.4.3 Location

The majority of Rhode Island lies outside the heavy snow and ice regions of the northeast. Due to its maritime climate, Rhode Island generally experiences cooler summers and warmer winters than inland areas. However, snow does occur and can be more than an inconvenience and cause extensive damage. The two major threats from heavy snow are stranded populations and snow loading on rooftops.

All of Foster is susceptible to snow storms. Roads, trees, and power lines will be the most affected.

3.3.4.4 Extent

Figure 3-5 shows average snowfall amounts in inches for the state. Foster lies in the 50–75-inch category. On average, Foster receives 57 inches of snow throughout the year.



Source: NOAA per RIEMA 2024

Figure 3-5 Rhode Island Average Annual Snowfall (1991-2020)

Based on the extent of past events and the criteria identified in Table 3-2, the extent of snow storms in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.4.5 Impact

The Northeast Snowfall Impact Scale is a scale used to assess and rank the impact of snowfall events in the northeastern United States. It was developed by NOAA to provide a standardized way of measuring the societal and economic impacts of snowstorms (RIEMA 2024). The scale considers factors such as snowfall amount, population density, and the area affected by the storm to determine its impact. The scale has five categories, each with its own associated impacts:

Table 3-12 Northeast Snowfall Impact Scale

Category	Description	Impacts
1	Notable	• Light to moderate snowfall. • Limited impacts on transportation and daily life. • Typically localized to small areas.

Category	Description	Impacts
2	Significant	• Moderate to heavy snowfall. • Widespread impacts on transportation, including delays and disruptions. • Some school and business closures. • Widespread power outages are rare.
3	Major	• Heavy snowfall, often exceeding one foot or more. • Significant transportation disruptions, including major highway closures. • Widespread school and business closures. • Power outages may occur, especially in areas with wet, heavy snow.
4	Crippling	• Extreme snowfall, often exceeding two feet or more. • Severe and prolonged transportation disruptions, including highway closures. • Widespread school and business closures for an extended period. • Widespread and prolonged power outages, especially in areas with ice accumulation.
5	Extreme	• Exceptional snowfall, often exceeding three feet or more. • Complete paralysis of transportation systems, including major highways and airports. • Extended school and business closures. • Widespread and prolonged power outages with significant damage to the electrical infrastructure.

Source: RIEMA 2024

As described in the 2024 State of Rhode Island HMP, impacts on people and the community from winter storms may include:

- **Injuries and Fatalities**: Slippery sidewalks, roads, and driveways can lead to slip and fall accidents, vehicle crashes, and pedestrian injuries. Exposure to extreme cold temperatures can cause frostbite, hypothermia, and cold-related illnesses, which can be life-threatening.
- **Power Outages**: Heavy snow, ice, and freezing rain can bring down power lines and disrupt electricity supply. Power outages can lead to heating and lighting challenges, particularly in extreme cold conditions.
- **Transportation Disruptions**: Winter storms can make roads and highways treacherous, leading to travel delays, accidents, and stranded motorists. Public transportation services may be disrupted, affecting commuters and essential travel.
- **Stranded or Isolated Communities**: Severe winter weather can leave communities isolated and cut off from emergency services and supplies. Residents may need to shelter in place or rely on local resources until conditions improve.
- **Health Risks**: Exposure to extreme cold can lead to a range of health risks, including frostbite, hypothermia, and cold-related illnesses. Individuals with pre-existing health conditions may face exacerbated risks.
- **Increased Heating Costs**: Cold weather can result in higher heating costs, which can be a financial burden for many households. Low-income individuals and families may struggle to afford adequate heating.
- **Disruption of Essential Services**: Severe winter weather can disrupt essential services such as healthcare, emergency response, and utilities. Hospitals may face increased patient volumes due to weather-related injuries and illnesses.

Additionally, the 2024 State of Rhode Island HMP, describes impacts on critical facilities and infrastructure:

- **Power Outages**: Severe winter storms can cause power outages by bringing down power lines, causing ice accumulation on electrical infrastructure, or overloading the electrical grid due to increased demand for heating. Critical facilities such as hospitals, emergency response centers, and data centers may rely on backup generators to maintain essential operations during outages.
- **Communication Disruptions**: Ice and freezing rain can damage communication infrastructure, including cell towers, telephone lines, and data centers, leading to disruptions in phone and internet services. This can hinder emergency communication and coordination, affecting critical response efforts.
- **Transportation Disruptions**: Snow and ice accumulation on roads, runways, and railways can disrupt transportation networks, leading to travel delays, accidents, and closures. Critical facilities may face challenges in receiving essential supplies and personnel during and after the storm.
- **Healthcare System Strain**: Hospitals and healthcare facilities may experience increased demand for medical services due to storm-related injuries and illnesses, including those related to slips and falls, traffic accidents, and cold exposure.
- **Water Supply Interruptions**: Freezing temperatures can cause water pipes to burst, leading to water supply interruptions and damage to water infrastructure. Critical facilities such as hospitals and emergency response centers rely on a continuous supply of clean water for various purposes, including patient care and firefighting.
- **Wastewater Systems**: Cold temperatures can affect wastewater treatment plants, leading to potential operational disruptions and contamination risks.
- **Fuel Supply Disruptions**: Snow and ice can disrupt fuel supply chains, leading to shortages of gasoline, diesel, and heating oil. Critical facilities may rely on fuel for backup power generators and heating systems.
- **Property Damage**: Severe winter storms can result in property damage, including roof collapses due to heavy snow accumulation, ice damming, and frozen pipes.

Past snow storms in Foster have caused power outages and caused schools and businesses to shut down for multiple days. During a heavy snow storm, the Town may activate their shelters for people without power.

3.3.4.6 Probability of Future Occurrence

Based on previous occurrences and the criteria identified in Table 3 3, it is Highly Likely that Foster will experience a heavy snow/snow storm event within the calendar year; there is a greater than 90% annual probability of occurring.

3.3.4.7 Future Conditions Including Climate Change

The 2024 State of Rhode Island HMP states:

Climate change can lead to greater variability in precipitation patterns. In Rhode Island, this may result in more erratic and intense winter storms with periods of heavy snowfall followed by rain or freezing rain. These mixed precipitation events can make winter storms more challenging to predict and can lead to a greater risk of ice accumulation.

Additionally, Rhode Island may experience milder winters as average temperatures rise due to climate change. While this could lead to a decrease in the frequency of traditional snowstorms, it may also increase the likelihood of winter storms that produce mixed precipitation, including freezing rain and sleet. Warmer

temperatures can lead to a higher snowfall threshold, meaning that storms that would have produced snow in the past may now bring more rain or a mix of precipitation types. This can affect the accumulation of snow in the state.

Changes in atmospheric circulation patterns associated with climate change can influence the tracks of winter storms. This could lead to a shift in the amounts of heavy snowfall, ice, and other winter weather hazards in Rhode Island (RIEMA 2024).

3.3.5 Ice Storm

3.3.5.1 Description

Ice storms are characterized by the accumulation of freezing rain or freezing drizzle, which coats surfaces with a layer of ice. These storms can have significant impacts on transportation, infrastructure, and the environment. Ice storms occur when there is a layer of warm air above a layer of cold air near the surface. Precipitation falls as rain in the warm layer and then freezes upon contact with surfaces at or below freezing temperatures in the cold layer. The most common type of precipitation during an ice storm is freezing rain. This is rain that falls as a liquid but freezes upon contact with cold surfaces, forming a layer of ice (RIEMA 2024).

3.3.5.2 Location

All of Foster is susceptible to ice storms.

3.3.5.3 History

Due to the unique weather in New England, ice storms are usually part of larger snow events. The winter storm event that crippled the state in February 1978 did include a FEMA disaster declaration for snow and ice. Subsequent storms have included ice warnings when there are rapidly warming and cooling temperatures.

Table 3-13 provides details for historical ice storms that impacted Foster. Note that more ice storms may have occurred but are classified as larger winter storm events. Since the 2018 HMP, there have been 0 ice storms that impacted Foster.

Table 3-13 Historical Ice Storms that Impacted Foster

Date	Description of Event
02/14/2018	An area of light freezing rain moved across Rhode Island during the morning rush hour, causing numerous traffic accidents and a few road closures due to icing. At 7:14 AM EST in Foster and Scituate, several multiple vehicle accidents were reported due to icing.

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a)

3.3.5.4 Extent

Ice storms can be the most devastating winter weather phenomena and are often the cause of automobile accidents, power and communication system outages, personal injury, and death. Moreover, they can hinder the delivery of emergency services needed in response to these catastrophes and endanger the responders. Ice storms accompanied by wind gusts cause the most damage.

Significant ice accumulations are usually accumulations of ¼" or greater.

The Sperry–Piltz Ice Accumulation (SPIA) Index is a scale for rating ice storm intensity, based on the expected storm size, ice accumulation, and damages on structures, especially exposed overhead utility systems (Table 3-14). The SPIA Index uses forecast information to rate an upcoming ice storm's impact from 0 (little impact) to 5 (catastrophic damage to exposed utility systems).

Table 3-14 The Sperry-Piltz Ice Accumulation Index

Ice damage index	Radial ice	Wind	Damage and impact descriptions
0	0–0.25 in	0-15 mph	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10–0.25 in	15–25 mph	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25–0.50 in	0–15 mph	
2	0.10–0.25 in	25–35 mph	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25–0.50 in	15–25 mph	
	0.50–0.75 in	0–15 mph	
3	0.10–0.25 in	Over 35 mph	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 to 5 days.
	0.25–0.50 in	25–35 mph	
	0.50–0.75 in	15–25 mph	
	0.75–1.00 in	0–15 mph	
4	0.25–0.50 in	Over 35 mph	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5 to 10 days.
	0.50–0.75 in	25–35 mph	
	0.75–1.00 in	15–25 mph	
	1.00–1.50 in	0–15 mph	
5	0.50–0.75 in	Over 35 mph	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75–1.00 in	Over 25 mph	
	1.00–1.50 in	Over 15 mph	
	Over 1.50 in	Any	

Foster expects at least a level 1 (isolated or localized utility interruptions) every year due to ice.

Based on the extent of past events and the criteria identified in Table 3-2, the extent of ice storms in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.5.5 Impact

The Foster HMPC is most concerned about ice taking down trees throughout the heavily forested town. Falling trees have taken out power lines, damaged buildings, and essentially shut down the town. Without power, many residents aren't able to operate their wells for drinking water. Icy roads can also cause dangerous driving conditions.

The HMPC reported that within a 2-week period in December 2023, there were 3 roll-over vehicular accidents due to icy roads in Foster.

3.3.5.6 Probability of Future Occurrence

Based on previous occurrences and the criteria identified in Table 3-3, it is Likely Foster will experience an ice storm in the next five years; there is a between 50-89.9% annual probability of occurring.

3.3.5.7 Future Conditions Including Climate Change

Warming temperatures will mean less snowfall but if there is enough moisture in the atmosphere, it may fall as freezing rain, coating everything in ice. It is likely that Foster will see more ice events.

3.3.6 Drought

3.3.6.1 Description

Drought is characterized as a continuous period of time in which rainfall is significantly below the normal for a particular area over a multi-year period. The American Meteorology Society defines drought as a period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance.

There are cases when drought develops relatively quickly and lasts a very short period of time, exacerbated by extreme heat and/or wind, and there are other cases when drought spans multiple years, or even decades (RIEMA 2024). While droughts typically cause very little structural damage, they can have profound economic, environmental, and social impacts.

There are four different ways that a drought can be categorized:

1. Agricultural: When the amount of moisture in the soil no longer meets the needs of previously grown crops.
2. Hydrological: When surface and subsurface water levels are significantly below their normal levels.
3. Meteorological: When there is a significant departure from the normal levels of precipitation.
4. Socio-Economic: When the water deficiency begins to significantly affect the population.

3.3.6.2 History

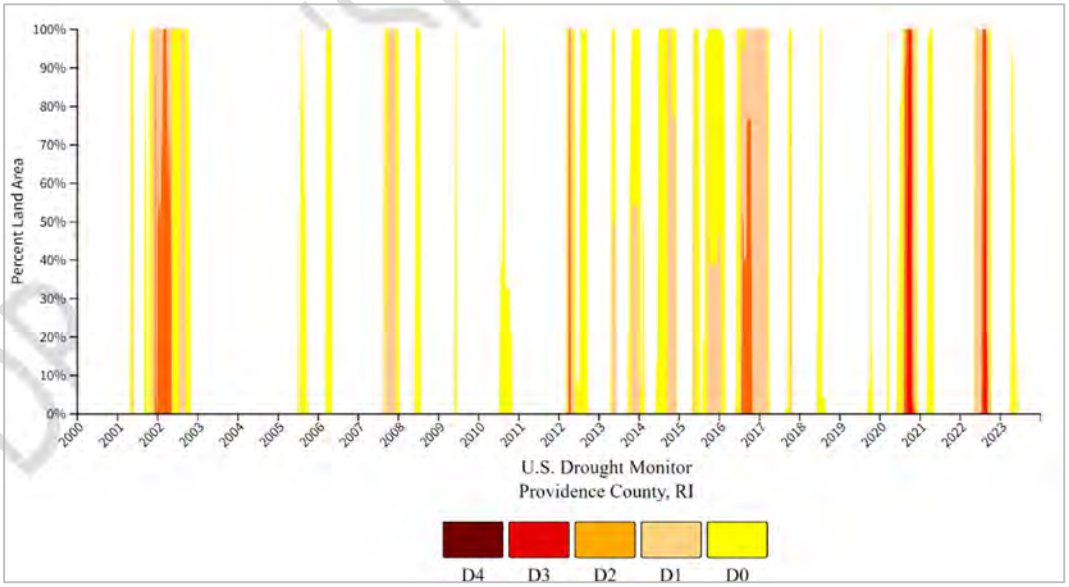
The United States Drought Monitor (USDM) tracks drought conditions in Rhode Island and in the rest of the nation. They create maps based on climate data, hydrologic and soil conditions, as well as reported impacts and observations from over 350 contributors nationwide. Table 3-15 describes the USDM's drought classification system as well as possible impacts from each category.

Table 3-15 USDM Classifications of Drought Conditions

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

Figure 3-6 shows historical drought conditions for Providence County from 2000-2023. The legend for this figure is below.

Since the 2018 HMP, Providence County has been through periods of drought ranging from D0 (Abnormally Dry) to D3 (Extreme Drought).



Source: NOAA NIDIS 2023

Figure 3-6 Historical Drought Conditions for Providence County (2000-2023)

Table 3-16 further breaks down the weekly percentage that Providence County was in one of the USDM categories from 2000-2023.

Table 3-16 Weekly Percentage of Providence County in USDM Categories (2000-2023)

County	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Providence	73.6%	26.4%	12.4%	3.4%	0.5%	0.0%

Source: RIEMA 2024

Additionally, The Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans available to producers suffering losses in those counties and in counties that are contiguous to a designated county. United States Department of Agriculture Secretarial disaster designations must be requested of the Secretary of Agriculture by a governor or the governor's authorized representative, and there is an expedited process for drought (RIEMA 2024).

Since 2012, there have been 3 Secretarial Drought Disaster Declarations issued for Providence County (2016, 2020, and 2022) (RIEMA 2024).

3.3.6.3 Location

All of Foster is susceptible to droughts.

3.3.6.4 Extent

The Rhode Island Drought Steering Committee assigns drought levels based on six indices including the Palmer Drought Index (PDI), the Crop Moisture Index (CMI), precipitation data, groundwater levels, stream flow, and surface water reservoir levels (RIEMA 2024).

The PDI, devised in 1965, was the first drought indicator to assess moisture status comprehensively. It uses temperature and precipitation data to circulate water supply and demand; incorporates soil moisture; and is considered most effective for non-irrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief (RIEMA 2024).

Table 3-17 Palmer Drought Index

Category	Range (Per Year)
Extremely Wet	4.0 or more
Very Wet	3.0 to 3.99
Moderately Wet	2.0 to 2.99
Slightly Wet	1.0 to 1.99
Incipient Wet Spell	0.5 to 0.99
Near Normal	0.49 to -0.49
Incipient Dry Spell	-0.5 to -0.99
Mild Drought	-1.0 to -1.99
Moderate Drought	-2.0 to -2.99

Category	Range (Per Year)
Severe Drought	-3.0 to -3.99
Extreme Drought	-4.0 or less

The CMI gives the short-term or status of purely agricultural drought or moisture surplus and can change rapidly from week to week. The CMI indicates general conditions and not local variations caused by isolated rain. Input to the calculations include the weekly precipitation total and average temperature, division constants and previous history of the indices. The CMI can be used to measure the status of dryness or wetness affecting warm season crops and field activities (RIEMA 2024).

Table 3-18 Crop Moisture Index

Category	Crop Moisture Index
Excessively Wet	3.0+
Wet	2.0 to 3.0
Abnormally Wet	1.0 to 1.9
Slightly Dry/Favorably Moist	-0.9 to 0.9
Abnormally Dry	-1.0 to -1.9
Excessively Dry	-2.0 to -2.9
Severely Dry	-3.0 or less

Based on these criteria, Normal, Advisory, and Watch drought levels are issued statewide, and Warning and Emergency drought levels are issued on a regional basis. Table 3-19 details State of Rhode Island drought classifications:

Table 3-19 State of Rhode Island Drought Classifications

Drought Level	PDI	CMI	Precipitation	Ground Water	Stream Flow	Surface Water Reservoirs
Normal	-1.0 to -1.99	0.0 to -1.0 Slightly Dry	Slightly dry	1 month below normal	2 consecutive months below normal	Reservoir levels at or near normal for the time of year
Advisory	-2.0 to -2.99	-1.0 to -1.9 Abnormally dry	2 months cumulative below 65% of normal	At least 2 out of 3 months below normal	3 consecutive months below normal	Small index reservoir below normal
Watch	-3.0 to -3.99	-2.0 to -2.9 Excessively dry	1 of the following criteria met: 3-month cum. <65% or 6 months cum.	4-5 consecutive months below normal	At least 4 out of 5 consecutive months below	Medium index reservoir normal

Drought Level	PDI	CMI	Precipitation	Ground Water	Stream Flow	Surface Water Reservoirs
			<70% or 12 months cum. <70%		normal	
Warning	-4.0 and below	> -2.9 Severely dry	2 of 3 of the above criteria met: 3 months cum. <65% **and** 6 months cum. <65% **and** 12 months cum. <65% Or 3 months cum. <65% **and** 12 months <65%	6-7 consecutive months below normal	At least 6 out of 7 consecutive months below normal	Large index reservoir below normal
Emergency	-4.0 and below	> -2.9 Severely dry	Same criteria as Warning and previous month was a warning.	7 months below normal observation wells recording monthly record lows	>7 months below normal	Continuation of previous month's conditions

Source: RIEMA 2024

Based on the extent of past events and the criteria identified in Table 3-2, the extent of droughts in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.6.5 Impact

Periods of drought can have significant environmental, agricultural, health, economic, and social consequences. The effects vary depending upon vulnerability and regional characteristics. Droughts can also reduce water quality through a decreased ability for natural rivers and streams to dilute pollutants and increase contamination. The most common effects are diminished crop yield, increased erosion, dust storms, ecosystem damage, reduced electricity production due to reduced flow through hydroelectric dams, shortage of water for industrial production, and increased risk of wildland fires (RIEMA 2024).

The main impact of meteorological drought is periods of very high fire danger. In addition, small pond levels are reduced, thereby impacting private wells. All Foster residents rely on wells for their drinking water.

Drought conditions have been known to trigger the rapid increase of the gypsy moth populations in the region. The extended period of dry weather (specifically in May and June) slows the fungus that usually keeps the gypsy moth caterpillars at bay. Denuded trees can have cascading effects on the local ecosystem.

3.3.6.6 Probability of Future Occurrence

Some level of meteorological drought, while not frequent, does occur in Foster every couple of years.

For the 2024 State of Rhode Island HMP, RIEMA reviewed historical data from the U.S. Drought Monitor weekly reports for each Rhode Island County from 2000 through 2023 (1,233 weeks) and created a weekly average that indicates the percentage time in each Drought Monitor category for the State. RIEMA used this average to extrapolate the potential likelihood of future drought conditions (Table 3-20).

Table 3-20 Estimated Weekly Probability of Rhode Island Being in U.S. Drought Monitor Category

None	D0-D4	D1-D4	D2-D4	D3-D4	D4
74.2%	25.8%	11.8%	3.4%	0.8%	0.0%

Source: RIEMA 2024

Based on previous occurrences and the criteria identified in Table 3-3, it is Likely that Providence County (Foster) will experience a drought event in the next five years; there is a between 50-89.9% annual probability of occurring.

3.3.6.7 Future Conditions Including Climate Change

The National Oceanic and Atmospheric Administration (NOAA) State Climate Summary 2022 for Rhode Island suggests that annual average precipitation, as well as extreme precipitation events, are projected to increase for Rhode Island. Although increased precipitation is projected, naturally occurring droughts are projected to be more intense because higher temperatures will increase evaporation rates (RIEMA 2024).

Additionally, higher temperatures associated with climate change can increase the rate of evaporation from soil, water bodies, and vegetation. This can contribute to soil moisture depletion and more rapid drying of surface water sources during dry periods (RIEMA 2024).

3.3.7 Brushfire

3.3.7.1 Description

Brushfires (smaller versions of wildfires) are fueled by natural cover, including native and non-native species of trees, brush and grasses, and crops along with weather conditions and topography. While available fuel, topography, and weather provide the conditions that allow fires to spread, most fires are caused by people through criminal or accidental misuse of fire.

Brushfires pose serious threats to human safety and property in rural and suburban areas. They can destroy crops, timber resources, recreation areas, and habitat for wildlife. Wildfires are commonly perceived as hazards in the western part of the country; however, brushfires are a growing problem in the wildland/urban interface of the eastern United States, including Rhode Island.

Brushfires are dependent upon the quantity and quality of available fuels. Fuel quantity is the mass per unit area. Fuel quality is determined by a number of factors, including fuel density, chemistry, and arrangement. Arrangement influences the availability of oxygen. Another important aspect of fuel quality is the total surface exposed to heat and air. Fuels with large area-to-volume ratios, such as grasses, leaves, bark, and twigs are easily ignited when dry.

Climatic and meteorological conditions that influence wildfires include solar insulation, atmospheric humidity, and precipitation, all of which determine the moisture content of wood and leaf litter. Dry spells, heat, low humidity, and wind increase the susceptibility of vegetation to fire. In Rhode Island, common factors leading to large fires include short-term drought, humidity below 20%, and fuel type.

Various natural and human agents can be responsible for igniting wildfires. Natural agents include lightning, sparks generated by rocks rolling down a slope, friction produced by branches rubbing together in the wind, and spontaneous combustion.

Human-caused wildfires are typically worse than those caused by natural agents. Arson and accidental fires usually start along roads, trails, streams, or at dwellings that are generally on lower slopes or bottoms of

hills and valleys. Nurtured by updrafts, these fires can spread quickly uphill. Arson fires are often set deliberately at times when factors such as wind, temperature, and dryness contribute to the fires' spread.

3.3.7.2 History

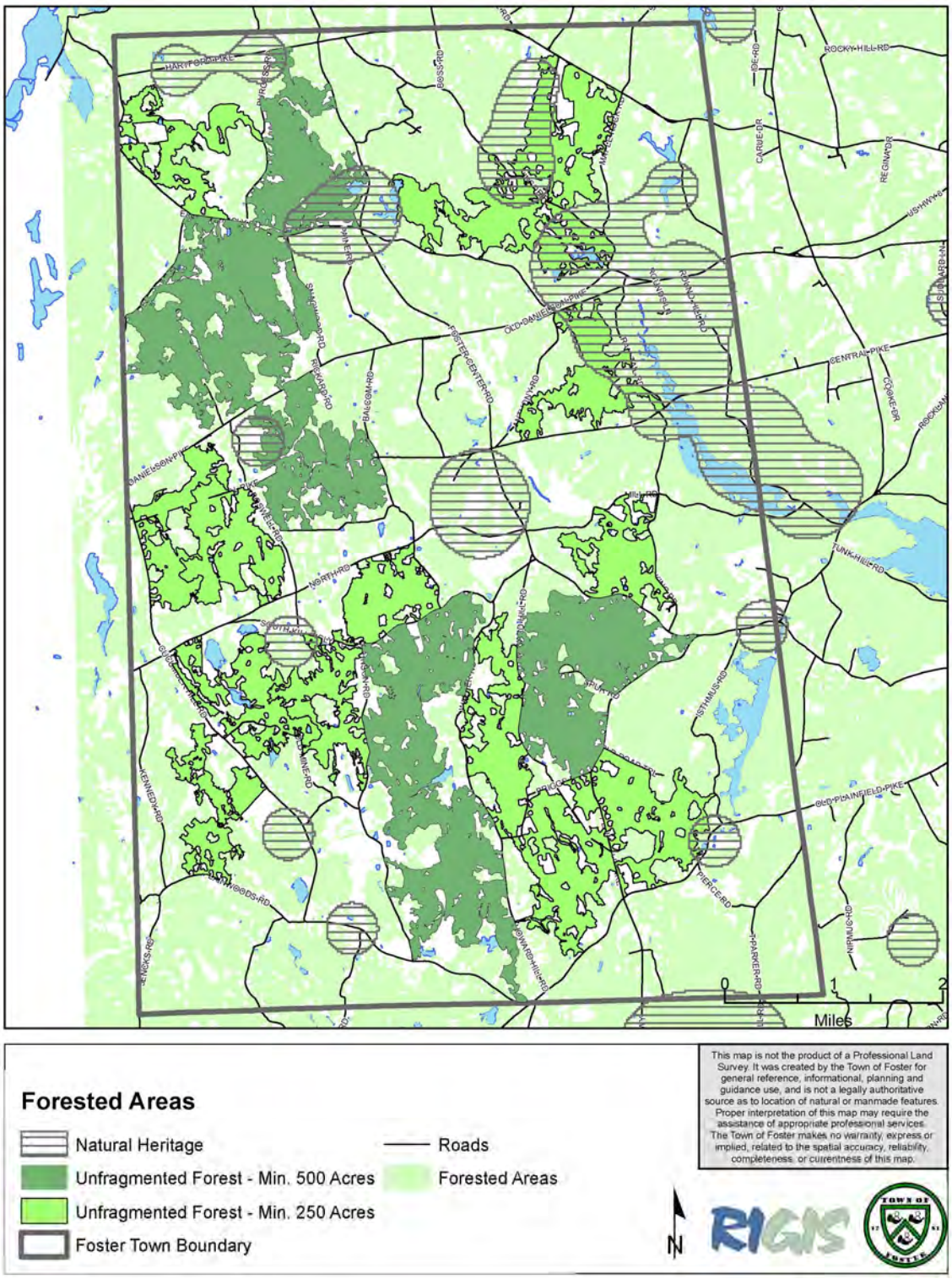
Foster has experienced 0 substantial (>1 acre per event) brushfires in the past 180 years. In 2017, however, there were 2 smaller brushfires totaling less than 2 acres. Since the 2018 HMP, there have been similarly sized brushfires totaling 10-20 acres. These fires occurred throughout the Town and more commonly occur near campgrounds.

The HMPC states that a fire started near the Barden Reservoir due to trespassers not properly putting out the fire. The fire was put out on the surface, but due to the extremely dry conditions, the fire travelled underground, and smaller fires popped up all across the Town for a 2-week period.

3.3.7.3 Location

The majority of land cover in Foster is forested, which is highly susceptible to fires (Figure 3-7).

Areas with downed and dead trees are more susceptible to catch fire. Invasive species, such as the gypsy moth caterpillar, are present in Foster, which have damaged forests in much of New England. They hatch in May, and pupate in late June. In that short time span, the caterpillar feeds on the leaves of deciduous trees. Beginning in 2016, they caused noticeable change in the Northeastern United States.



Source: 2022 Town of Foster Comprehensive Plan

Figure 3-7 Forested Areas in Foster

3.3.7.4 Extent

In Foster, less than 2 acres are burned annually due to brushfires.

Based on the extent of past events and the criteria identified in Table 3-2, the extent of brushfires in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.7.5 Impact

Individual buildings may be more or less vulnerable to damage from wildfire based on factors such as the clear distance around the structure and the structure's construction materials. Brushfire primarily impacts timber and forest ecosystems, although the threat to nearby buildings is always present. Farmland and animals may also be affected.

Additionally, fires require essential resources, like a fire department, to put out, which can be costly for a community.

3.3.7.6 Probability of Future Occurrence

Based on previous occurrences and the criteria identified in Table 3-3, it is Likely that Foster will experience a brushfire event in the next five years; there is a between 50-89.9% annual probability of occurring.

3.3.7.7 Future Conditions Including Climate Change

Changes in precipitation patterns may shorten the dry periods that produce ideal conditions for brushfires. However, periods of drought may be more intense, increasing the fire hazard during the summer.

3.3.8 Extreme Temperatures

3.3.8.1 Description

Extreme temperature events occur when climate conditions produce temperatures well outside of the predicted norm. These extremes can have severe impacts on human health and mortality, natural ecosystems, agriculture, and other economic sectors (RIEMA 2024).

Extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Ambient air temperature is one component of heat conditions, with relative humidity being the other. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when an area of high atmospheric pressure traps moisture laden air near the ground (RIEMA 2024).

Although no specific definition exists for extreme cold, an extreme cold event can generally be defined as temperatures at or below freezing for an extended period of time. Extreme cold events are usually part of winter storm events but can occur during anytime of the year and can have devastating effects on agricultural production (RIEMA 2024).

3.3.8.2 History

Extreme temperatures are recorded by NOAA and are the most accurate recording of weather in and around Foster. Table 3-21 summarizes extreme temperature events within Providence County.

Since the 2018 HMP, there have been 0 extreme temperature events recorded in Providence County.

Table 3-21: History of Extreme Temperatures in Providence County

Date	Event Type	Event Details
09/27/1998	Heat	The mercury soared to 86 degrees at the T.F. Green State Airport (24 miles SE of Foster). This broke the record high for the date of 85 degrees set in 1972.
02/12/1999	Heat	The high temperature of 61 degrees at T.F. Green Airport (24 miles SE of Foster) in West Warwick, reached during the late evening hours, broke the previous record high of 57 degrees which was set in 1984.
03/18/1999	Heat	The high temperature of 71 degrees at T.F. Green State Airport (24 miles SE of Foster) in West Warwick broke the previous record high for the date of 69 degrees, which was set in 1945.
07/06/2010	Heat	A strong ridge built into Southern New England resulting in temperatures nearing 100 with high humidity. Heat index values ranged from 100 to 106 for most of Southern New England on the 6th and again on the 7th in a more limited area, generally the Connecticut River Valley. Heat index values at the Smithfield Automated Weather Observing System were 100 to 104 degrees (17 miles NE of Foster).
07/07/2010	Heat	A strong ridge built into Southern New England resulting in temperatures nearing 100 with high humidity. Heat index values ranged from 100 to 106 for most of Southern New England on the 6th and again on the 7th in a more limited area, generally the Connecticut River Valley. Heat index values at the Smithfield Automated Weather Observing System were 100 to 101 degrees (17 miles NE of Foster).
07/22/2011	Excessive Heat	A strong upper-level ridge brought very hot temperatures to Southern New England. A moist southwest low-level flow increased humidity levels such that heat index values rose above 105 degrees for a period of a few hours. The Automated Weather Observation System at North Central State Airport near Smithfield recorded heat indexes of 105 to 107 over a five-hour period (22 miles NE of Foster).
07/20/2013	Heat	A pre-frontal trough moved into southern New England, providing a lift for showers and thunderstorms to develop in a hot and humid atmosphere. In addition, CAPE up to 2000 J/kg and 30-40 kts of shear provided enough instability and shear for thunderstorms to become severe. Because of warm air aloft, these thunderstorms mostly produced strong to damaging winds and not large hail. A heat advisory was in effect for southeast Providence County, with heat index values up to 102 expected. Heat index values reached 92 in Providence by 8am, peaked at 101 at 2pm and remained there for 3 hours before temperatures fell below 80 after a thunderstorm.
02/16/2015	Extreme Cold/Wind Chill	Low pressure off the Delmarva Peninsula intensified rapidly as it moved northeastward. Its path just southeast of Nantucket brought heavy snow to all of southern New England and blizzard conditions and coastal flooding to coastal areas. The Automated Surface Observation Station at T.F. Green Airport in Warwick, RI recorded wind chills as low as 26 below zero (24 miles SE of Foster).
02/14/2016	Extreme Cold/Wind	Arctic high pressure brought strong northwest winds and extremely cold wind chills to southern New England. Many locations reported wind chills between 25 and 35

Date	Event Type	Event Details
	Chill	degrees below zero. Wind chills as low as 32 below zero were reported in Smithfield (17 miles NE of Foster).

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a)

3.3.8.3 Location

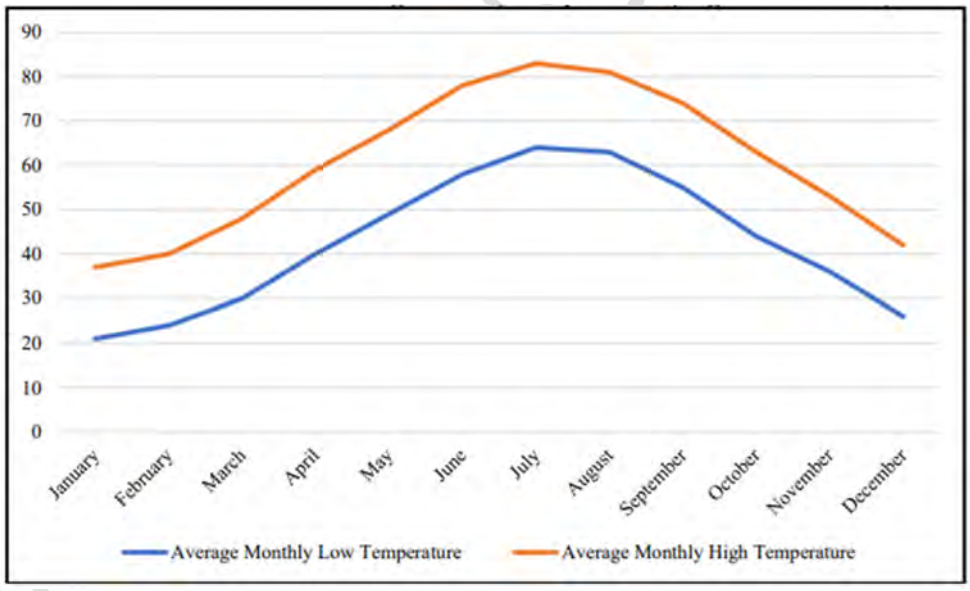
An extreme heat or cold event would be a regional issue affecting Foster and significant portions of Southern New England. Extreme temperatures could have a serious impact on private and public structures, as well as the general population throughout Foster. Those most at risk to extreme temperatures are the elderly and those who work outside. Foster has a high elderly population.

3.3.8.4 Extent

In Rhode Island, extreme cold usually involves temperatures below 0^0F.

The National Weather Service (NWS) issues extreme (or excessive) heat warnings when the maximum expected heat index is expected to be 105^0 F or higher for at least 2 consecutive days and night time air temperatures are not expected to fall below 75^0. In the northeast, these criteria are generally modified to a heat index of 92^0 or higher for 2 consecutive days.

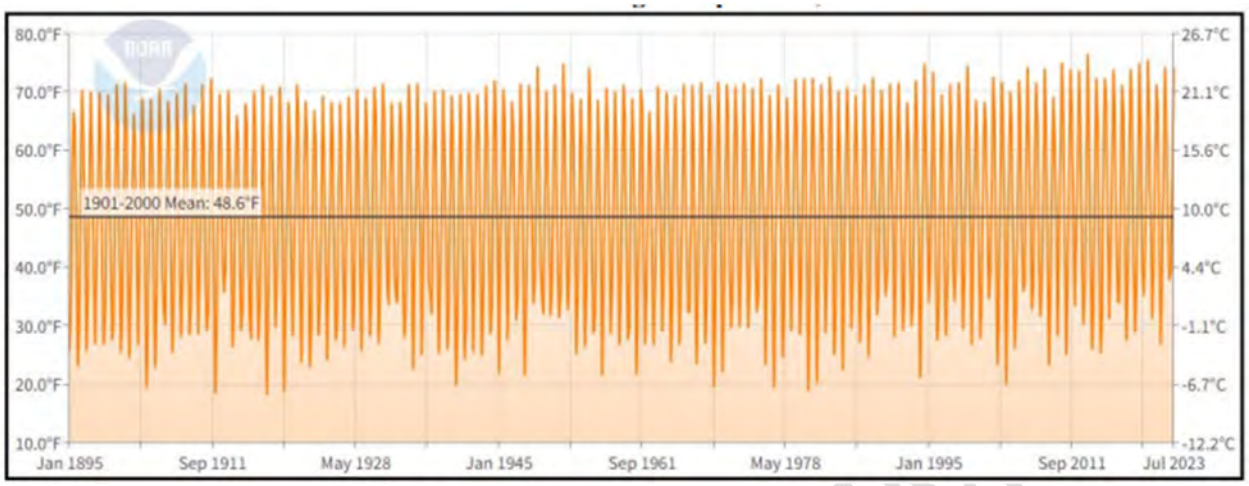
Figure 3-8 details monthly temperature averages for Rhode Island:



Source: NOAA per RIEMA 2024

Figure 3-8 Rhode Island Average Monthly Temperatures (^{0}F)

Figure 3-9 details the average temperature for Rhode Island from 1895 to 2023.



Source: NCEI 2023

Figure 3-9 Rhode Island Average Temperature (1895-2023)

Based on the extent of past events and the criteria identified in Table 3-2, the extent of extreme temperatures in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.8.5 Impact

Personal exposure to dangerous heat conditions may lead to heat cramps, heat exhaustion, and heat stroke. These are especially important to monitor in children, and vulnerable populations that are not able to move to cooler conditions. Agriculture and animals are also stressed by extremely high temperatures.

Extreme cold conditions may occur during, after, or without any connection to a winter storm. Exposure to extreme cold can lead to hypothermia and frostbite. Agriculture and animals are also stressed by extreme cold temperatures.

Frost heaves are a concern in Foster where many of the main roads are unpaved. This leads to investing more money in road repair.

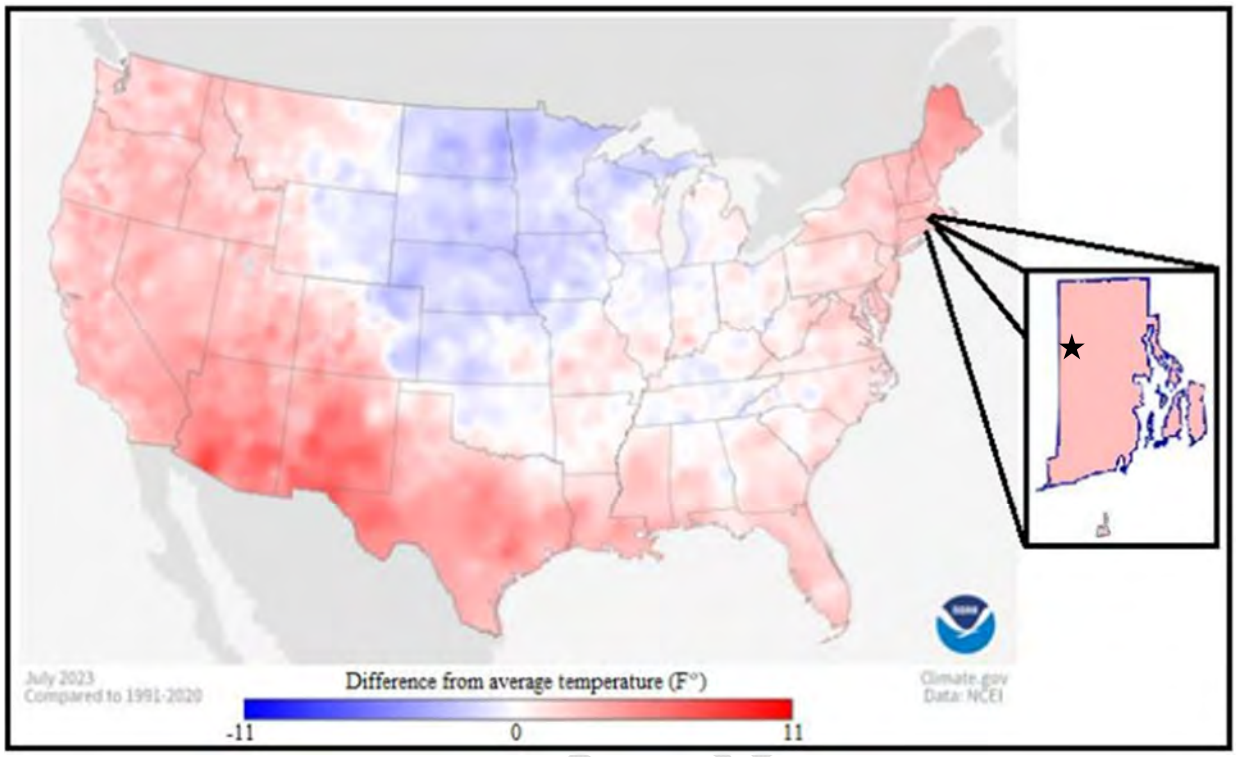
The Centers for Disease Control and Prevention (CDC) identifies the following six groups as being especially vulnerable to extreme temperatures:

- Older Adults (aged 65)
- Infants and Children
- Individuals with Chronic Conditions
- Low-income Individuals
- Athletes
- Outdoor workers

3.3.8.6 Probability of Future Occurrence

Predicting the probability of extreme temperature occurrences is tremendously challenging due to the large number of factors involved (RIEMA 2024). Available data suggests that both the average high temperatures and the record high temperature will likely increase over the coming years (Figure 3-10) (RIEMA 2024).

Rhode Island falls in the +3-5^0 above average range.



Source: NOAA per RIEMA 2024

Figure 3-10 Rhode Island Temperature Difference from Average (1990-2020)

Based on previous occurrences and the criteria identified in Table 3-3, it is Likely that Foster will experience extreme temperatures in the next five years; there is a between 50-89.9% annual probability of occurring.

3.3.8.7 Future Conditions Including Climate Change

The 2024 State of Rhode Island HMP states:

Temperatures in Rhode Island have risen by 4° F since the early 1900s, with the number of hot days above the long-term average since the 1990s. Additionally, the greatest number of warm nights has been recorded over the 2015–2020 period. Very cold days have been mostly below average since the 1980s (RIEMA 2024).

As global temperatures continue to rise, Foster should anticipate more frequent occurrences of extreme heat during the summer, but less extreme cold events during the winter.

3.3.9 Lightning/Thunderstorms

3.3.9.1 Description

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. The NWS classifies a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 mph or greater, or a tornado. About 10% of the estimated 100,000 annual thunderstorms that occur nationwide are considered severe. Thunderstorms affect a smaller area compared with winter storms or hurricanes, but they can be dangerous and destructive for a number of reasons. Storms can form in less

than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce flash flooding.

All thunderstorms contain lightning. Thunderstorms can occur singly, in clusters, or in lines. Therefore, it is possible for several thunderstorms to affect one location in the course of a few hours. Thunderstorms usually bring heavy rains (which can cause flash floods), strong winds, hail, lightning, and tornadoes. Lightning is caused by the attraction between positive and negative charges in the atmosphere, resulting in the buildup and discharge of electrical energy. Lightning is one of the most underrated severe weather hazards, yet ranks as the second-leading weather killer in the United States.

Hundreds of people across the nation are injured annually by lightning, most commonly when they are moving to a safe place but have waited too long to seek shelter. Lightning strike victims often suffer long-term effects such as memory loss, sleep disorders, weakness and fatigue, chronic pain, depression, and muscle spasms. Lightning has the potential to start both house fires and wildfires. Lightning causes an average of 55-60 fatalities, 400 injuries, and over $1 billion in insured losses annually nationwide. Lightning often strikes as far as 10 miles away from any rainfall.

3.3.9.2 History

Table 3-22 provides details for historical lighting/thunderstorm events that impacted Foster. Since the 2018 HMP, there have been 4 events that impacted Foster.

Table 3-22 History of Lightning and Thunderstorms in Foster

Date	Event Details	Damage
06/17/2001	Torrential rainfall associated with the remnants of Tropical Storm Allison resulted in flash flooding throughout Providence County. In Foster, two roads were washed out when runoff carved gulches into the roadways. Lightning struck a log house in Foster which ignited a fire, and completely destroyed the home.	$150,000
08/05/2005	Showers and thunderstorms developed in a humid airmass ahead of an approaching cold front during the afternoon across northern Rhode Island. Some of these thunderstorms were severe, producing damaging winds. These severe winds downed wires, limbs, and trees, which, in turn, knocked out electricity to thousands of customers. The severe thunderstorm winds blew down a street light pole in Foster. No known injuries directly resulted from these severe thunderstorms.	$30,000
08/14/2005	Showers and thunderstorms developed across northern Rhode Island in a hot and humid airmass ahead of a weak cold front during the evening hours of 14 August 2005. One thunderstorm became severe, producing damaging winds that knocked down numerous trees and wires in Burrillville, Foster, North Smithfield, Glocester, and Woonsocket. No known injuries directly resulted from these storms.	$30,000
08/21/2005	A line of heavy showers and thunderstorms moved across northern Rhode Island during the late afternoon of 21 August 2005. One thunderstorm was severe, producing damaging wind gusts that knocked trees down on wires on Central Pike in Foster. No known injuries directly resulted from this severe thunderstorm.	$5,000

Date	Event Details	Damage
07/28/2006	Severe thunderstorms brought damaging winds to much of northern Rhode Island.	$15,000
08/02/2006	Severe thunderstorms developed in northwest Massachusetts late in the afternoon and traveled southward, affecting much of Rhode Island, before exiting Cape Cod and the Islands - a path of approximately 175 miles. This short-lived derecho produced widespread wind damage throughout the region. A tree was downed on Route 101 in Foster.	$5,000
07/01/2012	A weak cold front produced showers and thunderstorms, a few of which became severe producing both large hail and gusty winds. Trees were downed by thunderstorm winds in Foster.	$10,000
02/25/2016	Low pressure tracked north through New York bringing a warm front through southern New England. Unseasonably deep moisture accompanied this front. This was a very complicated weather situation as a strong low-level inversion was in place over the area with a very strong low-level jet just above the inversion. As showers and thunderstorms developed, the storms and heavy rain allowed the stronger winds to mix down to the surface. In other areas, temperatures warmed enough at the surface to break the inversion and allow the stronger winds to mix down. This resulted in a complicated combination of severe thunderstorm winds and high winds. To add to the historical nature of this event, it occurred in February all during the overnight hours. A tree on Luther Road in Foster was downed by thunderstorm winds.	$5,000
08/12/2016	A mid-level disturbance and an approaching cold front resulted in showers and thunderstorms developing over much of southern New England. Like the storms the previous day, frequent lightning accompanied these storms. In addition, wind damage and flooding occurred. Trees and wires on Foster Road were downed by thunderstorm winds. Two barns struck-Shippee Schoolhouse Road and Round Hill Road. Both were set on fire.	$40,000
05/20/2019	A cold front moving across southern New England triggered an isolated severe thunderstorm in northern Rhode Island late in the afternoon. In Foster, trees and wires were down on Walker Road at South Killingly Road. Another tree was down on Mount Hygeia Road.	$3,500
08/21/2019	A warm front moved across southern New England and a moist southerly low-level jet at 850 mb developed. This set the stage for scattered severe thunderstorms. A few storms in MA and CT prompted Tornado Warnings, but the strong rotation remained aloft. In Foster, a tree was down on a house on South Killingly Road. Large tree limbs were down on Foster Center Road.	$2,000
07/12/2022	An upper-level short wave trough moving through northern New England combined with an advancing cold front to produce severe thunderstorms in the late afternoon and evening hours. Despite low K Indices and dry air aloft, the storms managed to strengthen, and the dry air helped enhance the severe wind gusts. The storms mainly impacted areas from western MA east-southeastward into northern CT and northern RI. In Foster, police reported a tree down at the intersection of Route 94 (Foster Center Road) and Route 102.	$500

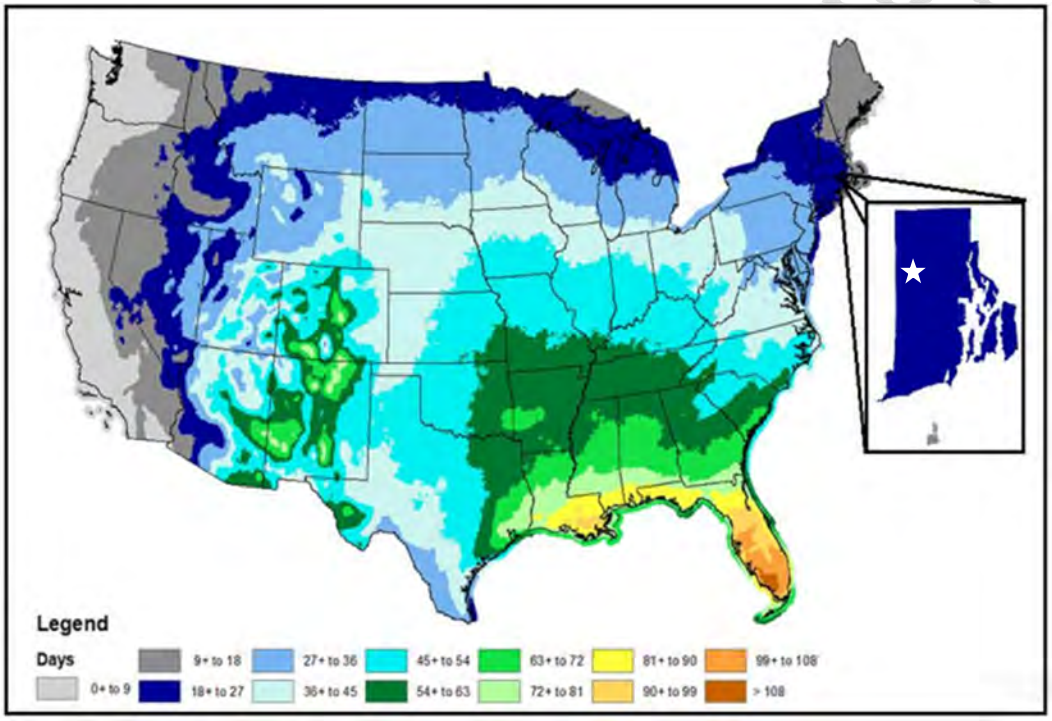
Date	Event Details	Damage
6/27/2023	A short-wave trough moved across southern New England overnight, triggering a few severe thunderstorms in a very warm and moist environment. In Foster, a tree was down on the 100 block of Danielson Pike.	$500

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a)

3.3.9.3 Location

All of Foster is susceptible to lightning/thunderstorms. The areas with dense forests are the most at risk.

Figure 3-11 shows the nationwide average number of thunderstorm days from 1993 through 2018. The entire State of Rhode Island falls in the 10-27 thunderstorms per year category.



Source: NOAA 2023b

Figure 3-11 Annual Average Thunderstorm Days in Rhode Island (1993-2018)

Figure 3-12 depicts the average annual lightning events per square kilometer per year, from 2016 through 2022. Foster falls in the 4-8 strikes per square kilometer per year category.

Source: Vaisala per RIEMA 2024

Figure 3-12 Average Annual Lightning Events per Square Kilometer per Year (2016-2022)

3.3.9.4 Extent

There is no universally accepted standard for measuring the strength or magnitude of a lightning storm. Similar to modern tornado characterizations, lightning events are often measured by the damage they produce. Building construction, location, and nearby trees or other tall structures will have a large impact on how vulnerable an individual facility is to a lightning strike. A rough estimate of a structure's likelihood of being struck by lightning can be calculated using the structure's ground surface area, height, and striking distance between the downward-moving tip of the stepped leader (negatively charged channel jumping from cloud to earth [the initial streamer of a lightning discharge]) and the object. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles which the stepped leader can jump to.

There is currently no scale to indicate the severity of a lightning strike, but data from NOAA indicates that there approximately 25,000,000 cloud-to-ground lightning strikes per year in the United States (RIEMA 2024).

Based on the extent of past events and the criteria identified in Table 3-2, the extent of lightning/thunderstorms in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.9.5 Impact

Lightning can strike buildings and accessory structures, often causing structure fires. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communication outages for businesses, residencies, and critical facilities.

Past lightning and thunderstorms in Foster have resulted in downed power lines and trees, and destruction of a home and barns due to fire.

Additionally, dead trees are more likely to catch fire if struck by lightning and can quickly catch fire. Fallen branches also pose a threat as they can be easily transported during high wind events.

Figure 3-13 shows a large tree on a private residence with a rotten core that has live and dead branches. The owner has notified Public Works of the potential hazard and the tree is listed on the Town's list of trees to be removed.

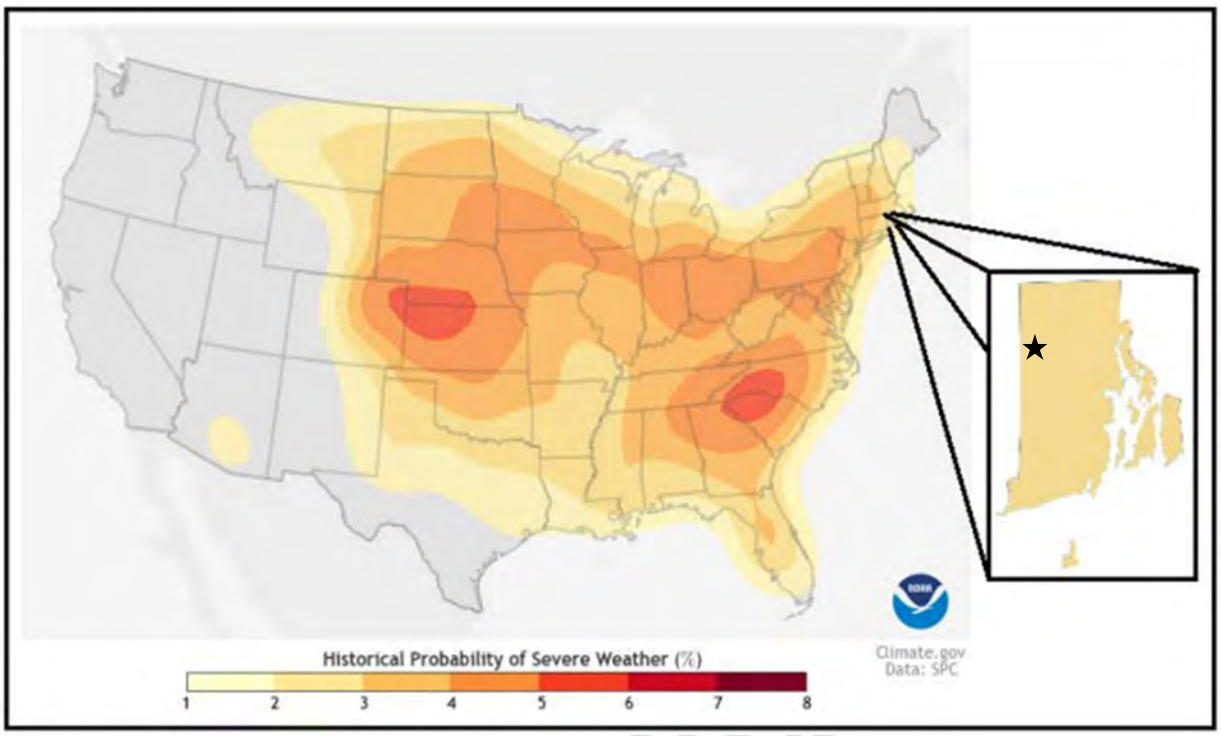
Photo Credit: Richard Sparks

Figure 3-13 Large Tree with a Rotten Core and Live and Dead Branches (E. Killingly Rd)

3.3.9.6 Probability of Future Occurrence

NOAA's National Severe Storms Laboratory (NSSL) uses multiple tools to forecast thunderstorms. Their Storm Prediction Center in Oklahoma monitors and forecasts the potential for severe weather across the continental U.S. Using computer forecast models, ensemble forecasting (when the weather becomes atypical), and satellite images, the Storm Prediction Center informs of severe weather conditions. Data from NOAA indicates that Rhode Island can expect between 18 to 27 thunderstorms per year (RIEMA 2024).

Figure 3-14 provides a snapshot for the probability of a severe weather event on a summer day.



Source: RIEMA 2024

Figure 3-14 Rhode Island Historic Probability of Severe Weather (Thunderstorm) on a Summer Day

Based on previous occurrences and the criteria identified in Table 3-3, it is Highly Likely that Foster will experience a lighting/thunderstorm event within the calendar year; there is a greater than 90% annual probability of occurring.

3.3.9.7 Future Conditions Including Climate Change

Changing weather patterns will lead to more severe thunder and lightning storms.

Climate change impacts on straight line winds (SLWs), or non-tornadic thunderstorm winds, have long been elusive. Combining multiple lines of evidence from kilometer-scale modelling, observational records, and theoretical considerations robustly shows that climate change increases the frequency and intensity of thunderstorm winds (Prein 2023). Theoretical considerations suggest that SLWs should intensify at a rate of ~7.5% per degree Celsius, yet the observed rates show a more pronounced increase of ~13% per degree Celsius (Prein 2023).

3.3.10 Hail

3.3.10.1 Description

Hail is a form of precipitation consisting of solid ice that forms inside thunderstorm updrafts. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 mph. In the United States, hail causes billions of dollars in damage to property each year (RIEMA 2024). Vehicles, roofs of buildings and homes, and landscaping are most commonly damaged by hail. Hail has been known to cause injury and the occasional fatality to humans, often associated with traffic accidents.

3.3.10.2 Location

All of Foster is susceptible to hail.

3.3.10.3 History

Table 3-23 identifies historical hail events in Foster from 1900-2023.

Since the 2018 HMP, there has been 1 hail event in Foster.

Table 3-23: History of Significant Hail in Foster

Date	Event Description
7/24/2015	Penny size hail fell on East Killingly Road in Foster.
6/2/2023	In Foster, there were several reports of dime size hail.

3.3.10.4 Extent

Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long. Hail larger than 0.75 inch in diameter can do great damage to both property and crops, and some storms produce hail over two inches in diameter.

Table 3-24: Hail Size

Hail Diameter	Size Description
1/4"	Pea Size
1/2"	Mothball Size
3/4"	Penny Size
7/8"	Nickel Size
1" (Severe Criteria)	Quarter Size
1 1/4"	Half Dollar Size
1 1/2"	Walnut or Ping Pong Ball Size
1 3/4"	Golf Ball Size
2"	Hen Egg Size
2 1/2"	Tennis Ball Size
2 3/4"	Baseball Size
3"	Teacup Size
4"	Grapefruit Size
4 1/2"	Softball Size

Hail in Foster is usually 1 inch in diameter or smaller.

Based on the extent of past events and the criteria identified in Table 3-2, the extent of hail in Foster is considered Negligible with the potential of minor injuries; no shutdown of critical infrastructure and facilities; scattered incidental residential and commercial structure damages; few or no operations impacted for short amounts of time.

3.3.10.5 Impact

Structure vulnerability to hail is determined mainly by construction and exposure. Metal siding and roofing is better able to stand up to the damages of a hailstorm than many other materials, although it may also be damaged by denting. Exposed windows and vehicles are also susceptible to damage. Crops are extremely susceptible to hailstorm damage, as even the smallest hail stones can rip apart unsheltered vegetation.

Human vulnerability is largely determined by the availability and reception of early warnings for the approach of severe storms, and by the availability of nearby shelter. Swimming, boating, and fishing are particularly dangerous during periods of frequent lightning strikes, which can also cause power outages, topple trees, and spark fires. Individuals who immediately seek shelter in a sturdy building or metal- roofed vehicle are much safer than those who remain outdoors. Early warnings of severe storms are also vital for aircraft flying through the area.

Past hail events in Foster have not caused significant damage.

3.3.10.6 Probability of Future Occurrence

Based on previous occurrences and the criteria identified in Table 3-3, it is Possible that Foster will experience a hail event in the next five years; there is a between 1-49.9% annual probability of occurring.

3.3.10.7 Future Conditions Including Climate Change

Climate change can influence the conditions necessary for hail formation within thunderstorms. Warmer temperatures at the surface and greater instability in the atmosphere can contribute to larger and more damaging hailstones (RIEMA 2024).

3.3.11 Tornadoes

3.3.11.1 Description

A tornado is a violent, dangerous, rotating column of air that is in contact with both the surface of the earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud. Tornadoes come in many shapes and sizes but are typically in the form of a visible condensation funnel, whose narrow end touches the earth and is often encircled by a cloud of debris and dust. Tornadoes are produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly.

The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year. Over 80% of all tornadoes strike between noon and midnight. During an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one-mile-wide and 50 miles long.

Figure 3-15 Tornado Watch Issued for Foster

3.3.11.2 History

Table 3-25 lists historical tornadoes that have impacted Foster. Not included in this table are an additional

5 tornadoes that occurred in Providence County, but did not directly impact Foster (RIEMA 2024).

On September 13, 2023, a frontal system brought a period of heavy rain, flash flooding, and embedded thunderstorms to southern New England from the morning to mid evening (NWS 2023). In addition to much tree damage from straight line winds, there was one tornado in Connecticut, 2 in Rhode Island, and 1 in Massachusetts.

This tornado resulted in downed trees and powerlines on Shippee Schoolhouse Road in Foster.

Additionally, since the 2018 HMP, there have been 2 tornado events in Foster reported by the National Weather Service.

Table 3-25 Historical Tornado Events in Foster

Date	Cat	Event Description	Damage
8/16/2000	F0	A weak tornado briefly touched down in a high elevation portion of North Foster. The location was on East Killingly Road, about 2 miles east of the Connecticut state line, at an elevation of 670 feet. The damage was isolated, with a large part of a tall pine tree snapped off near the top, and large branches near one foot in diameter taken down. Large limbs were broken off an oak tree adjacent to the pine. An apple tree was downed, and a six-foot wooden table was overturned. Aside from this, there was no damage evident anywhere else in the vicinity. Based upon the damage observed, the tornado was rated an F0, with wind speeds of 40 to 72 mph. The path length was only 0.2 mile, and the width was 15 yards. The funnel was observed moving from southwest to northeast.	$0
11/13/2021	EF0	A fast-moving cold front combined with a potent short-wave trough lifting northeastward across western and northern New England to produce severe thunderstorms across southern New England. Despite dewpoint temperatures only in the 30s and 40s, the cold pool aloft created instability and there was very strong low-level helicity. The result was an unprecedented outbreak of tornadoes across Long Island, Connecticut, and Rhode Island. This is a continuation of a tornado that began in Windham County, CT. Based on definitive radar confirmation of a tornado debris signature and video footage from our media partners, we confirmed that an EF-0 tornado touched down in Plainfield, CT at approximately 4:48 PM EST on Saturday, November 13. The tornado then tracked northeastward into Rhode Island and ended at the Cucumber Hill Farm in Foster at approximately 5:02 PM EST. Sheared trees and downed hardwood trees were observed on the farm. A heavy, large red trailer also was moved approximately 50 feet.	$10,000
09/13/2023	EF1	A frontal system brought a period of heavy rain, flash flooding, and embedded thunderstorms to southern New England from the morning to mid evening. In addition to much tree damage from straight line winds, there was one tornado in Connecticut, 2 in Rhode Island, and 1 in Massachusetts. These all occurred in the afternoon. An EF-1 with maximum winds of 100 mph began east of North Central State Airport along Wellington Road in the town of Lincoln, RI. A video did show a funnel cloud passing over the adjacent airport but found no damage. The tornado uprooted a large tree and damaged am estimated 20' by 30' section of roof on a building across the street and due north of the uprooted tree. Video provided by Lincoln Animal Control showed a thin tornado passing at the end of the facility's driveway and twisting a large branch from a tree. The tornado moved northeast into a field of solar panels which uplifted two sections. From here, the tornado likely lifted before moving across	$15K

Date	Cat	Event Description	Damage
		Route 146 at Route 116 which was documented on a DOT camera. This damage and the tree damage along the path was consistent with wind speeds between 90 and 100 mph, resulting an EF-1 rating on the Enhanced Fujita Scale. In Foster, there were downed trees and powerlines on Shippee Schoolhouse Road.	

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a)

Additionally, Rhode Island has experienced one Presidential Disaster Declaration related to tornados (Table 3-26). This Declaration was declared in relation to a series of tornadoes that occurred from September 10 to September 13, 2023. This declaration allows affected residents of Providence County to apply for Individual Assistance (IR) funding.

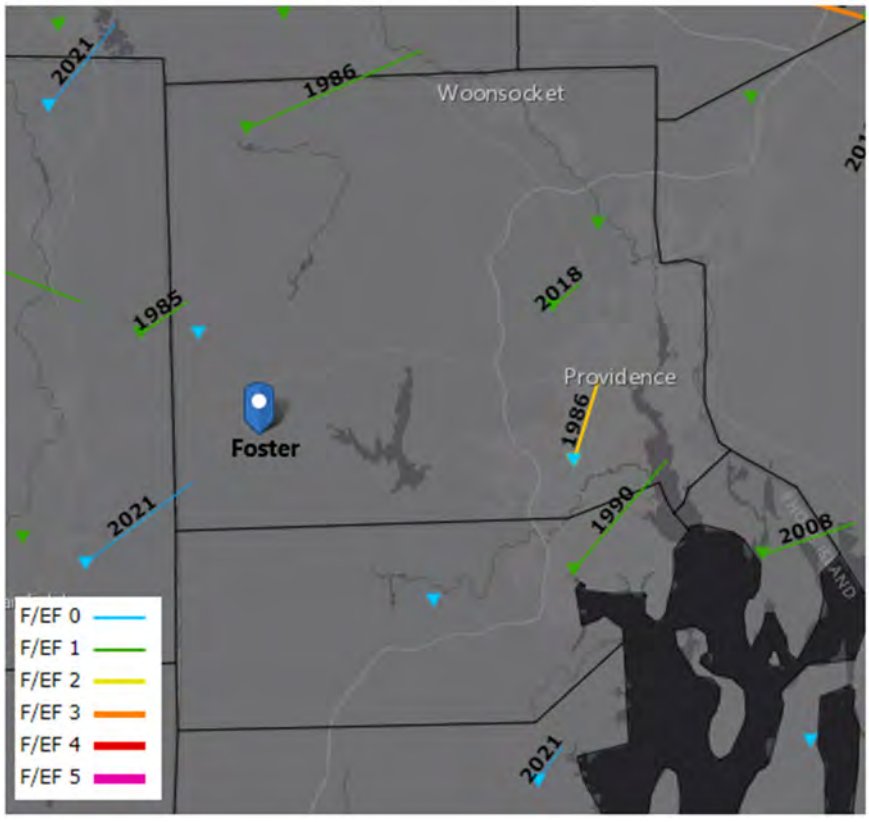
Since the 2018 HMP, there has been 1 Rhode Island Presidential Disaster Declaration relating to tornadoes.

Table 3-26 State of Rhode Island Presidentially Declared Disasters Relating to Tornadoes

Designation	Declaration Date	Incident Type
DR-4753-RI	01/07/2024	Severe Storms, Flooding, and Tornadoes (Providence County)

Source: FEMA 2024

Figure 3-16 shows historical tornado tracks near Foster from 1950-2022.



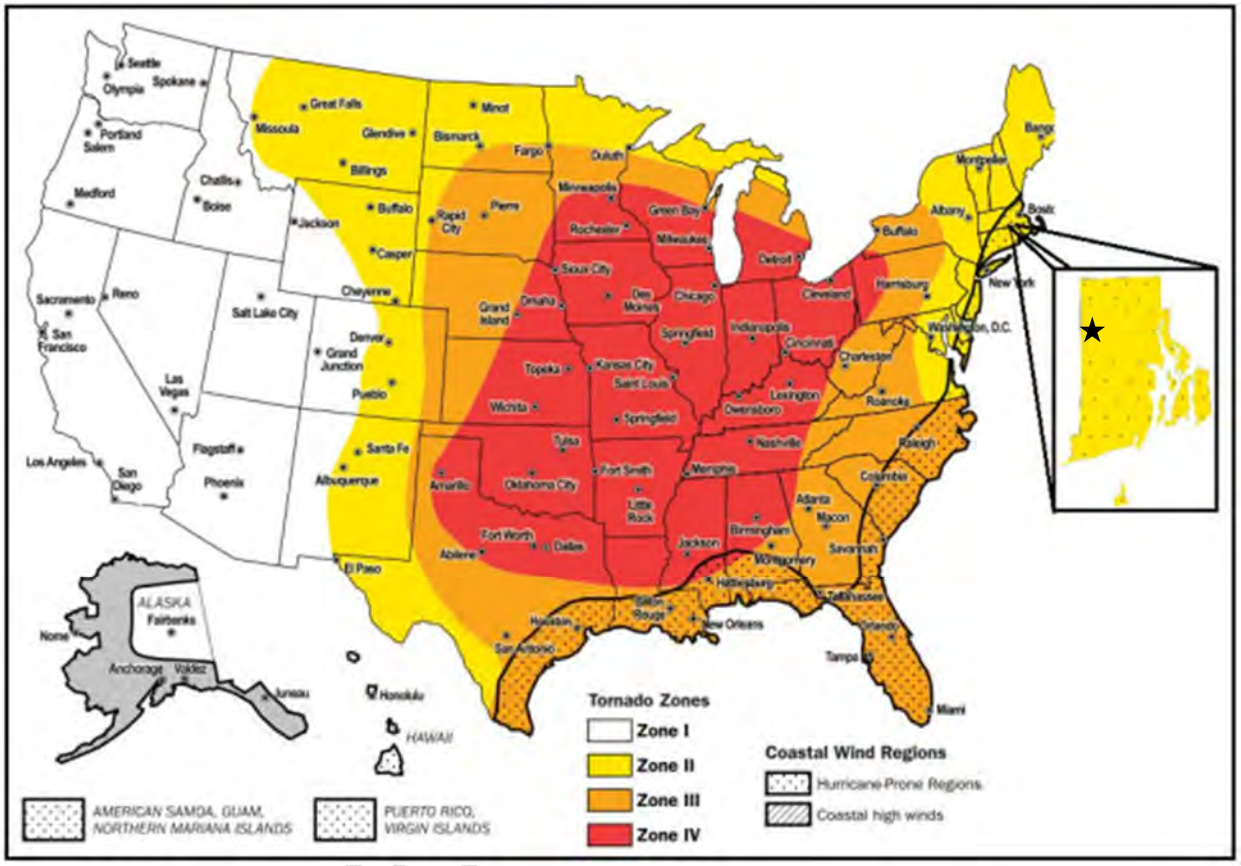
Source: MRCC 2023

Figure 3-16 Historical Tornado Tracts near Foster (1950-2022)

3.3.11.3 Location

All of Foster is susceptible to tornadoes.

Figure 3-17 shows the nationwide tornado/wind zones. Rhode Island, like much of New England, is located in Zone 2, which equates to ~150 mph winds.



*Tornado Zones- Zone I: 130 mph, Zone II: 150 mph, Zone III: 200 mph, Zone IV: 250 mph

Source: FEMA per RIEMA 2024

Figure 3-17 Nationwide Tornado Zones

3.3.11.4 Extent

Tornadoes are categorized according to the damage they produce using the Enhanced Fujita Scale (EF Scale), which is shown in Table 3-27. An F0 tornado causes the least amount of damage, while an F5 tornado causes the most amount of damage. It is important to note that the size of a tornado is not necessarily an indication of its intensity.

Table 3-27: Enhanced Fujita Scale

EF Number	3 Second Gust	Damage Scale
0	65-85 mph	**Light damage.** Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.

EF Number	3 Second Gust	Damage Scale
1	86-110 mph	**Moderate damage.** Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
2	111-135 mph	**Considerable damage.** Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165 mph	**Severe damage.** Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
4	166-200 mph	**Devastating damage.** Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown generating large missiles.
5	>200 mph	**Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 300 feet; trees debarked; incredible phenomena will occur.

Based on the extent of past events and the criteria identified in Table 3-2, the extent of tornadoes in Foster is considered Negligible with the potential of minor injuries; no shutdown of critical infrastructure and facilities; scattered incidental residential and commercial structure damages; few or no operations impacted for short amounts of time.

However, if a tornado were to pass directly though the Town, the impacts could be catastrophic.

3.3.11.5 Impact

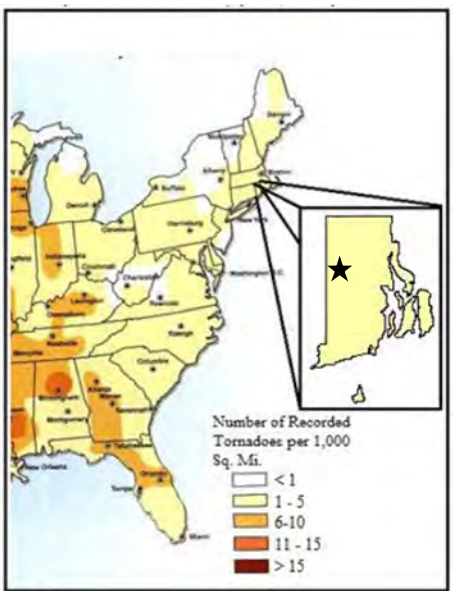
Tornadoes could cause significant damage to structures, trees and utility lines and flying debris can cause injuries to residents. Mobile homes are generally more vulnerable to tornado damage than steel framed structures. Since 1971, a Town Ordinance does not allow year-round mobile homes, but about 22 mobile homes on 15 properties have been grandfathered in. These properties are more susceptible to the threat of a tornado.

3.3.11.6 Probability of Future Occurrence

Predicting the probability of tornado occurrences is tremendously challenging due to the large number of factors involved and the random nature of formation. Data from the NCEI indicates that Rhode Island can expect infrequent tornado events based on the 14 statewide events recorded from 1950 to 2023. Available historical tornado data suggests that Rhode Island can expect future tornadoes to range from EF0 to EF2 on the Enhanced Fujita Scale.

Error! Reference source not found. shows Rhode Island's tornado activity per 1,000 miles. The entire state falls within the 1-5 tornadoes per 1,000 square miles category.

Based on previous occurrences and the criteria identified in Table 3-3, it is Possible that Foster will experience a tornado event in the next year; there is between 1-49.9% annual probability of occurring.



Source: RIEMA 2024

Figure 3-18 Rhode Island Tornado Activity per 1,000 Square Miles

3.3.11.7 Future Conditions Including Climate Change

The 2024 State of Rhode Island HMP states:

The relationship between climate change and tornadoes is complex, and while there is ongoing research in this area, it is not fully understood. Tornadoes are small-scale, short-lived weather phenomena that can be influenced by a variety of atmospheric factors, including temperature, humidity, wind patterns, and atmospheric instability. Climate change can influence some of these factors, which may, in turn, affect tornado activity.

Tornadoes typically form when warm, moist air near the surface clashes with cooler, drier air aloft, creating atmospheric instability. Climate change can alter temperature and humidity patterns, potentially affecting the conditions necessary for tornado formation. Additionally, climate change can lead to more extreme and variable weather patterns. While this may not necessarily increase the overall number of tornadoes, it could lead to more unpredictable and severe tornado events when they do occur. Some research suggests that climate change could lead to longer tornado seasons, with tornadoes occurring outside of their typical timeframes.

It's important to emphasize that while there may be some links between climate change and tornado activity, these links are not fully understood, and it is difficult to attribute specific tornado events to climate change. Tornadoes are influenced by a complex interplay of factors, and any changes in tornado patterns may vary by region (RIEMA 2024).

3.3.12 Earthquake

3.3.12.1 Description

An earthquake is the result of a sudden release of energy in the Earth's crust that creates seismic waves. This sudden movement can be felt at sometimes very distant sites from the epicenter, and it usually occurs without warning. The movement can build rapidly after just a few seconds and cause significant, sometimes catastrophic, damage and severe numbers of casualties, and this often-violent motion or shaking is the most common effect of earthquakes.

The seismicity or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured with a seismometer. The size or magnitude is recorded on a device known as a seismograph.

Despite the low probability of a high impact earthquake, physical characteristics in Rhode Island may increase earthquake vulnerability:

- Hard Rock: Due to the geological makeup of New England's base rock, seismic energy is conducted on a greater scale (4-10) times that of an equivalent Richter magnitude earthquake in California).
- Soft Soil: Many coastal regions of New England are made up of soft soils. These soils can magnify an earthquake as much as two times.
- Structures: The New England region, being one of the first settled areas of the United States, has an abundance of older, unreinforced masonry structures that are inherently brittle and very vulnerable to seismic forces.
- Low Public Awareness of Vulnerability: Little public recognition of earthquake threat, and no established system of educating or informing the public of the threat or how to prepare for or respond during an earthquake. Therefore, higher losses will occur here than in other regions of the country.

3.3.12.2 History

The United States Geologic Survey (USGS) and the Boston College Weston Observatory maintain earthquake records for the State of Rhode Island (RIEMA 2024). Data indicates that while the State has had numerous earthquakes, the largest on record occurred in June 1951 in Kingstown and was measured at a 4.6 on the Richter Scale. For both the USGS and Weston Observatory, reported earthquakes before 1951 had no recorded measured intensity (RIEMA 2024).

The Richter Scale measures the energy released by an earthquake using a seismograph. The Mercalli Intensity Scale measures the intensity of an earthquake by observing its effect on people, the environment and the earth's surface. The Modified Mercalli Scale (MMI) is the current standard for measuring intensity of earthquakes. The MMI is outlined in Table 3-29.

Table 3-28 lists historical earthquakes, M3.0 and greater within 50 miles of Foster, from 1900-December 2023. No damage was reported in Foster as a result of any of these earthquakes.

Since the 2018 HMP, there has been 1 earthquake magnitude 3.0 and greater and within 50 miles of Foster.

Table 3-28 Historical Earthquakes M3.0 and Greater within 50 miles of Foster

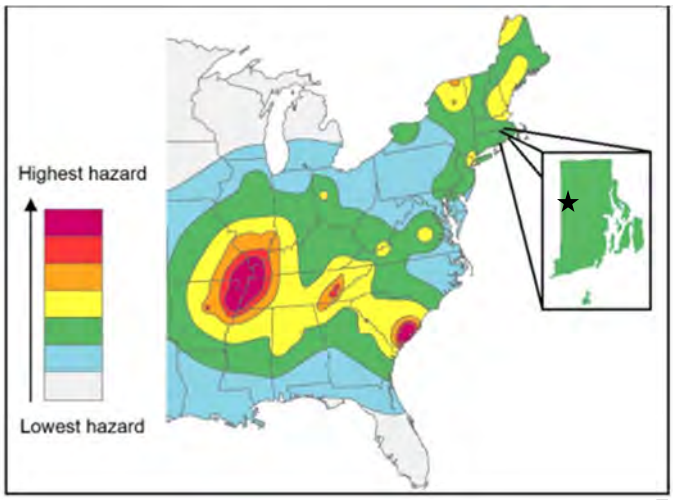
Date	Latitude	Longitude	Magnitude	Location
03/11/1976	41.56	-71.21	3.5	5 km SE of Portsmouth, RI
01/27/1982	41.87	-70.97	3	2 km WNW of North Lakeville, MA
06/17/1982	41.508	-72.377	3	6 km E of Moodus, CT
10/15/1985	42.493	-71.502	3	2 km E of Boxborough, MA
08/24/1989	41.614	-70.899	3	2 km S of Fairhaven, MA
10/02/1994	42.347	-72.277	3.7	6 km W of Hardwick, MA
10/02/1994	42.36	-72.218	3.3	1 km NW of Hardwick, MA
03/22/1996	41.69	-71.242	3.1	2 km NE of Bristol, RI
01/12/2015	41.7482	-71.9019	3.3	0 km NE of Wauregan, CT
11/08/2020	41.5208	-70.9546	3.6	10 km S of Bliss Corner, MA

Source: USGS 2023

3.3.12.3 Location

Rhode Island is located in the North Atlantic tectonic plate and is in a region of historically low seismicity. Additionally, the underlying geology of the State is largely composed of unsorted rock of varying size that is considered geologically stable and not prone to seismic amplification (RIEMA 2024).

Figure 3-19 shows the earthquake hazard potential for the eastern United States, with the entire state of Rhode Island being towards the lower end of the hazard potential. The Town of Foster is indicated with the star on the map below.



Source: USGS 2018

Figure 3-19 Rhode Island Earthquake Hazard Map

3.3.12.4 Extent

Both the intensity and magnitude are considered during the measurement of the severity of earthquakes. The observed level of damage and effects on people, nature, and human structures are variables when describing the intensity. The severity of intensity generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. The scale most often used in the U.S. to measure intensity is the Modified Mercalli Intensity (MMI) Scale.

As shown in Table 3-29, the MMI Scale consists of 10 increasing levels of intensity that range from imperceptible to catastrophic destruction. Peak ground acceleration (PGA) is also used to measure earthquake intensity by quantifying how hard the earth shakes in a given location, or measured as acceleration due to gravity (g). The USGS describes the MMI Scale as:

"The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. Although numerous intensity scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli (MM) Intensity Scale. The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the non-scientist than the magnitude because intensity refers to the effects actually experienced at that place."

The following table is an abbreviated description of the comparisons of earthquake magnitude, intensity, PGA, perceived shaking, and damage.

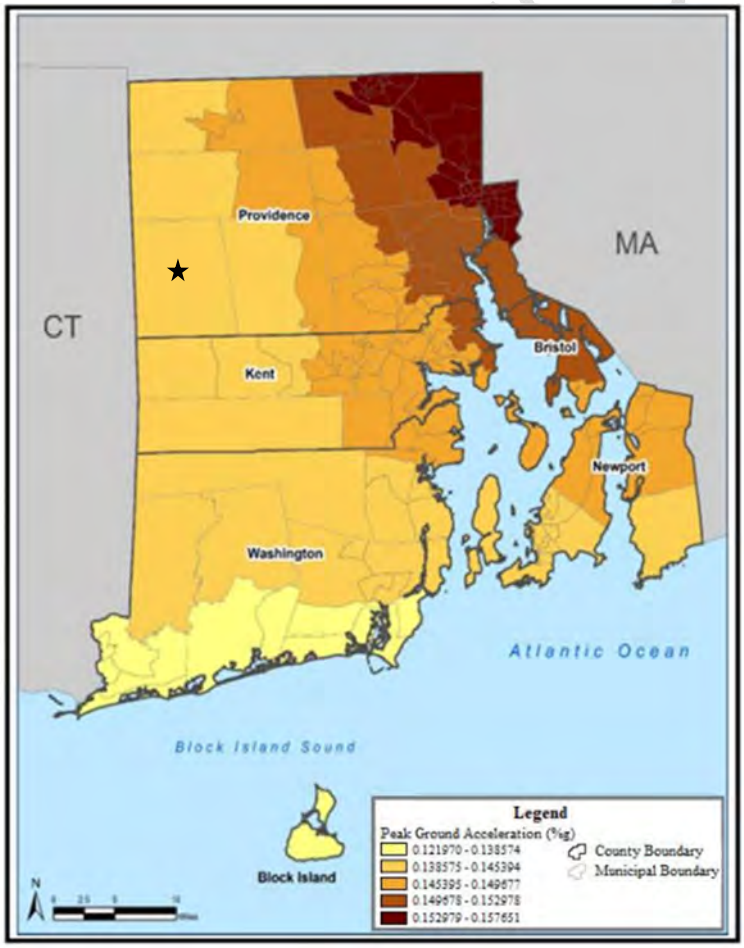
Table 3-29 Magnitude/Intensity/Ground-Shaking Comparisons

Magnitude	Intensity	PGA (%g)	Perceived Shaking	Damage
1.0-3.0	I	<0.0464	Not felt	None
3.0-3.9	II-III	0.0464-0.297	Weak	None
4.0-4.9	IV	0.297-2.76	Light	None

Magnitude	Intensity	PGA (%g)	Perceived Shaking	Damage
	V	2.76-11.5	Moderate	Very light
5.0-5.9	VI	11.5-21.5	Strong	Light
	VII	21.5-40.1	Very Strong	Moderate
6.0-6.9	VIII	40.1-74.7	Severe	Moderate/Heavy
	IX	74.7-139	Violent	Heavy
7.0+	X+	>139	Extreme	Very Heavy

Adapted from: USGS (2008) and Er et al. (2010)

Figure 3-20 shows Rhode Island's PGA potential. Foster is labeled as having a PGA of 0.138575-0.145394, which falls in the Magnitude 3.0-3.9/Intensity II-III (weak shaking, no damage) category above.



Source: RIEMA per RIEMA 2024

Figure 3-20 Rhode Island Potential Peak Ground Acceleration Map

Based on the extent of past events and the criteria identified in Table 3-2, the extent of earthquakes in Foster is considered Negligible with the potential of minor injuries; no shutdown of critical infrastructure and facilities; scattered incidental residential and commercial structure damages; few or no operations impacted for short amounts of time.

3.3.12.5 Impact

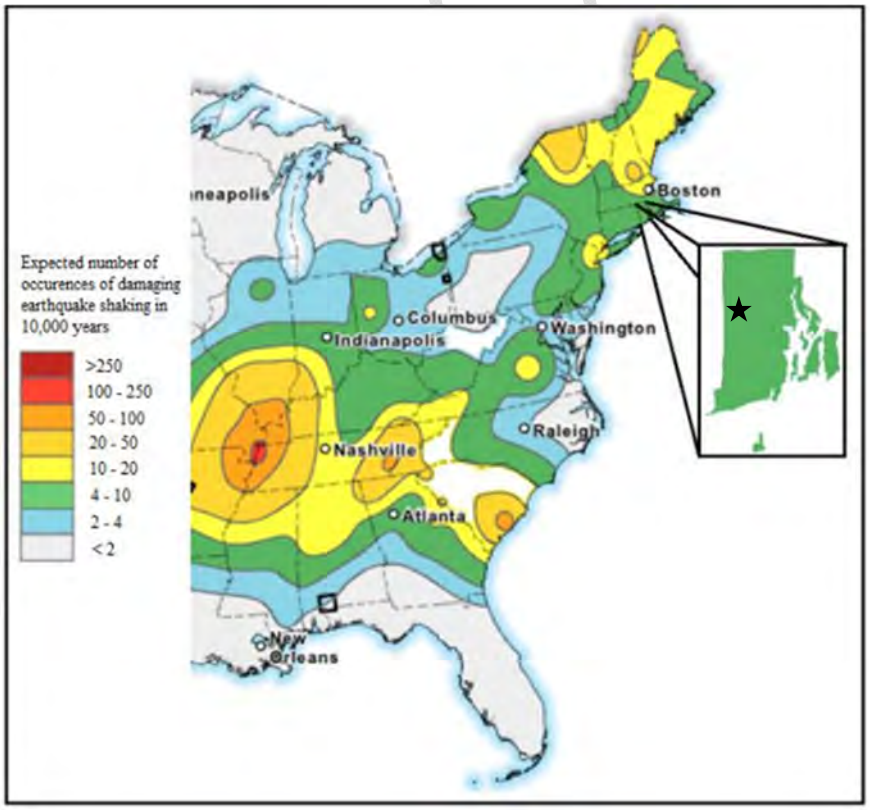
The HMPC recognizes that the potential for an earthquake to shake the Town of Foster is low, but the hazard could afflict city wide damage, causing power outages, building collapses, water main breaks, dam failures, gas leaks, fires and injuries or deaths.

Structures in Foster may be particularly vulnerable to the effect of a moderate to large earthquake as seismic design criteria are not required for either new building construction or old building renovation. Buildings that are most at risk from earthquakes are the old masonry buildings and large structures such as those in the Historic Districts.

3.3.12.6 Probability of Future Occurrence

While it is not possible to predict an earthquake, the USGS has developed earthquake probability maps that use the most recent earthquake rate and probability models to predict future earthquake potential.

Figure 3-21 illustrates potential earthquake events in Rhode Island. This map estimates the number of damaging earthquakes in 10,000 years. The entire state of Rhode Island is in the 4-10 expected number of earthquakes in 10,000 years category.



Source: USGS 2022

Figure 3-21 Rhode Island Earthquake Probability

Based on previous events and the criteria identified in Table 3-3, it is Possible that Foster will experience an earthquake event in the next five years; there is a between 1-49.9% annual probability of occurring. However, it is unlikely that future earthquakes will cause significant damage to the Town.

3.3.12.7 Future Conditions Including Climate Change

Climate change is expected to have no measurable impact on earthquake extent, impact, or future occurrences (RIEMA 2024).

3.3.13 Flooding (Riverine, Urban/Street, Flash)

This section focuses on flooding in terms of riverine, urban, and flash flooding. Further discussion on storm surge is **not included** in this plan, due to Foster's inland location over 18 miles from the Providence River at the upper part of Narragansett Bay.

3.3.13.1 Description

Flooding is the overflow or accumulation of water on normally dry land, often caused by heavy rainfall, snowmelt, storm surges, or the failure of natural or artificial barriers. Flooding can lead to the inundation of homes, roads, farmland, and other areas, causing damage to property, disruption of daily life, and potential threats to human safety and the environment (RIEMA 2024).

Riverine Flooding: Riverine flooding refers to the overflow of water from a river or a stream onto adjacent land areas. This type of flooding occurs when the water level in a river or stream rises significantly and exceeds its banks, inundating the surrounding areas. The severity of riverine flooding can be influenced by the amount and intensity of rainfall in the watershed, the size, shape, and slope of the river or stream channel, and the presence of dams on the river system.

Urban Flooding: FEMA defines urban flooding as 'the inundation of property in a built environment, particularly in more densely populated areas, caused by rain falling on increased amounts of impervious surfaces and overwhelming the capacity of drainage systems." In Rhode Island, urban flooding has consistently increased due to a number of factors, including the filling for development of natural wetlands and waterways, the reduction of permeable surfaces, and the aging and insufficient capacity of stormwater systems.

Flash Flooding: Flash flooding occurs during heavy or extended periods of rain, generally when the ground is unable to rapidly absorb the water. Most flash flooding in Rhode Island is caused by hurricanes or extra-tropical storms, Nor'easters, or stationary thunderstorms. Heavy sustained rain can create rapid flooding very quickly, and flooding can occur miles away from where the rain fell. Factors that can contribute to the severity of flash flooding include rainfall intensity, duration, drainage condition, and ground conditions (paved or unpaved). Flash floods are particularly dangerous to people and property, as six inches of moving water can knock a person down and two feet can lift a vehicle. As there is often little warning of a flash flood event, they are the cause of most flood fatalities.

3.3.13.2 History

While they might not be categorized as a flash flood or riverine flood, Foster experiences annual overflow on roads after heavy rains. The HMPC stated that in 2023, a culvert was clogged, and water began to overflow on Cucumber Hill Road. In another heavy rain event, water overflowed onto Salisbury Road due to a beaver dam that backed up water.

Table 3-30 provides details on historical floods that have impacted Foster. Since the 2018 HMP, there have been 0 significant flash or riverine floods that impacted Foster.

Table 3-30 Historical Flooding Events in Foster (1996-2023)

Date	Event Details
06/13/1998	On June 12th through June 14th, a very slow-moving complex storm system moved through southeast New England. The combination of its slow movement and the presence of tropical moisture across the region produced rainfall of 6 to 8 inches over much of Rhode Island. The heaviest rainfall amounts of 7 to 8 inches occurred in the northeast corner of the state in Providence County. Numerous small streams flooded over their banks. The following is a list of those reported to have flooded: The Ponaganset River in South Foster reached flood stage of 5 feet at 7:45 PM, crested at 5.3 feet at 10 PM, then fell below flood stage at 4 AM on June 14th. Then, it flooded again at 8 AM on the 14th, crested at 5.3 feet at 1 PM, then fell below flood stage at 7 PM -- all on June 14th.
07/01/1998	Heavy rainfall on June 30th resulted in flooding of small streams with at least two streams continuing above flood stage into July 1st. In Providence County, the Ponaganset River in South Foster had reached flood stage at 1 PM on June 30th, crested at 6.31 feet at 5 PM, then fell below flood stage at 3 AM on July 1st.
06/17/2001	Torrential rainfall associated with the remnants of Tropical Storm Allison resulted in flash flooding throughout Providence County. In Foster, two roads were washed out when runoff carved gulches into the roadways. Lightning struck a log house in Foster which ignited a fire, and completely destroyed the home. This storm caused $150,000 in damages.
03/31/2010	Pre-existing elevated river levels and saturated soil conditions from recent heavy rainfall combined with another round of significant rain to produce record flooding along the Pawtuxet River in Rhode Island from late March through early April 2010. The Pawtuxet River at Cranston, RI crested at 20.79 ft on Wednesday, March 31st 2010. This crest surpassed the previous record crest of 15.1 ft, which occurred just 1.5 weeks prior to this event at Cranston. Many roads were closed in the West Warwick and Cranston areas. The Warwick mall was flooded, a section of Interstate 95 was closed due to flooding, many streets were closed, bridges were washed away, and many homes and businesses were flooded. Foster was not severely impacted by this flood.

Source: NOAA Storm Events Database- Storm Prediction Center Product (NWS 2023a)

In total, from 1950-2023, Providence County experienced 3 coastal flood events, 31 flash flood events, and 55 other flood events (RIEMA 2024).

Additionally, Rhode Island has experienced three Presidential Disaster Declarations related to floodings (Table 3-31). Foster was not severely impacted by any of these disasters. Since the 2018 HMP, there have been 0 Rhode Island Presidential Disaster Declarations relating to flooding.

Table 3-31 State of Rhode Island Presidentially Declared Disasters Relating to Flooding

Designation	Declaration Date	Incident Type
DR-39-RI	08/20/1955	Hurricane and Flood
DR-1704-RI	05/25/2007	Severe Storms and Island/Coastal Flooding
DR-1894-RI	03/29/2010	Severe Storms and Flooding

Source: FEMA 2024

DR-1894-RI: The largest recent flood event in Rhode Island occurred in March and early April of 2010, and was caused by a series of moderate to heavy rainfall events over a five-week period from late February through March. The length and successive nature of the rainfall saturated soils and kept rivers and streams at or near flood stage. Then, on March 29 through 31, six to ten inches of rain fell over Rhode Island which resulted in record levels of river flooding across the State. The Pawtuxet River in Cranston broke its record crest by an elevation of 6 feet resulting in the West Warwick Wastewater Treatment Plant and the Warwick Mall being inundated by floodwaters. In Cranston, I-95 and the airport connector was shut down due to flooding. The Pawcatuck River in Westerly reached a new record level and did not recede below flood stage until April 12. In Westerly, a mile of train track in Westerly was inundated, resulting in a suspension of Amtrak services. In addition, Chapman Pond was flooded so badly that it effectively shut down Route 91 and Pound Road, causing a prolonged blocked access to an entire neighborhood. Blue Pond Dam failed in the headwaters of the Wood River in Hopkinton, with damage to infrastructure in the area. Nearly 26,000 residents of Rhode Island applied for assistance, with $79,000,000 approved for individuals and business owners.

3.3.13.3 Location

Although crisscrossed by streams, the Town of Foster sits at a relatively high elevation (~700-800 feet above sea level) and doesn't normally experience devastating riverine flooding. However, heavy rain events have washed out dirt roads in Foster. Sometimes entire sections are washed out but more often, the shoulders are rutted.

The Ponaganset River runs through Foster and past flooding events have caused the river to crest above the flood stage.

Flood prone areas and/or areas of concern in Foster include:

- Danielson Pike- bottom of Dolly Cole Hill
- North Road between Boswell and South Killingly- channelized water from private property.
- Foster Country Club -at parking lot into the road by the pond but drains quickly
- Salisbury/Balcolm- washout, dirt road issue
- 94/Foster Center at North Road- grade is higher than road

Figure 3-22 shows the numerous rivers and streams that flow through Foster.

Source: RIGIS 2023- Rivers and Streams (24K)

Figure 3-22 Rivers and Streams in Foster

During the March 2010 flood events when there was heavy rain and road flooding, a few bridges were damaged as well as a lot of road washouts. Specific areas which were affected included:

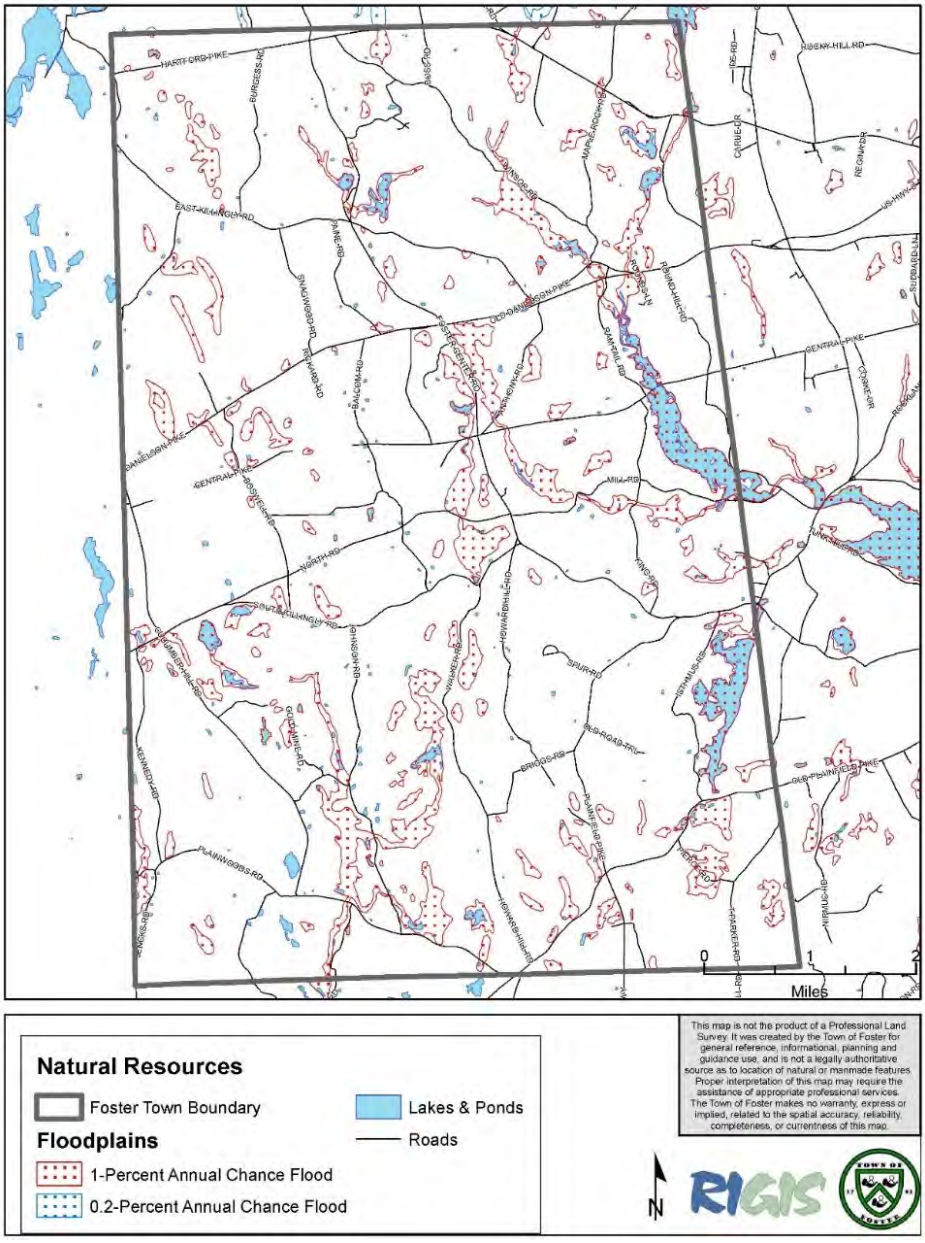
- Tucker Hollow Road- flooding exposed 3 culvert pipes
- Isthmus Road- flooding washed out two of the 3' culvert pipes
- Impact to paved roads throughout Town were undermined

3.3.13.4 Extent

Localized flooding can be expected to occur on an annual basis. The flood event which occurred in March 2010 was a 250 year +/- event.

A floodplain is a flat or gently sloping area adjacent to a river, stream, or other water body. These areas act as a buffer during periods of heavy rainfall or snowmelt, absorbing excess water and preventing it from rushing downstream too quickly. In its common usage, a floodplain refers to areas inundated by the 100-year flood, the flood that has a 1% chance of being equaled or exceeded in any given year, and the 500-year flood, the flood that has a 0.2% chance of being equaled or exceeded in any given year. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the NFIP (RIEMA 2024).

Figure 3-23 shows the 1% (100-year) and 0.2% (500-year) annual chance flood map for Foster.



Source: 2022 Town of Foster Comprehensive Plan

Figure 3-23 1% (100 year) and 0.2% (500 year) Annual Chance Flood Map

The Town of Foster participates in the National Flood Insurance Program (NFIP). As of January 2024, there are 4 policies in an A zone, and 6 policies in the X zone. More information for the NFIP can be found in Section **Error! Reference source not found.**.

FEMA maintains regulatory flood maps called Flood Insurance Rate Maps (FIRM). Insurance companies refer to these when providing coverage to homeowners. These maps are available for viewing at Town Hall and online at The FEMA Map Service Center https://msc.fema.gov. Please note that there is a process for the public to request a change in the flood zone designation for their property.

The FIRMS map for Foster was updated on July 19, 2023.

Based on the extent of past events and the criteria identified in Table 3-2, the extent of flooding in Foster is considered Limited, with potential for some injuries; short shutdown of some critical infrastructure and facilities; fewer than 10% of residential and commercial structures damaged; small number of local operations impacted for short amounts of time.

3.3.13.5 Impact

Heavy rains, quick thaws and precipitation, and hurricanes accompanied by heavy winds and rain make the Town vulnerable to personal, property and environmental damage as a result of flooding events. Furthermore, less than 40% of the roads in town are unpaved, making them more susceptible to washouts.

Vulnerable structures include dams, roads, historic buildings, and electric substations.

The following images were provided by members of the community.

Photo Credit: Paulette LaPrade

Figure 3-24 Standing Water on Cucumber Hill Road (December 18, 2023)

Photo Credit: Angela Cambio

Figure 3-25 Flooding on Foster Center Road (January 2024)

Photo Credit: Betsy Puckett

Figure 3-26 Water Overflowing Windsor Road (December 18, 2023)

Photo Credit: Angela Cambio

Figure 3-27 Water Overflowing Dirt Road (September 2023)

Photo Credit: Betsy Puckett

Figure 3-28 Driveway Washout from Heavy Rain at Personal Residence (December 2023)

Photo Credit: Kristen Cole

Figure 3-29 Water Runoff Near Pole 130 on E. Killingly Rd (January 2024)

Photo Credit: Barbara Money

Figure 3-30 Road Conditions after Flooding on North Rd Between Pole 52 and 53A (January 2024)

Photo Credit: Amy Pearson

Figure 3-31 Blocked Culvert on Johnson Rd Leading to Road Flooding (December 2023)

Photo Credit: Amy Pearson

Figure 3-32 Water Overflowing Johnson Rd Bridge (January 2024)

Photo Credit: Amy Pearson

Figure 3-33 Overtopping of Harrington Rd Bridge (January 2024)

Photo Credit: Amy Pearson

Figure 3-34 Right of Way Washout (December 2023)

3.3.13.6 Probability of Future Occurrence

Based on previous occurrences and the criteria identified in Table 3-3, it is Likely that Foster will experience a flood event in the next five years; there is a between 50-89.9% annual probability of occurring.

3.3.13.7 Future Conditions Including Climate Change

According to the 2024 State of Rhode Island HMP:

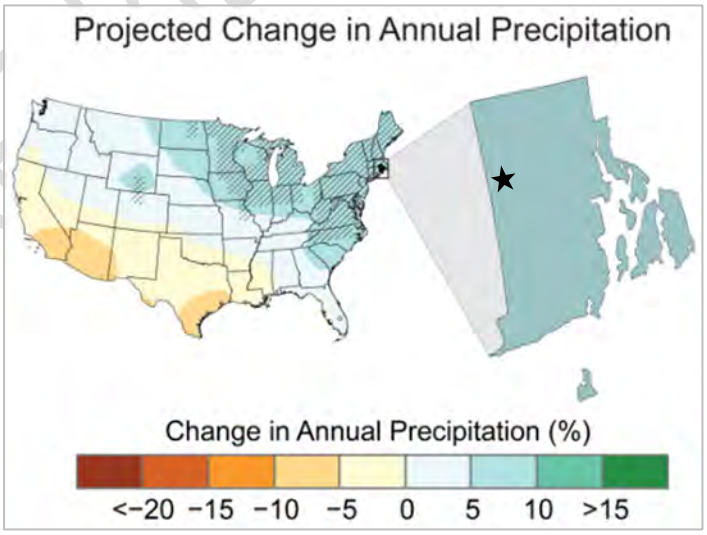
As per the State of Rhode Island Climate Change portal, the impacts of climate change upon Rhode Island's built and natural environments are wide-ranging, discernible, and documented, and, in many cases growing in severity. Related to flooding, Rhode Island will experience more extreme and intense precipitation events. Rhode Island's precipitation rates are climbing an inch almost every 10 years, and 2018 was the third wettest year on record. In 2018, Rhode Island saw a record number of days with over an inch of rain. Under a higher emissions pathway, it is expected that Rhode Island will see a continued increase in frequency and intensity of extreme precipitation events (RIEMA 2024).

The 2018 Resilient Rhody report states:

Climate change is expected to contribute to more intense and wetter precipitation events, now and into the future. Over the past 80 years, Rhode Island and southern New England have experienced a significant increase in both flood frequency and flood severity, including a doubling of the frequency of flooding and an increase in the magnitude of flood events. Intense rainfall events (heaviest 1% of all daily events from 1901 to 2012 in New England) have increased 71% since 1958. Rhode Island's average annual precipitation has increased more than 10 inches since 1930 (Resilient Rhody 2018).

While multiple climate change models suggest that greenhouse gas increases will result in increased precipitation in Rhode Island, observed increases in precipitation across the northeastern United States are greater than predicted models (Resilient Rhody 2018).

Figure 3-35 shows the nationwide projected change in annual precipitation. Rhode Island is in the +5-10% category.



Source: NCEI 2022

Figure 3-35 Rhode Island Projected Change in Annual Precipitation

3.3.14 Dam Failure

The HMPC recognizes that a dam failure is not a natural hazard in itself, but several of the hazards identified in this HM&FMP could result in a dam failure in the Town of Foster. Additionally, updated FEMA guidelines require that in order for a jurisdiction to be eligible for FEMA's Rehabilitation Of High Hazard Potential Dam (HHPD) Grant Program, they must address HHPDs in their Hazard Mitigation Plan.

Note: As of 2024, FEMA is only funding projects for the rehabilitation of HHPDs. The HMPC wanted to include information on the one Significant Hazard Dam in Foster in this section to explore funding available for the rehabilitation of non-HHPDs and in preparation in the event the Significant Hazard Dam is reclassified to a HHPD.

3.3.14.1 Description

A dam is a barrier across flowing water that obstructs, directs, or slows down the flow, often creating a reservoir, lake, or impoundment. Most dams have a section called a spillway or weir, over or through, which water flows, either intermittently or continuously. Dams commonly come in two types, embankment (the most common) and concrete (gravity, buttress, and arch), as well as sizes. They also serve a number of purposes and provide essential benefits, including drinking water, irrigation, hydropower, flood control, and recreation (RIEMA 2024).

Large or small, dams have a powerful presence that is frequently overlooked until a failure occurs. Dams fail in two ways, a controlled spillway release done to prevent full failure, or the partial or complete collapse of the dam itself. In each instance, an overwhelming amount of water, and potentially debris, is released. Dam failures are rare, but when they do occur, they can cause loss of life and immense damage to property, critical infrastructure, and the environment (RIEMA 2024).

Dams are classified as High hazard, Significant hazard, or Low hazard. The classification is not based on whether a dam is deemed safe or unsafe, but rather the impact/magnitude of a potential failure.

- A **High Hazard** dam is one whose failure or mis-operation will result in a probable loss of human life.
- A **Significant Hazard** dam is one whose failure or mis-operation results in no probable loss of human life but may cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public's health, safety, or welfare.
- A **Low Hazard** dam is one whose failure or mis-operation results in no probable loss of human life and low economic losses.

Dams are periodically inspected and given condition ratings. Each dam's hazard classification determines the frequency of inspection. The higher the classification, the more frequently the inspection is conducted. As part of each Rhode Island Department of Environmental Management (RIDEM) inspection, the major components of the dam are subjectively rated as satisfactory, fair, or poor. The major components being inspected are the embankment, the spillway, and the low-level outlet.

The following outlines criteria for a given condition rating.

- **Satisfactory**: No existing or potential dam safety deficiencies are recognized.
- **Fair**: No existing or potential dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in dam safety deficiency.
- **Poor**: A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. Poor may also be used when uncertainties exist as to critical analysis

parameters which identify a potential dam safety deficient. Further investigations and studies are necessary. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

- **Not rated**: The dam has not been inspected or has been inspected but, for unknown reasons, has not been rated.

The remainder of this hazard profile will focus on the dams where a dam failure may impact human life and critical facilities in Foster.

3.3.14.2 History

There has never been a dam failure in Foster. The most recent dam failure in Rhode Island occurred in 2010 in Hopkinton (34 miles south of Foster).

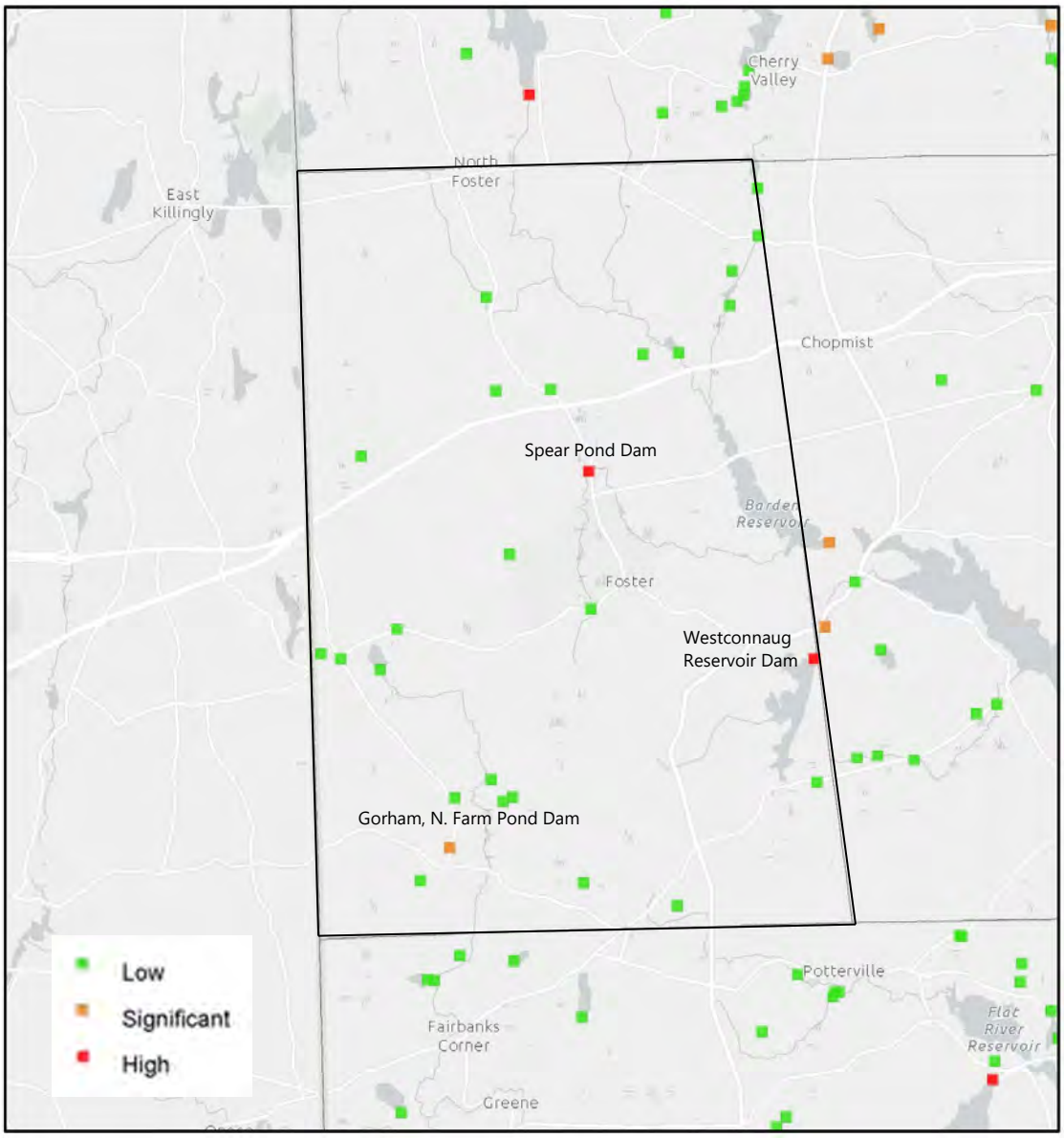
On March 30, 2010, as record rainfall pounded Rhode Island, the Blue Pond Dam collapsed, releasing 179 million gallons of water that raced through nearby woods before tearing into a road and washing out a bridge over Canonchet Brook (Providence Journal 2019).

The water surged through Hopkinton and on into Richmond, where it swamped another two bridges, leaving one impassable, and may have contributed to flooding further south around Chapman Pond in Westerly (Providence Journal 2019).

3.3.14.3 Location

As of 2024, there are a total of 26 dams in the Town of Foster (RIEMA 2024). Two are classified as High hazard, one is classified as Significant hazard, and 23 are classified as Low hazard.

Figure 3-36 shows the locations of dams, along with their hazard potential category, in and surrounding Foster (Rhode Island only).



Source: RIDEM- Dam Safety (ArcGIS Online)

Figure 3-36 Location of Dams In and Surrounding Foster

Table 3-32 provides specifications on the two high hazard and one significant hazard dams in Foster.

Table 3-32 Specifications on High and Significant Hazard Dams in Foster

Dam Name	Hazard Level	Height/Capacity	Purpose	Owner	Last Condition Assessment and Rating	Notes
Westconnaug Reservoir	High	Height: 17 ft Length: 322 ft Max. Storage: 1,620 acre-ft Drainage Area: 4 sq miles Max Discharge: 220 cubic ft/sec	Water Supply	Providence Water Supply Board/City of Providence	10/03/2017 Not Rated Vegetation prohibited inspection. Action was taken to address the unsafe conditions.	General: The downstream channel is approximately 16 feet wide at the base of the dam and spreads out into a ponded swampy area about 100 feet further downstream. The watershed encompasses an area of 3.87 square miles. A few houses can be found along the major roads passing through the watershed area. At spillway elevation, Westconnaug Reservoir has a storage capacity of 1,390 acre-feet; this increases to 1,952 acre-feet at the top of the dam. (USACE 1981)
Spear Pond	High	Height: 11 ft Length: 100 ft Max. Storage: 6 acre-ft Drainage Area: 2 sq miles	Fire Protection, Stock, Or Small Fish Pond	Private	06/27/2016 Poor Vegetation prohibited inspection, low level outlet inoperable, failed downstream wall, eroded spillway.	Downstream Description: Downstream of the dam, Hemlock Brook flows through a rectangular channel defined by stone masonry sidewalls. About 70 feet downstream of the dam, a wooden footbridge crosses the brook, and about 200 feet downstream of the dam, Foster Center Road (Route 94) crosses the brook on a concrete span bridge. Downstream of Poster Center Road, Paine Brook flows into Hemlock Brook, and the channel widens through a wetland area. Hemlock Brook then flows under bridges at Anthony Road and Central Pike about 0.4 and 0.6 miles downstream of the dam, respectively. The brook continues through a wetland area and crosses under a bridge at Mill Road about 1.4 miles downstream of the dam. Downstream of Mill Road, the Hemlock Brook channel is generally steep and narrow. The brook flows under a bridge at King Road about 2.3 miles downstream of the dam, and then discharges to the Barden Reservoir about 3.3 miles downstream of the dam. Hemlock Road crosses over Barden Reservoir just downstream of the Hemlock Brook confluence. Downstream Dams: About 4 miles downstream of Spear Pond Dam is the Barden Reservoir Dam. The Barden Reservoir Dam is an approximately 610-foot long, 31-foot-high gravity masonry and earthen embankment dam that is used for water supply. The Barden Reservoir Dam is beyond the anticipated impact flood area due to a

Dam Name	Hazard Level	Height/Capacity	Purpose	Owner	Last Condition Assessment and Rating	Notes
						failure of the Spear Pond Dam. Downstream Bridges: Hemlock Brook crosses five roadways between Spear Pond Dam and the Barden Reservoir. The first crossing is about 200 feet downstream of the dam, where Foster Center Road crosses the brook on a concrete span bridge. The second crossing is about 0.4 miles downstream of the dam, where Anthony Road crosses the brook on concrete and steel bridge. The Anthony Road bridge is closed to vehicle traffic, and is used only by pedestrians. The third crossing is about 0.6 miles downstream of the dam, where Central Pike crosses the brook on a concrete span bridge. The fourth crossing is about 1.4 miles downstream of the dam, where Mill Road crosses the brook on a small bridge. The fifth crossing is about 2.3 miles downstream of the dam, where King Road crosses the brook on a small bridge. Just downstream of the confluence of Hemlock Brook, Hemlock Road crosses over the Barden Reservoir. Failure of Spear Pond Dam would likely result in the overtopping of the bridge at Foster Center Road and may result in the overtopping of the bridge at Anthony Road downstream of the dam. The bridges at Central Pike, Mill Road, and King Road are not expected to be overtopped as a result of a dam failure at Spear Pond Dam. Failure of the dam is not expected to have a significant impact on Hemlock Road where it crosses the Barden Reservoir. Downstream Development: One private residence is located on the dam to the right of the spillway. Downstream of the dam, several private residences are located along Hemlock Brook in the overbank area near Foster Center Road, Anthony Road, and Central Pike. Several homes and two automobile scrap yards are located along the overbank area near Mill Road and King Road. These structures appear to be above the dam break flood hazard area. Downstream of King Road, the brook flows through an uninhabited, wooded area before discharging to Barden Reservoir. (RIDEM 2007a)

Dam Name	Hazard Level	Height/Capacity	Purpose	Owner	Last Condition Assessment and Rating	Notes
Gorham, N. Farm Pond	Significant	Height: 16 ft Length: 560 ft Max. Storage: 150 acre-ft Drainage Area: 1 sq mile Max Discharge: 217 cubic ft/sec	Fire Protection, Stock, Or Small Fish Pond	Foster Land Trust	05/04/2018 Poor Overgrowth in spillway. Low level outlet has not been connected in 40 years.	Downstream Description: Gorham North Farm Pond Dam is located on a tributary to the Moosup River in the Town of Foster. There is no residential development in the nearby downstream area. Downstream Dams: There are no downstream dams expected to be affected by a dam failure at Gorham North Farm Pond Dam. Downstream Bridges: The downstream channel flows beneath Cucumber Hill Road (immediately downstream of the Gorham North Farm Pond Dam) via a box culvert. The channel flows beneath Moosup Valley Road approximately 0.6 miles downstream of the dam. Cucumber Hill Road and Moosup Valley Road will likely be overtopped and damaged as a result of the hypothetical failure of Gorham North Farm Pond Dam. Downstream Development: The banks of the stream channel as well as the majority of the stream channel surroundings are primarily wooded. One house and a barn are located on the left overbank of the channel just upstream of Moosup Valley Road. There appears to be significant storage (for the flood wave) within the wooded area between Cucumber Hill Road and Moosup Valley Road and this home and barn are outside of the potential impact area. (RIDEM 2006a)

Source: RIDEM 2023, NID 2023, RIEMA 2024

The 2022 Annual Report to the Governor on the Activities of the Dam Safety Program (RIDEM 2023) provides information on the two HHPDs in Foster:

Dam number 163 (Westconnaug) in Foster

The dam was inspected in 2014, and the Department of Environmental Management (DEM) issued a Notice of Violation (NOV) to the City of Providence and the Providence Water Supply Board (PWSB) in November 2016 for unsafe conditions. In March 2022, the PWSB completed actions to resolve the unsafe issues.

Dam number 349 (Spear Pond) in Foster

The dam was inspected in 2016, and Department of Environmental Management (DEM) issued a Notice of Violation (NOV) to the owners in 2017 for the unsafe conditions. Because DEM was unable to confirm that the owners received the NOV, it was re-served in July 2018. The owners did not file an appeal of the NOV with DEM's Administrative Adjudication Division and have not complied with the NOV. No change in status occurred in 2022.

3.3.14.4 Extent

Flood events call into question the structural integrity of dams that would affect Foster. In addition to the threat of flooding downstream during a dam breach, the Town is also concerned about the dam gate systems. It is suspected that most of the antiquated dam gates may not open properly to let off water, thereby flooding the areas behind the dam.

All three dam hazard classifications are represented in Foster. Information on the extent of potential dam failure for dams that my impact critical facilities in Foster is below. Note: there are two low hazard dams that have an inundation area that may impact critical facilities. These two low hazard dams are included in the narrative below.

Westconnaug Reservoir Dam (High) (USACE 1981)

- Hazard Classification: The dam is classified as having a High hazard potential, because the failure discharge can cause damage due to high velocity, impact from debris, and flooding to 6 or 7 homes, 3 roads (State Road #94, Field Road, and Tunk Hill Road) and public utilities. The failure could also cause the potential loss of lives since the anticipated water depth at the homes may be 2 to 3 feet. Loss of the surface water supply will also cause an impact on the Providence Water Supply System.
- Dam Failure Analysis: The failure analysis covered a distance of 7,000 feet downstream. The dam breach would cause appreciable damage downstream of the dam and might result in the loss of lives. Several houses immediately downstream, in the vicinity of Field Road and Plainfield Pike, could be flooded to depths of 2 to 3 feet due to these flows, which could result in the loss of lives if adequate forewarning were not provided. Serious damage to the bridge on Field Road and three additional road crossings further downstream could also result.

Spear Pond Dam (High) (RIDEM 2007a)

- Potential Effects of Dam Failure: Results of the analysis indicate a peak flood depth near the toe of the dam of about 7 feet. The failure of the dam would likely result in the overtopping of Cucumber Hill Road and Moosup Valley Road. These roadways will likely be damaged. Extensive flooding of a residence above the Moosup River just upstream of Moosup Valley Road is unlikely. However, shallow flooding of this residence is possible, in part as a result of the hydraulic restriction presented by the bridge at Moosup Valley Road.
- Depending on the breach location, failure of the dam would likely result in destruction of the private

residence located on the right side of the dam. Failure of the dam would likely result in the overtopping and destruction of the bridge at Foster Center Road (Route 94) and may result in the overtopping of the bridge at Anthony Road. A peak flood depth of about 6 feet is anticipated near Anthony Road, which would likely result in shallow flooding of a portion of the properties of two private residences along the brook at Anthony Road. Although the dam failure flood wave is not anticipated to overtop the bridges at Central Street, Mill Road, and King Road, the flood wave may cause some damage to the relatively small bridges at Mill Road and King Road.

Gorham, N. Farm Pond Dam (Significant) (RIDEM 2006a)

- Potential Effects of Dam Failure: A potential dam failure of Gorham North Farm Pond Dam would likely result in no probable loss of human life, but may result in significant economic losses and disruption of state roadways. Cucumber Hill Road and Moosup Valley Road are likely to be overtopped and washed out. Shallow flooding is possible at the residence adjacent to the river on Moosup Valley Road.

Young's Pond Dam (Low) (RIDEM 2007b)

- Potential Effects of Dam Break: The hypothetical dam failure would likely overtop and wash out Willoughby Young's Rd. Hopkins Mill Pond Dam may also be overtopped and subsequently fail. The hypothetical dam failure would likely impact a residential building near the left bank of the downstream channel on the vicinity of Mount Hygeia Rd. This residential building may experience shallow flooding. Loss of life is not probable.

Gorham Farm Pond (Low) (RIDEM 2006b)

- Potential Effects of Dam Break: The failure of the Gorham Farm Pond Dam would likely result in shallow flooding in the Hemlock River Valley but would likely not result in the overtopping of and damage to North Road or Central Pike Road. The residence at Central Pike Road is likely above the flood wave and will not experience significant damage. Due to the limited storage volume of the dam, North Road and Swamp Meadow Covered Bridge are not expected to be affected by a dam failure at Gorham Farm Pond Dam.

Based on available reports and inundation mapping, it is not predicted that any dam failures of dams outside of Foster would have an impact to critical facilities in Foster.

Based on the lack of past dam failures and the criteria identified in Table 3-2, the extent of dam failure in Foster has been Negligible with minor injuries; however, if a High or Significant Hazard Dam in Foster were to fail, the extent of dam failure could be Significant with multiple deaths and severe injuries; medium shutdown of some critical infrastructure and facilities; 20% to 50% of residential and 10-25% of commercial structures are severely damaged; large impacts to local operations for long amounts of time .

3.3.14.5 Impact

Severe winter storms, flooding, and a hurricane could all bring enough rain and or snowfall to cause a dam failure. The age of dams also poses a risk to the structural integrity of dams. A failure of the antiquated gates could cause considerable loss of life, property, and economy.

3.3.14.6 Probability of Future Occurrence

According to the 2024 State of Rhode Island HMP:

"RIDEM 's Dam Safety Program conducts routine monitoring and inspection of dams within the state on the previously identified schedule, with priority placed on those dams which pose the greatest potential threat. However, to fully determine the probability of a future event, a full engineering inspection would need to be completed on each dam, something beyond the scope of this plan.

Dams undergoing repair and/or reconstruction are required to be designed to pass at least the 1%-annual-chance rainfall event with one foot of freeboard. The most critical and hazardous dams are required to meet a spillway design standard much higher than passing the runoff from a 1%-annual-chance rainfall event. Although not all the dams have been shown to withstand the 1%-annual-chance rainfall event, most of the dams meet this standard due to original design requirements or recent spillway upgrades."

The potential for dam failure reduces when the dam is properly taken care of and receives a "Satisfactory" condition rating.

Based on most recent condition assessments and the criteria identified in Table 3-3, it is Possible that Foster will experience a dam failure event in the next five years; there is a between 1-49.9% annual probability of occurring.

3.3.14.7 Future Conditions Including Climate Change

The 2024 State of Rhode Island HMP states:

A potential outcome of changing climate in Rhode Island is an increase in extreme precipitation events which may lead to more severe floods and a greater risk of dam failure. Additional projected greater periods of drought conditions and high heat may result in ground cracking, a reduction of soil strength, erosion, and subsidence in earthen dams (RIEMA 2024).

The 2018 National Climate Assessment report indicates that much of the water infrastructure in the northeast portion of the United States, including dams, is nearing the end of its planned life expectancy. As indicated in the report:

- "Aging and deteriorating dams and levees also represent an increasing hazard when exposed to extreme or, in some cases, even moderate rainfall. Several recent heavy rainfall events have led to dam, levee, or critical infrastructure failures, including the Oroville emergency spillway in California in 2017, Missouri River levees in 2017, 50 dams in South Carolina in October 2015 and 25 more dams in the state in October 2016, and New Orleans levees in 2005 and 2015. The national exposure to this risk has not yet been fully assessed."

At present, there is no comprehensive assessment of the climate-related vulnerability and risks to existing dams. Additionally, there are no common design standards concerning the repair or modification of existing dams nor for the designed and construction of new dams operated in the face of changing climate risk (RIEMA 2024).

The NOAA NCEI State Climate Summary 2022 for Rhode Island suggests that the number of extreme precipitation events are projected to increase for Rhode Island. These extreme events will likely place increased stress on dams within the State (RIEMA 2024).

3.4 Summary of Vulnerability

This section outlines the risk and vulnerability processes from various hazard impacts in determining potential losses for the Town.

This section addresses the remaining portion of Element B and a portion of Element G of the Local Mitigation Plans regulation checklist.

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT B. Risk Assessment
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii)) B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards? B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?
Source: FEMA 2022 (Local)

Regulation Checklist- 44 CFR § 201.6 Local Mitigation Plans
ELEMENT G. High Hazard Potential Dams (HHPD) (Optional)
HHPD2. Did the plan address HHPDs in the risk assessment? HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?
Source: FEMA 2022 (Local)

3.4.1 Overview

A vulnerability analysis estimates the exposure extent that may result from a hazard event, within a given area and with a given intensity. This analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures. This then allows the communities to focus their efforts and attention on areas with the greatest risk of damage.

Table 3-33 shows the overview of the Town of Foster's infrastructure hazard vulnerability, including the level of concern the HMPC assigned to each hazard.

Table 3-33 Vulnerability Overview

Hazard	Area's Hazard Vulnerability			
	Percent of Geographic Area	Percent of Population	Percent of Critical Facilities and Utilities	Level of Concern
High Wind	100	100	100	High
Nor'easter	100	100	100	High
Hurricane (Tropical Cyclone)	5	<1	<1	High
Snow Storm	100	100	100	High
Ice Storm	100	100	100	High

Table 3-33 Vulnerability Overview

Hazard	Area's Hazard Vulnerability			
	Percent of Geographic Area	Percent of Population	Percent of Critical Facilities and Utilities	Level of Concern
Drought	100	100	100	Medium
Brushfire	100	100	100	Medium
Extreme Temperatures	100	100	100	Medium
Lightning/ Thunderstorm	100	100	100	Medium
Hail	100	100	100	Low
Tornado	100	100	100	Low
Earthquake	100	100	100	Low
Flooding	10.5	1	2	Medium/High
Dam Failure	10	<1	9	Low

3.4.2 Population and Residential Buildings

Current population data for the Town of Foster was obtained from the 2020 US Census. The 2020 US Census reports that Foster's population is 4,469 individuals and there are a total of 1,836 housing units in the Town.

Estimated replacement values for residential building structures were obtained from the 2022 American Community Survey (US Census), which estimated the median home value per structure was $375,200. However, US Census replacement values are generally understated.

The United States Department of Housing and Urban Development (HUD) completed a new study in 2022 for Tribal communities throughout the United States and estimates an average 3-bedroom residential structure in Narragansett, RI (43 miles SE of Foster) has a replacement value of $467,423 (HUD 2022). The more conservative HUD approximation for replacement value was used for this analysis.

Table 3-34 Estimated Population and Residential Building Inventory

Population	Residential Buildings	
2020 Census	Total Housing Units (2020 Census data)	Total Value of Buildings*
4,469	1,836	US Census: $ 688,867,200 HUD: **$ 858,188,628** (used for analysis)

Sources: US Census 2023- Foster town, Providence County, Rhode Island population data, HUD 2022

3.4.3 Methodology

An analysis was conducted to assess the risks of each identified hazard. This analysis looked at the potential effects of each hazard on values of critical facilities at risk without considering the probability or level of

damage. The analysis also represents the number of people at risk from each hazard but does not estimate the number of potential injuries or deaths.

Fairweather Science used the critical facilities identified in the 2018 HMP as the foundation to complete this analysis. The HMPC provided information on newly constructed facilities and these critical facilities were then added to the inventory.

<table>
<tr><th>Hazard</th><th>Methodology</th></tr>
<tr><td>High Wind, Nor'easter, Snow Storm, Ice Storm, Drought, Brushfire, Extreme Temperatures, Lightning/Thunderstorms, Hail, Tornado, Earthquake</td><td>It is assumed that the entire Planning Area and all identified critical facilities are equally threatened by these hazards (100%).</td></tr>
<tr><td>Hurricane</td><td>For the 2018 HMP, Hazus was used to understand the potential risk from a large hurricane. Hazus is a FEMA software tool that contains models for estimating potential losses from earthquakes, floods, and hurricanes.

The results of the 2018 hurricane scenario were used for this HMP Update as there has been no changes in development or risk in Foster since 2018, according to the HMPC.

The Hazus results from the 2018 HMP are below:

In 1954, Hurricane Carol (peak gusts at 89 mph) tore through Southern New England, causing extensive damage throughout Rhode Island. If this same storm were to strike again today, it would cause nearly $2.5 million dollars in total economic losses (property damage and business interruption loss). Roughly 1 building is expected to be at least moderately damaged.

Table 3-35 1954 Hurricane Carol Hazus Loss Estimation
<table><tr><th>Damage</th><th>Loss Amount</th></tr><tr><td>Debris generated</td><td>18,080 tons</td></tr><tr><td>Buildings destroyed</td><td>0</td></tr><tr><td>Buildings at least moderately damaged</td><td>1</td></tr><tr><td>Displaced households</td><td>0</td></tr><tr><td>Essential Facility Damage (fire, police, schools)</td><td>Less than 1 day loss</td></tr><tr><td>Residential Property (capital stock)</td><td>$2.4 million</td></tr><tr><td>Business interruptions</td><td>$82,000</td></tr></table></td></tr>
<tr><td>Flooding</td><td>During the planning process for this HM&FMP Update, RIEMA requested for a Community Assistance Visit (CAV) in Foster, which is a major component of the National Flood Insurance Program's (NFIP's) Community Assistance Program (CAP). The CAV is a visit to a community by a FEMA staff member or staff of a State agency on behalf of FEMA that serves the dual purpose of providing technical assistance to the community and assuring that the community is adequately enforcing its floodplain management regulations.</td></tr>
</table>

Hazard	Methodology
	As part of this visit, the Town Planning Department populated an updated list of structures built in SFHAs (Zone A). This list was used to determine the structures threatened by flooding. Data from the recently updated (July 19, 2023) FIRMS maps was used to determine the percentage of geographic area that is susceptible to flooding. It was determined that SFHAs encompass 3,153 acres out of the total 33,216 acres in Foster (10.5%).
Dam Failure	RIDEM has a library of engineering reports for dams in Rhode Island. These reports contain information on the hazard potential assessment, estimated approximate flood impact area, and inundation maps, when available. The available inundation maps are digitized and are publicly available on ArcGIS online- these were used as the basis of estimating loss estimations in Foster for a potential dam failure. The inundation map for the Westconnaug Reservoir Dam is not digitized- the provided map in a 1981 dam inspection report was used to estimate losses (USACE 1981).

3.4.4 Data Limitations

The provided vulnerability estimates use the best data currently available, and the methodologies used result in a risk approximation. These estimates may be used to understand relative risk from hazards and potential losses. However, uncertainties are inevitable in any loss estimation. This is due in part to incomplete scientific knowledge or data concerning hazards and their effects on the built environment. As well as the use of approximations and simplifications, when necessary, for a comprehensive analysis.

It should be noted that the results from the quantitative vulnerability assessment are limited to the exposure of people, buildings, and critical facilities and infrastructure to the identified hazards. It was beyond the scope of this HM&FMP Update to develop a more detailed or comprehensive assessment of risk. A more comprehensive assessment may include loss of facility/system function, annualized losses, people injured or killed, shelter requirements, and/or economic losses. Such impacts may be addressed with future updates of this HM&FMP Update or other planning documents.

3.4.5 Critical Facilities Inventory

A critical facility is defined as a facility that provides essential products and services to the public. They assist in preserving quality of life and fulfill important public safety, emergency response, and disaster recovery functions.

While temporary street flooding is generally a nuisance, the HMPC is most concerned about the effects of strong winds on their built environment. Wind vulnerability to structures can be controlled in part by building and construction standards. Wind can also bring down trees, power, and communication lines, reducing access to the transportation network and leaving residents without power.

Foster has a few local roads that used to be connected via bridges but have since been left to become dead end roads. Some residents are concerned about first responders being able to quickly get to the homes during an emergency, especially if fallen trees are blocking the road. Emergency management officials have not expressed such concern but will be considering this issue when the plan is updated.

The critical facilities identified by the HMPC are in Table 3-36.

Table 3-36 Town of Foster Critical Facilities

	Facility	Location	Estimated Value	Facility Owner	Hazards		
					High Wind, Nor'easter, Snow Storm, Ice Storm, Drought, Brushfire, Extreme Temperatures, Lightning/Thunderstorms, Hail, Tornado, Earthquake	Flooding (A zone)	Dam Failure
Emergency Response	South Foster Fire Station/Shelter	0 Mt. Hygeia Road	$704,025	South Foster Fire Company	X		
	Moosup Valley Fire Station/Shelter	55 Moosup Valley Road	$527,494	Moosup Valley Fire Company	X		
	Foster Center Fire Station/Shelter	86 Foster Center Road	$708,886	Foster Center Fire Company	X		
	Police Station	182 Howard Hill Rd	$565,665	Town of Foster	X		
	Foster Town Hall	181 Howard Hill Rd.	$2,164,943	Town of Foster	X		
	DPW Garage	86 Foster Center Road	$810,743	Town of Foster	X		
	Paine School- Shelter	160 Foster Center Road	$12,420,725	Town of Foster	X	X	
	South Foster EMS	22 Mount Hygeia Rd	$450,723	South Foster EMS	X		
Roads	Town Roads	Paved: 46.52 miles	$165,821 per mile: $7,713,995	Town of Foster	X		X (0.34 mi)
		Unpaved: 29.15 miles	$7,290 per mile: $230,000	Town of Foster	X	X (washout)	
	State Roads	Paved: 36.03 miles	$165,821 per mile*: $5,974,531	State of Rhode Island	X		
	Private Roads	Paved: 3.22 miles	$165,821 per mile*: $533,944	Private	X		
		Total: 114.92 miles	**Total value of roads: $14,452,470**				
Bridges	Dolly Cole	N 41.8220467, W 71.7004932	$700,000*	State of Rhode Island	X		
	Ponaganset River	N 41.8211972, W 71.7056036	$700,000*	State of Rhode Island	X		X
	Barden Reservoir	N 41.8066646, W 71.6947896	$700,000*	State of Rhode Island	X		
	Spears	N 41.8114434, W 71.7344368	$700,000*	Town of Foster	X		

	Facility	Location	Estimated Value	Facility Owner	Hazards		
					High Wind, Nor'easter, Snow Storm, Ice Storm, Drought, Brushfire, Extreme Temperatures, Lightning/Thunderstorms, Hail, Tornado, Earthquake	Flooding (A zone)	Dam Failure
	Swamp Meadow Covered Bridge	N 41.7995333, W 71.7295310	$700,000*	Town of Foster	X		
	Moosup Valley	N 41.7361969, W 71.7510232	$700,000*	State of Rhode Island	X		
	Rams Tail Road	N 41.8188626, W 71.7050680	$700,000*	Town of Foster	X		X
	Hemlock Road- closed right now (weight limit)	N 41.7913240, W 71.6826231	$700,000*	Town of Foster	X		X
	Mill Road	N 41.7919079, W71.7093486	$700,000*	Town of Foster	X		
	Central Pike	N 41.8008985, W 71.7224446	$700,000*	Town of Foster	X		
	North Road	N 41.7896124, W 71.7332264	$700,000*	Town of Foster	X		
	Plain Woods Road	N 41.7397331, W 71.7889824	$700,000*	Town of Foster	X		
	Winsor Road	N 41.8503058, W 71.7455810	$700,000*	Town of Foster	X		
	Winsor Brook	N 41.836136, W 71.722671	$700,000*	Town of Foster	X		
	King Road	N 41.7906282, W 71.6986094	$700,000*	Town of Foster	X		
	Foster Center Rd	41.80418, -71.72781	$700,000	Town of Foster	X		X
	Anthony Rd	41.802044, -71.724549	$700,000	Town of Foster	X		X
Utility Facilities	Power Lines (x2)	Run through the Town	$200,000*	Unknown	X		
	Dry Hydrants	4 Briggs Road	$4,500	Caffrey, Lawrence A & Jennifer A	X		
		11 Briggs Road	$4,500	Dispigno, Peter & Dilibero, Mary	X		
		0 Moosup Valley Rd	$4,500	Town of Foster	X		
		41 Johnson Road	$4,500	Matthew and Bryna Haynes	X		
		146 Danielson Pike	$4,500	Giovanni, Maurice & M. Megan	X		
		Central Pike/Barden Reservoir	$4,500	Providence Water Supply Board/City Of Providence	X		

	Facility	Location	Estimated Value	Facility Owner	Hazards		
					High Wind, Nor'easter, Snow Storm, Ice Storm, Drought, Brushfire, Extreme Temperatures, Lightning/Thunderstorms, Hail, Tornado, Earthquake	Flooding (A zone)	Dam Failure
		96 Central Pike/Hemlock Brook	$4,500	Unknown	X		
		9 Mt. Hygeia Road	$4,500	Johnson Brothers Cranberries, LLC	X		
		7 Shippee School House Road	$4,500	Lowell, Michael S.	X		
		180 Hartford Pike	$4,500	Cucino, Richard	X		
		Hartford Pike/East Killingly CT	$4,500	Unknown	X		
		124 S. Killingly Road	$4,500	Tucci, Matthew L.	X		
		120 S. Killingly Road	$4,500	Mccullough, Ronald A & Helena	X		
	Cell Towers	Danielson Pike	$250,000	Property Owner: American Tower Asset Sub II LLC Co-Owner: ATTN: Land Management	X		
		Luther Rd	$250,000	Unknown	X		
		Danielson Pike at State Line	$250,000	Property Owner: Rubin, Rachel S., Trustee	X		
	Repeaters	Waterman Hill Rd - In Coventry, RI	$250,000	Unknown	X		
		Jerimoth Hill	$250,000	Unknown	X		
	Public wells (x3)	Throughout the Town	$45,000	Multiple owners	X		
Dams	Westconnaug Reservoir (High Hazard)	41.7721905, -71.6771914	$150,000	Providence Water Supply Board	X		
	Spear Pond Dam (High Hazard)	41.8038547, -71.7286555	$150,000	Knier, Frederick W. & Paul H.	X		
	Gorham, N. Farm Pond (Significant)	41.740034, -71.7601040	$150,000	Foster Land Trust	X		
	Low Hazard Potential Dams (x23)	Throughout the Town	$3,450,000	Various owners depending on dam	X		
Historic Resources	Foster Center Historic District	Foster Center, Howard Hill and South Killingly Roads	Unknown	Multiple property owners within the Historic District	X		

Facility	Location	Estimated Value	Facility Owner	Hazards		
				High Wind, Nor'easter, Snow Storm, Ice Storm, Drought, Brushfire, Extreme Temperatures, Lightning/Thunderstorms, Hail, Tornado, Earthquake	Flooding (A zone)	Dam Failure
Captain George Dorrance House	Jenks Road	$276,844	Venator, Deborah A, Trustee	X		
Solomon Drown House, "Mount Hygeia"	Mount Hygeia Road	$345,527	Moquin, Alicia & Matthew	X		
Mount Vernon Tavern	199 Plainfield Pike	$161,393	Mt. Vernon Chapel	X		
Hopkins Mills Historic District	Old Danielson Pike	Unknown	Multiple property owners within the Historic District	X		
Clayville Historic District	Bounded by Cole Avenue and Victory Highway in Foster, and Cole Avenue, Field Hill Road, Pleasant Lane and Victory Highway in Scituate	Unknown	Multiple property owners within the Historic District	X		
Moosup Valley Historic District	Barb's Hill, Cucumber Hill, Harrington, Johnson, Moosup Valley, Plain Woods and Potter Roads	Unknown	Multiple property owners within the Historic District	X		
Breezy Hill (archeological) Site, (RI-957)	Danielson Pike	Unknown	Unknown	X		
Deacon Daniel Hopkins House	Balcom Road and Old Central Pike	$531,833	Rao, Nidamboor Vasanth & Anna	X		
Burgess Farm, Nelson Aldrich Birthplace	Burgess Road	$299,400	Wooller, Ian P.M. & Co-Owner: Hunter, Jeffrey J.	X		
North Foster Baptist Church	81 East Killingly Road	$197,918	North Foster Baptist Church	X		
Phillips-Wright House	Foster Center Road	$300,000*	Unknown	X		
Paine Farm	22 Paine Road	$231,808	Ross, Ernest L. & Virginia	X		
Whidden-Fuller Farm	Plainfield Pike	$250,000*	Unknown	X		

	Facility	Location	Estimated Value	Facility Owner	Hazards		
					High Wind, Nor'easter, Snow Storm, Ice Storm, Drought, Brushfire, Extreme Temperatures, Lightning/Thunderstorms, Hail, Tornado, Earthquake	Flooding (A zone)	Dam Failure
	East Killingly Road Historic District	East Killingly Road	Unknown	Multiple property owners within the Historic District This is not an NHRP recognized district	X		
	Howard Hill Historic District	Howard Hill Road	Unknown	Multiple property owners within the Historic District	X		
	Winsor Road Historic District	Windsor Road	Unknown	Multiple property owners within the historic district. This is not an NHRP recognized district	X		
	Nike Site	23 Theodore Foster Road	$452,859	Town of Foster	X		
Community/ Recreational Facilities	Borders Farm	31 North Road	$425,100	Borders Farm Preservation Inc	X		
	Cranston Fish and Game	19A Tucker Hollow Rd	$619,000	Cranston Fish & Game Assn	X		
	Dyer Woods Campground	114 Johnson Rd	$550,800	Legacy Land Preservation LLC	X		
	Foster Country Club	67 Johnson Rd	$1,839,100	Tykamac Enterprises, LLC	X		
	Foster Fairgrounds	181 Howard Hill Rd	$1,714,700	Town of Foster	X		
	Foster Town House Field	181 Howard Hill Rd	Included in Fairground value	Town of Foster	X		
	Ginny B Campground	7 Harrington Rd	$1,382,700	Colaluca Holdings, LLC	X		
	Green Acres Park	0 Moosup Valley Rd	$14,000	Town of Foster	X		
	Hemlock Village Retirement Home	110 Foster Center Rd	$1,802,746	Foster Senior Housing	X		
	Highland Rod and Gun Club	66A Plainfield Pike	$309,200	Highland Rod & Gun Club Inc	X		
	Jerimoth Hill	41.8495° N, 71.7787° W	$82,700	State Of RI - DEM	X		
	Pine Tree Gun Club	4 Balcom Rd	$328,600	The Pine Tree Gun Club	X		

Facility	Location	Estimated Value	Facility Owner	Hazards		
				High Wind, Nor'easter, Snow Storm, Ice Storm, Drought, Brushfire, Extreme Temperatures, Lightning/Thunderstorms, Hail, Tornado, Earthquake	Flooding (A zone)	Dam Failure
Shippee Sawmill Pond	41°49'55.26"N, 71°45'8.75"W	$108,400	State of Rhode Island (Plat 14 Lot 41) Shippee, Harold R. Jr. & Carol A. (Plat 17 Lot 1)	X		
Thornton Beagle Club	37 Walker Rd	$291,400	Thornton Beagle Club	X		
Vasa Park Campgrounds	10 Boswell Trail	$323,442	Little Rhody Vasa Park INC % Janice Johnson	X		
Woody Lowden Recreation Center	16 Howard Hill Rd	$258,600	Town of Foster	X		
Maurie Dunbar Acres	0 Cucumber Hill Road	$111,100	Foster Land Trust	X		

Total Estimated Value of Critical Facilities: **$58,479,634**

*Value unknown- conservative estimation was used

Figure 3-37 shows the location of Foster's identified critical facilities. Black dots show facilities, red shaded areas show historic districts, and the colored dots represent dams along with their hazard category.

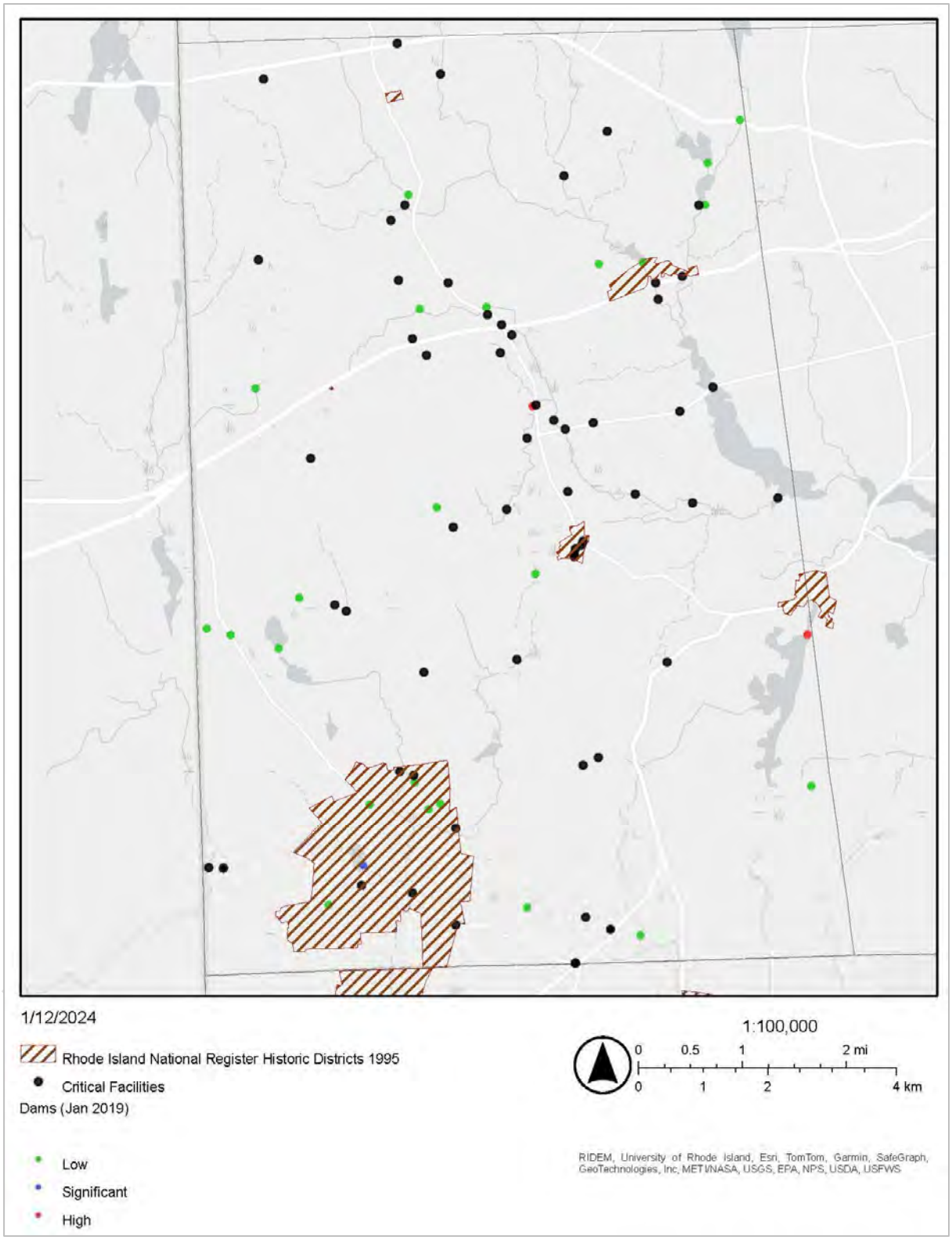


Figure 3-37 Map of Critical Facilities in the Town of Foster

3.4.6 Vulnerability Exposure Analysis

Table 3-37 summarizes the results of the vulnerability exposure analysis for loss estimations in the Town of Foster.

Table 3-37 Vulnerability Exposure Analysis

	Emergency Response	Roads	Bridges	Utilities	Dams	Historic Resources	Community/ Recreational Facilities	Residences
High Wind	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Nor'easter	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Hurricane	HAZUS: 1 building at least moderately damaged, value not listed							# of residences: 5 # of people: 12 Value: $2,400,000
Snow Storm	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Ice Storm	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Drought	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Brushfire	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628

	Emergency Response	Roads	Bridges	Utilities	Dams	Historic Resources	Community/ Recreational Facilities	Residences
Extreme Temperatures	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Lightning/ Thunderstorm	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Hail	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Tornado	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Earthquake	# of facilities: 8 Value: $15,962,076	114.92 miles Value: $14,452,470	15 bridges Value: $10,500,000	# of facilities: 23 Value: $1,553,500	26 dams Value: $3,900,000	# of facilities: 18 Value: $550,000	# of facilities: 17 Value: $10,161,588	# of residences: 1,836 # of people: 4,469 Value: $858,188,628
Flooding	# of facilities: 1 Value: $12,420,725	29.15 miles (unpaved) Value: $230,000	-	-	-	-	-	# of residences: 46 # of people: 112 Value: $21,501,458
Dam Failure	-	0.34 miles (paved) Value: $49,746	7 bridges Value: $4,900,000	-	-	-	-	# of residences: 10 # of people: 25 Value: $5,141,653

3.4.1 Land Use Patterns

Forests and farms help shape the identity of Foster. There are over 28,000 acres of forested areas in Foster (RIGIS Land Cover database). Providence Water Supply Board, Land Trust, and Audubon Society holdings support conservation and open space preservation.

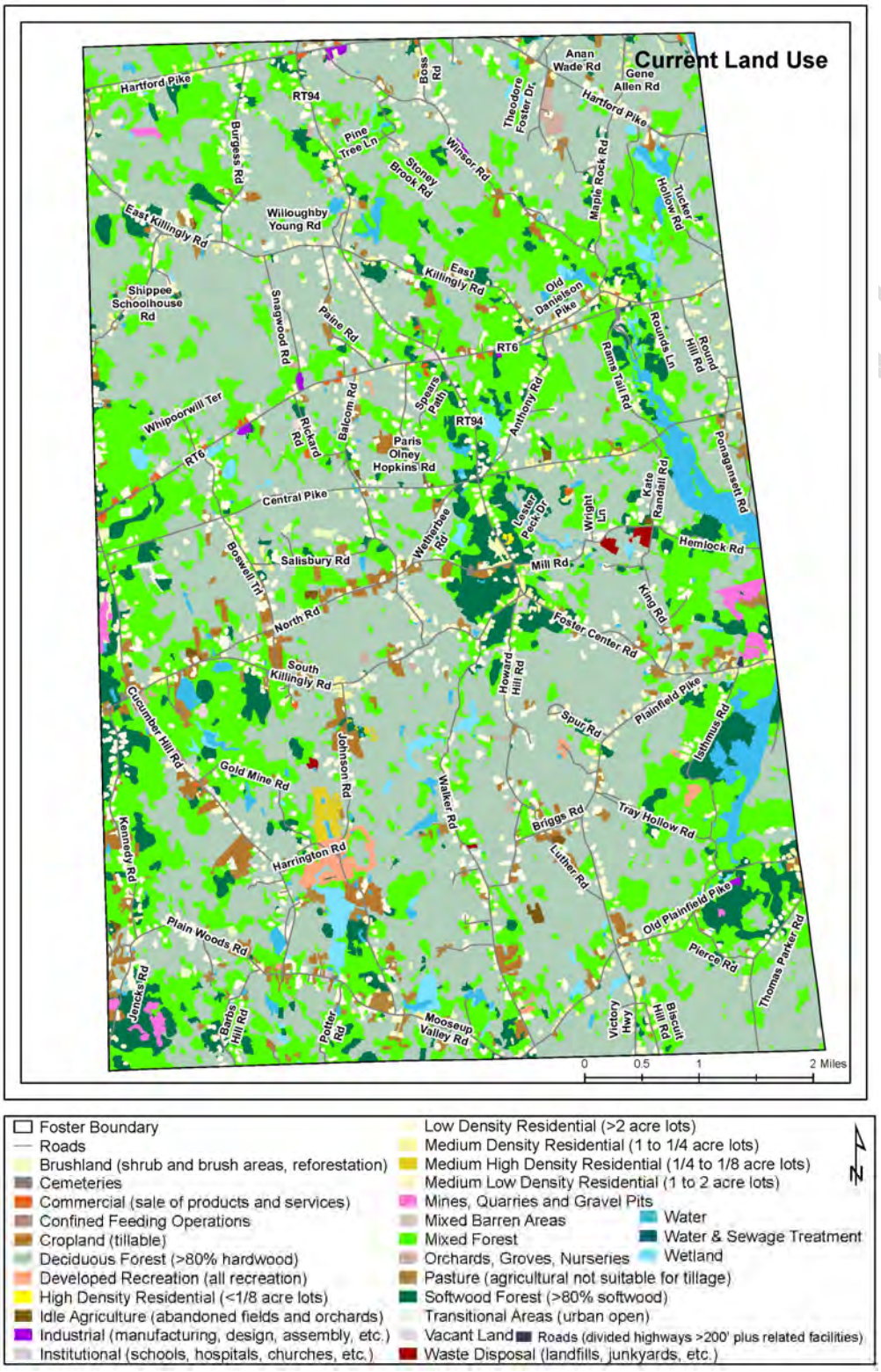
The total area of Foster is approximately 84% forested, 7% residential, 4% agriculture, 2% water, 0.25% commercial/industrial, and 2.75% of other uses (i.e., roads, gravel pits, etc.).

The residential and agriculture areas are located alongside the road corridors. The largest bodies of water (Westconnaug Reservoir and Barden Reservoir) are located on the eastern side of Foster. There are also smaller rivers and streams throughout town.

There is no centralized core or commercial district in Foster. Economic development has been limited by the rural character of the town and suitability of sites for wells and onsite wastewater treatment systems (OWTS).

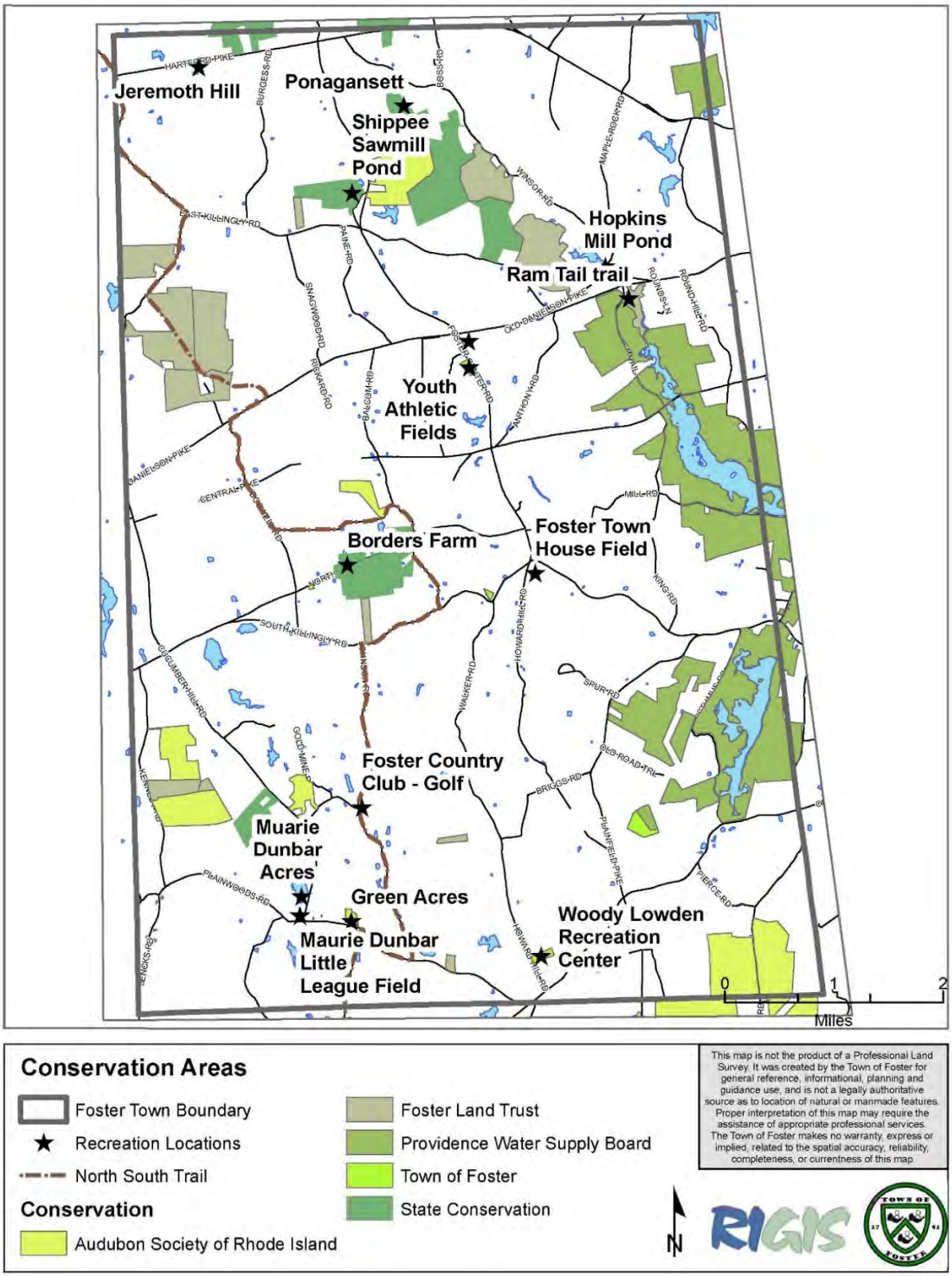
The Town's zoning laws help dictate future development while maintaining Foster's rural character. Continued enforcement of Rhode Island State building codes and new regulations as required will lessen potential damage caused by a natural hazard event. The codes adopted by the Town of Foster range from building codes and design standards, to zoning regulations.

Figure 3-38 shows the current land use in Foster in 2020 and Figure 3-39 shows conservation areas in Foster.



Source: 2022 Town of Foster Comprehensive Plan

Figure 3-38 Land Use in Foster



Source: 2022 Town of Foster Comprehensive Plan

Figure 3-39 Conservation Areas in Foster